UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990, 543-6061 or 543-2150
FAX (206) 543-3842; marks@blake.acs.washington.edu

1/15/89

Dr. Kwan Fai Cheung
Dept. of Electronic Engineering
City Polytechnic of Hong Kong
Tat Chee Avenue
Kowloon Tong, Kowloon
Hong Kong8

Dear Kwan,

I'm sending you two letters. The second one is more official.

First, I'll be sending a copy of Stark's spiral sampling paper under separate cover. I thought I sent it before but apparantly hadn't.

Secondly, we need to think about the Hong Kong paper a bit more. I think a good idea would be a homogeneous APNN with hidden neurons used to increase its capacity. Or do you think a tutorial would be better?

I'll look forward to your response to the second letter.

I have some more material to send you regarding Nanjing. I received the mats and will be sending them to you shortly. I think we can use pretty much the same paper as the recent one you sent to me. By the way, the English in that paper is the best you've ever written in a first draft.

Our new house is big. There's lots of work, but it will be fun.

My prayers are with you Brother! Sounds like your spiritual life is going fine.

Best regards,

Bob
(all round swell guy)

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1/15/89

Dr. Kwan Fai Cheung
Dept. of Electronic Engineering
City Polytechnic of Hong Kong
Tat Chee Avenue
Kowloon Tong, Kowloon
Hong Kong

Dear Kwan,

As you can see from item #1 of the attached memo, our College is interested in identifying Hong Kong Universities for an exchange agreement. Would Hong Kong Polytechnic be interested in such a relationship? If you think appropriate, please pass this by your administration and see if they think we should pursue a more formal dialog.

Best personal regards,

Robert J. Marks II
Professor

Enclosure

cc: Prof. Mark Damborg, Acting Chair

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING - FT-10

Mark, I am doing some work with Dr. Kwan Cheung, a former student there, at Hong Kong Polytechnic. If interested I will contact him concerning other. Bob Marks

DATE: January 5, 1989

TO: EE Faculty

FROM: Mark Damborg

SUBJECT: Various

1. The College is interested in identifying universities in Pacific Rim countries with which we have faculty engaged in joint research or "a continuing pipeline of students." Once identified, the College would consider an Exchange Agreement. The countries of interest are: Australia, Hong Kong, Indonesia, Malaya/Singapore, Philippines, Taiwan/China. Please let me know of any university that you think we should suggest.

2. Please contact Myrne Hovander if you would like a copy of the October 1988 US Army Research Office Broad Agency Announcement.

3. Available in Ola's office: LLNL Technical Abstracts for the period July-December 1987.

4. Announcements of these positions have been posted:

   a. Alfred Fitler Moore Professorship in Telecommunications Systems
      University of Pennsylvania
   b. Alfred Fitler Moore Professorship in Optronics
      University of Pennsylvania
   c. Faculty positions - Tufts University
   d. Dean, School and Graduate School of Business Administration
      The University of Washington
   e. Dean, College of Engineering, University of California,Riverside
   f. Vice President for Academic Affairs, Tennessee Tech

11 March 1991

to: BCS Materials
fr: Thomas Caudell
re: Sole source justification for U. of W.

Our 1991 IR&D project entitled "Adaptive Neural Systems" is studying the use of artificial neural networks in Boeing processes and products. We are developing the technology in the near term, testing it on real Boeing applications, and transfering it into the Boeing Divisions. We have limited resources to develop the technology in the far term. This is necessary for smooth technology transfer to occur over extended times.

We are in particular need of neural network research in signal processing and fuzzy logic. The University of Washington, Department of Electrical Engineering, is uniquely positioned to provide us with this research. Some of the worlds experts in neural network signal processing can be found in this department. In addition, they have a growing activity in fuzzy logic and fuzzy neural networks. Being situated close to the Boeing Bellevue Campus, we have high access to the professors and the graduate student population.

11 March 1991

to: BCS Materials
fr: Thomas Caudell
re: Sole source justification for U. of W.

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University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING, FT-10

November 6, 1990

To: Robert J. Marks

From: Thomas A. Seliga

Subject: Peer Review of Teaching

Attached please find a copy of the Peer Review of Teaching that was recently conducted and submitted by Professors Noges and Meditch on your behalf. In accordance with my previous statement on this subject, you are invited to submit a response to this review for my consideration and inclusion in your personnel file.

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING, FT-10

DATE: October 29, 1990

TO: Dr. Thomas A. Seliga
Chairman

FROM: Endrik Noges and James S. Meditch
Professors

SUBJECT: Teaching Peer Review of Professor Robert Marks

The 1990 Teaching Peer Review of Professor Marks was carried out by Professors Meditch and Noges on October 24, 1990. This review consisted of meeting with Professor Marks, examining course materials and reviewing student teaching records. Records show that Dr. Marks has been active in presenting materials in Advanced Optics and Communication Theory courses, as well as having developed two new graduate courses. The most recent of those was introduced in the Spring of 1989, EE 522, entitled "Shannon Sampling and Interpolation Theory". In most recent years, Dr. Marks' instructional activities have centered mostly around the graduate program. In addition to teaching graduate courses, he has been supervising four or five doctoral students and one to three masters students. In addition to the regular university activities he has also developed a video cassette course jointly with Professor Atlas for the Association for Media-based Continuing Education for Engineering, AMCEE. He has developed and given short courses in Artificial Neural Networks here at the University of Washington and at the University of Nantes in France.

In our discussions with Dr. Marks, it became apparent that he was not aware of the college requirement that every full professor obtain a student evaluation at least once a year. As a result, he has not had any formal evaluation since he became a full professor in 1987. However, his earlier 23 student evaluations all place him between the excellent and outstanding range. Subsequent informal evaluations which he conducted himself as well as the Eta Kappa Nu evaluation corroborate previous results in that the students hold him in high regard in course organization and presentation.

Based on the above results, it is our judgement that Dr. Marks should be ranked 1.5 (between outstanding and excellent) in the peer review classification.

UNIVERSITY OF WASHINGTON
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Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
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543-2150 (main office), 776-8995 (home), 543-3842 (FAX).
marks@blake.acs.washington.edu

8-1-90

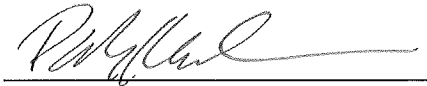
Dr. Dong Chul Park
Dept. of Electrical Engineering, FT-10
University of Washington
Seattle, WA 98195

I request your permission to use certain of the figures contained in your recent dissertation and in your dissertation defense. These figures will be used in a short course offered by Prof. Mohamed El-Sharkawi and me and will also be used in a book chapter on applications of neural networks to electric power engineering. Each use of a figure will be accompanied by a reference indicating the source of the figure. If you, as the copyright owner of these figures, agree to said nonexclusive world wide use of these figures, please indicate by signing in the space provided below.

Sincerely,

Robert J. Marks II
Professor

Agreed:



Dr. Dong Chul Park

Aug. 3, 1990

date

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING, FT-10

June 4, 1990

TO: EE Faculty

FROM: Thomas A. Seliga TAS

SUBJECT: College of Engineering Committees

At the Faculty Meeting of May 29, 1990 the following persons were elected to represent the Department and serve the College of Engineering:

Promotion and Tenure Committee - Robert J. Marks II
Research Policy Committee - Martin A. Afromowitz
Educational Policy Committee - Richard D. Christie

TAS:kr

OPTICAL SOCIETY *of* AMERICA

EXECUTIVE OFFICE
1816 JEFFERSON PLACE, N. W.
WASHINGTON, D. C. 20036
202—223-8130
TELEX 5106003965
FAX (202) 223-1096

May 21, 1990

Dr. Robert J. Marks
University of Washington
Department of Electrical Engineering
MS FT-10
Seattle, Washington 98195

Dear Dr. Marks:

On behalf of the OSA Board of Editors I am pleased to welcome you to the position of topical editor of JOSA A. Your term of topical editorship shall commence immediately and shall run through December 31, 1992, which is a standard appointment period for OSA journal editors.

We appreciate your willingness to serve one of the Society's journals and specifically to assist the editor, Harry Barrett, with manuscripts pertaining to optical, signal processing and image science. We hope you will find the experience challenging and worthwhile.

Sincerely,

Paul L. Kelley
Chair, OSA Board of Editors

cc: H. Barrett
B. Acre
J. Fleming
A. Kailo
J. Sprehe

m0136a.jlf

North Carolina State University

Center for Communications
and Signal Processing
AN INDUSTRY / UNIVERSITY / GOVERNMENT COOPERATIVE RESEARCH CENTER

Box 7914
Raleigh, NC 27695-7914
(919) 737-3015

PARTICIPATING ORGANIZATIONS:
National Science Foundation
AT & T
BellSouth Enterprises, Inc.
Eastman Kodak Co.
General Electric Co.
International Business Machines
Northern Telecom/BNR

April 19, 1990

Dr. Robert J. Marks
Dept. of Electrical Engineering MS FT-10
University of Washington
Seattle, WA 98195

Dear Bob,

Well, it's all decided. I have accepted the position in Winston-Salem, beginning this fall. I will hold a joint position as Professor of Radiology in the Medical School, and Professor of Computer Science at Wake Forest University. I will be primarily involved in biomedical image processing and analysis; initially concentrating on improving the quality of Magnetic Resonance Images.

Since my son, Graham, is a senior in high school this coming year, I will not be actually moving to Winston-Salem until the summer of 1991. Instead, starting in August, I will commute and spend Tuesday-Thursday in Winston-Salem, and Friday-Monday in Raleigh. It will be kind of hard, but it's not so bad, it's only a two hour drive.

Please continue to reach me at NCSU, and at my current Email address, wes@ecelet.ncsu.edu, until August. I will let you know my new address at that time.

Bob, your recommendation was instrumental in my getting this position, and I am most grateful for your support. For this, as well as for the

many other times we have collaborated, I am very glad to be your friend.

Sincerely

Wesley E. Snyder

Department of Electrical and Computer Engineering
West Virginia University

October 20, 1989

Dr. Robert J. Marks, II
Department of Electrical Engineering
University of Washington
Mail Stop FT-10
Seattle, WA 98195

Dear ~~Marks:~~ Bob

We are currently searching for a chairperson for our department. The department currently offers B.S.E.E., M.S.E.E., Ph.D., and a new degree B.S.Cp.E (first graduates in May 1989). We have approximately 350 undergraduates and 65 graduate students with about 20 full-time faculty. We are just moving into a new engineering research building this year and are looking forward to the new opportunities in research and teaching.

I am enclosing a copy of the position announcement and would be honored if you would apply! If not, please assist by nominating any good candidates.

Sincerely,

Roy S. Nutter
Professor

RSN:lf

RSN

Phone 304 293-6371 P.O. Box 6101 Morgantown, WV 26506-6101

West Virginia University

DEPARTMENT CHAIR, Electrical and Computer Engineering, West Virginia University

Nominations and applications for the position of Chairperson will be reviewed beginning December 15, 1989 and will continue until the position is filled. Candidates should have a Ph.D. in Electrical Engineering or a related discipline and must present credentials in research, teaching and on-going scholarly activities which qualify the individual for a tenured full professor position.

The chairperson must provide leadership and vision for the department and should communicate effectively with alumni, colleagues, other chairs and higher administration within the university. The chairperson is expected to promote research funding from all sources and to address the research and educational needs of the electrical and computer engineering industries.

The Department of Electrical and Computer Engineering has 20 faculty positions with research activities and laboratory facilities in the following areas: computers, controls, power systems and electronics, signal processing, microprocessors and engineering design. There are excellent computing facilities throughout the College of Engineering. A new Engineering Research Building and affiliations with the WVU based National Research Center for Coal and Energy offer considerable development opportunities. Growth in externally funded research is a department priority. The Department has approximately 400 undergraduates in electrical and computer engineering programs and 60 on-campus graduate students in the MS and Ph.D. programs.

West Virginia University is a land-grant institution. It is the only comprehensive, doctoral granting university in the state and enrolls 20,000 students in 175 degree programs through seven colleges and seven professional schools. Morgantown is a diverse, scenic community of approximately 45,000 with easy access to Pittsburgh, PA, and Washington, DC. Cultural and recreational opportunities are plentiful in the Morgantown area.

Applications should include a letter of interest, resume and the names of three references. The salary will be commensurate with qualifications and experience. Women and minorities are encouraged to apply. Send applications and nominations to:

Electrical and Computer Engineering Chair Search Committee
c/o Linda Fredrick
College of Engineering
West Virginia University
P. O. Box 6101
Morgantown, WV 26506-6101
Voice (304)293-7196
FAX (304)293-5024

IEEE THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

DIVISION X: SYSTEMS AND CONTROL

Anthony Ephremides, Ph.D., M.A.
DIRECTOR

PLEASE REPLY TO:
Electrical Engineering Department
University of Maryland
College Park, MD 20742 USA
(301) 454-6871
(301) 933-3445

December 20, 1989

Professor Robert J. Marks II
Department of Electrical Engineering
University of Washington
MS FT-10
Seattle, WA 98195

Dear Bob:

It is time to set in motion the mechanism for nominating candidates for succeeding me in the position of Director of Division X at the end of 1990. I am appointing a Nominating Committee consisting of the 1990 presidents of the Societies/Councils in our Division. Should you, as President, have an interest in being a candidate yourself, you should suggest to me a substitute member for the Committee who would represent your Society/Council.

I will ask you to submit to me nominations by the end of January. You should ascertain the willingness to serve of those whom you nominate. I will then circulate the slate of candidates to all members of the Committee with the request to rank them. The two candidates with the highest ranking will be the nominated individuals who will run for election to the post. Should there be ties, I will poll the Committee on how to resolve them. Details on the ranking procedure will be forthcoming after we complete the nomination procedure.

Thank you for your cooperation.

Truly yours,

A. Ephremides

AE/ef

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering, FT–10
Telephone: (206) 543–2150
FAX: (206) 543–3842

December 19, 1989

Professor Vijaya Kumar
Department of Electrical & Computer Engineering
Carnegie Mellon University
Pittsburgh, Pennsylvania 15213-3890

Dear Professor Kumar

As you know by now, we have not submitted a paper to your special issue of Optical Engineering. Although a paper was prepared, I decided that its quality was not of the standard we like to maintain in archival publications.

Thank you, however, for the invitation. I look forward to seeing the special issue.

Sincerely,

Robert J. Marks II
Professor

bcc: Les Atlas, Seho Oh, Jai Choi, James Taylor

Department of Electrical Engineering
University of Washington
Mail Stop: FT-10
Seattle, WA 98195
FAX: (206) 543-3842
TEL: (206) 543-6061
email: james@uw-isdl.ee.washington.edu

Professor Vijaya Kumar
Department of Electrical
and Computer Engineering
Carnegie Mellon University
Pittsburgh, PA 15213-3890

31 Aug, 1989

Professor Kumar,

This note and abstract is sent in response to your invitation to Dr. Robert Marks for submittal of a paper. I hope that the our topic will be of interest, and pertinent to the *Optical Engineering* special issue on Optical Pattern Recognition.

Following our telephone conversation Thursday, Aug 31, I am quite willing to review two papers intended for the special issue. Thank you, very much, for the opportunity to submit a paper to the Journal of *Optical Engineering*.

Sincerely,

James Taylor, MSEE

Title: Numerical Stability of Training Synthetic Discriminant Functions

Authors: James Taylor, Jai Choi, Seho Oh, Dr. Les Atlas, Dr. Robert Marks II

Abstract: Gram-Schmidt procedures have been suggested for the training of synthetic discriminant functions (SDF), composite matched filters (CMF), and layered classification artificial neural networks (LCANN's). Such training, however, becomes unstable as the sizes of the classifier and the data increases. We will demonstrate this instability and show how more computationally intensive techniques overcome these problems.

CALL FOR PAPERS

Special Issue of *Optical Engineering* on **Optical Pattern Recognition** (Sept. 1990)

Guest Editor:

B.V.K. Vijaya Kumar
Dept. of Electrical and Computer Engrg.
Carnegie Mellon University
Pittsburgh, PA 15213

Ofc. No. (412) 268-3026
FAX No. (412) 268-6345

The September 1990 special issue of *Optical Engineering* will be devoted to the topic of **Optical Pattern Recognition.** The field of Optical Pattern Recognition (OPR) has seen increased research activity in the past few years in such areas as construction of compact optical correlators, incorporating distortion-invariance into optical processors, improvement of spatial light modulators and use of partial-information filters. This special issue is intended to provide a forum for a discussion of advances in OPR. Topics to be covered include the following as well as other topics related to analyses, algorithms, architectures and applications of OPR systems.

- Optical correlator implementations.
- Design, analysis and evaluation of phase-only, binary phase-only and other partial-information filters for optical correlators.
- OPR systems (such as circular harmonic expansion-based filters, synthetic discriminant functions, lock and tumbler filters, etc.) capable of distortion-invariant pattern recognition.
- Pattern recognition methods employing optically-generated features such as geometric moments and Fourier coefficients.
- OPR techniques inspired by Artificial Intelligence (AI) methods and Artificial Neural Networks (ANNs).
- Advances in Spatial Light Modulators (SLMs) for OPR systems.
- Advances in Computer Generated Holography (CGH) for use with OPR systems.

Authors interested in submitting manuscripts for this special issue should submit four copies of their completed manuscripts to Professor Kumar by December 15, 1989.

INFORMATION FOR CONTRIBUTORS TO OPTICAL ENGINEERING

Optical Engineering publishes papers reporting on research and development of new optical technology or the practical application of known optical technology in new and inventive ways. Manuscripts should be submitted in English, and the presentation should be as succinct as comprehension will permit. Send manuscripts to B.V.K. Vijaya Kumar, Guest Editor, *Optical Engineering*, Department of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, PA 15213 (412/268-3026). Manuscripts that are commercial in nature will not be considered. Manuscripts are reviewed and refereed. Those accepted for publication are edited for conformance to this journal's style. Metric units should be used, unless to do so is not feasible or would result in a serious loss of clarity.

MANUSCRIPTS. One original and two photocopies of the manuscript and one original and two photocopies of each illustration are required.

The manuscript must contain the following:

Title page listing the title of the paper, the name of the author(s), and the affiliation and complete mailing address of each author. (Sponsorship information should be put in an acknowledgment paragraph at the end of the paper, not on the title page.)

Abstract, adequate as an index and summary, in one paragraph, 200 word maximum. The abstract may be used by abstracting journals; therefore, it should be (1) self-contained (no numerical references); (2) a summary, not an introduction; (3) substantive in nature, presenting concisely the objectives of the work reported, methodology used, results obtained, and the significance of these results.

Subject terms: Up to eight keywords should be typed following the abstract (see any paper in this issue for format).

Manuscripts must be typed double-spaced on one side of 8½"x11" white paper, with a 1¼" margin all around. Single-spaced manuscripts are not acceptable.

Equations must be typewritten, not handwritten. Every displayed equation must be numbered sequentially.

References (bibliographic) must be typed double-spaced and numbered consecutively in the order of their first appearance in the text. Only references to published literature are acceptable. (Private communications or unpublished reports may be cited in the acknowledgments section or as footnotes to text.) References should be formatted as follows:

Citing a book (or from a book), you would type:

J. Wormhoudt, J. A. Conant, and W. F. Herget, "High resolution infrared emission from gaseous sources," in Infrared Methods for Gaseous Measurements: Theory and Practice, J. Wormhoudt, ed., pp. 1-46, Marcel Dekker, Inc., New York (1985).

Sequence of information: Author(s) (or editor), chapter title (in quotes) if applicable, title of book (underscored), chapter no. or page nos., publisher, city of publication, and (in parentheses) year.

Citing a previously published journal paper, you would type:

D. Casasent, "Coherent optical pattern recognition: a review," Opt. Eng. 24(1), 26-32 (1985).

Sequence of information: Author(s), paper title (in quotes), journal in which published and vol. no. and (in parentheses) issue no., inclusive page nos. and (in parentheses) year.

Citing a paper published in a Proceedings, you would type:

S. K. Case and R. C. Enger, "Properties of optical elements with ultra-high spatial frequency surface corrugations," in Applications of Holography, L. Huff, ed., Proc SPIE 523, 269-276 (1985).

Sequence of information: Author(s), paper title (in quotes), volume title (underscored), volume editor, name or acronym of conference sponsor or publisher and vol. no., inclusive page nos. and (in parentheses) year.

Footnotes to text should be used only when they are necessary for presenting important documentary or explanatory material whose inclusion in the text would be distracting. A footnote should be typed on the page in which its reference appears.

Illustrations should be no larger than 8½"x11". They will generally be reduced to column width (3-9/16") or smaller. Allow for such reduction when preparing original drawings—make sure that letters and numbers are appropriately large and clear. Number each illustration and indicate "up" or "top." **Line drawings:** Send one glossy print or black ink drawing and two photocopies of each. **Photographs:** Send one glossy print and two photocopies of each. Do not send negatives, transparencies, or slides.

Figure captions must be typed double-spaced.

Tables should follow the text and references and must be typed with no vertical rules. Each table must have a title.

Biographies and photos of authors are printed at the end of each journal paper. A brief professional biographic paragraph (not resume) not to exceed 150 words and a glossy head and shoulders photograph of each author should accompany the manuscript.

SHORT COMMUNICATIONS are short papers containing new, significant material in rapidly advancing areas of optical engineering. Short communications are reviewed and published as quickly as possible. They must be complete in themselves (they are not a means of rapid communication, correspondence, or presentation of new material that will later form a full paper). They must follow the format prescribed above for full-length papers, including a brief abstract. Maximum length: four double-spaced typewritten pages (1000 to 1200 words), up to three figures or short tables. Send short communications manuscripts to the Editor, *Optical Engineering*, with a commitment to pay publication charges.

PUBLICATION CHARGES of **$90** per published page apply to papers and short communications published in *Optical Engineering*. We do not tie editorial acceptance of papers to payment of publication charges, but such payments are expected; if they cannot be met, publication may be delayed. Publication charges are financial contributions from authors' institutions to help defray the cost of publishing research results and should be regarded as an essential and proper part of their research budgets. **COLOR.** Authors or their sponsors must bear the cost of color, including separations and color printing.

OPTICAL ENGINEERING is published monthly on the first day of the month of issue. Please call Eric Pepper, Managing Editor, 206/676-3290 PT, if you have questions about preparing your manuscript.

THE RUDOLF KINGSLAKE MEDAL AND PRIZE is awarded annually for the most noteworthy original paper on the theoretical or experimental aspects of optical engineering to appear in *Optical Engineering*. All papers published in the journal are eligible. Honorarium: $1000.

Carnegie Mellon

Department of Electrical
and Computer Engineering
Carnegie Mellon University
Pittsburgh, PA 15213-3890
412-268-2454

20 June 1989

Professor Robert Marks
University of Washington
Interactive Systems Design Laboratory
Mail Stop FT-10
Seattle, WA 98195

Dear Bob:

I will be the guest editor for the September 1990 issue of *Optical Engineering* which will be devoted to the topic of **Optical Pattern Recognition.** I am writing this letter to invite you to submit a paper for this Special Issue. I am including a copy of the "call for papers" that will be published in a future issue of *Optical Engineering.* This should give you a good idea of the scope of this Special Issue. My intention is to include about ten papers in this area.

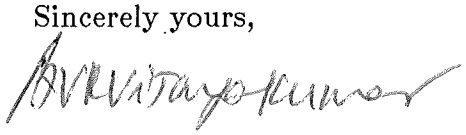
The deadline for the submission of manuscripts is 15 December 1989. This is because all final manuscripts must be in editor's office by 15 May 1990 and we need ample time for the review and revise cycle. Thus, while late submissions may still be published in *Optical Engineering*, they will not be a part of the special issue. If you are planning on submitting a manuscript, please complete the author information form and send it back to me in the postage-paid envelope along with a tentative title and brief abstract. Please do this as soon as possible, but no later than August 31, 1989.

The manuscripts must be prepared according to the requirements of *Optical Engineering* and I am enclosing a copy of the "Information for Contributors to Optical Engineering". In particular, I want to draw your attention to publication charges. It is difficult for me to, on one hand "invite" you to submit a paper, and then to inform you that you will be asked to pay page charges. Of course, the paper will be published if there is a problem in absorbing the page charges. *Optical Engineering* hopes to receive payments from at least 80% of the authors to help offset the cost of publication.

I am hoping that everyone contributing to this Special Issue will be able to review two other papers. However, even if you are not planning to submit a manuscript, I need your help in reviewing the papers. Thus, please volunteer to review at least one paper.

I hope that you will accept this invitation and am looking forward to receiving a quick response from you. I appreciate your patience in reading through this.

Sincerely yours,



B.V.K. Vijaya Kumar
Associate Professor of Electrical
and Computer Engineering

BVKVK:as

Enclosures (Author Information Form,
Call for Papers,
Information for Contributors to Optical Engineering, and
Postage-paid envelope)

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING - FT-10

DATE: September 13, 1989

TO: EE Faculty

FROM: Endrik Noges, Acting Chairman

SUBJECT: Awards Received by Professors Marks and Peden

Please join me in congratulating two of our colleagues, Professors Peden and Marks. Irene received two prestigeous awards during the summer. First, in July it was announced that Irene was awarded the IEEE Educational Activities Board Meritorious Achievement Award in Accreditation Activities Award. The citation for this award will read "For sustained leadership in support of the accreditation process in IEEE and ABET."

A month later, the IEEE Educational Activities Board further recognized Irene's contributions by awarding her the EAB Meritorious Service Citation.

This summer it was announced that Bob Marks was elected a Fellow of the Optical Society of America. We are proud of Bob for achieving such national recognition.

Again, we would like to congratulate both of you. National awards such as these reflect on the University of Washington and will increase the visibility of this Department on the national scene.

cc: J. Ray Bowen, Dean

University of Washington Correspondence

INTERDEPARTMENTAL

Interactive Systems Design Laboratory, Department of Electrical Engineering, FT-10
Telephone: (206)545-1315 (office), 543-6061 (secretary), 543-2150 (main office);
(206)543-3842 (FAX);les@isdl.ee.washington.edu

August 30, 1989

TO: Professor Endrik Noges

FROM: Professors Atlas and Marks L. Atlas/Marks ew

RE: College Biennial Report

The paragraph below is a description of our recent joint efforts within the Interactive Systems Design Laboratory.

Professors Les Atlas and Robert Marks have been making research progress by applying techniques of artificial neural systems to problems in power systems, speech processing, and signal classification. They have also been studying the implementations of these systems by using optical and digital technique. A patent was recently issued on an optical implementation of an artificial neural network developed by Atlas, Marks and research assistant Seho Oh.

A recent success in their Interactive Systems Design Laboratory has been the development of a new technique for the high-resolution time-frequency display of speech or sonar signals. This algorithm is inspired by the tremendous resolution ability of the human ear. Another success has developed out of a joint effort with the Energy Systems Laboratory of the Electrical Engineering Department. By making use of data from Puget Power and Light Company, an artificial neural network was trained to do power load forecasting with a very high accuracy.

Professors Mark's and Atlas' work in these areas has been funded by the National Science Foundation, the Washington Technology Center, and the Office of Naval Research.

LEA:ew

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990, 543-6061 or 543-2150
FAX: (206) 543-3842; marks@blake.acs.washington.edu

July 18, 1989

Dr. Selwyn E. Wright, Project Manager
Electrical Systems Division
Electric Power Research Institute
3412 Hillview Avenue
Post Office Box 10412
Palo Alto, CA 94303

Dear Selwyn:

I enjoyed meeting you at the Symposium in Seattle. Enclosed is the tutorial by Lippman that I mentioned plus a couple of our own on different topics.

I hope you find them useful.

Sincerely,

Robert J. Marks II ew

Robert J. Marks II
Professor

RJM:ew
Encs.

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Interactive Systems Design Laboratory
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FAX: (206) 543-3842; marks@blake.acs.washington.edu

July 18, 1989

Dr. Jarus W. Quinn, Executive Director
Optical Society of America
Executive Office
1816 Jefferson Place N. W.
Washington, D.C. 20036

Dear Dr. Quinn:

Needless to say, I am delighted to learn that I have been elected to the status of Fellow in the OSA.

I would like to receive the award at a local Puget Sound Section of the OSA meeting. Professor Martin Afromowitz, at the same above address, is currently Chair.

The name to appear on the certificate is Robert J. Marks II.

Sincerely,

Robert J. Marks II

Robert J. Marks II
Professor

RJM:ew

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON

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June 30, 1989

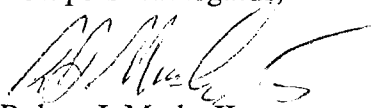
Professor Henry Stark
Illinois Institute of Technology
College of Engineering
Department of Electrical and Computer Engineering
IIT Center
Chicago, IL 60616

Dear Henry:

I was going through the stack of mail after two weeks of travel and came on your handwritten congratulations of my election as OSA Fellow. This was the first I had heard of it and needless to say, made my day! (...year even). The official notification was buried at the bottom.

Thanks for your support!

Best personal regards,



Robert J. Marks II
Professor
(and a jolly good fellow!)

RJM:ew

ILLINOIS INSTITUTE OF TECHNOLOGY
College of Engineering
Department of Electrical and Computer Engineering

June 23, 89

Dear Bob -

Congratulations on being elected a Fellow. What's next -- the National Academy?

I was glad to be of help.

Sincerely
Henry Stark

IIT Center Chicago, Illinois 60616 (312) 567-3400 Telex 190243/Illinois Tech

COLLEGE OF ENGINEERING

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061-0217

OFFICE OF THE DEAN (703) 231-6641

July 7, 1989

Dr. R. J. Marks, II
Interactive Systems Design Laboratory
University of Washington, FT-10
Seattle, WA 98195

Dear Dr. Marks:

As you may know, I will become the CAS Editor for the Circuits and Devices Magazine later this year. I am now in the planning stage and am writing to solicit your thoughts and ideas so that I can attempt to represent the CAS membership effectively. As well as writing to members of the CAS Adcom , I am contacting a number of our colleagues from universities, government and industry.

While I plan to continue providing timely information on conferences, society news, book reviews, personal notes on members, etc, I hope to solicit occasional articles on engineering education. In particular, I am concerned that we are all vigilant in seeing that our students receive adequate instruction in networks, electronics, and analog design. Please understand that these areas will NOT dominate. I simply want to ensure that analog design is not squeezed out of the curriculum. I'd like your thoughts on this.

But I am particularly concerned that the articles should be of general interest to CAS members. To this end, I would like you to review the attached list of articles which have appeared in the Magazine over the past couple of years. What do you think of these topics? What areas need additional stress? What features would you like to see included? In short, give me some frank thoughts and suggestions. Better still, you might even suggest some potential authors!

Sincerely yours,

Bill Stephenson
Associate Dean for Research and Graduate Studies
and Professor, Electrical Engineering

/bl

Circuits and Devices Magazine

January 1988

Special Issue on the Applications of Expert Systems to VLSI Technologies

Feature Article

May 1988

July 1988

November 1988

January 1989

March 1989

May 1989

March 1988

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

July 3, 1989

College of Engineering, FH–10
Office of the Dean

Professor Robert J. Marks II
Electrical Engineering, FT-10

Dear Robert:

Congratulations on your election as a Fellow of the Optical Society of America. This recognition is a testament to your skill as well as demonstrating a diversity of interests which enriches both areas of research.

.

Sincerely yours,

J. Ray Bowen
Dean

JRB:mln

cc: Endrik Noges

Telephone: (206) 543–0340

University of Washington Office of the President, AH-30

June 30, 1989

Professor Robert J. Marks II
Department of Electrical Engineering
FT-10

Dear Professor Marks:

Congratulations on your recent election as a Fellow of the Optical Society of America. I am pleased that your work has been recognized in this way.

Your achievement reflects well on the University of Washington, of course, so I send my thanks as well as my congratulations.

Sincerely yours,

William P. Gerberding
President

cc: Dr. Laurel L. Wilkening
Dean Gene L. Woodruff
Dean J. Ray Bowen
Professor Endrik Noges

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Office of the President

June 30, 1989

Dr. Jarus W. Quinn
Executive Director
Optical Society of America
1816 Jefferson Place, N.W.
Washington, D.C. 20036

Dear Dr. Quinn:

Thank you for informing me that Professor Robert J. Marks II has been elected as a Fellow of the Optical Society of America. It is a great honor for Professor Marks as well as the University of Washington.

We appreciate the recognition the Society confers upon its outstanding members.

Sincerely yours,

William P. Gerberding
President

cc: Dr. Laurel L. Wilkening
Professor Robert J. Marks II

301 Administration Building, AH-30 / Telephone: (206) 543-5010

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

April 18, 1989

Department of Electrical Engineering, FT–10
Telephone: (206) 543–2150

Prof. Yves Thomas, Directeur
IRESTE
ATLANPOLE, La Chantrerie CP 3003
44067 Nantes
FRANCE

Dear Yves,

Just a final confirmation of your visit. I will be expecting you at approximately 10:00 on Saturday, May 29. I'll be in my office in the Electrical Engineering Building, (#301).

Subject to your modifications, I have set up the balance of the morning as time for you to spend with your two students, allowing them to report to you as to their progress and show you the laboratory facilities in which they work. It may be a good idea also, at that time, to allow you to have some time with Professor Zick, to permit you to discuss the students' progress and his hopes for their future work (in finishing up).

I've tried to organize a lunch with Professors Atlas and Marks so that you can get to know each other informally. They will be interested in showing you their labs and discussing with you any mutual interest in possible arrangements for the next academic year (for 4 or 5 week periods at IRESTE). We will also find a block of the afternoon for you to spend with Steve Tanimoto in his laboratory.

You mentioned the need to discuss a more complete (or formal) arrangement with the College of Engineering in reference to the exchange program between our two institutions. My preliminary questions about this have yielded the fact that such a discussion will probably be best pursued with Greg Zick. He is the Associate Dean for computing and is cognizant of the college policy in such manners. The Associate Dean who legally deals with such matters will not be available on the 29th, but I think that Greg can provide you with the basic information and avenues to get things started....perhaps in such a form that they may be completed by mail.

We have invited the Tanimotos, the Zicks and the Damborgs to have dinner with us Saturday evening. We are actively interviewing candidates (now) to come in and take over the Chair next September. Mark Damborg is being considered as one of the potential internal candidates.

University of Washington Correspondence

INTERDEPARTMENTAL

Bob Marks
I am returning this to you.
MJD

4/17 orig. mailed 4/17/89 AIRMAIL

DATE: April 13, 1989

TO: Neil Hawkins

FROM: Mark J. Damborg

RE: Developing Exchange Programs in Asia

Enclosed is a memo to Bob Marks who passed it along to me concerning the development of exchange programs with Asian universities. This is a follow-up to the interest of developing exchange in Hong Kong that we had communicated with you previously. Professor Marks is interested in knowing whether there is anything he can do to help develop this exchange. Please contact him if there is. Thank you for your interest in developing these programs.

MJD:lab

Kwan,
Here's the status of this. If anyone there wants to talk to the coordinator here - they should call Hawkins. I'll keep you up on what's happening -
Bob -

香港城市理工學院
City Polytechnic of Hong Kong
九龍旺角彌敦道七零零號旺角中心第二座
電話：三・九八四三二一
Argyle Centre, Tower II
700, Nathan Road, Mongkok, Kowloon, Hong Kong
Cable: CITYPOLYHK Telex: 39369 CPOLY HX
FAX: 3-970275 Phone: 3-984321

Director: Dr David Johns

Your ref:

Our ref:

Mark, This is a continuation of our previous dialog
Let me know if I can help on this.
Bob

Kwan F. Cheung
Dept. Electronic Engineering
Kowloon Tong Campus
Tel: 3-7887778
Fax 3-7881167
e-mail: *hkucs!CPCCVX!EE-KFCHEUN*

March 20, 1989

Prof. Robert J. Marks II
Interactive System Design Laboratory
FT-10 University of Washington
Seattle, Wa 98195
U.S.A.

Dear Bob,

Here is a revision of the first sampling paper. Most of the correction made are in accordance with the comments from the referees.

Sorry, Bob, I still can't take out time to check out "thinned antenna array". The work load is just unreasonable. As I told you on the phone, I work as a lecturer but also a tutor in quiz sections as well as a proctor in lab sections. No TA! The Spring term I have a lecture on speech processing, two quiz sections and three 3-hour labs. All these make up 22 hours. You know, those who assign these assignments have only 3 hours work load per week. I haven't seen any research work or publications from them! They spend about 2 hours for lunch and 1 hour for tea breaks everyday.

I'll definitely go to the Chinese University if they offer me. The Chinese University is probably the only research institution in Hong Kong (the other three, Hong Kong University, Hong Kong Polytechnic and City Polytechnic of Hong Kong are all operating under British system, research activity is minimal yet lots of buracracy) and is the only institution operating in American style — credit system and four–year curriculum. Most of the faculties are American educated. The President, Charles K. Kao, is an *IEEE fellow* due to his contribution in the work of optical fiber. The work load is no more than three courses per year, and no quiz sections nor lab proctoring. By the way, they are very much interested in the exchange program you mentioned in one of your letter. Would you, if possible, establish a more formal dialogue?

Bob, thanks for the book "A Foreign Devil in China". I haven't had time to read it yet but I determine to starting reading it as soon as the work load is lightened a little bit. **BELIEVE IT OR NOT, MOST CHINESE STILL REFER CAUCACIANS AS DEVILS.**

Best regards,

Kwan Cheung

Kwan F. Cheung
Lecturer

Kwan F. Cheung
Dept. Electronic Engineering
Kowloon Tong Campus
Tel: 3-7887778
Fax 3-7881167
e-mail: *hkucs!CPCCVX!EE-KFCHEUN*

March 22, 1989

Prof. Robert J. Marks II
Interactive System Design Laboratory
FT-10 University of Washington
Seattle, Wa 98195
U.S.A.

Dear Bob,

Oops! I sent the revision of the first decimation paper two days ago and now I found some misspellings and typos. So I send another to you today.

Some business stuffs:

- The deadline of the submitting an abstract to IEE International Symposium in Hong Kong is approaching — April 7. Have you got the abstract of APNN ready yet?
- Daniel and I are finishing the proposal and will send one to you.
- Bob, I have a colleague who just got his Ph.D. in EE from the Chinese University of Hong Kong. His dissertation is on III-V compound and fabrication. He has lots of fabrication and processing experience and he is an expert on operating iron implanters. Well, I think it'll be nice if he can go to the states and further his research (research on VLSI in Hong Kong is very small scale. The government just aborted the funding for VLSI research in the Chinese University). I wonder if Dr. Peter Cheung would be interested to take him as a postdoc. Can you possibly find out (if convenient)?

Happy Easter, my friend and my colleagues in *ISDL*.

Best regards,

Kwan Cheung

Kwan F. Cheung
Lecturer

Kwan F. Cheung
Dept. Electronic Engineering
Kowloon Tong Campus
Tel: 3-7887778
Fax 3-7881167
e-mail: *hkucs!CPCCVX!EE-KFCHEUN*

March 10, 1989

Prof. Robert J. Marks II
Interactive System Design Laboratory
FT-10 University of Washington
Seattle, Wa 98195
U.S.A.
FAX:206-543-3842

Dear Bob,

I tried to call you this morning (around 3:30pm in Seattle) but you weren't in your office. What I got was a few seconds of Noel's voice. In order to save dollars, I hang up the phone right away. Hope she wouldn't mind.

I got your FAX Wednesday. Thanks for your comments and advices since Daniel and I are very primitive on NN. Both of us are concentrating on writing a proposal of *APNN* at the moment. We seem to have some idea, see what you think:

- From Trussell's fuzzy set's paper (*ASSP* 1986), we found *POCS* in corporation with fuzziness relaxation can be applied to restore a function, say $\vec{f}$, from its linearly distorted version: $\vec{g} = \underline{H}\vec{f} + \vec{\eta}$, where $\underline{H}$ is the distortion matrix and $\vec{\eta}$ is the noise vector. This linear distortion model is probably the most popular model used in modelling blurring with additive observation noise. We hope this result may be useful to enhance the *APNN*'s CAM capability.
- Another idea is multilayer *APNN*. We hope this enhancement can be utilized to tackle scale, rotational and shift variancies.
- A question come to my mind is about training. So far, my understanding of NN learning comes from the scenario of one pattern at a time. My question is a pattern may have a number of associated patterns. Say, stereovision. Two patterns constructed a entity. Or CAT, a number of projections make up a pattern. There are endless applications on this composite pattern learning. Have you heard any work done or currently under research on this problem?

People in Hong Kong are getting more and more interested on NN. After I deliver my NN seminar, I got an invitation to give a NN seminar at the *IEEE* Hong Kong Chapter in mid April. The Chinese University of Hong Kong called me up for an interview around two days after the seminar. May be you still remember that I contacted with them last spring and they request you to send a letter of reference about me. They have a position opened at the Department of Information Engineering and they consider me appropriate. They got the reference letters form you and Jim and now they need a reference letter from Prof. Atlas.

I FAX a letter to Prof. Atlas Monday to ask me if he could send the letter by FAX. Bob, would you ask Prof. Atlas if he has FAX the letter yet? The person to send the FAX is:

Dr. Yum, Tak-shing Department of Electronics FAX: (852)0-6957358 or (852)0-6954234

Bob, it may take another week on the correcting the first sampling decimation paper. Work load at *CPHK*

are catching up on me.

Best regards,

Kwan Cheung

Kwan F. Cheung
Lecturer

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 (office), 543-6061 (secretary),
543-2150 (main office), 776-8995 (home), 543-3842 (FAX).
marks@blake.acs.washington.edu

3-8-89

Marilee Dunn
Optoelectric Computing Systems Center
ECE Dept.
Campus Box 425
Boulder, Colorado 80309-0525
(303) 449-1055
FAX: 303-492-3674

Dear Marilee:

Here is my effort at a draft of a description of the effort in optical computing here. I'm not used to writing such things, so I expect there will have to be an iteration on this. I'd be happy to talk with you about it.

I work at home on Thursdays. See the letterhead for the phone number. Feel free to call me there.

I've also enclosed some other press and a copy of the ISDL logo: its Prof. Les Atlas amd me. Atlas is the other principal in the lab. If it's to be used, let me know & I can send you a better copy.

Sincerely,

Robert J. Marks II
Professor

THERE ARE SEVEN 8 PAGES IN THIS FAX TRANSMISSION.

Optical Computing at the University of Washington

Research in optical computing at the University of Washington is currently performed at the *Interactive Systems Design Laboratory* (ISDL) in the *Department of Electrical Engineering*. The ISDL is dedicated to approaching problems from the viewpoints of various technologies, including optical computing. Currently, three projects are underway in this area.

1. Increasing the Accuracy of Optical Processors: Analog optical processors have the innate capacity for processing large amounts of data in parallel yet, in their generic form, are relatively inaccurate. The ISDL is investigating techniques whereby the massive throughput capabilities of optical processors can be traded for higher accuracy. This is in contrast to use of quantization where the processor's dynamic range is sacrificed to the cause of higher accuracy (*e.g.* in digital optical processing).

Accuracy can be increased in an inaccurate processor by redundant computation.[1-2] Within the processor, redundancy can either be lumped or distributed. An example of lumped redundancy is the use of a small number of parallel channels to compute a coded form of the processor output so that error detection and correction can be performed in the spirit of conventional error correction codes. Neural networks are an example of distributed redundancy. Here, outputs resulting from perturbed inputs and/or systems can still be quite good.

Accuracy can also be increased by the wise use of nonlinearities. In correlation based optical associative memories, for example, a suitable strong nonlinearity in the correlation domain can guarantee the accuracy of the memory output[3]. In neural networks, forming a hidden layer of neurons that is nonlinearly related to the input neural states can increase both capacity and accuracy of the network[4].

2. Artificial Neural Networks: The ISDL has proposed an architecture for the *alternating projection neural network* (APNN) that iterates at light speed using passive optical feedback[5] and whose performance is unaffected by clock skew[6]. Nonlinear optical phenomena invariably involve interaction of light with materials. By placing nonlinearities in the feedback path of an optical processor, iteration is therefore slowed. The APNN, on the other hand, places the nonlinearities in the input rather than the feedback path. There is thus only a single interaction time delay rather than one delay per iteration. Prototyping the

processor is currently under way at the Optical Systems Laboratory at Texas Tech University.

3. Asynchronous Behavior of Optical Processors that Use Feedback: Predicted speed and accuracy in an optical processor is sometimes not achieved because the inherent asynchronous nature of such processors. The effect of processor clock skew needs to be understood to accurately ascertain the fundamental accuracy and speed limits of optical processors.

The ISDL is investigating the effects of clock skew in iterative optical processors and its affect on the processor's predicted accuracy[6-7]. We have shown that if the iterative operation is contractive, then the processor's steady state solution is unaffected by clock skew. If, on the other hand, the iteration contains hard nonlinearities such as a *sign* function, the clock skew can alter the steady state solution.

The ISDL projects in optical computing and artificial neural networks are currently funded by SDI, NSF and the Washington Technology Center.

1. K.F. Cheung, L.E. Atlas, J.A. Ritcey, C.A. Green and R.J. Marks II "A comparison of conventional and composite matched filters with error correction", **Applied Optics**, vol. 26, pp.4235-4239 (1987).

2. S. Oh, D.C. Park, R.J. Marks II and L.E. Atlas "Error detection and correction in multilevel algebraic optical processors", **Optical Engineering**, vol. 27, pp.289-294 (1988).

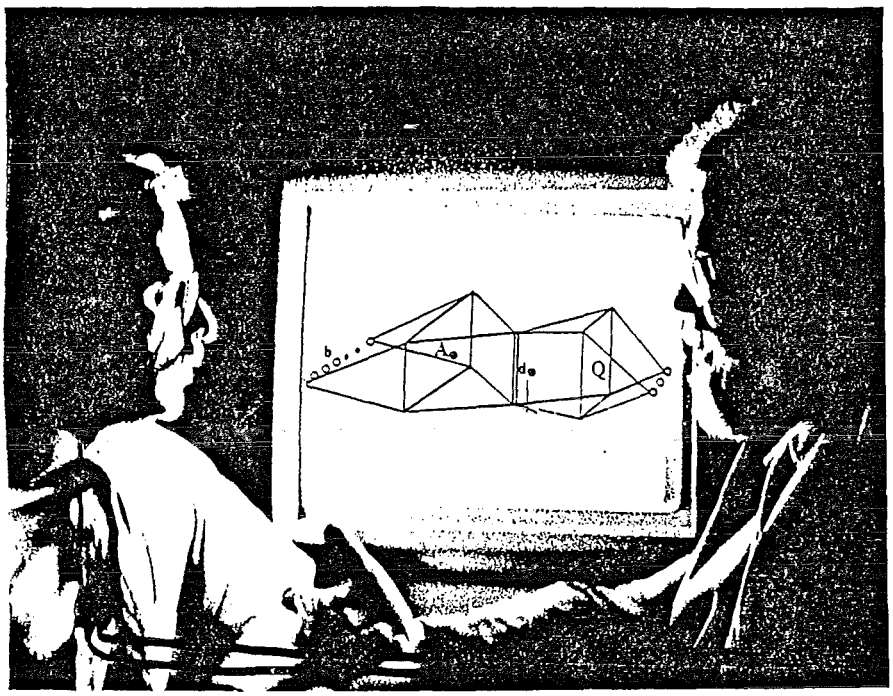
3. R.J. Marks II, L.E. Atlas, J.J. Choi, S. Oh, K.F. Cheung and D.C. Park "A performance analysis of associative memories with nonlinearities in the correlation domain", **Applied Optics**, vol. 27, pp.2900-2904 (1988).

4. R.J. Marks II, S. Oh, L.E. Atlas and J.A. Ritcey "Homogeneous and layered alternating projection neural networks", in **Real-Time Signal Processing for Industrial Applications**, edited by Bahram Javidi (SPIE Optical Engineering Press, Bellingham, WA. 1989), pp. 217-232.

5. R.J. Marks II, L.E. Atlas and K.F. Cheung "Optical processor architectures for alternating projection neural networks", **Optics Letters**, vol. 13, pp.533-535 (1988).

6. S. Oh, L.E. Atlas, R.J. Marks II and D.C. Park "Effects of clock skew in iterative neural network and optical feedback processors", **Proceedings of the IEEE International Conference on Neural Networks**, San Diego, July 24-27, 1988, vol.II, pp.429-436.

7. K.F. Cheung, L.E. Atlas and R.J. Marks II "Synchronous versus asynchronous behavior of Hopfield's content addressable memory", **Applied Optics**, vol. 26, pp.4808-4813 (1987).



ISDL LOGO

TECHNOLOGY SECTION 2
ELECTRONIC ENGINEERING TIMES

Optics And Neural Nets: Marriage Of Convenience

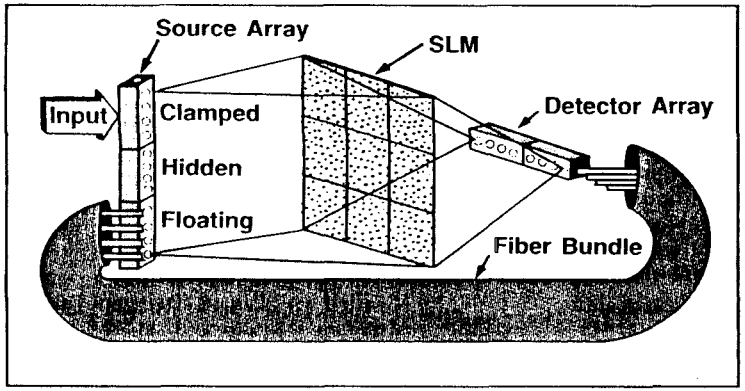
By R. Colin Johnson

LOS ANGELES — Last week's O-E/LASE '88 conference here saw the marriage of optical computing and neural nets. The couple was hitched at the Neural Network Models for Optical Computing portion of the Jan. 10 to 15 show, sponsored by the Society of Photometric and Instrumentation Engineers.

Both technologies were given a boost from academia and industry. A team of University of Washington researchers demonstrated how their neural architecture could learn in a single pass what it takes others hundreds of passes to do. And a Lockheed research group described how to control mirror perturbation in sensitive "listening" instruments.

Optical technology has for decades been a solution looking for problem. Though many simultaneous signals can be passed through any given node in an optical network without scrambling them, engineers have been hard pressed to capitalize on that characteristic.

The same problem exists in traditional computer technology. Tens, hundreds or even thousands of parallel processors have been fabricated on chips. The biggest trouble isn't with forging the hardware links for all these nodes but writing the software that harnesses them.



An optical alternating projection neural network accepts input to clamp some nodes, electronically generates a non-linear combination of the input at its hidden nodes and sends the result around an optical feedback loop through a spatial light modulator to its floating nodes.

Optical technologies promise even more parallel processing, but what to do with it? If traditional parallel processors can't take full advantage of their nodes, then what profit is in having orders of magnitude more nodes?

Enter neural networks, whose main purpose is to simulate the manner in which billions of analog processing nodes (nerve cells or neurons) are connected in the brain. There, each node simultaneously evaluates the state of thousands or even tens of thousands of incoming messages from its neighbors. After processing, the node then sends on a single message to thousands of other nodes.

Optical technology is perfect for the massive number of connections needed for neural nets, since light beams can pass though each other without interacting. And they can be passed through the light-sensitive media separating each neural plane, which is where the strength of connections between neurons is stored. The network is usually "programmed" by altering the light-sensitive material separating the planes.

Cal Tech researcher Demetri Psaltis has demonstrated several neural-net prototypes over the last few years, most recently at the IEEE conference on Neural Information Processing Systems—Natural and Synthetic, held in Denver. In some of these systems a so-called volume hologram separated the planes and could be altered in real time by the actual flow of light-encoded information among its nodes. Such systems, when perfected, should be able to learn the tasks assigned to them by example, rather than depend upon explicit programming.

Most of the current systems take many presentations of a data set to learn it, since they are based on neural network architectures such as the back-propagation network. One paper at O-E/LASE, though, described a neural architecture for optical technology that took but a single presentation for any particular set of data to be learned.

It also was claimed to be very fast, since its passive optical feedback used only guided or free-space propagation. Other systems rely on the intervention of slow optical devices, such as phase conjugators, or even slower electronics.

The University of Washington professor Robert Marks II gave the presentation on his collaborative work with professor Les Atlas and assistants Seho Oh and Kwan Cheung. The architecture he described is called an alternating projection neural network (APNN). In it, a collection of nodes is divided into those whose states are fixed and those whose states are termed "floating."

The fixed-state nodes are ei-

(Continued on Page 42)

TECHNOLOGY

Optics And Neural Nets: Marriage Of Convenience

(Continued from Page 41)

ther the input nodes or hidden nodes that are set according to a non-linear function of the input. While the hidden nodes have no effect on the learning of the network, they have a profound affect on the ability of the network to generalize.

Unlike traditional semiconductor memories that can recall only that with which they have been programmed, neural networks often possess the peculiar ability to generalize from their data set and come up with accurate responses to queries with which they have not been specifically trained.

For instance: Suppose an associative neural network is taught the cosine of each whole degree angle from 1 degree to 360 degrees. A traditional memory would not know how to respond to a request for 28½ degrees, but a neural network would generalize on its knowledge and come up with a reasonable answer. It turns out the number of specific data packets (vectors in this case) that can be stored in the APNN is on the order of the number of fixed nodes it contains.

The floating nodes have the most interesting behavior. They take on a value that is the sum of their inputs from the other nodes. The inputs to each node are multiplied by a value stored in a passive, planar spatial-light modulator of the kind developed at Stanford University (Palo Alto, Calif.) in the late 1970s. By providing feedback with fiber optics, a loop can be formed from the floating nodes into the spatial light modulator and then back into the floating nodes. This feedback loop converges on the "answer," which is then read by other devices.

Also at the conference, researcher Robert Smithson (of Lockheed Missile and Space Corp.) used neural networks to control mirror perturbation for sensitive listening instruments.

Lockheed allocated over $330,000 in 1987 toward developing an analog neural network, largely under Smithson's guidance (see Dec. 14, Page 51). The result was an LSI programmable-interconnection chip fabricated by Siliconix Inc. (Palo Alto, Calif.). It will be used by Lockheed to build feedback-style neural networks such as the energy-minimization nets originated by professor John Hopfield at Cal Tech. The chip is basically a crossbar switch with adjustable resistor values, called weights, at each connection. Smithson's segmented active mirror for solar observations demonstrated that neural networks can be used for real-time control. Since light beams are deformed by turbulence in the atmosphere, a neural network can be used to learn about those deformations and compensate by controlling the mirror. Smithson offered a tutorial on his techniques at the conference. His paper addressed the general area of applying neural network concepts to adaptive control.

In active mirror-control applications, Smithson's team has built both feed-forward and feedback prototypes. The feedback networks, of the Hopfield type, have also been developed for target classification. Such energy-minimizing feedback networks may produce the first workable neural network applications, especially for adaptive control systems. But Smithson cautions that the applications in which feedback works best is when the system is asked to make small perturbations from a known solution, as when interpreting signals that have been slightly altered by atmospheric conditions.

Smithson's project for feed-forward active mirror control incorporated learning capabilities. By adapting to changing atmospheric conditions, it used self-programming for different mirrors and wave-front sensors. Analog hardware operating at 10 kHz to 100 kHz should be relatively easy to build. The main restriction on network is the lack of architectural definition.

Currently, Smithson is studying the convergence and stability criteria to make the circuits more reliable. That involves looking in detail at the energy surfaces produced and the circuit dynamics.

Artificial neural networks model the human brain

Sharon Kasper

The problems of the traveling salesman have long been a subject of considerable speculation and humor. But one such problem, that of mapping out a minimum-distance route among 30 or 40 cities, is part of the serious research effort in the field of optical computers. The Traveling Salesman Problem (TSP) represents the type of puzzle that a computer modeled on the neural network of the brain could solve with ease.

Robert J. Marks II, professor, and Les Atlas, assistant professor, both of electrical engineering, are combining their skills in optical computers and speech recognition to help uncover the secrets of neural networks. One possible outcome of their work might be a computer which could deal with problems of even greater complexity than the TSP.

Developing a computer that can deal with such complexity requires an understanding of the human (biological) brain and the way in which its billions and billions of neurons interact. Each neuron is connected to a large number of other neurons that make up individual neural networks. And the operation of the network is based on the changing status of each individually functioning neuron and its ability to r- -se changes in those neurons to which it is con- -ted.

Professors Marks and Atlas, working with a team of graduate students, have developed and are training an *artificial* neural network in their Interactive Systems Design Lab (ISDL). Their model is called the APNN or Alternate Projection Neural Network. Marks points out that much conventional training is based on sets of rules, "but if you had to give rules by which something was a bush or a tree, it would be very, very difficult." It is necessary, then, to program a neural network in the same way that humans are programmed. "You show the neural network a bush and you say, 'That's a bush,' and you show it a tree and you say, 'That's a tree,' and you show it another tree and you say, 'That's another tree,' and after a while the neural network begins to learn to distinguish all by itself; it learns by example as opposed to learning by rules."

The motivation for developing an artificial neural network computer model of the biological network is plain. Every day the scientist can observe the results of human neural networks in action—a human can identify a tree or a bush in a picture that contains both trees and bushes. And, although we are naturally equipped with the ability to classify in this way, a non-biological neural network must be trained to make such distinctions.

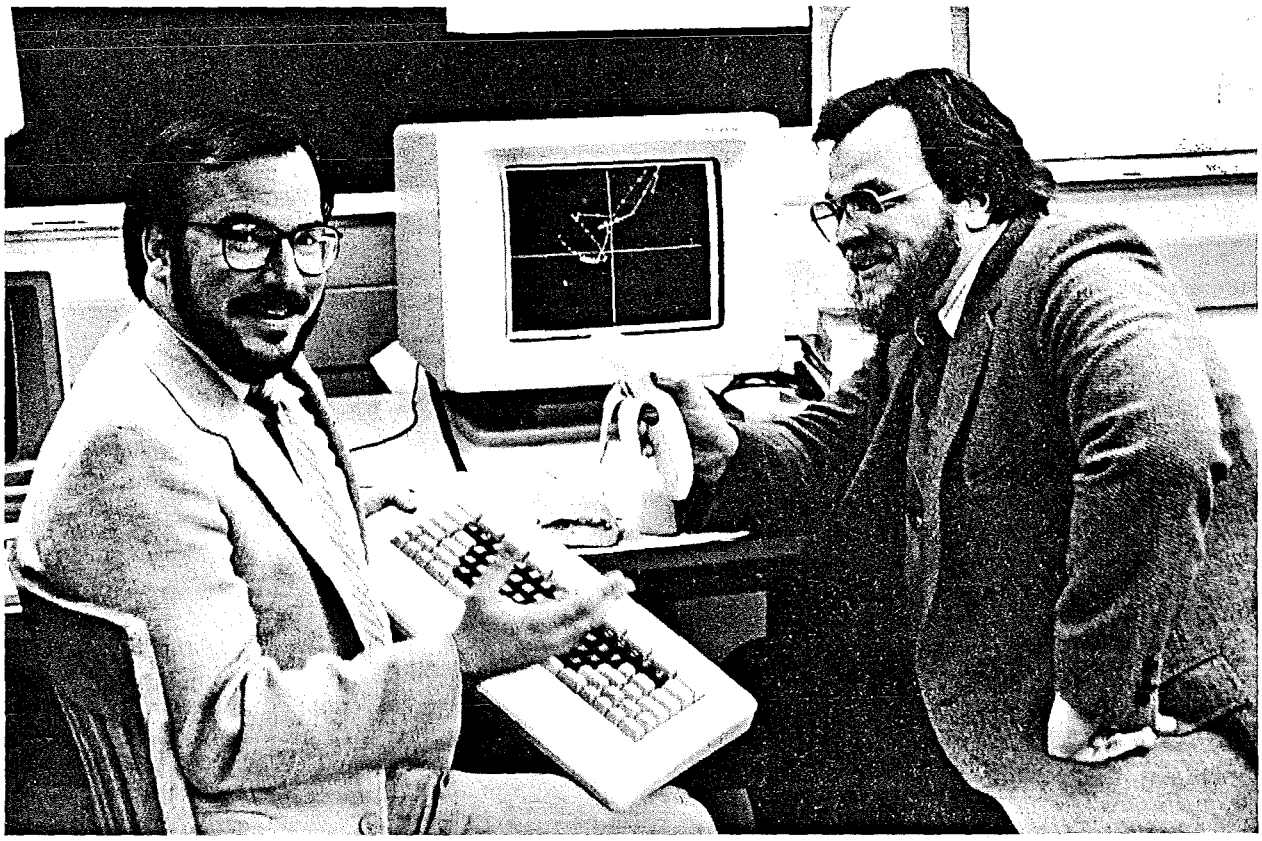


Photo David Spengler

Working lunches led to neural network research partnership between Les Atlas and Robert J. Marks

Optics, Marks' specialty, will be used to 'show' images to the computer and to manipulate the data internally. "At the front end of the computer, where you gather the data," Marks explains, "there might be an array of photo-detectors that would detect the image. Internal manipulation of the data that is conventionally done electronically would be done using light instead of electrons. It's obviously faster; you can't get much faster than light."

More than just a search for speed is involved in modeling the internal architecture of a neural network. The hundreds of electronic connections required between the neurons, using a conventional computer, would be impossible due to interference, but using photons rather than electrons eliminates that interference. The basic artificial neural network consists of many nodes or neurons that do very simple operations, and in some models, every neuron is connected to every other neuron. Using conventional connections would require the impossible: electrons going through electrons. Marks describes the advantage of using optics: "If you do it optically, photons can go through photons. Light can go through itself, so using light gives you the nice ability to have the natural physics for intense interconnections of the nodes or neurons."

One technology available with the neural network is parallel rather than serial processing. "One neuron doesn't have to wait for what another neuron does; they all kind of do their own thing and come out with a really neat answer."

Reaching "a really neat answer" in neural network p nce is called converging, and Atlas and Marks' A N outperforms previous thermodynamic models of neural networks in accomplishing convergence efficiently and consistently. The thermodynamic models use an energy reduction approach which Marks says, "doesn't prove uniqueness of convergence, that is, one time the neural network converges to one thing, and another time it converges to something else. So in that sense it's a relatively poor model." Marks elaborates, "Our model of the APNN draws upon a wealth of mathematical theory, including projection onto convex sets, which is a recent field of interest and analysis from which we've been able to borrow."

Besides convergence, the ability of a neural network to generalize is a requirement of any efficient classification network. Marks describes generalization between the two modeling systems, "It's easy to train a classifier to respond to training data. What's important, however, is how it responds to new data. Can it recognize a totally new bush?" A disadvantage of the conventional neural network is that determining how it will respond can only be done empirically. "You actually have to expose it to the new material and see if it responds correctly. However, with the APNN, the math is so well developed that we can predict the manner in which the network generalizes, and we can write down math equations th ow whether and in what manner the network ge alizes to other than the training data."

The ability to generalize to new data or environments is a problem that conventional computers respond to poorly. Even the recent developments in artificial intelligence, such as expert systems, have this problem. "Neural networks offer the theoretical potential to control and design the specifics of generalization," according to Atlas. "However large amounts of data from many real-world environments are needed to test and refine this theory."

Training a network by example requires incredible amounts of time to pass through the data, and the problem with conventional neural nets is that they can forget the earliest data by the time they are exposed to the final data. This forgetting requires repetitive passes through the training data. However, repetitive passes are not required for the APNN, because it has an elephant-quality memory. It never forgets. A single pass through the training data is sufficient.

Improved memory within the actual computer architecture is another advantage of the APNN. The associative memory capability of the artificial neural network could allow the APNN to identify a black and white picture (similar to a digitized picture) of the Mona Lisa, given only her smile. "We have a matrix of neurons," explains Marks, "that can take on gray levels. In this matrix every neuron is connected to every other neuron, and each neuron can assume a value that relates to a gray level. So, having been given a picture of the Mona Lisa, the gray levels of that picture are imposed on the neurons and the information is stored in the interconnects," (these interconnects correspond to the synapses that connect the neurons in the biological brain) "and remarkably, if the network is then given only the Mona Lisa's smile, the APNN could then extrapolate the entire face of the Mona Lisa."

The future of the APNN, is being extended to some real world applications: A *speaker-independent* system of speech recognition is being developed by Atlas and his team of graduate students. Using a large data base containing many words from many speakers, the team plans to have a demonstration system ready in two years. In order to make the system commercially acceptable, it is necessary to keep the rate of recognition errors to a minimum. It is also essential that the remaining errors be as "natural" as possible. "Human voice interaction is not error-free either," Atlas explains. "A key problem with conventional recognizers is that their errors are not at all like natural human errors. We feel that the APNN has the potential to behave as a human does, which would include the errors that naturally occur in human speech recognition." Other applications of the APNN include efficient routing of computer links and an automatic system to identify irregularities in electrocardiograms (EKG's).

Funding for Atlas and Marks' APNN comes from a variety of sources: The National Science Foundation, The Office of Naval Research, Physio Control Corp. and the Washington Technology Center. Although a considerable amount of research remains to be done, based on the available funding and the incredibly high level of interest in the field, Marks and Atlas are optimistic that neural network computers will be commercially available in the near future.

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January 4, 1989

Zheng Shihai
Institute of Physics
Academia Sinica
Beijing
PEOPLE'S REPUBLIC OF CHINA

Dear Zheng:

Thank you for your recent inquiry concerning a visiting scholar position here. Unfortunately, my present workload will not allow quality interaction time with you. Furthermore, my support money is already committed for the next two years. I'm sorry.

I would be very interested to see your publications on Mellin transforms, rotation invariance and sampling theory. Could you please send a copy to me?

Sincerely,

Robert J. Marks II

Robert J. Marks II
Professor

RJM:cc

INSTITUTE OF PHINESE,CHINESE ACADEMY OF SCIENCE
BEIJING,CHINA

RESUME

Name	Zheng Shihai
Sex	Male
Address:	Institute of Physics, Academia Sinica,Beijing
Phone:	282163
Citizen:	PRC
Date of birth:	June 21,1941
Place of birth:	Zhijiag, Hubei Province,PRC
Health:	excellent

EDUCATION

1960-1965: undergraduate student as Wuhan University dept.physcs

MAIN RESEARCH WORK:

1965-present: Optical Holograpy,Optical computing and Electro-microscope image processing by optical metod

MAIN PUBLICATIONS:

(1) Production of a spatial filter with high efficiency and broad dynamical range by using composite hologram and bleaching technique
Laser Journal,Vol.7-No.2(1980),55.
(2) Clearing electron microscopic image of protein crystals by optical method
Kexue Tongbao,Vol.27-No.1(1982),83.
(3) The optical processing on direct observation x-ray topographs of microdefects in silicon crystals
Kexue Tongbao,Vol.28-No.11(1983),1231.
(4) Study on the refractive index charcteristics of holographic emulsion due to bleaching effect and the preparation of phase filters
Laser Journal,Vol.9-No.9(1982,603.
(5) A simulation experiment of phase adjustment for a phase-adjusted focusing laser accelerator
Acta Physica Sinica,Vol.31-No.7(1982),895.
(6) A new method for performing optical mellin transform
Acta Physica Sinica,Vol.35-No.4(1986),529.
(7) Space-invariant and rotation-invariant in a given angle range pattern recognition and their filter design
Acta Physica Sinica,Vol.36-No.6(1985),760.
(8) Fourier optical implementation in generalized transformation
Acta Optica Sinica,Vol.7-No.3(1987),236.
(9) A discrete sampling method in optical transforation
Acta Physica Sinica,Vol.35-No.10(1986),1390.
(10) Study on optical transformation in high sequence
Acta Physica Sinica,Vol.37-No.2(1988),261.

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BEIJING,CHINA

(11) Transfer function improvement by means of synthesis of different defocused electron micrographs with unsymmetrical rotational aberrations
Acta Optica Sinica,Vol.8-No.2(1988),171.

(12) Image improvement of high resolution electron micrographs with spatial rotational variant system by optical means
Chinese Journal of lasers,Vol.15-No.3(1988),156.

(13) Optical walsh-hadamard transfom for orders 32 and 64
Appl,Opt.,Vol.27-No.12(1988),2608.

(14) Image quality improvement of high resolution electron micrographs with astigmatism and coma aberrations by optical means
Optik, Vol.79-No.4(1988),171.

INSTITUTE OF PHYSICS,CHINESE ACADEMY OF SCIENCES
BEIJING, CHINA

Dec.26,1988

R.J.Marks II
University of Washington
Interactive Systems Design Laboratory
Seattle,Washington 98195

Dear Prof. Marks

My name is Zheng Shihai. I'm a reseacher of optical Lab at Institute of Physics,Academia Sinica in Beijing. I'm writing to you about the possibitity of a visiting resercher's appoitment. Could you give me a chance of position ?

I've chosen to write to you. Because I've read your papers. I have long been familiar with your own work.I'm intersted in your work very much. If I could be to your department work. I should work very good.

Enclosed please find a brief resume of my education, research and publication.

I wish I could find words to express the importance of a visiting research appointment. Thank you for your consideration. I look forward to hearing from you.

Sincerily

Zheng Shihai

Texas Tech University

Optical Systems Laboratory
Department of Electrical Engineering
Lubbock, Texas 79409-4439/(806) 742-3465

15 December 1988

Dr. Robert J. Marks II
Department of Electrical Engineering
University of Washington
Seattle, Washington 98195

Dear Dr. Marks:

I have analyzed the suggestions you have made concerning the multi-level error correction problem and find no major problems. However, I still am a ways away from having the data that is required for this effort. Precisely, I still need 1) experimental data that includes spatial light modulators (the data you saw was only for source-detector.) , 2) I need to determine the pdf from this data (I will be using a $\chi 2$ - test to determine the pdf's), and 3) you assume uniform levels and my results show signal-dependent noise which means non-uniform levels. The first two of these areas are currently being worked on and as soon as results are available, I will be in contact with you. Hopefully, this will be by January 15th. The third could be gotten around by using log amplifiers as one possibility. Also, Texas Tech needs to publish or at least submit the experimental results before a paper on multi-level coding using the experimental pdf's appears so that we can reference that paper without a lot of unneccessary explaination of where the results came from.

Next, I wish to point out on page two of your hand written notes (enclosed) that there are two errors. First, in the second drawing, Δ's spacing is twice that shown to agree with figure 1. Secondly,

$$\mathbf{P_E(\frac{D}{2L}) = \int_{Shaded} pdf\ dx = 1 - \int_{\frac{D}{2L}}^{\frac{D}{2L}} pdf\ dx}$$

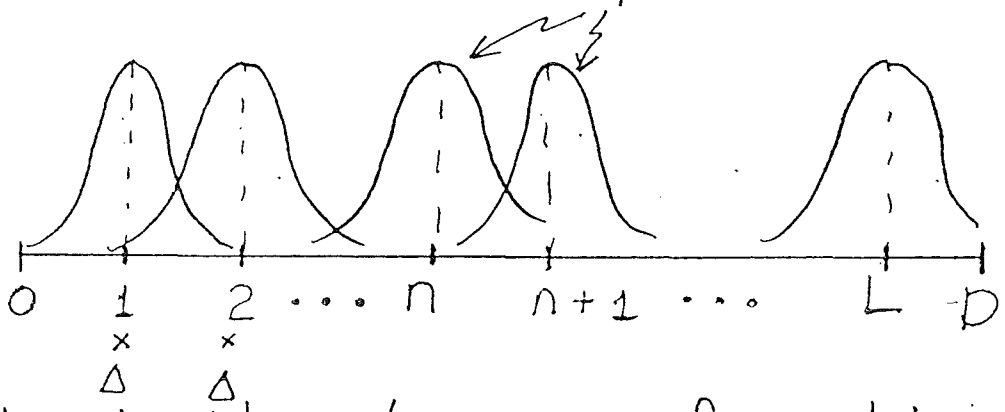
Finally, I have enclosed a brief outline of the general problem and where we currently are.

Sincerely yours,

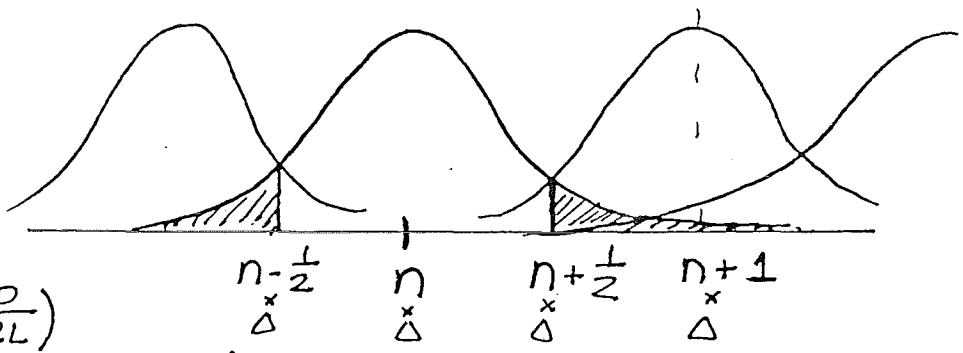
Stephen Batsell

Stephen Batsell

We can visualize the quantization for each output detector as follows: ($\Delta = D/L$):



What is the chance of making an error? Let's look:



$P_E\left(\frac{D}{2L}\right)$

$= \text{Prob}(\text{error}/n) = \int_{\text{shaded}} pdf\ dx$

"given"

$$= \int_{-\frac{D}{2L}}^{\frac{D}{2L}} pdf\ dx$$

$$= 2F_X\left(\frac{D}{2L}\right) \text{ if pdf is symm.}$$

$$= F_X\left(\frac{D}{2L}\right) - F_X\left(\frac{-D}{2L}\right) \text{ if not}$$

Thus

$$\text{Prob}(\text{error}) = P_E = P(E/1)P(1) + \ldots + P[E/L]\,P[L]$$

$$= P\left(\frac{D}{2L}\right)$$

Noise in Optical Linear Algebra Processors

A. Overview of Problem

Given a matrix-vector multiplier such as the one in Figure1:

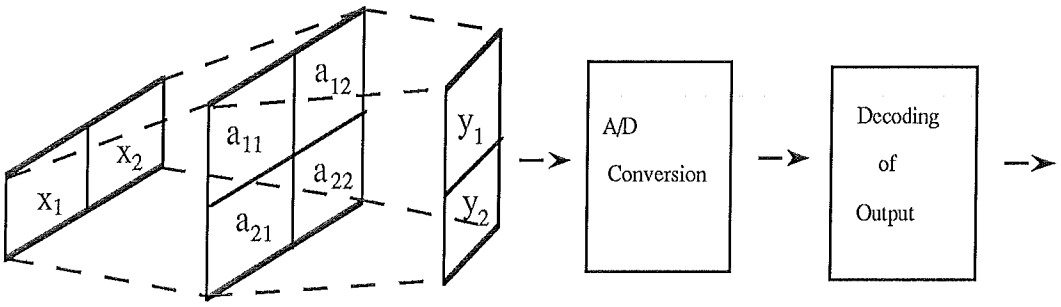


Figure 1: Stanford Matrix-Vector Architecture

The following questions naturally arise:

1. What is the noise at the voltage output (i.e. at y_1 and y_2) ?
2. Is the resulting noise SDN or SIN ?
3. Are the levels in the A/D converter uniform or non-uniform for this noise ?
4. How do we make these levels uniform ?
5. How are these levels connected with accuracy ?
6. What are the maximum number of levels we can accurately detect?
    a) W/O signal processing
    b) With signal processing (i.e. using error-correcting codes)

B. Where we are & What we need to do

1. Now have most Source-Detector data
    a) Still need chopped laser data
2. Need data with SLMs

a) DMD
b) MOD
c) AOD
d) LCLV
e) LCTV

3. Need to write a computer program to generate pdf's

4. Since we have SDN, we violate one of the assumptions about uniform levels

a) Must work on how to generate uniform levels

b) One possibility is to use log amps at the output as

the SDN noise $=AX^B$

$$\log(SDN) = \log(AX^B) = B*\log(AX) = B(\log(A) + \log(X))$$

So that given :

Output = Signal + SDN + SIN

$$Y = X + AX^B + C$$

Then

$$\log(Y) = \log(X) + \log(AX^B) + \log(C)$$

$$\log(Y) = \log(X) + B(\log(A) + \log(X)) + \log(C)$$

$$\log(Y) = (1+ B)\log(X) + B*\log(A) + \log(C)$$

Output = Signal + New SIN

(A & B are functions of noise type and temperture, but are constants for particular devices and at a particular temperature)

The problem with this technique is that while we are now linear in noise or standard deviation we are no longer linear in mean signal level with respect to the the input levels. However, for a log curve there is a region which is approximately linear . Hence, we have traded dynamic range for uniform levels which makes our consideration of error-correcting codes a critial concern for if we

can decrease level spacing by using codes to correct errors we can make up for decreased dynamic range.

5. Once these problems are solved then the multilevel error correction problem is easy to solve .
6. Futhermore the problem can be generalized to the case of correcting n errors using a Hamming code.

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December 5, 1988

Dr. John F. Walkup
Electrical Engineering Department
Texas Tech University
Lubbock, TX 79409

Dear John:

As always, the visit was delightful! I remain quite impressed with the quality of your students and research.

Some quick items:

1. The attached 2-page monograph is for Mr. Smith. I'm afraid I don't agree with him that $|\xi_n| / |\xi_{n-1}|$ is a constant unless its dimension is one. I tried a simulation using random library vectors to confirm this.

2. Tell Prof. Mitra the Stark reference is JOSA-A, p.1309 (August, 1988). I thumbed through it and think what she is doing is much more general.

3. I grabbed some department reports that are enclosed. I'll send some more information as I get it.

Best personal regards,

- Bob -

Robert J. Marks II
Professor

RJM:cc

P.S. We got a new FAX in our department. The number is (206) 543-3842.

On APNN Convergence

From the APNN, we have

$$\vec{X}_{n+1} = \underline{T}_4 \vec{X}_n + \underline{T}_3 \vec{f}_P$$

$$= \underline{A} \vec{X}_n + \vec{f} \quad (1)$$

Define:

$$\vec{\xi}_n = \vec{X}_n - \vec{X}_{n-1} \quad (2)$$

Then

$$\vec{\xi}_n = \underline{A}^n \vec{f} = \underline{A} \vec{\xi}_{n-1} \quad (3)$$

Thus:

$$\| \vec{\xi}_n \| = \| \underline{A} \vec{\xi}_{n-1} \| \quad (4)$$

$$\leq \| \underline{A} \| \, \| \xi_{n-1} \|$$

or (main result):

$$\frac{\| \vec{\xi}_n \|}{\| \xi_{n-1} \|} \leq \| \underline{A} \| = \lambda_{max} = \text{Spectral radius of } \underline{A} \quad (5)$$

Proof: The solution to (1) is

$$\vec{X}_n = \sum_{k=0}^{n} \underline{A}^k \vec{f} \quad (6)$$

since

$$\vec{X}_{n+1} = \sum_{k=0}^{n+1} \underline{A}^k \vec{f}$$

$$= \vec{f} + \sum_{k=1}^{n+1} \underline{A}^k \vec{f}$$

$$= \vec{f} + \sum_{\ell=0}^{n} \underline{A}^{\ell+1} \vec{f}$$

$$= \vec{f} + \underline{A} \vec{X}_n \quad (7)$$

From (6)

$$\vec{x}_n = \vec{f} + \underline{A}\,\vec{f} + \ldots + \underline{A}^n f$$

$$\underline{A}\,\vec{x}_n = \underline{A}\,\vec{f} + \ldots + \underline{A}^n f + \underline{A}^{n+1} f \qquad (8)$$

Subtracting:

$$(\underline{I} - \underline{A})\,\vec{x}_n = (\underline{I} - \underline{A}^{n+1})\,\vec{f} \qquad (9)$$

or

$$\vec{x}_n = (\underline{I} - \underline{A})^{-1}(I - \underline{A}^{n+1})\,\vec{f} \qquad (10)$$

Thus:

$$\vec{\xi}_n = \vec{x}_n - \vec{x}_{n-1}$$

$$= (\underline{I} - \underline{A})^{-1}(I - \underline{A}^{n+1})\,\vec{f} - (\underline{I} - \underline{A})^{-1}(\underline{I} - \underline{A}^{n})\vec{f}$$

$$= (\underline{I} - \underline{A})^{-1}(\underline{A}^n - \underline{A}^{n+1})\,\vec{f}$$

$$= (\underline{I} - \underline{A})^{-1} \quad (I - \underline{A})\,\underline{A}^n \vec{f}$$

$$= \underline{A}^n \vec{f}$$

$$= \underline{A}\,(\underline{A}^{n-1}\vec{f})$$

$$= \underline{A}\,\vec{\xi}_{n-1} \qquad (11)$$

Equation (4) follows.

Note: From (11), if the dimension of $\vec{\xi}_n$ is 1 then, clearly;

$$\xi_n / \xi_{n-1} = a_{11}$$

12/2/88
Bob Markus
In a plane over WA.

香港城市理工學院
City Polytechnic of Hong Kong
九龍旺角彌敦道七零零號旺角中心第二座
電話：三・九八四三二一
Argyle Centre, Tower II
700, Nathan Road, Mongkok, Kowloon, Hong Kong
Cable: CITYPOLYHK Telex: 39369 CPOLY HX
FAX: 3-970275 Phone: 3-984321

Director: Dr David Johns

Your ref:

Our ref:

November 23, 1988

Prof. Robert J. Marks II
Dept. Electrical Engineering
FT-10 University of Washington
Seattle, Wa 98195
U.S.A.

Dear Bob,

This is to reply to your most recent letter.

Yes, I did received your letter about the Nanjing Conference. At the present moment, I still be unable to tell if I can attend the conference. However, I am applying the travelling grant from the CPHK. The chance of getting the grant is good. I just sent a letter to you yesterday (as a matter of fact, I FAXed a letter to you last week). Both letters request more detail information about the conference, 'cause I need them to fill out the travelling grant request form.

Thank you for all the good news you sent to me. Yeah, the Howard paper looks excellent. Believe it or not, I am the most "publishized" lecturer in this Department. Congratulation that you CAS APNN got accepted.

I am fine at the moment. Good news: the "top management" in this Department allows me to teach image processing and speech processing in the next two quarters (don't ask me the detail, the system in HK is so complicated). Good news: paper from the Computer Studies and Applied Science Dept. approach me about research project in Neural Nets. There are considerable interest in this new exciting area, except there is no single person in Hong Kong that are known knowledgeable in NN.

By the way, I forgot to bring Stark's paper about spiral sampling theorem back. Could you kindly send me a copy ? Talk to ya next time. Regards

Kwan Cheung

Dept. Electronic Engineering
City Polytechnic of Hong Kong
Tat Chee Avenue, Kowloon Tong
Hong Kong

November 29, 1988

Prof. Robert J. Marks II
Dept. Electrical Engineering
FT-10 University of Washington
Seattle, Wa 98195
U.S.A.

Dear Bob,

Howdy.

I am so glad every time to receive your letters. They really *make my day.* Thanks for the rainbow paper bunch and a biblography of neural network publication. A professor at the Computer Studies Department came to see me and ask if there is any possibility of collaboration in neural network research. He is very interested in this area. He told me he'd been with *TRW* in the last twenty years (he got a PhD in mathematic), and therefore he knows very well of Hecht-Nelson and his group. He, nevertheless, does not like Hecht-Nelson. There is another professor at the Applied Science Department interested in NN. This person has been working with optics in the last five years. We may be able to get some funding from the Government in the NN research.

Good news, the second paper of the M–D sampling is finished. The paper at the time being is typed into the LaTeX format. I will try to send a copy through the e–mail to you and a hard copy with the diskette to you through mail. Another good news is that at CPHK we have draftmen to produce plots without charge for staffs. All the graphs in that paper will be produced by them.

To answer your question: the U.S. Counsulate General in Hong Kong is processing the quota up to 8/1/1985 means the Immigration Section of the Counsulate General is processing all the necessary paper work for the persons who was qualified to be a potential immigrant before 8/1/1985. My quota is at 9/21/1987, about 25 months away. At this present rate, I may be able to return in Summer. Thanks to Bush because he simplified the paper work so much that the processing rate has been increased considerably. I'm glad he became the next U.S. president.

Thanks for all the good news and sad news from Seattle. I feel sorry for Les and Janet. Chinese are always proud of their five thousands year civilization, and they have a proverb "Ten out of nine things are always against wishes." I guess this is true almost anywhere, but may be more so in Hong Kong. This morning on newspaper, a man from the mainland Chinese came to Hong Kong a year ago. His wife was pregnant and they were so glad that they finally have a son. Yet two days ago when his wife was delivering in the hospital (they had been waiting for that day in the last ten months), both she and the baby died. I hope Les and Janet know we are always around and pray for them. And only from God can find true peace, hope and joy.

There are hardly good news here. The British Government is obviously retreating and they are exercising the *usual policy* they have been exercising over their colonies before they retreated. In this last few remaining years, the Government is trying to get as much as they can in here and take them back to U.K.. The tax rate is increasing but no itemized deduction. A lot of huge public projects are opening for bids: a new modernized international airport, bridges from Hong Kong directly to the mainland, environment protection.... Well, all this projects will be awarded to British firms. The Government is setting "regulations" to limit the duration of undergrad programs in all universities and polytechnics to three years, even though the publics have been fighting for years for four–year programs and adopting credit system (the system used in the U.S). A very obvious reason for three–year programs is to save money for the Government. All these reflect the true face of the British Government. I am afraid all these "iron–hand" policies will lead to a riot some day.

Well, I am positive I can go to the Nanjing Conference. However, if by then my immigration quota came up (I don't think it will be that early), then I may not be able to go. At the present time, I need an extra document to complete the paper work. A formal letter from you requesting me to go to the conference (All things here needs to be formal).

Say hello to Cindy, I received her word. Say hello to Choi, Oh and Park. Hope to see you all soon.

best regards.

Kwan

Kwan F. Cheung

GEORGIA INSTITUTE OF TECHNOLOGY
SCHOOL OF ELECTRICAL ENGINEERING
ATLANTA, GEORGIA 30332

TELEPHONE: (404) 894- 2929

November 17, 1988

Professor Robert J. Marks, II
University of Washington
Department of Electrical Engineering
Seattle, WA 98195

Dear Bob:

I want to thank you for your hospitality last week. The campus is lovely, and I enjoyed talking before a responsive group. I know that Theresa enjoyed the visit too. Sometime we hope to be able to reciprocate by having you visit us here.

One question: An oriental student listening to the talk raised the issue of (I think he said) "gate functions" in connection with the nonlinear filtering operations I was describing. Do you remember who he was, and, if so, could you ask him for me where I might look for a discussion of the subject? I would greatly appreciate it.

Sincerely,

William T. Rhodes
Professor

WTR:svs

P.S. Thanks again for the coffee (and perhaps something else) mug.

GEORGIA INSTITUTE OF TECHNOLOGY
SCHOOL OF ELECTRICAL ENGINEERING
ATLANTA, GEORGIA 30332

TELEPHONE: (404) 894-

November 14, 1988

Dr. Robert J. Marks II
Department of Electrical Engineering
University of Washington
Seattle, WA 98195

Dear Bob:

It was a great pleasure to meet you and some of your associates during my recent visit to your department. I wish we had had the time to tour some of your laboratories. Nevertheless, I appreciate the opportunity to speak to your group and to walk about the campus. What a beautiful place! I thank you and your students for the U of W mug (which I put to immediate use).

I look forward to meeting you again in the future.

Sincerely,

Theresa

Theresa A. Maldonado

The Washington Technology Centers
Office of the Executive Director

University of Washington, 376 Loew Hall, FH-10, Seattle, Washington 98195. General phone (206) 545-1920. FAX (206) 543-3059

June 18, 1990

Robert J. Marks
University of Washington
Elec Engineering FT-10
Seattle, WA 98195

Dear Bob:

You may have already learned of my plans to leave The Washington Technology Centers and the University of Washington. However, in case you haven't, please find attached a copy of my letters of resignation to Dr. Thomas Seliga, Chair of Electrical Engineering Department and Dr. J. Ray Bowen, Dean of the College of Engineering.

As you can see from these letters, I have accepted an exciting new opportunity. As the old saying goes, "I was made an offer I couldn't refuse". I will certainly miss the WTC and my interactions with you. I have always believed that, in any organization, it is the people that really count. Oh sure, you need facilities and money, etc., but ultimately, it is the people who make the real difference. In the case of WTC, I have been particularly pleased over the years by the caliber and dedication of the investigators working in the various WTC Centers. I have certainly appreciated the efforts they have made and the fine results that they have achieved.

I'm especially pleased to have had the privilege of working with you in what I believe is a very important new kind of activity in the state of Washington. I am very bullish on the future of WTC and the state's research universities, and you can be assured that I will do everything I can to help further develop both WTC and these fine universities. It is just too important to this state to do otherwise.

There is a great deal yet to be done in the WTC. I believe that most of our programs are up and running in a reasonably satisfactory way. However, all of them would benefit greatly from an increase in funding and size and, in some cases, an increase in focus. More importantly, there are many great opportunities for future interdisciplinary work between the centers which is just now beginning to emerge and which needs further strengthening.

It is quite clear to me that the success that WTC has had to date is due directly to the combined efforts of all of the individual investigators. I hope you will continue to be associated with the center and that you will continue to give it the priority and support that you have given it in the past. Without individuals like you and your colleagues, the WTC could have not have been developed, and only with you can it be sustained.

Sincerely,

Edwin B. Stear
Executive Director

The Washington Technology Center
376 Loew Hall, FH-10, University of Washington, Seattle, WA 98195

Office of the Executive Director
(206) 545-1920

May 31, 1990

Dean J. Ray Bowen
College of Engineering
University of Washington
Seattle, WA 98195

Dear Ray,

I hereby resign my appointment as Executive Director of The Washington Technology Centers effective June 30, 1990. I have accepted the position of Corporate Vice President for Technology Assessment at the Boeing Company.

I greatly appreciate the opportunity you afforded me to help you develop the College of Engineering and The Washington Technology Centers. I have benefitted greatly from this professional association with you over the past seven and one-half years, and I hope we will have the opportunity to work together in some significant ways in the future.

Sincerely,

Edwin B. Stear

Edwin B. Stear

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-6061

June 17, 1988

Dr. Thomas F. Krile
Electrical Engineering Department
Texas Tech University
Lubbock, TX 79409

Dear Tom:

For he's a jolly good Fellow. For he's a jolly good Fellow. For he's a jolly good Fellow that nobody can deny.

CONGRATULATIONS!

Best personal regards,

- Bob -

Robert J. Marks II
Professor

RJM:cc

OPTICAL SOCIETY *of* AMERICA

EXECUTIVE OFFICE
1816 JEFFERSON PLACE, N.W.
WASHINGTON, D.C. 20036
202—223-8130
TELEX 5106003965
FAX 202—223-1096

May 26, 1988

Dr. Thomas F. Krile
Electrical Engineering Department
Texas Tech University
Lubbock, TX 79409

Dear Dr. Krile:

I have the honor to inform you that the Board of Directors of the Optical Society of America, at its meeting on April 29, 1988, elected you a fellow of the Society in recognition of your distinguished service in the advancement of optics, particularly for contributions in optical signal processing, digital image processing and optical engineering.

As a Fellow, you will enjoy all of the privileges of your previous class of membership and will pay the same dues. You will receive a certificate confirming this recognition. Will you please let us know, as soon as you can, how you would like your name to appear on the certificate? The Board of Directors has instituted a policy whereby the certificates may be presented at one of the meetings sponsored by the Society, at a local section meeting at which an officer of the Society speaks, or mailed directly to you. I enclose our latest meetings calendar and ask for your direction in this matter.

In the name of the Board of Directors, may I extend to you our congratulations on your advancement to the class of Fellow. We look forward to a continuation of your active participation in optics and the work of the Society.

Sincerely,

Jarus W. Quinn

JWQ/bba

Enclosure

bcc: Marion O. Hagler
John F. Walkup
Robert J. Marks
Alexander A. Sawchuk

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-6061

October 12, 1988

Prof. William T. Rhodes
Georgia Institute of Technology
Atlanta, GA 30332-0252

Dear Bill:

We are looking forward to your visit on November 7th. Enclosed is a parking permit. Personnel at any of the entrance gates to the University of Washington can give you directions to our building.

I look forward to receiving titles and, if possible, short abstracts of your talks.

Sincerely,

-Bob-

Robert J. Marks II
Professor

RJM:cc

Enclosure

DAY OF WEEK Monday

DATE November 7, 1988

AREA ASSIGNMENT
PARKING ASSIGNED ON
SPACE AVAILABILITY

DISPLAY FACE UP ON DASH
RESALE PROHIBITED

NO. D 920557

DAILY COMMUTER TICKET

UoW 1173 (Rev. 8/87 • 1369

DEPARTMENT NAME **(NOT VALID IF BLANK)**

Electrical Engineering

THIS TICKET MUST BE VALIDATED AT ONE OF THE CAMPUS ENTRANCE GATES.

EXCEPTION: WHEN CAMPUS GATES ARE NOT STAFFED OR WHERE ASSIGNED AREAS ARE OUTSIDE OF GATE CONTROL, ENTER THE CURRENT DATE AND DAY OF THE WEEK *IN INK* ON THE FACE OF THE TICKET AND PLACE FACE UP ON THE DASH.

DEPARTMENTAL NO. D 920557

University of Washington Correspondence

INTERDEPARTMENTAL

Interactive Systems Design Laboratory, Department of Electrical Engineering, FT-10

October 27, 1988

TO: Carol Cassinelli, Editor
Engineering Publications, FH-10

FROM: Bob Marks, FT-10 Bob Marks/cc

Here is an item submitted to Data which was not included in the last issue. Can it be included in the next?

Prof. Robert J. Marks II in the Department of Electrical Engineering has been awarded the first Honorary Membership in the **Puget Sound Section of the Optical Society of America** for "his efforts in founding the the Puget Sound Section and his excellent performance as the section's first president". The award was made by current President Dr. R. Aaron Falk (Boeing Aerospace) at the Section's bi-monthly meeting on August 2, 1988.

RJM:cc

OPTICAL SOCIETY *of* AMERICA

EXECUTIVE OFFICE
1816 JEFFERSON PLACE, N. W.
WASHINGTON, D. C. 20036
202—223-8130
TELEX 5106003965
FAX (202) 223-1096

October 21, 1988

Bethel High School
c/o Kathy Paris
22215 38th Ave. East
Spenaway, Washington 98387

Dear Ms. Paris:

It is my pleasure to officially inform you that the Education Council of the Optical Society of America has approved the award of $757.00 to support your project entitled "How do various light wavelengths affect Daphnia and what are the ecological significances?". Enclosed please find a check for $757.00.

As you may know, the 1988-89 grant recipients are requested to provide a final report on their project early in the summer of 1989. Although the report may be in any form, we encourage reports in poster form with photos from the activities so that we may display them at the annual meeting of the Society.

In order that you may have access to assistance and advice from the local optics community, I have included the name, address and telephone number of the president of the OSA local section in your area. The name of your local section contact is: Robert Marks
Dept. of Electrical Engineering
Univ. of Washington
Seattle, Wash. 98195
206/543-6990

Please accept my congratulations on your award. I look forward to hearing from you at your earliest convenience.

Sincerely,

Evelyn A. Roberts
Technical Activities Manager

cc. Grant subcommittee
John Walkup
Robert Marks

University of Washington Correspondence

INTERDEPARTMENTAL

Interactive Systems Design Laboratory, Department of Electrical Engineering, FT-10

October 25, 1988

TO: Bill Moritz

FROM: Bob Marks Bob Marks/ca

I understand that new courses must be approved by their respective professional groups. I have some related questions which should require only very short answers.

1. Since the professional groups were explicitly reformed as an undergraduate entity, do new graduate courses need to be thus approved before forwarding to the graduate curriculum committee?

2. Special topics courses (e.g. EE579 and EE595) and the seminar course (EE500) have already been approved by the faculty. Must they undergo the same approval procedure as a new course?

3. What is the timing for approval. Should groups meet now to approve courses for Winter or Spring quarter? Or have those decisions already been made?

RJM:cc

University of Washington Correspondence

INTERDEPARTMENTAL

Interactive Systems Design Laboratory, Department of Electrical Engineering, FT-10

October 26, 1988

TO: Endrik Noges, Chair

FROM: Robert J. Marks II & Les E. Atlas

SUBJECT: Research and resources

The copy expenditures outlined in your recent memo is indeed high. The recent directives to our secretary concerning similar issues and the recent memo from "the Stockroom" are also evidence of the current fiscal concerns surfacing in our department. We believe, however, there are some other issues that need to be weighed before a final decision is made concerning strict enforcement of distribution of departmental supplies and services. The purpose of this correspondence is to outline some issues which may have not yet been considered in this regard.

First, we employ a full time secretary fully on research money. For obvious reasons, she also performs duties associated with our teaching and service. Strictly speaking, this is in direct violation of grant conditions. We believed in the past, however, that use of an extra small portion of departmental resources would balance this inequality.

Secondly, there is money taken from our grants to support the department's secretary pool. If we did not have Cindy, we would be using the services of the secretaries in the main office.

We believe that if there is going to be strict enforcement of departmental resource allocation in the two categories of (1) teaching & service and (2) research, then it should be applied bilaterally. If materials are to be strictly billed to categories, then so should service. Hence, a portion of Cindy's salary should be paid by the Department. We estimate that 30% of her time is spent on category (1). There is the alternative of assigning our teaching & service tasks to the department's secretary pool, but this would increase their already high workload while underutilizing Cindy's talents.

We request the opportunity to meet and discuss this matter further with you so that we have a clear understanding of your final thoughts on this issue.

cc: S. Schlittenhard

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-2150

10/20/88

Dr. Kwan Fai Cheung
City Polytechnic of Hong Kong
Argyle Centre, Tower II
700, Nathan Road, Mongkok, Kowloon
Hong Kong

Dear Kwan,

Greetings!

I just got back a letter I had sent to you at your home. I hope the other letters I sent got to you okay. Anyway, I thought I would send this one to your work address.

I got the copy of your diploma. Congratulations! It looks fantastic. I recently got a bound copy of your dissertation from the print shop. I'm jealous. It's much thicker than mine.

You're becoming famous! Enclosed is an excerpt from a recently published book on non-uniform sampling theorems.

I'd like to tell you that I've gone on a diet and am presently skinny as a rail! *

Are you gonna go to Nanjing?

In Christ,

Bob

Robert J. Marks II

---

* But I can't.

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING - FT-10

DATE: October 19, 1988

TO: EE Faculty and Staff

FROM: Endrik Noges

RE: Xerox Copy Machine

During a recent shortage of Xerox paper in the main office, I became aware of the tremendous volume of Xerox paper that is used in this Department (between 15 and 20 reams per day). The Xerox paper the Department orders is intended for the main office copier only. If you need paper for individual copiers/printers within the Department, please order your supply through Central Stores on a budget number appropriate for its usage. This is necessary for both planning and budgetary purposes.

A related and even larger issue is the overall cost of the Xerox machine to the Department. Between February and September 1988, we averaged 111,271 copies per month. This cost the Department $24,956.32 in supplies, maintenance, and leasing costs. We recovered from other budgets the sum of $3,539.75 over the same period. This represents only 14.2% of our total expenses. For the period 7/1/87-6/30/88 our research expenditures represented 42.65% of our total expenditures.

I URGENTLY SOLICIT YOUR HELP IN CURBING THESE COSTS.

> Whenever possible, organize lecture notes and other class handouts and have them available at the beginning of the quarter so that the appropriate costs can be recovered from the students.

> Help us to more equitably distribute the Xerox charges to appropriate research budgets by remembering to use your research budget numbers on each and every Xerox work order.

University of Washington Correspondence

INTERDEPARTMENTAL

DATE: October 20, 1988

TO: Laurel Wilkening, Provost

FROM: Bob Haralick
Electrical Engineering • FT-10

SUBJECT: CE/CS Coordination

I believe that there are a couple of things which your office can do to put the coordination between CE and CS on a smooth road.

I think that there needs to be explicit recognition that there do exist differences of opinion between the faculties of EE and CS, and that these need to be resolved by a constructive conflict resolution process in which the faculties of each group participate as equals. These differences of opinion should not be cast in the light of who is wrong or who is right, nor even whose position is best. Rather, there needs to be a recognition that to a large extent these positions are subjective preferences and that there is a variety of different cost-effective and productive ways of coordinating the courses, the laboratories, the recruiting, the shared space, and the joint research. There needs to be the recognition that these different cost effective ways are acceptable to the administration as long as the duplication has been eliminated and that the joint faculty have collectively made their choice by a suitable process involving all the faculty. In this light the focus of attention shifts from rationalization and arguments which are variations on the "I have religion and God is on my side" theme or the "I want control or I will not play" theme to the compromises which offer the best resolution among the different subjective preferences.

In other words, if instead of the administration pushing for forward motion on the issues, the administration pushed for explicit discussion of the process by which differences of opinions get resolved and if coupled with this shift it was made known that the administration does not view rigidity as a positive attribute and does not view any of the variety of memos issued from its office with a strict legalism, then enough breathing room can be created so that forward motion could be made on the issues at a rapid pace. Indeed, it is not difficult to find all sorts of middle grounds between the positions taken by both groups. What is needed now is a statement from the Provost's office to both CE and CS that the goal is the middle ground and that the watchword is compromise.

RMH:gal

October 5, 1988

TO: Dow
Marks
Redeker

FROM: Clark

SUBJECT: Review Committee for Charlie Redeker meeting

It appears that the first time we can get together is:

Tuesday, October 18 at 8:30 am

Please meet in my office, Room 314F Guggenheim.

Charlie, please get your updated biographical record into our mail boxes well in advance of the meeting.

Thanks,

Bob

Ali Safaei-nili
Box 1396, Welch Ave Station,
Ames, Ia. 50010

October 5, 1988

Dr. R. Marks
Electrical Engineering Dept.
University of Washington,
Seattle, Washington 98195

Dear Dr. Marks,

Thank you for the information that you sent me. I found the area of your work very interesting and it seems there are some areas that my background overlaps with your work.

During my graduate program, I learned the basics of Fourier synthesis and studied different problems that exist in real application. The field that I was interested in was radio interferometry where arrays of antennas paired as interferometers collect information which effectively is the fourier transform of the source image. The spatial frequency at which the observation occurs depends on the projection of the interferometer's baseline on the plane normal to the direction of the source. Since in a large array there are different sizes of baselines, one can collect enough points in the frequency domain to feed a fourier transform algorithm. The result of the fourier transform is of course the image of the source.

In Fourier synthesis one has to worry about the missing information in the spatial frequency domain. This lack of information can be described as the convolution of the fourier transform of the sampling function with the true image of the source being observed. This distortion can be very severe due to the high sidelobes of the synthesized beam. This distortion can be reduced effectively by using deconvolution algorithms like CLEAN.

My knowledge about neural network is unfortunately minimal, however, I do not have any doubt in my mind about the significance and beauty of such system.

Overall, I found your research topics very exciting and I am sure I can learn very much by being a part of your group. I will be sending the necessary documents to the admission office. However, if you have any question about my background please let me know so I can send you the information.

I again thank you for your quick response. I look forward to hearing from you soon.

Sincerely,
ali Safaei-nili
Ali Safaei-nili

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-6061

October 5, 1988

Murry J. Mercier
Manager Program Administration
Battelle Memorial Institute
505 King Avenue
Columbus, OH 43201

Dear Murry:

I appreciate the opportunity to have visited at Battelle's Pacific Northwest Laboratories and appreciate your willingness to cover my expenses. Here's the breakdown.

I drove from Seattle to Richland by personal vehicle. The round trip was 480 miles.

I stayed at the Hanford House both Sunday and Monday nights. As I mentioned, they said that Battelle had not specifically given them my name, but they gave me a $50 per night "University rate" because of my affiliation with U.W. The $65 on the attached bill reflects the $15 extra charged for my wife and children.

Thank you again for the opportunity. It was a delightful visit.

Best regards,

Robert J. Marks II

Robert J. Marks II
Professor

RJM:cc

Attachment

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-6061

September 30, 1988

Prof. Fathi Salam
Department of Electrical Engineering
Michigan State University
E. Lansing, MI 48824

Dear Dr. Salam:

I enjoyed talking with you today. I hope you and Aaron Falk can work out some exciting activities at ISCAS '89.

I'll be mailing information to you concerning the neural technical committee's meeting. I look forward to meeting you there.

Sincerely,

Robert J. Marks II/cc

Robert J. Marks II
Professor

RJM:cc

The University
Of Alabama
In Huntsville

Center for Applied Optics

Huntsville, Alabama 35899
Phone: (205) 895-6030

August 11, 1988

Dr. Robert Marks
Dept. Electrical Engineering
University of Washington
MS FT-10
Seattle, WA 98195

Dear Bob:

April in Paris in the year celebrating centennials of both the French Revolution and the Eiffel Tower should be a great experience. Couple that with a major optics meeting and you have a winner. I would like to invite you to present your work in Optical Pattern Recognition there. If you are willing, please send me your

- Title
- Authors
- Affiliations
- Brief Abstract

by the first week of September, so we can assemble the program by mid-September. Thanks!

Sincerely yours,

H. J. Caulfield
Director

HJC/fgj

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-6061

September 29, 1988

D&D Travel Service
3219 N.E. 123rd Street
Seattle, WA 98125

Greetings!

I just received my Northwest frequent flyer statement and noticed that only one of the NW flights I booked through you had been credited to me. Northwest flights (with approximate dates) I've booked through you include:

Seattle - Quebec - roundtrip: 23-26 Aug. '87

Seattle - San Diego - roundtrip*: 23-27 July '88

Seattle/Detroit/Cleveland - roundtrip: 26-30 June '88

Also, I have received no credit from United for the European trip we booked through you. Since I turn in my tickets with my expense report, I cannot generate copies.

Would you please take care of this so we can continue to do business with your office? Thanks for your attention.

Sincerely,

Robert J. Marks II
Professor

RJM:cc

cc: Pam Eisenheim

*On US Air. They give NW credit.

TRAVEL SERVICE, inc.
3219 NE 123rd SEATTLE, WA 98125
(206) 364-6160

AMERICAN SOCIETY OF TRAVEL AGENTS ASTA

MARKS/ROBERT

ROBERT MARKS
DEPT OF OCEANOGRAPHY WB-10
UNIVERSITY OF WASHINGTON
SEATTLE WA. 98195

RETURN WITH REMITTANCE

JUN 28 1988 700

23 JUL 88 - SATURDAY
US AIR 1892 COACH CLASS
LV: SEATTLE 430P ONE STOP CONFIRMED
AR: SAN DIEGO 815P
SNACK SNACK

27 JUL 88 - WEDNESDAY
US AIR 1815 COACH CLASS
LV: SAN DIEGO 545P NONSTOP CONFIRMED
AR: SAN FRANCISCO 710P
SNACK

US AIR 1705 COACH CLASS
LV: SAN FRANCISCO 755P NONSTOP CONFIRMED
AR: SEATTLE 945P

PLEASE NOTE THIS IS A NON REFUNDABLE AND NON CHANGEABLE FARE

TICKET NUMBER/S:
MARKS/ROBERT 1411020440 DS CARD 250.00

AIR TRANSPORTATION 237.88 TAX 12.12 TTL. 250.00
SUB TOTAL 250.00
CREDIT CARD PAYMENT 250.00
AMOUNT DUE .00

NOTE: IT IS IMPORTANT TO RE-CONFIRM ALL FLIGHTS AND CHECK FOR ANY TIME CHANGES.

University of Washington Correspondence

INTERDEPARTMENTAL

Interactive Systems Design Laboratory, Department of Electrical Engineering, FT-10

September 19, 1988

TO: Tom Rekdal

FROM: Bob Marks Bob Marks/cc

RE: $

I'm lost on the status of salary money. Can we cover the following salaries from the current grant balances:

1. WTC Neurocomputers

   Les Atlas - 3 mos. summer '89

   Bob Marks - 1 month summer '89

   2 R.A.'s now through summer '89

2. Texas Tech

   Bob Marks - 1 month summer '89

   1 R.A. now through Winter Quarter

3. NSF (Power and Neural Networks)

   Marks - 1 month summer '89

   Damborg - 1 month summer '89

   El-Sharkawi - 1 month summer '89

   3 R.A.'s now through summer '89

Is this right? Any cuts will come from R.A.'s.

Thanks for your help.

RJM:cc

香港城市理工學院
City Polytechnic of Hong Kong

MEMO

From: To

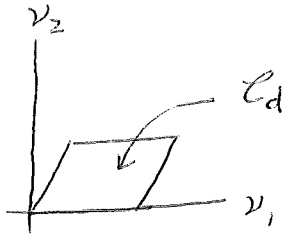
Ref:

Tel. No. Your Ref.

Date Dated

Dear Bob,

Thank you for your letter, the sampling paper and also your encouragement. By the way, in the sampling paper there is a figure 19 ~~with~~ :



Actually, this figure is not necessary. So, you can delete this figure in the text without affecting the content.

Hong Kong indeed is very crowded and fast-paced. For a person like me who have spent around 10 yrs. in Seattle, this kind of life pattern is of course not comfortable. So, besides working, I stay home most of the time. Later, I will move with my family to a bigger house mansion of ours. I think, I will feel a lot better then.

At the moment, I don't have an office yet. The polytechnic is renting a commerical building as the temporary campus. Later this month, my department will move to the permanent campus. At there, I and another colleague will share an office with an area of around 300 square feet. Each room will have an IBM AT or Sun Work station.

香港城市理工學院
City Polytechnic of Hong Kong

MEMO

From: To

Ref:

Tel. No. Your Ref.

Date Dated

My first impression of the college education in Hong Kong is rigid, dull and a lot of waste. Every course has only two lectures per week (which of course is far from adequate). Every student are not allowed to change their major or even classes during their progression of course work. Senior electives are minute compared to UW. Students do not have part-time option nor any option to choose their pace in the course work. Every quarter, the course work is rigidly assigned and therefore, all students are "rigidly" put out of school (graduate) every 3 yrs or 4, no more no less. I hope the U.S. system will be adopted here. The U.S. system are a lot more flexible and interesting, or, well, may be more expensive, but it will be a lot better for the students.

After some consideration, I will devote most of my research interest in electro-optics, and minor in ~~M~~ 2-D signal processing (image processing and pattern-recognition etc). So if you have any publication in these area or related publications you read or journals, please send me a copy. I will be very appreciated.

I think I will adapt very well in Hong Kong. There are needs in the youth work in churches. Under the shadow of 1997, many more well-established couples in churches will emigrate. This will leave a vacuum in the youth work. But the Lord is always able, and changes curse to blessings.

Pray for me, Bob. I miss Seattle and ISDL ~~terribly~~ terribly. God bless you, Connie, and the kids.

Kwan 8-31-1988

By the way, my Fax # is 3-7893698. What's yours?

Texas Tech University

Optical Systems Laboratory
Department of Electrical Engineering
Lubbock, Texas 79409-4439/(806) 742-3465

September 9, 1988

Dr. Robert J. Marks
Dept. of Electrical Engineering
University of Washington
Seattle, WA 98195

Dear Bob:

As you may already know, we have recently moved back into the remodeled electrical engineering building at Tech. To say that the architects and contractors did a great job is an understatement, but to appreciate it, you really have to see the changes in person. That is why I am writing this letter.

Our 1988 Homecoming at Texas Tech is on Saturday, September 24th. A number of Optical Systems Lab alumni have indicated that they will be coming to Lubbock for Homecoming and would like to get together with other "former OSLers." You may also know that Dr. Russ Seacat and a number of other former Tech faculty will be here to help us celebrate the completion of the "new" EE building. There will be our traditional EE reception in the new Bullen Room from 3:30 PM - 5:30 PM. The Texas Tech vs. Baylor football game begins at 7:00 PM. Since some of you who come will be going to the game and some will not, Pat and I would like to plan an informal reception/ open house at our house (3213 75th Street/ 792-0671) from 8:00 PM - 11:00 PM with the idea being that those who do go to the game can come after the game is over (around 10:00 PM). Our current OSL graduate students will also be invited so you will get a chance to meet them.

Some of you "old timers" will be surprised at all the changes that have taken place in OSL since you have been away. Many of you know that the labs are now located on the second floor of the EE Annex (Rooms 203B-C-D). We will be delighted to give you a "tour" and tell you what is going on in OSL these days. Dr. Tom Krile is away this year on sabbatical at Wright State University in Dayton, Ohio (next door to Wright-Patterson AFB) but Dr. Sunanda Mitra and I are going strong and we are also looking to recruit another faculty member to join us.

In summary, I hope that a number of you will be joining us on September 24th, and am enclosing some hotel information if you need it. You might want to let our OSL secretary, Pansy Burtis ((806) 742-3465) know if you will be coming. Hope to see you here!

Sincerely,

John

John F. Walkup
Horn Professor
Director, OSL

Enclosure

Bob - I'll be calling you. Hope you can still come! Mike Jones & Glenn Baird are coming for sure. You can stay with us.

John

Reference only

HOTELS - LUBBOCK
(Area Code **806**)

Barcelona Court of Lubbock	5215 Loop 289 South Toll Free-Dial "1" and 800-528-1234	794-5353
Days Inn	2401 4th St.	747-7111
Days Inn	505 Avenue Q	747-6222
Holiday Inn-Casa Grande	6624 Avenue H	794-5253
Holiday Inn Civic Center	801 Avenue Q	763-1200
La Quinta Inns	601 Civic Center Avenue Q Toll Free-Dial "1" and 800-531-5900	763-9441
Lubbock Inn	3901 19th Street	792-5181
Lubbock Plaza	3201 South Loop 289 South	797-3241
Motel 6	909 66th Street	797-3241
Paragon Hotel	3201 Brownfield Hwy	792-0065
Sands Motor Inn	310 Avenue Q	763-2661
Village Inn Motor Hotel	4925 Brownfield Road Toll Free-Dial "1" and 800-528-1234	795-5281

香港城市理工學院
City Polytechnic of Hong Kong

MEMO

From: Kwan | To Bob Marks

Ref: |

Tel. No. | Your Ref.

Date 9/9/1988 | Dated

Dear Bob,

After talking with you on the phone this morning, at least one thing I know is that you have been praying for me. I just want to appreciate of your "hidden" support and to thank God our Lord who has been showing mercy on me.

Having been working for around two weeks, I have gradually come to understand the direction of the Department. At the present moment, the Department is in the stage of maturing. Next year the Department will be splitted into two departments: electronic engineering and computing engineering. As I have told you on the phone, all executive positions in goverment agencies are British. My Department Head is also a British. Surprised to me is that He is a rather kind and mild person. I've talked with him about neural networks and he has shown great interest in this new area and hope that I can work together with him in neural network applications. Therefore, I hope you can send me a list of ISDL ~~applicats~~ publications, and if possible, a bibliography of neural network publications.

Mobile phones and Fax machines are very much more popular here than in Seattle. I have seen a ~~mobl~~ mobile phone in shops. That ~~no~~ phone is small enough to be put into the shirt pocket, and lighter than a walkman ~~Compatible~~ portable unit. A major direction in the electronic industry is to mass produce very compact mobile phone, which is believed to have a large market here and abroad, especially U.S.. Major electronic products are PC based. Most major U.S. computer manufacturers have production line in Hong Kong. One reason is the cheap labor. I have interviewed a number of students who applied for the part time evening program. Almost all of them are working as designers in the industry. Their highest income is about US$500 per month, less than a TA at U.W.. A major research branch in my Department is manufacturing technology with emphasis in utilization of Robotics, I may have a chance there to ~~apply~~ use neural networks for learning and control.

香港城市理工學院
City Polytechnic of Hong Kong

MEMO

From: To

Ref:

Tel. No. Your Ref.

Date Dated

Economy in Hong Kong seems never tired. Looking out the window, I can see people walking very fast on the street. Buses come and go may be every 30 seconds. Subway's train is as frequent as 2 minutes for each train. Restaurants are always full. On the surface, Hong Kong is very prospherous. Yet, I feel the need of gospel are urgent. God loves this mass density of people and therefore He died on the cross. Sometimes I think if Jesus were on the earth to day, He would visit Hong Kong. With this feeling in my heart, I am learning to be humble and ~~to~~ be involved in the society. I am learning to identify with people because I am one of them. The first few days after I arrived, I had a lot of complaints in my heart (The environment in Seattle is indeed precious) I complained the enirronment, the job, the people..... But the life of God is not a life of full of complaints, that is from my old life. the life of God is from the Holy spirit, full of love and humility. With this life, I can learn to adapt, to love and to appreciate. Believe it or not, I am still sleeping on the floor every night. But I don't know why I sleep very well. This must be a grace of God that let me sleep on the floor and sleep well.

By the way, I am moving to a larger house (which is put on sale). The enviroment there is very quiet and therefore I can work in the house. You can use the same address I gave you because my parents are living there. I hope you can come to Hong Kong sometimes. my house has three bedrooms so you should have no problem to accomodate. I am glad that I am not thinking of Seattle as much as the first week I arrived here. Well, I remembered I need to say there is no place like Hong Kong. Now - changed it to there is no place like Seattle. God bless you, send my greetings to Connie and the Kids.

Kwan

9/9/88 from Hong Kong.

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering, FT–10
Telephone: (206) 543–2150

September 9, 1988

Miss Lily Ma
City Polytechnic of Hong Kong
Argyle Centre, Tower II
700, Nathan Road, Mongkok
Kowloon, Hong Kong
FEDERAL REPUBLIC OF CHINA

Dear Miss Ma:

This letter is to certify that Mr. Kwan Cheung has completed all the requirements for his Ph.D. degree in Electrical Engineering at the University of Washington. Mr. Cheung's Ph.D. degree was conferred Spring Quarter 1988.

If you need additional information please don't hesitate to contact me.

Sincerely,

Linda A. Belanger

Linda A. Belanger
Graduate Program Assistant

cc:Kwan Cheung
Prof. Robert Marks

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-6061

September 1, 1988

Dr. Neil K. Jablon
AT&T
200 Laurel Avenue
Room 3B-216
Middletown, NJ 07748

Dear Dr. Jablon:

Enclosed is a copy of a dissertation abstract of Kwan Fai Cheung. Dr. Cheung earned his Ph.D. from the Department of Electrical Engineering in autumn of this year. Please consider it for inclusion in IEEE ASSP Magazine.

Sincerely,

Robert J. Marks II

Robert J. Marks II
Professor

RJM:cc

Enclosure

University of Washington

Abstract

IMAGE SAMPLING DENSITY REDUCTION BELOW THAT OF NYQUIST

by Kwan Fai Cheung

Chairperson of the Ph.D. Supervisory Committee:
Professor Robert J. Marks II
Department of Electrical Engineering, FT-10
University of Washington, Seattle, WA 98195

The Nyquist sampling density of a bandlimited function is that density corresponding to maximally dense packed spectral replications. The minimum sampling density, on the other hand, is the sampling density where the samples are linearly independent. If there exists gaps among spectral replications, the samples are linearly dependent and the function is oversampled. For 1-D lowpass bandlimited functions, the Nyquist density is the minimum sampling density. This, however, may not be the case for M-D lowpass bandlimited functions. In many cases, the Nyquist density is higher than the minimum density. Whether the two are the same depends upon the shape of the support of the function's spectrum. For example, a 2-D function whose support is circular always has gaps among its spectral replications. Thus, the Nyquist density is higher than the its minimum density. However, if the support is rectangular, then the Nyquist denisty is also the minimum density. Thus, to sample a M-D bandlimited function at the minimum density is not as trivial as its 1-D counterpart. By using a sampling decimation technique, all M-D bandlimited functions can be sampled directly and arbitrarily close to the minimum density. This technique is applicable to any periodic sampling geometry and any spectral support. Indeed, the minimum sampling density is shown to be equal to the hyperarea of the support of the function's spectrum, regardless of the shape of that support. The restoration of the decimated samples and ultimately the whole signal can be performed by linear interpolation. The resulting interpolation noise level varies with the decimation geometry. The greater the clustering of the decimated samples, the higher the noise level. The optimal decimation geometry, which yields the smallest INL, can be located by a Gram-Schmidt type algorithm.

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-6061

August 18, 1988

Prof. S. Y. Kung
Department of Electrical Engineering
Princeton University
Princeton, NJ 08544

Dear Prof. Kung:

I would appreciate receiving a copy of the full paper you will be giving at the Boston INNS conference. From your abstract, I appreciate your use of signal space analysis in describing neural network dynamics. As you see in the enclosed paper, we have similarly approached neural network description, yet in a different way.

Sincerely,

Robert J. Marks II
Professor

RJM:cc

Enclosure

University of Washington Correspondence

INTERDEPARTMENTAL

Interactive Systems Design Laboratory, Department of Electrical Engineering, FT-10

August 8, 1988

TO: Lynn Fleming

FROM: Bob Marks Bob Marks/cc

Two items:

1. What is the status of our NSF proposal? We have been awarded the grant and want to make sure all is going well. Please send us cc's of your correspondence to NSF so we know what's going on.

2. I don't understand why the duration of my Texas Tech money is for 15 days. Do you?

RJM:cc

University of Washington Correspondence

INTERDEPARTMENTAL

Interactive Systems Design Laboratory, Department of Electrical Engineering, FT-10

May 12, 1988

TO: Bob Clark

FROM: Bob Marks Bob Marks/cc

Would you please convey the following information to Paul Frank over BITNET?

Connie, Marilee (our one year old daughter) and I will be arriving in Dusseldorf on May 29th. We will meet my mother there, rent a car and drive to Duisburg. We plan to spend the 30th adjusting to jet lag.

I will be giving my seminar on the 31st and will be available that day and the next to tour the labs and talk to faculty. We plan to begin playing tourist on Thursday morning.

Would Prof. Dr. Frank be so kind as to arrange for reservations for the four of us at a local lodging establishment starting late Sunday evening (May 29th) to the following Thursday morning?

RJM:cc

RJM —
Done.
— RMC

I have asked Jim to respond to me with info on reservations.
— Bob

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-6061

June 14, 1988

Dipl.-Ing. Peter Richert
Fraunhofer-Institut für Mikrolektronische
Schaltungen und Systeme
Finkenstrabe 61
D- 4100 Duisburg 1
Federal Republic of Germany

Dearest Herr Richert:

It was good to have met you. Enclosed, as requested, is a sample of our work. I hope you find it useful.

Sincerely,

Robert J. Marks II
Professor

RJM:cc

Enclosures

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-6061

June 14, 1988

Dipl.-Ing. David Sanchez
Deutsche Forschungs- und Versuchsanstalt
für Luft- und Raumfahrt e.V.
German Aerospace
Research Establishment
Oberpfaffenhofen
D-8031 Wessling
Federal Republic of Germany

Dearest Herr Sanchez:

It was good to have met you. Enclosed, as requested, is a sample of our work. I hope you find it useful.

Sincerely,

Robert J. Marks II
Professor

RJM:cc

Enclosures

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-6061

June 14, 1988

Dipl.-Ing. Wolfgang M. Grimm
Fachgebiet Meb-und Regelungstechnik
Fachbereich Elektrotechnik
Universität -GH- Duisburg
Bismarckstrabe 81, BB
D-4100 Duisburg 1
Federal Republic of Germany

Dearest Herr Grimm:

Thank you for taking the time to act as my guide and interpreter during my visit.

I had a delightful time.

Sincerely,

Robert J. Marks II/cc

Robert J. Marks II
Professor

RJM:cc

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-2150

June 14, 1988

Prof. Dr.-Ing. P. M. Frank
Universität Gesamthochschule Duisburg
Fachbereich 9 Elektrotechnik
Postfach 10 16 29
D-4100 Duisburg 1
Federal Republic of Germany

Dear Dr. Frank:

What a wonderful visit! Thank you so much for hosting my stay and coordinating the tour of your institute. I cannot imagine a more delightful three days.

The remainder of our time in your country was spent on the Rhein. The cathedral at Köln was awesome. We stopped at the Marksburg castle thinking we had possibly found our roots. No such luck. No one named Marks ever lived there. The castle was named after St. Mark. (But then again, maybe so are we.)

In Weisboden, the U.S. military let us on base to visit the hospital in which Connie was born. We were nearly arrested, however, for taking pictures of the building. They let us go with a warning after we convinced them of our innocent motives.

My research program here is presently too hectic to take a sabbatical in the near future. When circumstances are better, I may contact you concerning the possibility of visiting Duisburg.

I hope to see you again soon.

Best personal regards,

Robert J. Marks II/cc

Robert J. Marks II
Professor

RJM:cc

P.S. If you haven't heard, Endrik has been appointed acting Chair of our department.

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-2150

April 7, 1988

Prof. Dr.-Ing. P.M. Frank
Universitat Gesamthochschule Duisburg
Fachbereich 9 Elektrotechnik
Postfach 10 16 29
D-4100 Duisburg 1
Federal Republic of Germany

Dear Dr. Frank:

Thank you for your kind invitation to speak at your institution on May 31st. I am in the process of finalizing our travel plans and will let you know of my itinerary as soon as it is formulated. I look forward to visiting your colleagues and facilities.

My wife and one year old daughter will be accompanying me on the trip. My wife was born in Wiesbaden, yet has not had the opportunity to return to your country since her childhood.

I am sorry that you will be out of town during our visit. Nevertheless, I look forward to interaction with your department.

Best regards,

Robert J. Marks II/cc

Robert J. Marks II
Professor

RJM:cc

Fachbereich 9
Elektrotechnik

Fachgebiet
Meß- und Regelungstechnik
Prof. Dr.-Ing. P. M. Frank

Universität · Gesamthochschule · Duisburg

Universität - Gesamthochschule - Duisburg · Postfach 10 16 29 · D-4100 Duisburg 1

Prof. Robert J. Marks
Dept. of Electrical Engineering
FT-10
University of Washington
Seattle, Wa. 98195

U.S.A.

Auskunft erteilt: Prof. Frank

Telefon (02 03) 37 90

Durchwahl 379- 3386

Gebäude: Bismarckstraße 81, BB

Ihr Schreiben vom	Ihr Zeichen	Mein Zeichen	Datum
		Fr/co/20	11.03.1988

Dear Prof. Marks,

Prof. Clark has informed me that you plan to come to Europe end of May/ beginning of June. He also mentioned that you would be able to visit Duisburg and give a seminar talk on "Neural Networks". We are very much interested in such a talk in our colloquium on Automatic Control, organized by Prof. Schwarz and myself. Also on behalf of Prof. Schwarz I would therefore like to invite you to come to Duisburg and give a seminar talk on "A signal space interpretation of neural network associative memories and classifiers".

The most convenient date for us would be Tuesday, May 31. I should mention however that I personally might be out of town (at the University of Prag) during that whole week, but even in this case you would be well received here. We would be glad if you could provide some time for visiting our laboratories and meet with our scientific co-workers so that we could show you our research activities.

I am glad to inform you that we would be able to pay you a modest honorary for your talk (DM 200,-) and pay your travel expenses in Germany.

Please let me know if the proposed date fits to your plans and if you accept the invitation. I would very much appreciate to have further information from you on your time of arrival and leave.

We are very much looking forward to seeing you in Duisburg.

Sincerely yours,

Paul Frank

(Prof. Dr.-Ing. P. M. Frank)

Φ: Prof. Schwarz, Prof. Clark, Dipl.-Ing. Berlin

Professor R.J. Marks
Department of Electrical
Engineering, FT-10
University of Washington
Seattle, Washington 98195

8 Fucheng Rd. #36-2
Beijing, P.R. China

April 5, 1988

Dear Professor Marks:

I was Accepted by the Graduate School as a pre-doctor to the Department of Electrical Engineering. As I was applying for the admission I wrote to the department expressing my interestt in your researching field and asked for more detailed information about your work. It is a pity that I have not got the answer, perhaps I should have written to you directly for those informations.

In the registration bulletin of the 14th Congress of ICO I got to know that you have a paper about optical computing (A Class of Continuous Level Neural Net) presented on the meeting. It is by chance that my Master thesis (A differential polarized light interferometric system for measuring flatness of magnetic disks) was presented to the same meeting. Here enclosed is the abstract of my thesis. I shall be greatly pleased if you can give me a brief introduction of your recent research work in optical computing and optical information processing on your convenience.

With this letter I also sent you my resume. I wish those materials could be of any interest to you. My graduate study in China concentrated on the study of optical information processing. This is also the most interesting field to me. Now I want to extend my research scope to optical computing, the very advanced subject, and image processing, a more practical subject. I expect to do reserch work in an appropriate project to develop my professional experience and to get some financial support which is very important to me.

I plan to arrive at the University in June,1988. Though I have been admitted to begin my study in spring term, due to some unfinished formalities I have to postpone it to next term.

Very pleased to hear from you, I am looking forward to it.

Sincerely yours,

Ye Chen

Ye Chen

YE CHEN

Address:
8 Fucheng Rd. #36/2
Beijing, P. R. China

OBJECTIVE Research in modern optics, such as optical information processing, coherent and partial coherent optics, holography, optical image processing, optical communication, integrated optics.

EDUCATION M.S. of engineering in optical information processing, Qinghua University, Beijing, China, June,1986

B.S. of engineering in optical instruments, Qinghua University, Beijing, July, 1983

TOEFL score: 617
GRE score: to be revealed

WORKING EXPERIENCE Research engineer of Chinese Academy of Space Technology. Working on optical image processing in the field of satellite information processing, Aug.,1986--present

Research Assistant in the Department of Precision Instruments, Qinghua University. Sept., 1984--June, 1986. Successfully designed an optical profiling instrument using inteferometry of polarized light. This includes optical system and digital circuits designing, microcomputer interfacing and mathematical modelling on IBM-PC.

Research Assistant in the Department of Precision Instruments, Qinghua University. Mar.--July,1983. Designed the optical system for the measurement of the diameter of glass tube used in the optical fiber communication.

Teaching Assistant, Department of Precision Instruments, Qinghua University. Responsible for teaching senior level modern optics lab. Sept.,1984-July.,1985

Teaching Assistant, Department of physics, Qinghua University. Responsible for teaching undergraduate general physics lab. Sept.,1983-July,1984

SKILLS Familarity with microprocessors
Reading ability and simple conversation in German
Basic knowledge in Russian

INTERESTS Enjoying classical music esspecially operas
Philosophy and romantic novels of the twentieth century
Travelling and skating

PRIVATE & CONFIDENTIAL

香港城市理工學院
City Polytechnic of Hong Kong
九龍旺角彌敦道七零零號旺角中心第二座
電話：三・九八四三二一
Argyle Centre, Tower II
700, Nathan Road, Mongkok, Kowloon, Hong Kong
Cable: CITYPOLYHK Telex: 39369 CPOLY HX
Phone: 3-984321

Director: Dr David Johns

Your ref:

Our ref: EE/49/88

14 April 1988

Prof. Robert J. MARKS II
Dept. of Electrical Engineering,
FT-10, University of Washington,
Seattle, Wa 98195,
U.S.A.

Dear Prof. Marks II,

Re : Mr. CHEUNG Kwan-fai

The letter of reference which you provided on the abovenamed was very useful to our assessment.

Thank you very much for your kind assistance.

Yours sincerely,

(Miss Sandie YAN)
for General Secretary

SY/is

CGS 415

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering, FT–10
Telephone: (206) 543–2150

April 4, 1988

Ms. Denise Banfield
The Institute of Electrical and
Electronics Engineers, Inc.
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331

Dear Denise:

I had meant the $8.00 to apply to IEEE Trans Computers. If there is an overage, please bill me.

Sincerely,

Robert J. Marks II/cc

Robert J. Marks II
Professor

RJM:cc

IEEE SERVICE CENTER
THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.
445 HOES LANE, P.O. BOX 1331, PISCATAWAY, NJ 08855-1331, U.S.A. TEL. (201) 981-0060 TELEX 833233

DIRECT NUMBER (201) 562-

March 24, 1988

Mr Robert J Marks II 6402291
Univ of Washington
Dept of Elec Eng Ft-10
Seattle WA 98195

Dear Mr Marks:

Thank you for your payment of $118.00 for your 1988 IEEE membership which has been applied as follows:

$ 67.00	1988 IEEE Membership Dues
10.00	Membership in the Acoustics, Speech, and Signal Processing Society to receive TRANSACTIONS on Acoustics, Speech, and Signal Processing (01-1001)
14.00	Membership in the Circuits and Systems Society to receive TRANSACTIONS on Circuits and Systems (04-1051)
19.00	Subscription to PROCEEDINGS OF THE IEEE (101-5011)
$110.00	Total
8.00	In Pending Account
$118.00	Amount Received

We are sorry we are unable to identify what the remaining $8.00 is intended to cover. This amount is being held in a pending account until we hear from you.

Sincerely,

Denise Banfield

Denise Banfield
Membership Services

DB:ms
0004D9

Natural Sciences and Engineering
Research Council of Canada

200 Kent Street
Ottawa, Canada
K1A 1H5

Conseil de recherches en sciences
naturelles et en génie du Canada

200, rue Kent
Ottawa, Canada
K1A 1H5

March 21, 1988

R. Marks
Interactive Systems Design Lab.
Department of Electrical Eng._FT-10
University of Washington
Seattle, WA 98195
USA

On behalf of the Natural Sciences and Engineering Research Council, I am writing to thank you for your help in assessing the NSERC grant applications which were sent to you for review.

I can assure you that the assistance of external referees such as yourself forms an essential part of the peer-review process, and I am very grateful for the considerable time and effort you have dedicated to this task.

Yours sincerely,

Nigel Lloyd

Nigel Lloyd
Assistant Director
(Operating Grants)

Canada

Texas Tech University

Optical Systems Laboratory
Department of Electrical Engineering
Lubbock, Texas 79409-4439/(806) 742-3465

March 29, 1988

Dr. Robert Marks, II
Electrical Engineering Department
University of Washington
Seattle, WA 98195

Dear Bob,

Just a short note to thank you for the glowing letter you wrote to support my sabbatical application at Texas Tech. Your efforts were not in vain, as I found out last Friday that my request was successful. Dr. McAulay already has my name on a proposal and he's eager for me to come to work at Wright State by mid-summer. Kathy and I are gearing up for the big move and my brother is working on housing on the Dayton end, so we're moving ahead to change and adventure. Thanks again for your efforts on my behalf. Best regards to Connie and the kids.

Sincerely,

Tom Krile

Thomas F. Krile

Bob, this is partially your fault!
Les

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

LES E. ATLAS
MAR 3 1 1988

College of Engineering, FH–10
Office of the Dean

March 29, 1988

Dr. Les E. Atlas
Department of Electrical Engineering
FT-10

Dear Dr. Atlas,

I have recently been notified by the President that he concurs in the recommendation made by your Department and College colleagues that you be awarded tenure in the Department of Electrical Engineering and be promoted to Associate Professor, effective September 16, 1988.

Please accept my warmest congratulations on this accomplishment.

Sincerely,

Robert M. Mortensen
for J. Ray Bowen
Dean

lar
cc: Prof. R. P. Porter

Telephone: (206) 543–0340

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering, FT-10
Telephone: (206) 543-2150

February 29, 1988

Dr. John F. Walkup
Optical Systems Lab
Dept. of Electrical Engineering
Texas Tech University
Lubbock, TX 79409

Dear John:

Greetings!

I appreciate your nominating me for OSA Fellow. As you requested, I've filled out a rough of the nomination.

For references, I think Henry Stark is obvious. John Caulfield might be good. Your locals, such as Tom or Marian, would also be good.

I'm playing with an optical system for you in my head. I'll be writing to you about it in the near future.

Best personal regards,

Robert J. Marks, II
Professor

RJM:cc

Attachment

OPTICAL SOCIETY OF AMERICA

Fellow Nomination Form

The procedure to be followed in nomination of regular members of the Society to the rank of fellow is for a primary sponsor to complete the Fellow Nomination Form and arrange with two or more additional individuals for completion of Fellow Reference Forms. Nominations to the rank of fellow are reviewed by the Committee on Fellows and Honorary Members each year in June. The recommendations of this committee are transmitted to the board of directors for consideration. Elected fellows are notified in June of the year following.

The bylaws specify that: "Any regular member who has served with distinction in the advancement of optics is eligible for transfer to the class of fellow."

"Regular members may be transferred to the class of fellow at any regular meeting of the board of directors by a two-thirds (2/3) vote of the members of the board of directors present. The number of fellows shall at no time exceed one-tenth (1/10) of the total membership of the society, except that no one who has been transferred to the class of fellow shall be displaced from that class because of a reduction in the total number of members in the society. Fellows shall pay the same dues as regular members."

Privileged Information

Candidate's Name: Robert J. Marks II Date and place of birth: 8/25/50, W. Va.

Position: Professor of Electrical Engineering

Employer: University of Washington

Professional recognition (honors, awards; include dates): IEEE Centennial Medal & Certificate, 1984, Sigma Xi, Eta Kappa Nu

Education (institution, field of study, dates attended, degrees awarded): Ph.D in Electrical Engr. 1974-1977, Texas Tech U, Lubbock; BS & MS in Electrical Engr.; 1968-1972, 1972-1973, Rose-Hulman Inst. Tech, Terre Haute, Ind.

Areas of professional specialization: Optical Processing, Neural Computing, Image Restoration and Synthesis

List specific optical science and/or engineering professional accomplishments and contributions meriting election to fellowship: Significant research contributions in: Neural computing, image restoration and synthesis, space-variant and radar related optical processing.

Principal professional society memberships and activities (indicate membership grade, contributions to the work of the society, important offices held, and committee activities): OSA: Cofounder & current president of the Puget Sound Section of the Optical Society of America. IEEE: Senior Member, Current Chair of IEEE Circuits & Systems Society Technical Committee on Neural Systems and Applications.

(continued overleaf)

Other noteworthy pertinent accomplishments in science, engineering, and public service [boards, committees, consultantships (include dates)]: Consulted for numerous Northwest firms: John Fluke, Lasentec, FLOW, Appa Systems, Space Labs and Technical Arts

Record of professional experience (list employer, position, and dates): Professor (1987-present), Associate Professor (1982-1987) Assistant Professor (1977-1982)

Publications and patents (list significant work, publications, and patents to support this nomination. Attach separate sheet if necessary): see attached list

Proposed citation (summarize nominee's contributions for citation in twenty or fewer words): for research contributions in image recovery and sythesis and space-variant, radar and neural optical processing.

Referees: The following individuals have agreed to complete a fellow reference form for the candidate. (A minimum of two referees is required; one of the referees should be a fellow.)

1. _____

2. _____

3. _____

4. _____

Check one: _____ Send Fellow Reference Forms to the referees.

_____ I have sent Fellow Reference Forms to the referees.

Nominated by: _____ _____
Signature Date

John F. Walkup
Name

Optical Systems Lab
Address

Dept. of Electrical Engineering
Texas Tech University, Lubbock, TX 79409

806/742-3500
Telephone

Return to: OPTICAL SOCIETY OF AMERICA
1816 Jefferson Place, N.W.
Washington, D.C. 20036

PUBLICATIONS - JOURNAL ARTICLES

1. R.J. Marks II and T.F. Krile "Holographic representations of space-variant systems: system theory", **Applied Optics**, vol. 15, pp.2241-2245 (1976).

2. R.J. Marks II, J.F. Walkup and M.O. Hagler "A sampling theorem for space-variant systems", **Journal of the Optical Society of America**, vol. 66, pp.918-921 (1976).

3. R.J. Marks II, J.F. Walkup, and M.O. Hagler "Line spread function notation", **Applied Optics**, vol. 15, pp.2289-2290 (1976).

4. R.J. Marks II, J.F. Walkup, M.O. Hagler and T.F. Krile "Space-variant processing of one-dimensional signals", **Applied Optics**, vol. 16, pp.739-745 (1977).

5. R.J. Marks II, J.F. Walkup and M.O. Hagler "Ambiguity function display: an improved coherent processor", **Applied Optics**, vol. 16, pp.746-750 (1977).

6. T.F. Krile, R.J. Marks II, J.F. Walkup and M.O. Hagler "Holographic representations of space - variant systems using phase-coded reference beams", **Applied Optics**, vol. 16, pp.3131-3135 (1977).

7. R.J. Marks II and S.V. Bell "Astigmatic processor analysis", **Optical Engineering**, vol. 17, pp.157-169 (1978).

8. R.J. Marks II, J.F. Walkup and M.O. Hagler "Sampling theorems for linear shift-variant systems", **IEEE Transactions on Circuits and Systems,** vol. CAS-25, pp.228-233 (1978).

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45. R.J. Marks II, L.E. Atlas and K.F. Cheung "Optical processor architectures for alternating projection neural networks", (in review).

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PUBLICATIONS - PROCEEDINGS PAPERS

1. R.J. Marks II, J.F. Walkup and T.F. Krile "An improved coherent processor for ambiguity function display", **Proceedings of the International Optical Computing Conference**, Capri, Italy, September 1976 ... invited paper.

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15. K.F. Cheung, R.J. Marks II and L.E. Atlas "Neural net associative memories based on convex set projections", **Proceedings of the IEEE First International Conference on Neural Networks**, San Diego, June 1987.

16 R.J. Marks II, L.E. Atlas and K.F. Cheung "A class of continuous level neural nets", **Proceedings of the Fourteenth Congress of the International Commision for Optics**, pp.29-30, Quebec City, Quebec Canada, August 24-28, 1987.

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18. T. Homma, L.E. Atlas and R.J. Marks II "An artificial neural network for spatio-temporal bipolar patterns: application to phoneme classification" **Proceedings of the IEEE Conference on Neural Information Processing Systems - Natural and Synthetic**, Boulder Colorado, November 1987.

19. R.J. Marks II, L.E. Atlas and K.F. Cheung "Architectures for a continuous level neural network based on alternating orthogonal projections", **Proceedings of O-E/LASE '88 Conference on Neural Network Models for Optical Computing**, Los Angeles, January 1988.

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8. K.F. Cheung and R.J. Marks II "Image sampling density reduction below that of Nyquist", **Journal of the Optical Society of America A**, vol. 3, pp.P42-43 (1986).

9. L.E. Atlas, J.A. Ritcey, K.F. Cheung and R.J. Marks II "Improving the performance of composite matched filters", **Journal of the Optical Society of America A**, vol. 3, P.P13 (1986).

INVITED PRESENTATIONS:

1. "Coherent space-variant processing", *Gordon Conference on Coherent Optics and Holography*, Santa Barbara, CA, (June 1978).

2. "Coherent space-variant processing", *Gordon Conference on Coherent Optics and Holography*, Santa Barbara (1980).

3. "An iterative coherent processor for bandlimited signal extrapolation", *1980 International Computing Conference,* Washington D.C., (April 1980).

4. Invited discussion leader for "Space-variant coherent optical processing", *Workshop on the Future Directions for Optical Information Processing*, Texas Tech University, Lubbock (May 1980).

5. "Applications of Gerchberg's algorithm to bandlimited signal extrapolation", *Gordon Conference on Holography and Optical Information Processing*, Ventura, CA (June 1980).

6. "Signal extrapolation (or how to clone a signal", *Industrial Affiliates Program - Second Annual Research Review*, Battelle Seattle Conference Center, Seattle (January 19,1981).

7. "Linear deconvolution and extrapolation algorithms", *Advance Institute on Transformations in Optical Signal Processing*, Battelle Seattle Conference Center (February 24,1981).

8. "Superresolution", *Limits of Passive Imaging Workshop,* Mackinac Hotel, Mackinac Island, MI (May 24-26,1983).

9. Chair of Processing Group, *Limits of Passive Imaging Workshop*, Mackinac Hotel, Mackinac Island, MI (May 24-26,1983).

10. "Speckle Suppresion", *Technical Arts Corp.,* Seattle, WA (November 28, 1983).

11. "Superresolution by coherent optical feedback", EE/CS Seminar, Texas Tech University, Lubbock, Texas (April 17, 1985).

12. "Adaptive equalization and line coding", *John Fluke Manufacturing Company*, Everett, WA (August 8, 1985).

13. "A system approach to Hopfield networks", *Boeing High Technology Center* (June 30,1986).

14. "Fault tolerance in optical matched filters", Optical Systems Lab Seminar, Texas Tech University, Lubbock (September 16, 1986).

15. "Neural net content addressable memories: processors that recall information the way you do, EE/CS Seminar, Texas Tech University, Lubbock (September 17, 1986).

16. "Associative memories and POCS (projection onto convex sets)", *Boeing Aerospace Optical Pre-Processing Workshop,* Seattle (October 27-28, 1986).

17. "A class of continuous level neural nets and their optical implementation", *Boeing High Technology Center* (December 12, 1986).

18. "Continuous level neural nets", *Applied Physics Laboratory*, University of Washington (April 2, 1987).

19. *Artificial Neural Systems and Applications*, session organizer and co-chair, *1987 International Symposium on Circuits and Systems,* Philadelphia (May 6, 1987).

20. "Optical implementation of neural nets", *Puget Sound Section of the Optical Society of America* (June 2, 1987).

21. "Attributes of alternating projection neural networks", *Boeing Advanced Systems Co.*, Kent , WA (December 4, 1987).

22. "An introduction to neural network interpretation in a signal space", *Delta Graphics*, Bellevue WA (January 21, 1988).

23. "Geometrical interpretation of neural networks", *Boeing Electronics Co.*, Bellevue, WA (February 11, 1988).

BOOK REVIEWS

R.J. Marks II "Optical Information Processing by Francis T.S. Yu", **Applied Optics**, vol. 22, p.3465 (1983).

PATENTS

R.J. Marks II, L.E. Atlas and S. Oh, "An optical neural network", assigned to *the Washington Technology Center* (pending).

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Mechanical Engineering, FU-10

March 3, 1988

Professor A. Ishimaru
Electrical Engineering
FT-10

Dear Prof. Ishimaru:

Many thanks to you for your thoughtful nomination of Professor Marks for the College of Engineering Faculty Outstanding Research Award. The selection committee met on February 24, 29, and March 2, and made the final choice of the winners. I am transmitting their names to Professor James S. Meditch, Associate Dean today, and they will be made known at his discretion. The awards will be presented at the Dean's Recognition Dinner, April 21, 1988. Many excellent nominations were received, and the committee's task was not an easy one. Your participation in this process is greatly appreciated.

Sincerely,

M. Ramulu, Chairman
College of Engineering Faculty and
Student Achievement Awards
Committee

MR:bfp
cc: James S. Meditch, Associate Dean

Telephone: (206) 543-5090

University of Colorado at Boulder

Department of Electrical and Computer Engineering

Campus Box 425
Boulder, Colorado 80309-0425
(303) 492-7327

February 12, 1988

Professor Robert Marks II
University of Washington
Seattle WA 98195

Dear Professor Marks:

Thank you very much for your recent letter concerning a faculty position in the Department of Electrical and Computer Engineering at the University of Colorado, Boulder.

We are almost ready to begin our recruiting process for this year. I will keep your CV and letter on file and contact you as soon as the search committee has had an opportunity to meet and go through the applications that we have received. At that time we will contact you again.

Thank you for your interest in the University of Colorado at Boulder.

Sincerely yours,

David C. Chang
Professor and Chairman

DCC/amp

Enclosure: Affirmative Action Form

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING

DATE: February 11, 1988

TO: Prof. M. Ramulu, FU-10

FROM: Prof. M. A. El-Sharkawi

SUBJECT: Burlington Northern Faculty Achievement Award

I would like to nominate my friend and colleague, Prof. Robert J. Marks II, for the Burlington Northern Faculty Achievement Award. Bob's scholarly achievements this last year are nothing short of incredible. He has thirteen archival publications (two invited), nine proceedings papers, six off-campus invited presentations and a pending patent. As is witnessed by the recently published article in EE Times (attached), his work in artificial neural networks in conjunction with Prof. Les Atlas, has brought our college positive international visibility. His other activities in artificial neural networks include weekly seminars on neural networks and, with Les Atlas, a continuing education short course. The neural network efforts in EE will soon be featured in an issue of Trend.

Bob has supplied me with a list of his publications this year. They are attached. I have difficulty in imagining a more qualified candidate for an award for scholarly achievement.

Please call me at 5-2286 if you'd like to talk to me more.

MAE:cl

Archival Publications:

R.J. Marks II and L.E. Atlas "Composite matched filtering with error correction", **Optics Letters**, vol. 12, pp.135-137 (1987).

R.J. Marks II "A class of continuous level associative memory neural nets", **Applied Optics**, vol. 26, pp.2005-2009 (1987).

R.J. Marks II, J.A. Ritcey, L.E. Atlas and K.F. Cheung "Composite matched filter output partitioning", **Applied Optics**, vol. 26, pp.2274-2278 (1987).

K.F. Cheung, L.E. Atlas, J.A. Ritcey, C.A. Green and R.J. Marks II "A comparison of conventional and composite matched filters with error correction", **Applied Optics**, vol. 26, pp.4235-4239 (1987).

M.I. Dadi and R.J. Marks II "Detector relative efficiencies in the presence of Laplace noise", **IEEE Transactions on Aerospace and Electronic Systems,** vol. AES-23, pp.568-582 (1987).

K.F. Cheung, L.E. Atlas and R.J. Marks II "Synchronous versus asynchronous behavior of Hopfield's content addressable memory", **Applied Optics**, vol. 26, pp.4808-4813 (1987).

J.G. McDonnel, R.J. Marks II and L.E. Atlas "An introduction to neural networks for solving combinatorial search problems", **IEEE Expert**, (in press) ... invited paper.

R.J. Marks II, L.E. Atlas, J.J. Choi, S. Oh, K.F. Cheung and D.C. Park "A performance analysis of associative memories with nonlinearities in the correlation domain", (in review).

R.J. Marks II, L.E. Atlas and K.F. Cheung "Optical processor architectures for alternating projection neural networks", (in review).

R.J. Marks II, L.E. Atlas, J.A. Ritcey, S. Oh and K.F. Cheung "Alternating projection neural networks", (in review).

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Y. Zhao, L.E. Atlas and R.J. Marks II "Application of the generalized time-frequency representation to speech signal analysis", (in review).

S. Oh, D.C. Park, R.J. Marks II and L.E. Atlas "Error detection and correction in multilevel algebraic optical processors", submitted to **Optical Engineering** ...invited paper.

Proceedings:

L.E. Atlas, T. Homma and R.J. Marks II "A neural network model for vowel classification", **Proceedings of the International Conference on Acoustics, Speech and Signal Processing**, 1987.

J.A. Ritcey, L.E. Atlas, A. Somani, D. Nguyen, F. Holt and R.J. Marks II " A signal space interpretation of neural networks", **Proceedings of the International Symposium on Circuits and Systems**, pp.370-376, Philadelphia, May 1987.

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K.F. Cheung, R.J. Marks II and L.E. Atlas "Neural net associative memories based on convex set projections", **Proceedings of the IEEE First International Conference on Neural Networks**, San Diego, June 1987.

R.J. Marks II, L.E. Atlas and K.F. Cheung "A class of continuous level neural nets", **Proceedings of the Fourteenth Congress of the International Commission for Optics**, pp.29-30, Quebec City, Quebec Canada, August 24-28, 1987.

R.J. Marks II, L.E. Atlas, S. Oh and J.A. Ritcey "The performance of convex set projection based neural networks", **Proceedings of the IEEE Conference on Neural Information Processing Systems - Natural and Synthetic**, Boulder Colorado, November 1987.

T. Homma, L.E. Atlas and R.J. Marks II "An artificial neural network for spatio-temporal bipolar patterns: application to phoneme classification" **Proceedings of the IEEE Conference on Neural Information Processing Systems - Natural and Synthetic**, Boulder Colorado, November 1987.

R.J. Marks II, L.E. Atlas and K.F. Cheung "Architectures for a continuous level neural network based on alternating orthogonal projections", **Proceedings of O-E/LASE '88 Conference on Neural Network Models for Optical Computing**, Los Angeles, January 1988.

R.J. Marks II, L.E. Atlas, J.J. Choi, S. Oh and D.C. Park "Nonlinearity requirements for correlation based associative memories", **Proceedings of O-E/LASE '88 Conference on Optical Computing and Nonlinear Materials,** Los Angeles, January 1988.

Invited Presentations:

"Continuous level neural nets", *Applied Physics Laboratory*, University of Washington (April 2, 1987).

Artificial Neural Systems and Applications, session organizer and co-chair, *1987 International Symposium on Circuits and Systems,* Philadelphia (May 6, 1987).

"Optical implementation of neural nets", *Puget Sound Section of the Optical Society of America* (June 2, 1987).

"Attributes of alternating projection neural networks", *Boeing Advanced Systems Co.*, Kent , WA (December 4, 1987).

"An introduction to neural network interpretation in a signal space", *BBN Delta Graphics*, Bellevue WA (January 21, 1988).

"Geometrical interpretation of neural networks", *Boeing Computer Services*, Bellevue, WA (February 11, 1988).

Patents:

R.J. Marks II, L.E. Atlas and S. Oh, "An optical neural network", assigned to *the Washington Technology Center* (pending).

TECHNOLOGY

ELECTRONIC ENGINEERING TIMES

SECTION 2

Optics And Neural Nets: Marriage Of Convenience

By R. Colin Johnson

LOS ANGELES — Last week's O-E/LASE '88 conference here saw the marriage of optical computing and neural nets. The couple was hitched at the Neural Network Models for Optical Computing portion of the Jan. 10 to 15 show, sponsored by the Society of Photometric and Instrumentation Engineers.

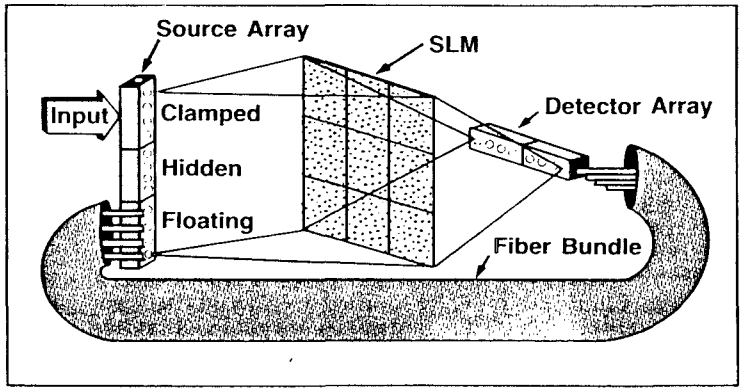
Both technologies were given a boost from academia and industry. A team of University of Washington researchers demonstrated how their neural architecture could learn in a single pass what it takes others hundreds of passes to do. And a Lockheed research group described how to control mirror perturbation in sensitive "listening" instruments.

Optical technology has for decades been a solution looking for problem. Though many simultaneous signals can be passed through any given node in an optical network without scrambling them, engineers have been hard pressed to capitalize on that characteristic.

The same problem exists in traditional computer technology. Tens, hundreds or even thousands of parallel processors have been fabricated on chips. The biggest trouble isn't with forging the hardware links for all these nodes but writing the software that harnesses them.

Optical technologies promise even more parallel processing, but what to do with it? If traditional parallel processors can't take full advantage of their nodes, then what profit is in having orders of magnitude more nodes?

Enter neural networks, whose main purpose is to simulate the manner in which billions of analog processing nodes (nerve cells or neurons) are connected in the brain. There, each node simultaneously evaluates the state of thousands or even tens of thousands of incoming messages from its neighbors. After processing, the node then sends on a single message to thousands of other nodes.



An optical alternating projection neural network accepts input to clamp some nodes, electronically generates a non-linear combination of the input at its hidden nodes and sends the result around an optical feedback loop through a spatial light modulator to its floating nodes.

Optical technology is perfect for the massive number of connections needed for neural nets, since light beams can pass though each other without interacting. And they can be passed through the light-sensitive media separating each neural plane, which is where the strength of connections between neurons is stored. The network is usually "programmed" by altering the light-sensitive material separating the planes.

Cal Tech researcher Demetri Psaltis has demonstrated several neural-net prototypes over the last few years, most recently at the IEEE conference on Neural Information Processing Systems—Natural and Synthetic, held in Denver. In some of these systems a so-called volume hologram separated the planes and could be altered in real time by the actual flow of light-encoded information among its nodes. Such systems, when perfected, should be able to learn the tasks assigned to them by example, rather than depend upon explicit programming.

Most of the current systems take many presentations of a data set to learn it, since they are based on neural network architectures such as the back-propagation network. One paper at O-E/LASE, though, described a neural architecture for optical technology that took but a single presentation for any particular set of data to be learned.

It also was claimed to be very fast, since its passive optical feedback used only guided or free-space propagation. Other systems rely on the intervention of slow optical devices, such as phase conjugators, or even slower electronics.

The University of Washington professor Robert Marks II gave the presentation on his collaborative work with professor Les Atlas and assistants Seho Oh and Kwan Cheung. The architecture he described is called an alternating projection neural network (APNN). In it, a collection of nodes is divided into those whose states are fixed and those whose states are termed "floating."

The fixed-state nodes are ei-

(Continued on Page 42)

TECHNOLOGY

Optics And Neural Nets: Marriage Of Convenience

(Continued from Page 41)

ther the input nodes or hidden nodes that are set according to a non-linear function of the input. While the hidden nodes have no effect on the learning of the network, they have a profound affect on the ability of the network to generalize.

Unlike traditional semiconductor memories that can recall only that with which they have been programmed, neural networks often possess the peculiar ability to generalize from their data set and come up with accurate responses to queries with which they have not been specifically trained.

For instance: Suppose an associative neural network is taught the cosine of each whole degree angle from 1 degree to 360 degrees. A traditional memory would not know how to respond to a request for 28½ degrees, but a neural network would generalize on its knowledge and come up with a reasonable answer. It turns out the number of specific data packets (vectors in this case) that can be stored in the APNN is on the order of the number of fixed nodes it contains.

The floating nodes have the most interesting behavior. They take on a value that is the sum of their inputs from the other nodes. The inputs to each node are multiplied by a value stored in a passive, planar spatial-light modulator of the kind developed at Stanford University (Palo Alto, Calif.) in the late 1970s. By providing feedback with fiber optics, a loop can be formed from the floating nodes into the spatial light modulator and then back into the floating nodes. This feedback loop converges on the "answer," which is then read by other devices.

Also at the conference, researcher Robert Smithson (of Lockheed Missile and Space Corp.) used neural networks to control mirror perturbation for sensitive listening instruments.

Lockheed allocated over $330,000 in 1987 toward developing an analog neural network, largely under Smithson's guidance (see Dec. 14, Page 51). The result was an LSI programmable-interconnection chip fabricated by Siliconix Inc. (Palo Alto, Calif.). It will be used by Lockheed to build feedback-style neural networks such as the energy-minimization nets originated by professor John Hopfield at Cal Tech. The chip is basically a crossbar switch with adjustable resistor values, called weights, at each connection. Smithson's segmented active mirror for solar observations demonstrated that neural networks can be used for real-time control. Since light beams are deformed by turbulence in the atmosphere, a neural network can be used to learn about those deformations and compensate by controlling the mirror. Smithson offered a tutorial on his techniques at the conference. His paper addressed the general area of applying neural network concepts to adaptive control.

In active mirror-control applications, Smithson's team has built both feed-forward and feedback prototypes. The feedback networks, of the Hopfield type, have also been developed for target classification. Such energy-minimizing feedback networks may produce the first workable neural network applications, especially for adaptive control systems. But Smithson cautions that the applications in which feedback works best is when the system is asked to make small perturbations from a known solution, as when interpreting signals that have been slightly altered by atmospheric conditions.

Smithson's project for feed-forward active mirror control incorporated learning capabilities. By adapting to changing atmospheric conditions, it used self-programming for different mirrors and wave-front sensors. Analog hardware operating at 10 kHz to 100 kHz should be relatively easy to build. The main restriction on network is the lack of architectural definition.

Currently, Smithson is studying the convergence and stability criteria to make the circuits more reliable. That involves looking in detail at the energy surfaces produced and the circuit dynamics.

1/30/88

Dear Bob,

Thanks for agreeing to write a recommendation letter for me for my sabbatical application at Tech. I'm hoping to join Dr. Alastair McAulay at Wright State Univ in Dayton for a year starting about midsummer and will be going up there in Feb. to give a seminar & look the place over. They have a unique combination of optics in a computer engineering/computer science department and are trying to deal with the practical issues of how to use optics components & capabilities in workable computer architectures. There are several areas in which I hope to interact with them: (a) helping get equipment picked out and set up for their growing optics capability, (b) working on their project to characterize new SLM's and see how they can optimally be incorporated into computing architectures, (c) get involved in their neural network studies in conjunction with Harry Klopf at Wright-Pat and the local A.I. institute, and (d) get involved in their project on image processing (digital & optical) of radiographic images in conjunction with their med. school. (I'm looking for a way to tap into NIH funding and this may afford a good opportunity as I'd like to do some medically-oriented research. Of course, being close to my brother & his family is another plus for me and I'll be able to visit

Dr. Khorana at Rose-Hulman & Hal Sabbagh in Bloomington.

In talking with Dr. Hagler, it sounds like the recommendation letter is supposed to give assurances that past history shows that I'm capable of doing things & the proposed sabbatical projects are worthwhile and important. Then I have to convince the committee that my sabbatical will be beneficial to the college, the University, & Texas. Here's the address for the letter:

Dr. Donald R. Haragan, Vice President
Office of Academic Affairs and Research
P.O. Box 4609
Texas Tech Univ.
Lubbock, TX 79409

I don't ~~think~~ you need to send me an advance copy, all we need to do is meet the Feb. 12 deadline. Thanks again for your help. Best regards to your family.

As ever,

Tom K,

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-2150

2-8-88

Dr. Donald R. Haragan, Vice President
Office of Academic Affairs and Research
P.O. Box 4609
Texas Tech University
Lubbock, Texas 79409

Dear Dr. Haragan,

I write at the request of Prof. Tom Krile in support of his sabbatical proposal. I am an alumnus of Texas Tech and have worked with Dr. Krile as graduate student. I have also followed his work closely in the journals and at conferences.

As I am sure you are aware, Tom Krile's research credentials are extensive and diverse. He is recognized as one of the nation's premier researchers in optical processing and, more recently, has pursued research endeavors in the related fields of image processing and neural networks.

I believe that Dr. Krile's participation in research at Wright State University is a rare opportunity for all concerned. With John Walkup, Tom Krile has established the Optical Systems Laboratory at Texas Tech as one of the most respected centers of optical processing in the world. While John leans primarily to theory, Tom has extraordinary strengths in both theory and hands-on implementation. With Wright State's new initiative in optical processing, there will be mutual benefit in Dr. Krile's participation. Tom will contribute his experience in the recommendation of new equipment purchases and will reciprocally benefit from the study of some newly available optical hardware and its incorporation into optical processing architectures.

Neural networks are a currently hot topic in optical processing (and elsewhere). Dr. Krile will have the opportunity to interact with local internationally recognized expertise in this field to enhance the neural network processing research presently under way in the Department of Electrical Engineering at Tech. If research intensity continues at its present pace, neural networks will sprout into a significant industry in the next decade. Those who benefit will be those close to the development of this dynamic field.

I enthusiastically support Tom Krile's sabbatical proposal and hope that this input will be of use to you in making a positive decision in this regard.

Sincerely,

P.O. Box 4439
Optical System Lab
Dept. of Electrical Engineering
Texas Tech University
Lubbock, TX 79409
Dec. 4, 1987

Dr. Robert J. Marks II
Interactive System Design Lab
Dept. of Electrical Engineering
University of Washington at Seattle
Seattle, Washington 98195

Dear Dr. Marks II:

I am currently working on my M.S. degree in electrical engineering at Texas Tech University. My field of interest is Neural Network and my graduate advisor is Dr. John F. Walkup.

Recently ,I wrote a simulation program for the Hopfield model and I found some interesting results . Test stored vectors are bipolar and the connection matrix T is not clipped. Three different retrieval schemes were used and there respective (N,n) were thus obtained. N is the number of neurons and n is the maximum number of vectors that N-neurons net could store without severely recalled output error. (i.e. the probability of successfully retrieving any stored vector is greater than 95%). Three different retrieval schemes are :

Scheme 1 $$Y_i = \sum_{i}^{N} T_{ij} V_j \qquad \text{(Original Hopfield)}$$

Scheme 2 $$Y_i = \sum_{j}^{N} \sum_{k}^{N} T_{ijk}\, V_j V_k \qquad \text{(Triple order correlation)}$$

Scheme 3 $$Y_i = \sum_{i}^{N} T_{ij} V_j + \sum_{j}^{N} \sum_{k}^{N} T_{ijk}\, V_j V_k$$

Where $T_{ij} = 0$ if i=j. $T_{ijk} = 0$ if i=j or j=k or i=k.

After thresholding the output is given by

$$V_i = 1 \quad \text{if } Y_i > 0$$

$$V_i = -1 \quad \text{if } Y_i < 0$$

and if $Y_i = 0$ then V_i is randomly decided as either -1 or 1.

As you can see scheme 2 is a triple order case in Gile's propositions
(" High order correlation model for associative memory ").

Simulation results are as follows:

S \ N / n	5	10	15	20	25	30	35	40	45	50
①	1	2	3	3	4	5	5	6	7	7
②	3	9	11	19	24	35	42	52	65	87
③	3	9	11	19	24	35	42	52	65	87

Where S ① = Scheme 1

Note that all recalls are made in Synchoronous dynamics.

Two comments:

1. By doubling the number of neurons, we could double the network storage capacity. For example, in scheme 1 and scheme 2 we have (N,n)=(15,11) , but by increasing N from 15 to 30 , we obtained (N,n)=(30,35).

2. By comparing the results from scheme 1 and scheme 2, we see no difference in the storage capacity between these two retrieval schemes. Thus it seems to me that one can totally disucard the binary order correlations when using scheme 3.

Your comments on above ressults are welcomed. I am eager to have an opportunity to talk more on this subject.

Yours Sincerely,

Mike Wang

Sandia National Laboratories

Livermore, California 94550

October 30, 1986

Prof. Robert J. Marks II
Dept. of Electical Engineering FT-10
University of Washington
Seattle, WA 98195

Dear Prof. Marks,

I appreciate your interest and enthusiasm in our work on optical median filtering. I am enclosing a preprint of a paper that we have recently submitted to Applied Optics.

As we note in the paper, our system can perform not only median, maximum and minimum filtering, but can also be used to implement a broader class of nonlinear filters, which perform adaptive rank operations.

Sincerely,

Ellen Ochoa

Ellen Ochoa, Staff Member
Imaging Technology Division

EO:8355:lal
encl.

TO

Dear Bob,

This paper is 90% of what I wanted to do. I can do it better (greater accuracy, SNR, etc.). Worth pursuing??

Joan Caulfield

Hideki Yumoto

8258 Niles Center Road

Skokie IL 60077

Dr. Robert J. Marks

Department of Electrical Engineering

University of Washington

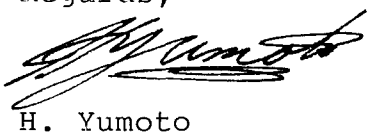
Seattle WA 98159

November 3 1987

Dear Dr. Robert J. Mrarks

I am a graduate student of University of Illinois. My thesis topics is detection theory. Your paper "Detection in Laplace noise" published in November 1978 in "IEEE transaction on aerospace and electronic system" is great interest to me. However, the mathematical derivation of eq(4) to eq(7) is difficult for me to follow. If you have the detail of these derivations, and if you could possibly send a copy to me, it will be a great help to me. Of course, I am glad to pay for the cost associated to copying and mailing.

Regards,



H. Yumoto

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-2150

11-10-87

Hideki Yumoto
8258 Niles Center Road
Skokie IL 60077

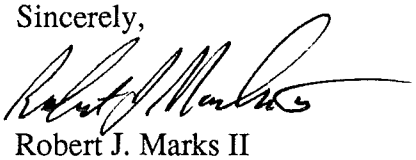
Dear Hikedi,

Thank you for your letter.

The derivation of eq(7) from eq(4) was given in an earlier paper a copy of which is enclosed. If you desire further elaboration, please write and I will see if I can locate my personal notes on the derivation.

Thank you for your interest in our work.

Sincerely,



Robert J. Marks II
Professor

cc: Dadi

Hideki Yumoto

8258Niles Center Road

Skokie IL 60077

Dr Mark Robert

November 22 1987

University of Washington

Department of Electrical Engineering

Seattle WA 98195

Dear Dr Robert Marks

I was very glad to have your copy of "Detection in Laplace Noise" published in 1987. Especially I was delighted to see how you came up the closed form of the Laplacian noise. The discussion in the paper was brief but it was not much problem for me. I spent probably four days in the library about four hours a day to reproduce all derivations.

Thank you very much for your help, greatly appreciated.

Regards.

H. Yumoto

HARVEY
MUDD
COLLEGE
CLAREMONT,
CALIFORNIA
91711

DEPARTMENT
OF
ENGINEERING

714-621-8019

Hi Bob,

Thanks for the material. It was a great help in getting us started.

Our project is to actually build a neural net, probably using back propagation. This is a clinic project sponsored by Hughes. They probably view it as recruiting expense for Harvey Mudd students, but it will be a really fun project for us.

The title pages of some of the things we have collected on back propagation are enclosed, along with an entire article on matched filters which I thought might be more along your line of interest. If any of the title pages look appealing, and the entire article is not readily available to you, say the word and I'll have it in the mail.

Do you know how to access BITNET? It is available to you from the computer in your office via the IBM across the street. It is a very handy way to communicate. I'm pretty sure that Yongmin Kim is a routine user.

My bitnet address is GCUNNINGHAM @ HMCVAX. Since you are on an IBM system it may require you use the first eight letters of my login GCUNNING. That will get it here. If you use bitnet, please send me a message and we can begin to communicate on a little better basis.

If you don't use bitnet, I encourage you to take the time to learn how. It will be worth it to you.

Thanks again

George Cybenko
10/10/87

Marks

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering, FT-10
Telephone: (206) 543-2150

October 30, 1987

Professor Teuvo K. Kohonen
Helsinki University of Technology
Laboratory of Computer and Information Science
Rakentajanaukio 2 C
SF-02150 Espoo, Finland

Dear Teuvo:

On behalf of the Department of Electrical Engineering, its faculty, and students, I would like to thank you for your seminar presentations at the Department of Electrical Engineering and for your many consulting and visit sessions with our students and faculty. Discussions with you gave further inspiration to our graduate students in the Interactive Systems Design laboratory.

I am enclosing a check for $1,000.00 which covers your seminar honorarium, travel expenses, and consulting in the Department of Electrical Engineering, as well as your activities with the Acoustical Society of America. It is my understanding that your honorarium from the Boeing High Technology Center will be handled directly by the Boeing Company.

Thank you again for your presentations. Please let us know on developments of your appointment to a permanent position as an academy professor. With best regards,

Sincerely,

Endrik

Endrik Noges
Professor and Associate Chairman

EN:ew
Encl.
cc: Atlas, Marks

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING - FT-10

DATE: October 2, 1987

TO: R. Marks

FROM: R. Porter

SUBJECT: Salary Increases Effective with Promotion

A one-step increase is automatically awarded this year for current promotions. Additional salary consideration must await the scheduled March merit increase. However, you should be aware that I have only 2.9% of the salary base to work with. In making these decisions, I am required to pay careful attention to "the correction of compression and inequities."

University of Washington Correspondence

INTERDEPARTMENTAL

Dept. of Electrical Engineering, FT-10

DATE: October 20, 1987

TO: Les Atlas and Robert Marks
Professors, Electrical Engineering

FROM: Janell Douglas
Administrative Assistant, FT-10

RE: Arun Somani

The Tenure Review Committee for Arun Somani met on Thursday, October 15, 1987. The Committee members are Professors Linda Shapiro, William Moritz and Peter Cheung. It was noted at this meeting that Professor Somani has been a co-investigator on a neo-network research project. The Committee kindly requests information from you on Professor Somani's contribution to this research, particularily an assessment of his quality of work.

The Committee would appreciate your quick attention to this urgent request. The Committee needs to meet again to review your notes and then respond to Dr. Porter. Thank you!

cc: Dr. P. Cheung

ARUN1087.00C

School of Engineering
Electrical, Computer, and
Systems Engineering Department
(518) ~~283~~ 276-6072

Rensselaer Polytechnic Institute Troy, New York 12180-3590

23 September 1987

Prof. Robert J. Marks II
Electrical Engineering Department
University of Washington
Seattle, Washington 98195

Dear Bob:

Thanks for all the reprints and your generous referencing of my work. I did not realize that you have been so prolific in recent years in several different areas. It is quite impressive. One paper you sent me (I think it was on green paper) dealt with the relation of Hopfield's neural nets and iterative matched filters and seemed extremely interesting but it was missing many pages. Could you send me a full preprint (or reprint)?

A new sampling theorem dealing with reconstruction from spiral samples appears in the September issue of IEEE Trans. Med. Imaging, September 1987 p. 193. You might be interested in it. One of my other students (Hui Peng - she is outstanding) cracked a significant problem in medical imaging - it also appears in that issue on p. 209 but the subject may be too far from what you are doing.

In any case, I am very impressed by your work, your range of interests, and your energy. If you ever need a recommendation I would be glad to furnish one. In the meanwhile, you could remind your chairman that I would not be adverse to considering U of W if the need came up and the parameters were o.k.

By the way, are you a Fellow of OSA? If not, do you need a sponsor?

With regards,

Henry Stark

Henry Stark
Professor

HS:mcl

University of Washington Correspondence

INTERDEPARTMENTAL

10-2-87

TO: Robert P. Porter, Chair

FROM: Robert J. Marks II, Professor

As you can see from the attached letter, Henry Stark has expressed an interest for a position in our department. Since one of his fortes is image reconstruction from projections, I'm certain that you are familiar with his work. He has authored three well known books and would be a fine addition to our department if and when such a position is available.

enclosure

University of Washington Correspondence

INTERDEPARTMENTAL

10-1-87

TO: Robert P. Porter, Chair

FROM: Robert J. Marks II, Professor

I have just learned from our business office that my salary increment for promotion from Associate to Full Professor amounts to $32.75 per week. I remain concerned about my salary which is still exceeded by many Associate and *Assistant* Professors in our department.

I have attracted roughly one half million dollars in grant commitments (about half of that joint with Les Atlas) since we last talked about my salary and, as I think you are aware, my publication record is comparable with any in this Department's etc. etc.. What must I do to receive a salary comparable with my junior colleagues ? (This is *not* meant to be be a rhetorical question.)

Thank you for your attention to this matter. I request and look forward to your response.

cc: Dean Bowen

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering, FT–10
Telephone: (206) 543–2150

9-15-87

Dr. W. Thomas Cathey
Center for Optoelectronic Computing Systems
Campus Box 425
University of Colorado
Boulder, Colorado 90309-0425

Dear Tom,

Enclosed are copies of my receipts for the Gold Lake Conference. In summary:

Hotel and registration..	$255
Air fare...	$390
Rental car...	$182
total...	$827

I hope that the check can be made in the form of an honorarium rather than as travel reimbursement. Either way, the support is appreciated.

Best personal regards,

Robert J. Marks II
Professor

[illegible]

[redacted] USD

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MIN 1 DA						(32) WEEKS @ $ 294.00	

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(14) ADDITIONAL INFORMATION
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(15A) FREQUENT FLYER NO./REMARKS

(37) ARC/IATA NO. T/50617313/

(36) SUB TOTAL ADD (29) THRU (35) 168.00

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NA

(37A) YES X TA COM

(37B) PD %

MARKS, BOB
16515 ASHWORTH AVE
SEATTLE, WA, 98133

(39) MISC. CHARGES

(38) TIME AND MILEAGE CHARGE 168.00

(40) ONE WAY SVC FEE | (39A) ADD'L DRIVERS NO. | FEE/DRVR $

(42) (CDW) COLLISION DAMAGE WAIVER READ TERMS ON OTHER SIDE		
I ACCEPT	I DON'T ACCEPT	RATE PER DAY
	X	8.95

(41) REFUELING SVC (TAXABLE)

(42) RESPONSIBILITY 0

(46A) (PAI) PERSONAL ACCIDENT INSURANCE READ INS. CERT. ON OTHER SIDE		
I ACCEPT	I DON'T ACCEPT	RATE PER DAY
	X	3.00

(43) PAI, PEP, ALI (TAXABLE)

(17) DRIVER'S LICENSE NUMBER
WAMARJS501N5

(18) SPACE NO.

(44) SUB TOTAL 168.00

(19) WIZARD NUMBER

(20) RESERVATION NUMBER
5503-2426

(46B) (PEP) PERSONAL EFFECTS PROTECTION READ OTHER SIDE		
I ACCEPT	I DON'T ACCEPT	RATE PER DAY
	X	1.25

(45) TAX OR SURCHG. 8.300 % 13.94

(46) PAI, PEP, ALI (NON-TAXABLE)

(21) I HAVE READ AND AGREE TO THE TERMS ON BOTH SIDES OF THIS AGREEMENT. IF I HAVE PRESENTED A CREDIT CARD FOR PAYMENT, ALL CHARGES, INCLUDING PARKING TICKETS, MAY BE BILLED TO THE CREDIT CARD AND MY SIGNATURE BELOW WILL BE CONSIDERED TO HAVE BEEN MADE ON THE APPLICABLE CREDIT CARD VOUCHER.

(47A) (ALI) ADDITIONAL LIABILITY INSURANCE READ OTHER SIDE		
I ACCEPT	I DON'T ACCEPT	RATE PER DAY
	X	4.95

(48) REFUEL SRVC (NON-TAXABLE)

AVIS

X ____________________

(49) TOTAL CHARGE 181.94

(23) PREPAYMENT [illegible]

(50) ON THE ROAD EXPENSES

(51) NET CHARGES 181.94

(22) DATE OF BIRTH	(47) LIABILITY INSURANCE LIMITS PROVIDED (SUBJECT TO FULL TERMS & CONDITIONS ON OTHER SIDE)		
(22A) SURCHARGE	INJURY PER PERSON	INJURY PER ACCIDENT	PROPERTY DAMAGE
	25000	50000	25000

CDW RESPONSIBILITY - 3000

(52) METHOD OF PAYMENT
CENTRAL

(53) AMOUNT DUE (U.S. $) 181.94

(54) EXCHANGE RATE

(55) AMT DUE CHECKIN CURR

(63) PREVIOUS MVA NUMBER	(64) MLS/KMS IN	(65) MLS/KMS DRIVEN	(66) NUMBER OF VEHICLE EXCHANGES	(67) LAST EXCHANGE LOCATION	(56) CASH REFUND EQUIV. RENTING CURR

(68) EXCHANGE DATE/TIME	(69) REFUELING SRVC	(70) OTHER EXPENSE DEDUCT AT FINAL CHECK-IN	(71) CASH REFUND RECEIVED	(57) CASH REFUND RECD CHECKIN CURR
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(58) ACTUAL RETURN LOC

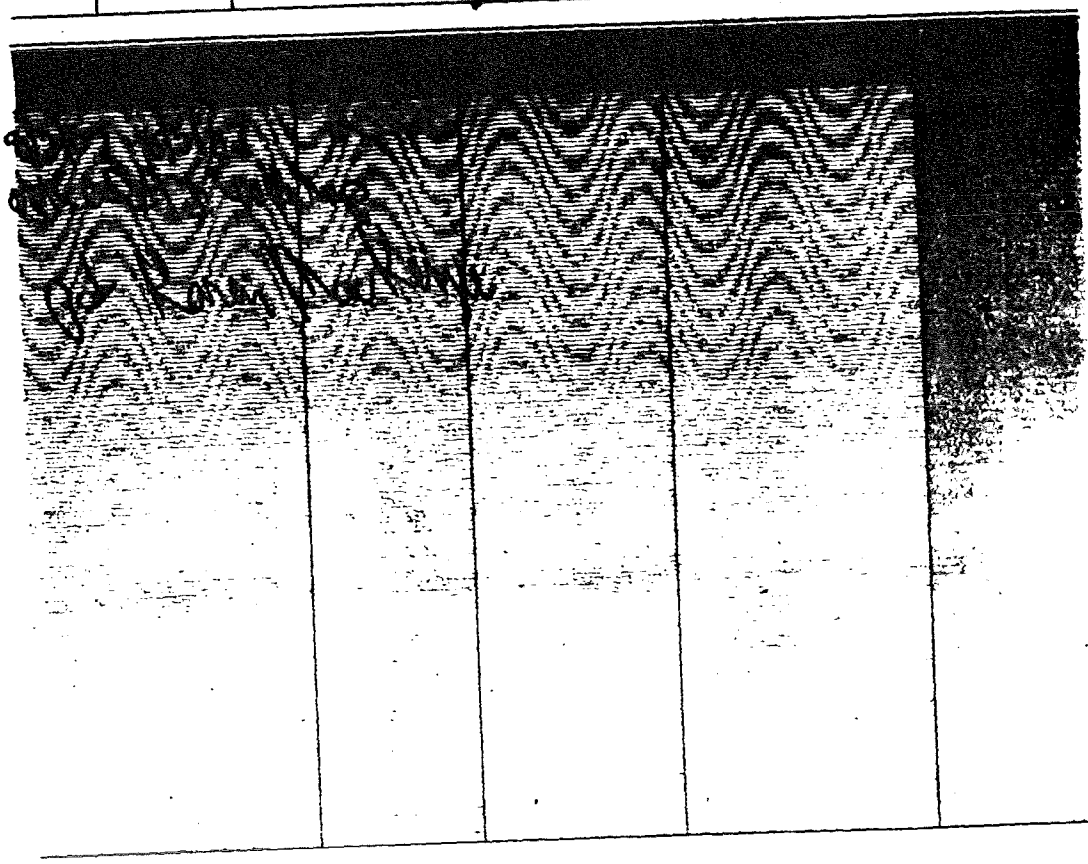
F-19 (Rev. 1/87) Page 2

CUSTOMER'S MEMO 4

Marks, Bob

288560

P.O. 695150



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P.O. 695150

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FROM SEATTLE	UA	660B		1AUG	630P	OK B
TO DENVER	UA	525B		5AUG	500P	OK B
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TO VOID				VOID		
TO VOID						

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TOTAL 390.00

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ORIGINAL ISSUE

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UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering, FT-10
Telephone: (206) 543-2150

9-10-87

Dr. Richard S. Howe, Director
Division of Engineering
The University of Texas at San Antonio
San Antonio, Texas 78285

Dear Dr. Howe,

I am delighted to write this letter of recommendation for Mr. Kwan Fai Cheung. I have supervised Mr. Cheung's M.S. and PhD work.

Kwan is quite a remarkable man. He has impressive and diverse talents in electrical engineering that are probably best illustrated by example:

*Mr. Cheung is presently the coordinator of the ISDL photonics laboratory. He is also the individual responsible for starting the lab. He has supervised laboratory projects relating to speckle suppression, pattern recognition and order statistic filtering. He has fabricated instrumentation for the lab and has altered other devices for our specific needs. Kwan is very good with hands-on projects.

* Mr. Cheung has superb theoretical grasps on a number of classical and contemporary topics. He has made major contributions to three of our group's recent archival publications and is first author on three additional papers (two of which were officially accepted only in the last month or so). None of these papers concerns the contents of his dissertation from which I expect at least two more archival papers. The topics of the contributions are quite diverse and include neural networks, pattern recognition, error correction coding, optical processing and multidimensional sampling theory.

* Mr. Cheung is a good teacher. For a few years, he was the graduate student coordinator of our department's undergraduate electro-physics lab. He has also guest lectured for me in two courses and was heavily involved in our college's introductory program for high school students. I have also listened to him present papers at conferences (he has given two). He does quite well.

* Mr. Cheung's English is not that of a native yet has matured greatly. Whereas I assisted him extensively on the English in his M.S. thesis in 1983, the last paper for which he was first author was almost totally composed by him. It reads quite well.

There is no doubt that Kwan Fai Cheung will perform superbly in any position he chooses to take. He will make an excellent addition to your academic team.

Please contact me at the above address or at (206) 543-6990 if I can be of further assistance to you.

Sincerely,

Robert J. Marks II
Professor

University of Washington Correspondence

INTERDEPARTMENTAL

7-22-87

To: Robert Porter, Chairman
From: Robert J. Marks II
Subject: 7-17-87 memo

In accordance to your directive, I have instructed my MS student to no longer make use of the secretarial services in our department. I agree that the student was totally out of line in applying any sort of pressure to the secretaries to meet *his* deadline. He was my student and my responsibility. I apologize for his actions.

I would, however, like to arrive at an understanding concerning the use of secretaries. I know that you agree that our department is understaffed in this area. As a result, I have been using this department's typing services quite sparingly. I have, rather, used RA's quite extensively as typists. Enclosed are some documents generated just this summer quarter without the use of our department's salaried typists. This, I believe, is evidence of our conscientious and sparing use of the Department's state funded resources.

Also, I never have and never will request state funded assistance for the typing of a thesis or dissertation. I have, however, requested the typing of a paper to be sent to an archival journal that may later be the the body of such a document. And I believe that it is right and proper to do so.

The error that needs to be corrected, I believe, is the student interaction with the secretary and the defense deadline as a factor in the completion of the work. I will not knowingly let such incidents happen in the future. I believe, however, that the typing of a manuscript for archival or proceedings publication, independent of its subsequent use, is wholly within the charter of state funded secretarial support. If you do not agree, I request that we schedule a short meeting at your convenience so that I can better understand your position. If you agree, please so indicate.

Thank you for your attention to this matter.

To: Bob Marks, J. Ritsey

I am enclosing a copy of a memo on requests for thesis typing. I am sure you realize that the staff can not be used for thesis typing and that this is unfair to the rest of the faculty.

I am instructing Ola to not accept this work.

Robert

ROBERT PORTER

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING - FT-10

DATE: July 17, 1987

TO: RPP

FROM: OOG

You will recall that I mentioned to you some time ago that the Main Office staff was requested by Bob Marks to type a long, technical paper which was co-authored by Marks and one of his students. While the "paper" may be submitted for publication, the body of the text is also the student's thesis. The student coordinated the production of the paper through the main office, pressured the staff to meet his deadline which was the date of his defense.

This is happening again with Marks, Ritcey and a student.

I don't think the main office staff is large enough to be expected to type student theses, even under the guise of a joint paper with the student's professor. If every faculty member attempted to have students' theses typed in the main office, it would obviously be an impossible task.

Will you please speak to Bob Marks about this.

University of Washington Correspondence

INTERDEPARTMENTAL

Dept. of Electrical Engineering, FT-10 10-22-87

TO: Robert Porter, Chair

FROM: Robert J. Marks II

Our department's representation on college committees (e.g. Student Affairs, Promotion and Tenure, Educational Policy) have been appointed by the department chair for as long as I can remember. They are in fact supposed to be elected by the faculty as their representatives. Since the school year is still young, I suggest that the appointments to these committees made this year be voted on by our faculty.

In my June 12th memo to you, I agreed to have my name placed in nomination before the faculty to represent this department on the college's educational policy committee because my service to the department as the ad-hoc undergraduate curriculum committee was supposedly complete. This position, however, has been resurrected and renamed *Chairman, Co-Core and Undergraduate Operations Sub-Committee and New Curriculum Implementation.* Since I foresee the duties of this position to be as time consuming as the ad-hoc chairmanship, I request that I no longer represent this department on the Educational Policy Committee.

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING, FT-10

DATE: June 12, 1987

TO: Robert P. Porter, Chair

FROM: Robert J. Marks II R.J.M. II

1. In response to your June 5 memo, I have attached a copy of a memo sent to Dr. Golde concerning the AT&T donation. Despite the dates, this memo was sent before yours was received. I have also been in phone contact with Ms. Vadnais concerning this matter.

2. Since my ad-hoc chair duties have ended, I accept your request to place my name in nomination before the faculty to represent this department on the college's educational policy committee.

RJM/dmr
att.
cc: Les Atlas
David Johnson

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-2150

May 23, 1988

Dr. R. Aaron Falk
Boeing Aerospace Company
P.O. Box 3999, M/S 87-50
Seattle, WA 98124

Dear Aaron:

1. I saw your 2 papers in Applied Optics. They look great!

2. The notebook contains miscellaneous items from previous PSOSA activities in no particular order. Keep or purge as you see fit.

3. I have some exciting neural network implementation ideas using the concepts we talked about. We need to talk!

Best regards,

Robert J. Marks II/cc

Robert J. Marks II
Professor

RJM:cc

Enclosure

University of Washington Correspondence

INTERDEPARTMENTAL

Interactive Systems Design Laboratory, Department of Electrical Engineering, FT-10

April 27, 1988

TO: Executive Committee:
Profs. Noges, Moritz, Damborg, Soma and Venkata

FROM: Bob Marks Bob Marks /ca
Rubens Sigelmann Rubens Sigelmann /ca

Subject: Food for thought for the May 17th faculty retreat

We believe that some of the problems delineated in the report on our graduate program (and the response) could be addressed by the establishment of an Associate Chair of Research. Here are our initial concepts of the duties associated with such a position:

Proposed Duties of the Associate Chair for Research

1. Become familiar with the research directions of the Electrical Engineering faculty.

2. Monitor new developments in technology, corresponding funding opportunities and their potential interface with faculty talents.

3. Maintain contacts with personnel at government and industrial funding agencies.

4. Assure the mentoring of new faculty either directly or in the confines of an established research group.

5. Coordinate the industrial affiliates program.

6. Facilitate and stimulate activities which create an exciting research atmosphere in the Department. Such activities include colloquia, brain storming sections, public relations to release important research achievements, preparation of public relation materials (*e.g.* pictures, tapes, removal of the two dead flies from the two display windows in the department and substituting posters, samples of research products, etc.)

RJM:cc

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Interactive Systems Design Laboratory
Department of Electrical Engineering, FT-10
Telephone: (206) 543-6990 or 543-2150

April 25, 1988

Ye Chen
8 Fucheng Rd. #36-2
Beijing
PEOPLE'S REPUBLIC OF CHINA

Dear Mr. Chen:

Thank you for your recent letter.

Enclosed are some preprints of some of our more recent papers. I hope you find them of interest.

I presently have no uncommitted funds available for a research assistantship. Teaching assistantships, however can be applied for from the department.

I look forward to meeting you.

Sincerely,

Robert J. Marks II
Professor

RJM:cc

cc: Graduate Office

University of Washington Correspondence

INTERDEPARTMENTAL

ELECTRICAL ENGINEERING, FT-10

DATE: June 8, 1987

TO: Dr. Hellmut Golde, Vice Provost for Computing

FROM: Robert J. Marks II, Associate Professor

In response to your June 3, 1987 memo, I am attaching a copy of our response to your September 4, 1986 memo and repeat: If there are unused units, we can put them to use.

RJM:ew
Att.
cc: Les Atlas

University of Washington Correspondence

INTERDEPARTMENTAL

Office of the Vice Provost for Computing
AF-14

==========

Date: June 3, 1987

To: Recipients of AT&T donations

From: Hellmut Golde, Vice Provost for Computing

Subject: Use of previous AT&T donations

In 1985 and 1986, several University faculty received donations of computing equipment and associated software from AT&T. I believe that most recipients are very happy with the donations and are using the equipment extensively. On the other hand, not all equipment appears to be used effectively. I am aware of the fact that some of the equipment received was different from what was requested.

I recently contacted the local office of AT&T regarding a donation program in 1987. Richard Ellis, the previous AT&T campus representative, has left AT&T, and a new permanent person has not been appointed. I talked with Russ Frankenfeld, who is temporarily filling in for Ellis.

The following story emerged: AT&T has decided to change its grant program in 1987 and invite specific schools to apply for donations. The University of Washington was not invited because AT&T believes that we did not use the previous donations wisely, at least not all of the equipment. During previous visits, AT&T personnel has seen unopened cartons of equipment long after delivery. As I wrote to the 1985 recipients on September 4, 1986, there had been rumors last fall regarding poorly or unused equipment. I had hoped that my request at that time had laid these rumors to rest.

It is unfortunate that a major vendor and donor to the University of Washington decided not to include us in the 1987 grant program because of at least the impression of idle equipment. If we are interested in receiving future donations from AT&T and cooperate with the company in other endeavors, we must rectify this impression.

I have asked Ms. Salle Vadnais, Tel. 3-4280, in my office to contact each of you to determine what has happened to the equipment and document its current and planned use. If some of the equipment is not needed by a recipient I would like to

allocate it to somebody else. At the same time I would like to hear from you any problems that you have encountered with AT&T in requesting, receiving, or using the donated equipment. I would like to present AT&T with as complete a review of their grant program as possible. Stories of innovative and extensive use are also welcome.

Your cooperation is appreciated. I would like to complete this effort by June 30, 1987.

cc: Provost Beckmann
Department chairs

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING - FT-10

DATE: October 6, 1986

TO: Dr. Hellmut Golde, Vice Provost for Computing

FROM: R. J. Marks II, Associate Professor

SUBJECT: Sept. 4 memo concerning AT&T 3B2 donations

We were surprised to hear that some of our colleagues are not using their AT&T donations. Give them to us! Our current and projected use of the 3B2 is enormous. We have just augmented our system with a laser printer and wish we had another 5620 terminal, or better yet, another system. Our current projects on the 3B2 include the following:

1. The fantastic 5620 resolution allows us to display computer generated holograms which will be used in an optical processor for pattern recognition. This will be the MS thesis of Wai Sun Leung.

2. Another graduate student, Hamid Amindavar, is using the 3B2 to empirically study fault tolerant algorithms.

3. Prof. Marks is using the CIPS package to generate figures for a book he is writing.

4. Prof. Atlas is using the equipment for simulation of speech processing.

5. The system is being used for word processing.

6. Mr. Wong, an RA, will be simulating neural nets with graphics on the 3B2.

7. Prof. Atlas is also using the system for sonar signal synthesis.

Our students have asked if more terminals could be made available for student use. Is there a chance we could get further equipment - either from someone who's not using theirs - or from an additional donation? We certainly could use them.

RJM/brs

cc: Les Atlas

University of Washington Correspondence

INTERDEPARTMENTAL

Office of the Vice Provost for Computing AF-14

Date: September 4, 1986

To: Les Atlas, Electrical Engineering
Gary P. Drobney, Chemistry
Conrad Fong, Chemistry
E. David Ford, Center for Quantitative Science
R.J. Marks II, Electrical Engineering
Donald C. Martin, Biostatistics
R. Douglas Martin, Statistics
Larry Sorenson, Physics

From: Hellmut Golde, Vice Provost for Computing

Subject: Request for Information

Last year, you received a donation from AT&T consisting of 3B2 computers and terminals. Just a few days ago, the University of Washington received a new donation of AT&T equipment. In discussing the 1986 donation with AT&T and some of the recipients, I became aware of some unfortunate rumors, namely that some of last year's donation is not being used at all. To put these rumors (hopefully) to rest, I asking you to provide me with a description of the use of the equipment. One description per recipient group is, of course, sufficient. Please provide information about who uses it for what purpose and to what extent. Also please indicate the use you plan to make of the equipment during the 1986-87 academic year.

If there is indeed equipment that is not used and will not be used in the near future, please let me know. I am sure that I can find a home for it. We cannot afford to request equipment from a vendor, accept a donation, and then let it sit idle.

Thank you for your cooperation.

Marks

MEMO

7/18/87

To: EE News
From: Bob Marks
Subject: Recent Publications and misc.

Publications

R.J. Marks II, J.A. Ritcey, L.E. Atlas and K.F. Cheung, "Composite Matched Filter Output Partitioning", **Applied Optics**, vol.26, pp.2274-2278 (1987).

L.E. Atlas, Y. Zhao and R.J. Marks II, "Application of the Generalized Time-Frequency Representation to Speech Signal Analysis", **Proc. IEEE Pacific Rim Conference on Communicatiuons, Computers and Signal Processing**, June 4-5, 1987, Victoria B.C., pp.517-520.

R.J. Marks II "A Class of Continuous Level Associative Memory Neural Nets", **Applied Optics**, vol. 26, pp.2005-2010 (1987).

J.A. Ritcey, L.E. Atlas, A. Somani, D. Nguyen, F. Holt and R.J. Marks II "A Signal Space Interpretation of Neural Nets", **Proc. 1987 IEEE International Symposium on Circuits and Systems**, 4-7 May, Philadelphia, pp370-376.

L.E. Atlas "Auditory Coding in Higher Centers of the CNS", **IEEE Engineering in Medicine and Biology Magazine**, pp.29-32, (June 1987).

J.A. Ritcey "On the Probability of a Maximum Likelihood Mean Frequency Estimator", **IEEE Trans. on Acoustics, Speech and Signal Processing**, vol. ASSP-35, pp.579-580 (1987).

J.U. Quistgaard and J.A. Ritcey "An Adaptive Window Median Filter", **Proc. Pacific Rim Conference on Communications, Computers and Signal Processing**, 4-5 June 1987, Victoria.

Other Activities

Prof. Les E. Atlas was an invited participant at a workshop on neural networks at the recent AAAI conference in Seattle. At the workshop, he presented a paper entitled "Neural Networks for Pattern Generalization".

Prof. Robert J. Marks II has recently been asked to Chair a newly formed Technical Committee on Neural Systems and Applications for the IEEE Circuits and Systems Society.

University of Washington Correspondence

INTERDEPARTMENTAL

ELECTRICAL ENGINEERING, FT-10

July 17, 1987

TO: Robert P. Porter, Chairman

FROM: Robert J. Marks II, President R.J.M.II
OSA Puget Sound Section

Mr. Park has informed me that he has received a check for his work for the OSA Puget Sound Section.

On behalf of the Section, I thank you for your support during these first few formative months.

RJM:ew
cc: Leung Tsang

MEMO 7/18/87

To: EE News
From: Bob Marks RJM
Subject: The Puget Sound Section of the Optical Society of America

Could you include the following in the EE News? If you have any questions, reservations or extensive editorial suggestions please let me know. I'd prefer *not* to have a bi-line.

NEW LOCAL SECTION OF THE OPTICAL SOCIETY OF AMERICA

Areas where Electrical Engineers are concerned with optics include fiber communication, remote sensing, scattering, photonic computing and display. Indeed, the IEEE often teams with the Optical Society of America (OSA) in sponsoring conferences and workshops. *The Journal of Lightwave Technology* is coordinated by both the IEEE and the OSA.

Those of you interested in optics will be excited to know that a new local section of the OSA has just formed in our area. The *Puget Sound Section* of the OSA, formed in May, is only local section that boasts of a student officer elected by the student membership. The purpose of the local section is to familiarize local academia and industry with each other. Towards this end, dinner meetings are held every other month. These meetings provide an excellent opportunity for students to make contact with local industry and listen to local, national and international optikars. Student members pay reduced prices for the dinner.

If you want to find out more about the new OSA local section, talk to Shira Broschat (the student representative), Prof. Tsang or Prof. Marks. All have offices in the EE Bldg. Yellow membership application forms are outside of Prof. Marks' door.

cc. Tsang and Broshat

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING FT-10

DATE: 10 June 1987

TO: Robert Porter

FROM: Mark J. Damborg

SUBJECT: Promotion and Tenure Review of Jim Ritcey

The first meeting of the department Promotion and Tenure Review Committee for Jim Ritcey met on 9 June. This committee consists of myself as chairman, with Bob Marks and Yongmin Kim. Our primary purpose of meeting with Jim at this time was to discuss his progress toward promotion and tenure, to review activities he planned for the summer and to see if he had any questions about the process or his activities that we could help him with.

Jim has a few concerns that I feel you should be aware of. He appears to be rather upset about the way his support for the summer has been treated. He understands that the original promises were made without the money to back them up and that we could not necessarily make good on those original promises as stated. However, he also feels that he never got a very clear sense of exactly what the problem was and how it was going to be taken care of. In fact, as recently as yesterday, he did not know how his summer salary was to be covered. We suggested to him that he needed to contact Karen immediately to make sure that she had received guidance as to what budgets were to be used. Perhaps he was remiss in not having done so before. However, we do agree he should probably have been informed in some specific manner of how many months salary he would receive and probably from what budgets.

Jim is also concerned that he did not end up with the travel support that he expected. In particular, he submitted a paper for a conference in Syracuse this August immediately before he learned that the travel support was unavailable. We suggested he make a specific request to you to receive travel support for this conference and I think you will be receiving such a request. I do not know if you will be able to respond to it, but we would encourage you to try.

Bob, Yongmin, and myself held a brief discussion among ourselves after meeting with Jim. I don't think we mean to sound alarmed, but we are concerned that Jim may be rather discontent about this whole process and the way he and the other Associate Professors are being treated in the department. Bob Marks, who works quite closely with Jim, says that he thinks Jim is disturbed about it.

On a positive note, we think that Jim has mapped out his summer in a productive fashion. He has graduated five master's degree students and will be working with two Ph.D. students and five to six master's degree students this summer and into next year. He is intending to work on both the proposal and publication front this summer and there doesn't seem to be any question in his mind that he is proceeding in a direct and productive manner.

cc: Bob Marks
Yongmin Kim

OPTICAL SOCIETY OF AMERICA

Fellow Reference Form

The procedure to be followed in nomination of regular members of the Society to the rank of Fellow is for a primary sponsor to complete the Fellow Nomination Form and arrange with two or more additional individuals for completion of Fellow Reference Forms. Nominations to the rank of Fellow are reviewed by the Committee on Fellows and Honorary Members each year in June. The recommendations of this committee are transmitted to the board of directors for consideration. Elected fellows are notified in June of the year following.

The bylaws specify that:

"Any regular member who has served with distinction in the advancement of optics is eligible for transfer to the class of fellow.

"Regular members may be transferred to the class of fellow at any regular meeting of the board of directors by a two-thirds (2/3) vote of the members of the board of directors present. The number of fellows shall at no time exceed one-tenth (1/10) of the total membership of the society, except that no one who has been transferred to the class of fellow shall be displaced from that class because of a reduction in the total number of members in the society. Fellows shall pay the same dues as regular members."

Privileged Information

Candidate's Name: Thomas F. Krile

I have known the candidate professionally for 16 years.

I consider the candidate to be: X exceptionally well qualified for Fellow,

____ well qualified for Fellow,

____ marginally qualified for Fellow,

____ not qualified for Fellow.

My judgement is based on: X personal knowledge of candidate's work,

____ scrutiny of candidate's record.

Please describe your specific knowledge of the candidate's professional and other accomplishments that support election to Fellow of OSA (use other side of form if necessary):

Tom Krile has made numerous significant contributions to optical information processing in the areas of space-variant system analysis and synthesis, volume hologram applications, noise properties of recording media and optical computers. I have had the opportunity to have interacted with Professor Krile both as a student and a research colleague. He is a brilliant researcher and a superb teacher. There is not doubt that he deserves the title of OSA Fellow.

(continued overleaf)

Rate the candidate on a five-point scale on each of the following factors (circle appropriate rating):

Factor	Very Significant				Insignificant
Contributions to optics by enhancing scientific knowledge	(5)	4	3	2	1
Contributions to optics by applications of technical knowledge	(5)	4	3	2	1
Contribution to optics through management of technical resources	5	4	(3)	2	1
Contribution to optics through professional service and/or teaching	(5)	4	3	2	1

Submitted by: Robert J. Marks II 6/17/87
Signature Date

Robert J. Marks II , Professor
Name
Electrical Engineering Dept., FT-10
University of Washington
Seattle, WA 98195
Address

Return to: OPTICAL SOCIETY OF AMERICA
1816 Jefferson Place, N.W.
Washington, D.C. 20036

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering, FT-10
Telephone: (206) 543-2150

June 12, 1987

Mr. Mark O. Freeman
Department of Electrical and
Computer Engineering
University of Wisconsin
Madison, WI 53706

Dear Mr. Freeman:

Thank you for your recent correspondence and preprints. Your book chapter was quite interesting. I appreciate your generous referencing of my work.

Personally, I would welcome the opportunity to consider working with someone with your background. Unfortunately, the powers-that-be are not targeting current faculty positions in areas in which you and I specialize. Nevertheless, I have forwarded your CV for consideration to Professor Robert P. Porter, our department chair. The search committee should respond to you officially at a later date.

Please give my best regards to Dr. Saleh.

Sincerely,

Robert J. Marks II

Robert J. Marks II

RJM/dmr
att.
cc: Robert P. Porter

June 4, 1987

Dr. Robert J. Marks
Electrical Engineering Department
University of Washington
Seattle, Washington, 98195

Dear Dr. Marks,

I have recently applied for an assistant professor position at the University of Washington. My advisor, Bahaa Saleh, brought to my attention the fact that you are a professor there, and since I'm familiar with some of your work, I thought I'd write to you personally. I collaborated with Bahaa on a chapter about optical transformations which will appear in a book edited by J. L. Horner. I referred to a number of your publications in writing the section on space-variant optical transformations. A copy of that chapter in its prepublication form as a departmental report is included with this letter.

I expect to be finishing my PhD. around August or September of this year. I would like to begin work around December or January, though if necessary, I could arrange to begin in time for Fall semester '87-'88. My expertise lies in the areas of optical data processing and pattern recognition, with a reasonably good background in communications. I also worked for the General Electric Company at their Corporate Research Labs in the area of fiber optics for two years before coming to Madison. I'm interested in continuing research in optical processing and branching into the areas of optical computing and optical interconnects. I want to work where there are others in my field who are good so that we can bounce ideas off eachother and, in the end, improve the quality of all of our research.

I have a number of places I'm looking into, but the University of Washington is one of my highest preferences. The geographical location and the size and stature of the University fit my needs exactly. I've also included a copy of my resume. Please feel free to check with any of the references if you feel there might be a place for me in your department.

Sincerely,

Mark Freeman

Mark O. Freeman
Dept. of Elec. and Comp. Eng.
University of Wisconsin
Madison, WI, 53706

University of Washington Correspondence

INTERDEPARTMENTAL

6-11-87

To: EE Faculty

Please remember to attend the EE Commencement Reception on Saturday. 4:00 to 5:30.

Because Prof. Onemug did not attend any social functions, his head began to tilt slightly due to the disproportionate use of his left brain hemisphere.

University of Washington Correspondence

INTERDEPARTMENTAL

6-12-87

To: EE Faculty

Don't forget the Commencement Reception tomorrow! 4:00 to 5:30.

After the graduation open house, the students will toast the faculty.

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering, FT-10
Telephone: (206) 543-2150

February 26, 1987

Professor Saleem A. Kassam
University of Pennsylvania
Moore School of Electrical
Engineering
200 South 33rd Street
Philadelphia, PA 19104-6390

Dear Saleem,

Greetings! I write to update you on the Dadi paper. As you can see from the enclosed, the paper is scheduled for publication in the 9/87 issue of IEEE Trans. AES. Also, the Bozos asked us to shorten the title. (If you recall, they previously asked us to lengthen the title). Anyway, the revised, revised title is:

"Detector Relative Efficiencies in the Presense of Laplace Noise".

Again, thank you for the citation.

Best personal regards,

Robert J. Marks II
Professor

RJM/dm

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT-10
Telephone: (206) 543-2150

February 2, 1987

IEEE Service Center
455 Hoes Lane
Piscataway, N.J. 08854

Dear Service Center Manager:

In 1985, I paid to join the Communications Society. I recieved a few copies of Communications Magazine, but have yet to recieve any copies of the Transactions. Also, even though I paid dues for 1986 and 1987, I have received no publications from the society.

I do not want the Communications journals or magazines. I would like, rather, a refund of my 1986 and 1987 Comm. dues and a prorated refund of my 1985 dues.

Sincerely,

Robert J. Marks II
Member #6402291

RJM/dm

IEEE

SHIPMENT ACKNOWLEDGMENT

DATE 9/12/85 SN/M 6402291

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BY dm UNIT MS

WE ARE SHIPPING THE CIRCLED 1985 ISSUES.
PLEASE ALLOW 2-4 WEEKS FOR DELIVERY.

KEY	PUBLICATIONS		PROD #
	AC-30	#1	JH69625
	AC-30	#2	JH69633
	AC-30	#3	JH69641
	AC-30	#4	JH69658
	AC-30	#5	JH69666
	AC-30	#6	JH69674
	AC-30	#7	JH69682
	AC-30	#8	JH69690
	AC-30	#9	JH69708
	AC-30	#10	JH69716
	AC-30	#11	JH69724
	AC-30	#12	JH69732
	AES-21	#1	JH69443
	AES-21	#2	JH69450
	AES-21	#3	JH69468
	AES-21	#4	JH69476
	AES-21	#5	JH69484
	AES-21	#6	JH69492
	AP-33	#1	JH69500
	AP-33	#2	JH69518
	AP-33	#3	JH69526
	AP-33	#4	JH69534
	AP-33	#5	JH69542
	AP-33	#6	JH69559
	AP-33	#7	JH69567
	AP-33	#8	JH69575
	AP-33	#9	JH69583
	AP-33	#10	JH69591
	AP-33	#11	JH69609
	AP-33	#12	JH69617
	ASSP-33	#1	JH69385
	ASSP-33	#2	JH69393
	ASSP-33	#3	JH69401
	ASSP-33	#4	JH69419
	ASSP-33	#5	JH69427
	ASSP-33	#6	JH69435
	M-ASSP-2	#1	JH72231
	M-ASSP-2	#2	JH72249
	M-ASSP-2	#3	JH72256
	M-ASSP-2	#4	JH72264
	BC-31	#1	JH69864
	BC-31	#2	JH69872
	BC-31	#3	JH69880
	BC-31	#4	JH69898

KEY	PUBLICATIONS		PROD #
	BME-32	#1	JH69740
	BME-32	#2	JH69757
	BME-32	#3	JH69765
	BME-32	#4	JH69773
	BME-32	#5	JH69781
	BME-32	#6	JH69799
	BME-32	#7	JH69807
	BME-32	#8	JH69815
	BME-32	#9	JH69823
	BME-32	#10	JH69831
	BME-32	#11	JH69849
	BME-32	#12	JH69856
	C-34	#1	JH70185
	C-34	#2	JH70193
	C-34	#3	JH70201
	C-34	#4	JH70219
	C-34	#5	JH70227
	C-34	#6	JH70235
	C-34	#7	JH70243
	C-34	#8	JH70250
	C-34	#9	JH70268
	C-34	#10	JH70276
	C-34	#11	JH70284
	C-34	#12	JH70292
	M-C-18	#1	JH72579
	M-C-18	#2	JH72587
	M-C-18	#3	JH72595
	M-C-18	#4	JH72603
	M-C-18	#5	JH72611
	M-C-18	#6	JH72629
	M-C-18	#7	JH72637
	M-C-18	#8	JH72645
	M-C-18	#9	JH72652
	M-C-18	#10	JH72660
	M-C-18	#11	JH72678
	M-C-18	#12	JH72686
	M-C&D-1	#1	JH72272
	M-C&D-1	#2	JH72280
	M-C&D-1	#3	JH72298
	M-C&D-1	#4	JH72306
	M-C&D-1	#5	JH72314
	M-C&D-1	#6	JH72322

KEY	PUBLICATIONS		PROD #
	CAD-4	#1	JH70300
	CAD-4	#2	JH70318
	CAD-4	#3	JH70326
	CAD-4	#4	JH70334
	CAS-32	#1	JH69906
	CAS-32	#2	JH69914
	CAS-32	#3	JH69922
	CAS-32	#4	JH69930
	CAS-32	#5	JH69948
	CAS-32	#6	JH69955
	CAS-32	#7	JH69963
	CAS-32	#8	JH69971
	CAS-32	#9	JH69989
	CAS-32	#10	JH69997
	CAS-32	#11	JH70003
	CAS-32	#12	JH70011
	CE-31	#1	JH70342
	CE-31	#2	JH70359
	CE-31	#3	JH70367
	CE-31	#4	JH70375
	CHMT-8	#1	JH70144
	CHMT-8	#2	JH70151
	CHMT-8	#3	JH70169
	CHMT-8	#4	JH70177
	COM-33	#1	JH70029
	COM-33	#2	JH70037
	COM-33	#3	JH70045
	COM-33	#4	JH70052
	COM-33	#5	JH70060
	COM-33	#6	JH70078
	COM-33	#7	JH70086
	COM-33	#8	JH70094
	COM-33	#9	JH70102
	COM-33	#10	JH70110
	COM-33	#11	JH70128
	COM-33	#12	JH70136
B	M-COM-23	#1	JH72330
B	M-COM-23	#2	JH72348
	M-COM-23	#3	JH72355
	M-COM-23	#4	JH72363
	M-COM-23	#5	JH72371
	M-COM-23	#6	JH72389

KEY	PUBLICATIONS		PROD #
	M-COM-23	#7	JH72397
	M-COM-23	#8	JH72405
	M-COM-23	#9	JH72413
	M-COM-23	#10	JH72421
	M-COM-23	#11	JH72439
	M-COM-23	#12	JH72447
	M-CS-5	#1	JH72694
	M-CS-5	#2	JH72702
	M-CS-5	#3	JH72710
	M-CS-5	#4	JH72728
	M-D&T-2	#1	JH72736
	M-D&T-2	#2	JH72744
	M-D&T-2	#3	JH72751
	M-D&T-2	#4	JH72769
	M-D&T-2	#5	JH72777
	M-D&T-2	#6	JH72785
	E-28	#1	JH70383
	E-28	#2	JH70391
	E-28	#3	JH70409
	E-28	#4	JH70417
	ED-32	#1	JH70524
	ED-32	#2	JH70532
	ED-32	#3	JH70540
	ED-32	#4	JH70557
	ED-32	#5	JH70565
	ED-32	#6	JH70573
	ED-32	#7	JH70581
	ED-32	#8	JH70599
	ED-32	#9	JH70607
	ED-32	#10	JH70615
	ED-32	#11	JH70623
	ED-32	#12	JH70631
	EDL-6	#1	JH72793
	EDL-6	#2	JH72801
	EDL-6	#3	JH72819
	EDL-6	#4	JH72827
	EDL-6	#5	JH72835
	EDL-6	#6	JH72843
	EDL-6	#7	JH72850
	EDL-6	#8	JH72868
	EDL-6	#9	JH72876
	EDL-6	#10	JH72884
	EDL-6	#11	JH72892
	EDL-6	#12	JH72900

KEY CODES: A - PERMANENTLY OUT OF STOCK. (B) - TEMPORARILY OUT OF STOCK. WILL BE SHIPPED WHEN AVAILABLE. C - OTHER

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IEEE

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC

IEEE SERVICE CENTER
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SHIP TO:

NAME Mr. K. J. Marks II 6402291

ADDRESS Univ of Washington

Dept of Elec Eng Ft-10

Seattle, WA 98195

CITY _____ STATE/COUNTRY _____ ZIP CODE _____

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ATTORNEYS AT LAW

900 S W FIFTH AVENUE, SUITE 2300
PORTLAND, OREGON 97204-1268

TELEPHONE (503) 224-3380
TELECOPIER (503) 220-2480
CABLE LAWPORT
TELEX 703455

WRITER'S DIRECT DIAL NUMBER

(503) 294-9314

January 30, 1987

Robert J. Marks II, Ph.D.
Leung Tsang, Ph.D.
University of Washington
FT-10
Seattle, Washington 98195

Dear Bob and Leung:

Thank you for taking the time to meet with me this week to discuss the division of the Pacific Northwest Chapter of the Optical Society of America into smaller geographic chapters. I plan to discuss this matter with Bill Borrelle of the national organization to determine how to bring about the division in a timely manner. I will advise you as soon as I have had an opportunity to consult with Mr. Borrelle.

If you have any questions, please give me a call.

Very sincerely yours,

Paul S. Angello

Paul S. Angello

PSA.76:bk

University of Washington Correspondence

INTERDEPARTMENTAL

ELECTRICAL ENGINEERING, FT-10

DATE: January 15, 1987

TO: Neil Hawkins, Acting Assoc. Dean

FROM: Robert J. Marks II, Assoc. Professor

SUBJECT: Mr. K.B. Thornton's grievance

I called Mr. Thornton on January 14, 1987 and explained to him that, according to your December 18, 1986 memo, I had violated University policy by rescheduling a final examination without the permission of the Dean. I told him that I saw three options: (1) pursuing his grievance, (2) retaking the final on a mutually agreeable format or (3) dropping the matter. He said he would get back with me with his decision.

cc: Endrik Noges, Assoc. Chairman
Ken Thornton

University of Washington Correspondence

INTERDEPARTMENTAL

December 18, 1986

TO: Professor Robert J. Marks II
Electrical Engineering FT-10

FROM: Neil M. Hawkins, Acting Associate Dean
College of Engineering FH-10

CONCERNS: Complaint by Mr. K.B.Thornton
Concerning Scheduling of Final Exam for EE 595

Dean Bowen has received the attached letter concerning the scheduling of the final exam for EE 595.

University policy on this matter is clear and for your information I enclose a copy of the relevant section of the University Handbook. The student's rights are spelled out in Chapter 12, Section 2B. Only the Dean can permit an instructor to change the scheduled time for a final examination. That authority rests in this office. Further, I cannot approve such a change if even one student objects. Since in this case the student has formally objected and is within his rights, I welcome your suggestions for appropriate action under Chapter 12, Section 1B.

NMH:jh
Enclosure: Vol. IV, Page 23
cc: R. Porter
Dean J. Ray Bowen
A. Maki

shall consult with the instructor to determine whether the evaluation of the student's performance was fair and reasonable or whether the instructor's conduct in assigning the grade was arbitrary or capricious. Should the chairperson believe the instructor's conduct to be arbitrary or capricious and should the instructor decline to revise the grade, the chairperson (or the dean in a non-departmentalized school or college), with the approval of the voting members of his or her faculty, shall appoint an appropriate member, or members, of the faculty of that department to evaluate the student's, or students', performance and assign a grade. The dean and provost shall be informed of this action.

3. Once a student submits a written appeal, this document and all subsequent actions on this appeal shall be recorded in written form for deposit in a department (or college) file.

C. In the event that an instructor is physically or mentally incapacitated and unable to assign course grades, or unable to address requests for grade changes as provided in paragraph B above, or in the event that the instructor is no longer in the employ of the University and is unavailable or refuses to address requests for grade changes as provided in paragraph B above, the chairperson (or the dean in a non-departmentalized school or college) with the approval of the voting members of his or her faculty, may designate another instructor, or instructors, to act in the stead of the original instructor to assign grades or address requests from students in accord with paragraph B above.

S-B 79, May 1958; S-B 106, May 1969; S-B 145, May 23, 1985: all with Presidential approval; HB, 1946

Section 3. Honors Awards

A. The President's Medal shall be conferred at Commencement upon the graduating senior who has the most distinguished academic record. A transfer student who is eligible for University honors may be considered for the President's Medal.

[S-B 86, November 1961; S-B 138, December, 1981; both with Presidential approval]

B. The following awards shall be presented annually by the President in the name of the faculty: [S-B 70, April 12, 1956]

1. The Junior Medal, which shall be awarded to the senior having the highest scholastic standing for the first three years of his or her course.

2. The Sophomore Medal, which shall be awarded to the junior having the highest scholastic standing for the first two years of his or her course.

3. Certificates of High Scholarship, which shall be awarded to seniors, juniors, and sophomores for excellence in scholarship in their junior, sophomore, and freshman years, respectively.

Senate Action, May 1939

C. Quarter scholarship lists shall include the names of regular undergraduate students who have attained a grade-point average, non-cumulative, of 3.50 in the final grades for at least 12 registered credits, exclusive of lower-division physical education activity, and lower-division ROTC courses. They are published in many newspapers in Washington State about four weeks after the end of each quarter. [HB, 1966]

D. The yearly undergraduate honor list shall include the names of all undergraduates who have achieved a cumulative grade-point average of 3.50 or better for at least 36 credits in resident instruction in three quarters or 46 credits of resident instruction in four quarters at the University of Washington during the preceding academic year, exclusive of lower-division physical education activity and lower-division ROTC courses. [HB, 1966]

Section 4. Degrees with University Honors

Degrees with University honors may be conferred by determination of the Registrar, following guidelines provided by the Faculty Council on Academic Standards with the confirmation of the Faculty Senate Executive Committee. Transfer students are eligible for honors if they have earned at least ninety approved credits at the University of Washington. [HB, 1966]

Section 5. Alumnus Summa Laude Dignatus Award

Annually at Commencement, the University of Washington Alumni Association awards to a former student who is judged to be an outstanding living alumnus, distinguished for service over a period of years, the designation of *Alumnus Summa Laude Dignatus.* The recipient of the award is chosen by a special committee composed of representatives of the Alumni Association and the University. The award is given for achievement not only during the preceding year, but also during an individual's entire career. "Alumnus" is construed to mean a student who has been awarded any bachelor's degree, or a graduate student who, after not less than two years of resident study, has been awarded a degree, or a former student who, in the opinion of the committee of selection, has qualified for this honor. [A1, March 1966]

Chapter 12

EXAMINATIONS

Section 1. General Requirements

A. Each instructor shall be responsible for the fair and equitable administration of the examinations in his or her course.

B. A student absent from any examination or class activity through sickness or other cause judged by the instructor to be unavoidable shall be given an opportunity to take a rescheduled examination or perform work judged by the instructor to be the equivalent. If the instructor determines that neither alternative is feasible during the current quarter, the instructor may exempt the student from the requirement. Examples of unavoidable cause include death or serious illness in the immediate family, illness of the student, and, provided previous notification is given, observance of regularly scheduled religious obligations. The regulations for Incompletes in Vol. IV-21, Section 1.A.3 shall apply.

Section 2. Final Examinations

A. All students shall be required to take final examinations, provided that in a course for which an examination is not the most appropriate test for the work covered, the instructor may dispense with the final examination. When a final examination is given it will be administered in accordance with the following procedures.

B. A final examination schedule shall be provided by the Registrar, and all final examinations shall be administered in accordance with this schedule. The dean may permit an instructor to change the scheduled time of a final examination upon prior application demonstrating good cause for such a change. In such cases the final examination may be postponed; it may not be moved to an earlier time except to an earlier time within the examination period if agreed to by all the students and the instructor. Before approving the rescheduling of a final examination, the dean shall obtain assurances that the change will not have an undue adverse impact on the students. The dean shall notify the Registrar of approval granted to change the date of a final examination. An instructor shall not, except in very unusual circumstances, permit a student to take a final examination earlier than the scheduled time.

S-B 140, December 1982; with Presidential approval

December 15, 1986
4225 11th Ave NE
Apt. 206
Seattle, WA 98105

J. Ray Bowen
Dean
College of Engineering
371 Loew Hall
University of Washington
Seattle, WA 98195

Dear Mr. Bowen,

I have several questions concerning the exam re-scheduling policy of the College. As you know, the exam schedules are published in the "Class Time Schedule" each quarter. Under what circumstances may a professor change these schedules? What responsibility does he have to those students who cannot take the exam at the re-scheduled time?

I am a graduate student in the Department of Electrical Engineering. I was enrolled in EE 595, taught by Professor Marks this quarter. On November 27, he announced that he was not going to hold an in-class examination on December 17, but rather handout a take-home examination on December 10, due December 12.

I had previously scheduled my time between my full-time job and towards completing a project for another class. The exam time change was very unsatisfactory. I spoke to Mr. Marks twice concerning my desire not to take the exam one week early, but he refused, citing the following reasons: a. the graduate student assigned to grade the exam was scheduled to leave the country December 14, and b. it would be unfair to the other students to make any exceptions to the new exam schedule. As a result, I neither had time to complete the exam nor time to finish the project for the other class.

I would greatly appreciate a written reply concerning this matter. I have written the chairman of the Department of Electrical Engineering and the Vice President of Student Affairs, as well. For my benefit, and for the benefit of future students, I sincerely hope that if I was affected by a College of Engineering policy, that policy can be changed, and if no policy exists, one can be established.

Sincerely,

634-1834

Kenneth B. Thornton

Kenneth B. Thornton

854-1853

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT–10
Telephone: (206) 543–2150

January 15, 1987

Lee C. Giles
Naval Research Lab/Optical
Science Division
Code 6530
Washington, D.C. 20375

Dear Lee:

I would deeply appreciate receiving reprints and preprints of your papers concerning neural nets. I am specifically interested in your work in storage capacity.

Best regards,

Robert J. Marks II

RJM/dm

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT-10
Telephone: (206) 543-2150

December 8, 1986

Dr. Dziem Nguyen
Research Engineer-Info Proc Lab
High Technology Center
P.O. Box 3707, MS 7J-24
Seattle, WA 98124-2207

Dear Dziem and Fred,

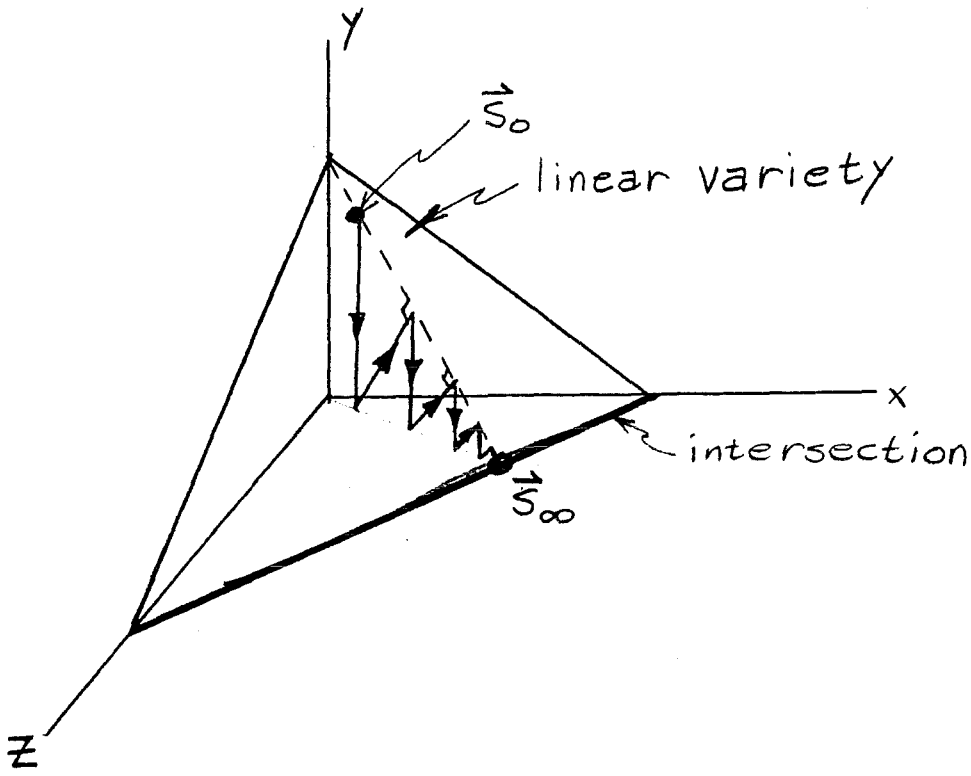
Enclosed are 2 copies of the Trussel paper on fuzzy sets and POCS. I have highlighted the statement concerning convergence to the closest point from the initialization. In 3 dimensions, this can be seen clearly in the attached figure. The intersection of a linear variety with an octant is shown. The subspace is the X-Z plane. The intersection of the two planes is shown by the bold line on the X-Z plane. No matter where we start, alternating projections will end somewhere on this line. According to the paper, it is the closest point to initialization. Consider starting at $\vec{S}_0$ as shown, we clearly do converge to $\vec{S}_\infty$ which is the closest point to $\vec{S}_0$.

Thus, my original "necessary and sufficient conditions" are for single point intersection - not unique convergence. Thank you for shedding light on this!

Sincerely,

Robert J. Marks II
Associate Professor

RJM/dm
Enclosure


y
$\vec{s}_o$
linear variety
x
intersection
$\vec{s}_\infty$
z

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING, FT-10

DATE: January 12, 1987

TO: Sharon McComb
Special Event and Guest Parking
ND-05

FROM: Deborah McDonnell-Rogers

On Tuesday, February 3, 1987, Dr. James Douglas from Boeing will visit Professor Robert J. Marks II in our Department. Will you please try to arrange for him to park in C-16. We have sent him a commuter ticket. He should arrive around 12:00 noon and will be here all day.

Thank you very much.

cc: R.J. Marks II

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Robert P. Porter, Chairman
Department of Electrical Engineering

19 January 1987

Mr. Hamidreza Amindavar
5318 24th Ave. NE, #102
Seattle, WA 98105

Dear Mr. Amindavar:

I am pleased to tell you that you have passed the Electrical Engineering Department qualifying examination administered on 17 January 1987. Following the exam, the faculty met to consider the results of the examination as well as the complete academic records of the students being examined. On the basis of this review, the faculty judges that you are likely to be successful in pursuing a Ph.D degree in electrical engineering.

I wish to convey the congratulations of the entire electrical engineering faculty on your significant achievement. It is now our hope that you will progress as rapidly as possible toward your degree. Toward that end, you should confer with your advisor, Professor Marks, as soon as possible to develop your future academic program. If you have any questions about how to proceed, please see Professor Damborg, the Graduate Program Advisor.

Again, congratulations and best wishes for success in your future efforts.

Sincerely,

Robert P. Porter
Chairman

cc: Professor Marks
Student File

211 Electrical Engineering Building, FT-10 / Telephone: (206) 543-6515

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Robert P. Porter, Chairman
Department of Electrical Engineering

19 January 1987

Mr. Seho Oh
5306 24th NE, #204
Seattle, WA 98105

Dear Mr. Oh:

I am pleased to tell you that you have passed the Electrical Engineering Department qualifying examination administered on 17 January 1987. Following the exam, the faculty met to consider the results of the examination as well as the complete academic records of the students being examined. On the basis of this review, the faculty judges that you are likely to be successful in pursuing a Ph.D degree in electrical engineering.

I wish to convey the congratulations of the entire electrical engineering faculty on your significant achievement. It is now our hope that you will progress as rapidly as possible toward your degree. Toward that end, you should confer with your advisor, Professor Marks, as soon as possible to develop your future academic program. If you have any questions about how to proceed, please see Professor Damborg, the Graduate Program Advisor.

Again, congratulations and best wishes for success in your future efforts.

Sincerely,

Robert P. Porter
Chairman

cc: Professor Marks
Student File

211 Electrical Engineering Building, FT-10 / Telephone: (206) 543-6515

University of Washington Correspondence

INTERDEPARTMENTAL

Electrical Engineering, FT-10

Date: December 10, 1986

TO: Dean Lytle

FROM: Bob Marks Bob Marks

SUBJECT: Visiting Scholar

Attached is some material on Zhao-Xin Dong who desires to be a visiting scholar in our department. His credentials look very good. Is there anyone who can use his services?

University of Washington Correspondence

INTERDEPARTMENTAL

Electrical Engineering, FT-10

Date: December 10, 1986

TO: Dean Lytle

FROM: Bob Marks Bob Marks

SUBJECT: Visiting Scholar

Attached is some material on Zhao-Xin Dong who desires to be a visiting scholar in our department. His credentials look very good. Is there anyone who can use his services?

Dong Zhao-xin
Associate Professor
Director
Dept.of Electronic Technology
Changsha Istitute of Technology
Changsha, Hunan
People's Republic of China
November 2, 1986

Dear Prof. Marks,

My name is Dong zhao-xin. I am a director of the dept. of Electronic Technology,Changsha Institute of Technology in Hunan. I'm writing to you about the possibility of a visiting scholar's appointment in your department next year. I've chosen to write to you not only because UW has such an excellent reputation, but because I would like to establish a possibility of cO-operation between our two departments in many respects. In the future we may mutually benefit from technique exchanges and, of course, visit to another's universities.

Since 1965, I have worked ceaselesslythrough both study and laboratory research in a broad area to acquire and pass on to colleagues and students the modern technology essential to building New China. Several of my paper have won national acclaim here in China, and some of my techniques and theories have been adapted for use throughout Chinese factories, engineering institutes and universities.

Enclosed please find a brief resume of my education,research, teching experience,and publications.

I understand that it is very difficult asking your university to support my travel and living expenses duing my visiting period, but, as you probably know, foreign exchange is difficult to obtain in my country.So if I can't get your financial support, It will be impossible for me to come.

In any case, I would appreciate it very much If my application receives consideration. I look forward to hearing from you.

Yours sincerely,

Dong Zhaoxing

Dong Zhao-xin

UNIVERSITY HOSPITAL
UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

November 17 1986

Dear Prof. Marks,

Enclosed please find the copy of my husband's resume and a letter written by him.

I've got some information from Chinese ambassador. It is stipulate that if a professor or an associate professor is invited to the U.S.A, he should get living support at least 500-700 $/mon, , Otherwise his application won't be approved. Should you require any further information, please let me know. I shall be happy to supply with it.

I can't tell how much I appreciate your time and effort in considering my husband to visit your department and work with you.

I sincerely hope your decision in his case is a favorable one,

[my husband will be invited to visit Switzerland and Western Germany for two months next spring or summer.]

Yours truly,

Shouyong Yi

RESUME

NAME: Zhao-xin Dong

PERSONAL: Born on Oct. 25, 1940, married, excellent health, P.R.C. citizenship

Room 407, Dept. of Electronic Technology
Changsha Institute of Technology
Changsha, Hunan, P.R.C.

Tel: 26356-4407

EDUCATION: M.S. in Radio Electronics, Northwest Telecommunication Engineering Institute, Xian, Shanxi - 1965

B.S. in Radio Electronics, Northwest Telecommunication Engineering Institute, Xian, Shanxi - 1962

EXPERIENCE:

1978 - present Associate Professor, Director of the Teaching-Research Group of Communication Technology, Dept. of Electronic Technology, Changsha Institute of Technology, Changsha, Hunan.

Designed an experiment for Dynamic Filter Theory and Usage, which won the prize at the National Conference on Communication.

Assigned to participate in design of the T.V. MF Relay in Hunan Province.

Assigned to participate in design of the Flood-Control Communication System in Hunan Province.

Assigned to participate in design and testing of a midium-sized Earth-Station for Satellite Communications.

Assigned to paticipate in design and testing of the commission part of the ISDN program.

Assigned to participate in design and testing of the Optical Communication System.

Assigned to write textbook on Digital Communication Theory for the Institute.

Assigned to teach post-graduates and work on Fiber Optic Communications, Satellite Communications and Computer Communication Network.

Assigned to teach undergraduates Theory of Digital Communications.

Have written the following papers that are published:

1) Digitalize of Modem and Digitalization by ΔP.

2) Digital Transmission of HF Development.

3) Research on Dynamic Filter.

4) Usage of Walsh Function in Digital Transmission.

5) Optical Communication Development.

1970 to 1978 Chief Engineer, Chenzho Telecommunication Research Institute, Chenzho, Hunan.

Led a group of engineers to do research work on Digital Communications.

Led a group of 50 people to design and test a HF Modem, which won the prize at the National Conference of Science. The correspondent paper"Research on a kind of Changing-Number Channal Modulation"was published at the National Coference on Digital Communications.

Completed design, testing of a VHF multiplexing telecontrol equipments, which won the prize at the Guandong Conference of Science.

Assigned to participate in design, testing of the Zn-Air Battery.

1965 to 1970 Engineer, Guanzho Telecommunication Research Institute, Guanzho, Guandong.

Assigned to work on administration and maintenance of communication equipments.

Assigned to do research work on antenna and cable equipments.

Assigned to participate in design and testing of the physics Antenna and the Cable Maintenance System in Urban Districts program. (Including a set of equipments for daily watching and repairment for both cable in the air and under the earth) The correspondent paper was awarded at the National Conference of Antenna.

MEMBERSHIP IN PROFESSIONAL SOCIETIES:

The member of Chinese Association of Nature Science.

The vice chairman of Hunan Association of Electronics.

The vice chairman of Hunan Association of Communication and the director of the Committe of Digital Communication and Computer Network in the association.

The member of Hunan Consulatative Committe of Science.

Dong Zhao-xin
Associate Professor
Director
Dept.of Electronic Technology
Changsha Istitute of Technology
Changsha, Hunan
People's Republic of China
November 2, 1986

Dear Prof. Marks,

My name is Dong zhao-xin. I am a director of the dept. of Electronic Technology,Changsha Institute of Technology in Hunan. I'm writing to you about the possibility of a visiting scholar's appointment in your department next year. I've chosen to write to you not only because UW has such an excellent reputation, but because I would like to establish a possibility of cO-operation between our two departments in many respects. In the future we may mutually benefit from technique exchanges and, of course, visit to one another's universities.

Since]965, I have worked ceaselesslythrough both study and laboratory research in a broad area to acquire and pass on to colleagues and students the modern technology essential to building New China. Several of my paper have won national acclaim here in China, and some of my techniques and theories have been adapted for use throughout Chinese factories, engineering institutes and universities.

Enclosed please find a brief resume of my education,research, teching experience,and publications.

I understand that it is very difficult asking your university to support my travel and living expenses duing my visiting period, but, as you probably know, foreign exchange is difficult to obtain in my country.So if I can't get your financial support, It will be impossible for me to come.

In any case, I would appreciate it very much If my application receives consideration. I look forward to hearing from you.

Yours sincerely,

Dong Zhaoxing

Dong Zhao-xin

OPTICAL SOCIETY *of* AMERICA

EXECUTIVE OFFICE
1816 JEFFERSON PLACE, N.W.
WASHINGTON, D. C. 20036
202—223-8130
TELEX 5106003965

November 14, 1986

Robert J. Marks, II
16515 Ashworth Avenue, North
Seattle, WA 98133

Dear Bob:

Thank you for providing me with the names of individuals to serve as exhibit hall tour guides for the Optical Society's second annual Educators' Day.

The Board of Directors of the Society were so encouraged by the efforts of all who participated, that they have approved a budget for this event next year, to be held in conjunction with the 1987 Annual Meeting in Rochester, New York.

As a token of OSA's appreciation for recruiting help, I have enclosed a laser-engraved Optical Society notepad. I hope you find it useful.

Thanks again for helping to make the day so successful.

Kind regards,

Bill Borrelle

William A. Borrelle
Technical Activities Manager

WAB/kyj

Enclosure

Eaton Corporation
AIL Division
Walt Whitman Road
Melville, New York 11747
Telephone (516) 595-5000

February 5, 1986

Professor Robert J. Marks, II
Electrical Engineering Department, FT/10
University of Washington
Seattle, Washington 98195

EATON

Dear Professor Marks:

I want to thank you for your efforts, on my behalf, leading to my admission to the Polytechnic Institute of New York. This evening, classes begin toward the Engineer, Electrical Engineering program.

One course is EE611, Signals, Systems, and Transforms, using Professor Papoulis' book, Signal Analysis. This is a natural follow-on to EE505/508 at U.W. The other course is EE533, Introduction to Communication Systems. Both are at the Graduate level, true to my form of pursuing in-depth education at an advanced level.

A few more courses in signal processing, communications, information theory, modulation and detection theory, and systems will presage the concentration in electro-optics and quantum electronics.

All of these will enhance my research work here in optical signal processing of radar signals. This specialization is intensely multidisciplinary, involving ultrasonics, laser science, electronics, optics, radar principles, systems theory, and now very advanced linear algebra.

Your excellent teaching and continuing friendship and support are deeply appreciated. Thank you.

Sincerely,

Richard C. Reinhold

Richard C. Reinhold
Consultant
Advanced Systems Department
RCR:sn

TWX 510-227-6073

605 Third Avenue
New York, NY 10158
212-850- 6640
Telex 12-7063
Cable JONWILE
New York, Chichester,
Brisbane, Toronto

John Wiley & Sons, Inc. Publishers
Scientific and Technical Division

November 24, 1986

Professor Robert J. Marks, II
Electrical Engr. Dept.
Univeristy of Washington
Seattle, Washington 98195

Dear Professor Marks:

Francis Yu has mentioned your interest in his book on WHITE-LIGHT OPTICAL SIGNAL PROCESSING. I am having a copy sent to you with his and our compliments. Would you, when you have been able to look through the book, let me know what you think of it?

Sincerely,

Beatrice Shube, Senior Editor
WILEY-INTERSCIENCE DIVISION

BS/ge

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering, FT-10
Telephone: (206) 543-2150

November 14, 1986

Dr. Abdul J. Jerri
Department of Science
The American University in Cairo
113, Sharia Kaar El Aini
Cairo
Egypt

Dear Dr. Jerri:

Thank you very much for the copy of your recent monograph. The bibiliography is incredible! I hope you publish it archivally.

Below, I've listed some references I'm not sure were in your list. Refs. 1, 6 and 7 are book chapters that leave a similar flavor to Wallsup's paper (p. 45, #6 in your bibliography).

Enclosed are reprints of some of our work - much of which concerns the sampling theorem. I hope you find them of interest.

References

1. T. Kailath, "Channel Characterization: Time-Variant Dispersive Channels," in Lectures on Communications Systems Theory, edited by E.J. Baghdady, (McGraw-Hill, New York, 1960).

2. N.C. Gallagher, Jr. and G.L. Wise, "A Representation for Bandlimited Functions," Proc. IEEE 63, 1624 (1975).

3. G.C. Temes, V. Barcilon and F.C. Marshall III, "The Optimization of Bandlimited Systems, " Proc. IEEE 61, 196 (1973).

4. Y.I. Khurgin and V.P. Yakovlev, "Progress in the Soviet Union on the Theory and Applications of Bandlimited Functions," Proc. IEEE 65, 1005 (1977).

5. D.E. Dudgeon and R.M. Mersereau, Multidimensional Digital Signal Processing (Prentice-Hall, Englewood Cliffs, N.J., 1984).

THE AMERICAN UNIVERSITY IN CAIRO
الجامعة الأمريكية بالقاهرة

October 21 , 1986

Prof. R.J. Marks
Department of Electrical Eng.
University of Washington
Seattle, WA
U.S.A.

Dear Prof. Marks:

You will soon receive (from my home institution - Clarkson University) a copy of my recent report entitled: "Equalities and Inequalities for Fourier Analysis and the Sampling Expansion (Part I) - with Detailed Bibliography of the Sampling Expansion (Part II)". I hope that you and your colleagues will find it useful, and I apologize for any of the references that may have been missed. The bibliography is classified in parallel to the subjects covered in my 1977 tutorial review article, on the sampling theorems, in the Proceedings of the IEEE.

Of course, I would appreciate very much your sending me copies of your related papers on the subject. Please send your main (airmail if possible) to the following address:

Prof. Abdul J. Jerri
Dept. of Science
The American Univ. in Cairo
113, Sharia Kasr El Aini
P.O. Box 2511
Cairo, EGYPT, ARE

as I am spending my sabbatical leave at the American University in Cairo.

Thank you,

With my Compliments
and best regards
A. Jerri

Sincerely yours,
Abdul J. Jerri

Department of Science
113, Sharia Kasr El Aini, Cairo - Egypt
P.O. Box: 2511
Tel. 22969 — Telex 92224 AUCAI UN
Cable Address : VICTORIUS

قسم العلوم
١١٣ شارع قصر العيني ـ القاهرة ـ ج.م.ع.
صندوق بريد ٢٥١١
تليفون ٢٢٩٦٩ ـ تلكس ٩٢٢٢٤ AUCAI UN
العنوان التلغرافي : VICTORIUS

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering, FT-10
Telephone: (206) 543-2150

November 18, 1986

Dr. James W. Patterson
Chairman, Search Committee
Illinois Institute of Technology
Armour College of Engineering
Pritzker Department of Environmental Engineering
Chicago, ILL 60616

Dear Dr. Patterson:

I deeply appreciate your invitation to apply for the Chairmanship of IIT's EE Department. If I were further along in my career, I would accept. Since I am still at the level of Associate Professor, however, I believe such acceptance would be premature.

Thank you again for your invitation. I am deeply flattered.

Sincerely,

Robert J. Marks II
Associate Professor

RJM:oog

Ola Please:
1. Type letter & copy.
2. address envelope to Patterson.
Fri P.M.
Thanks!
— Bob —

Dr. James W. Patterson, PhD

Dear Dr. Patterson,

I deeply appreciate your invitation to apply for the Chairmanship of IIT's EE department. If ~~this I were later~~ ~~in my career~~ I was further along in my career (sp?), I would accept. ~~your invitation~~. ~~However I~~ Since I am still at the level of Associate Professor, however I believe such acceptance would be premature. ~~I'm sure I'm sure you agree.~~

Thank you again for your invitation. I ~~I'm sure you're aware receiving such a~~ am deeply flattered.

Sincerely,

Robert J. Marks II
Assoc. Prof.

ILLINOIS INSTITUTE OF TECHNOLOGY

Armour College of Engineering
Pritzker Department of Environmental Engineering

November 12, 1986

Dr. Robert J. Marks II
Department of Electrical Engineering
University of Washington
Seattle, WA 98195

Dear Dr. Marks:

As you may be aware, Illinois Institute of Technology is seeking a Chairman for its Department of Electrical and Computer Engineering, and I am pleased to inform you that you have been nominated for that position. I believe that this Chairmanship offers exciting and challenging opportunities for the right candidate. The Department has a large enrollment, active and enthusiastic faculty, and diverse research including the NSF endorsed University-Industry Cooperative Center in Integrated Information Systems and Telecommunications.

I am enclosing some information on the Electrical and Computer Engineering Department and IIT. If, upon review of this material, you are willing to be considered as a candidate for the position, I would appreciate receiving a resume and the names and addresses of at least three references.

I am hopeful that you will be interested in this very challenging opportunity.

Cordially yours,

James W. Patterson, Ph.D.
Chairman
Search Committee

JWP/at

Encl.

IIT Center Chicago, Illinois 60616 (312) 567-3535 Telex 190243/IllinoisTech

Illinois Institute of Technology

Department of Electrical and Computer Engineering

The Department of Electrical and Computer Engineering offers programs of study leading to the B.S., M.S., and Ph.D. degrees.

The Bachelor of Science curriculum prepares graduates for entry into such areas as electronic circuit design, communication systems engineering, solid state devices, power systems engineering, electromagnetic fields and waves, control systems, digital systems and computer engineering. Senior electives include design oriented courses in each of these areas, many with an experimental laboratory component. The specialization in computer engineering includes both hardware and software aspects of digital systems. Graduates are prepared to pursue career opportunities in industry, as well as to continue their education towards an advanced degree.

The Master of Science degree emphasizes both the professional and scientific aspects of electrical engineering. It requires the completion of 32 credit hours of approved course work. An optional thesis of 6-8 credit hours is encouraged for students who intend to pursue the Ph.D. degree. A written comprehensive examination is required for students who do not include a thesis in their program. Fields of study include circuits and electronics, communication systems, computers and digital systems, control systems, and power engineering.

The Ph.D. degree requires completion of 64 credit hours beyond the Master's degree, normally divided evenly between course work and thesis. Ph.D. students are required to spend a minimum of one year of full-time study in residence. During the first year of their Ph.D. studies a written qualifying examination demonstrating depth and breadth in three areas is required. A second doctoral exam follows that emphasizes the research activities of the student. A written dissertation on original research and an oral thesis defense completes the program.

The Department of Electrical and Computer Engineering has active research programs in the areas of communication systems, control systems, digital and computer systems, power systems, and biomedical engineering. Current projects include knowledge and expert systems, robotics, parallel processing, fault tolerant local area networks, speech and image processing, multimedia database design, office and factory automation, VLSI design, implantation technology, and biomedical signal processing. The ECE Department actively

participates in the NSF sponsored University-Industry Cooperative Center in Integrated Information and Telecommunications Systems. The Department cooperates with the IIT Pritzker Institute of Medical Engineering in some of its research projects.

Several computer systems are available for student use. The Academic Computing Center operates and maintains a computer complex that includes a VAX 11/780, two VAX 11/750, a PRIME 650 and two PRIME 550s that are available for interactive computing and graphics. The Center provides programming support for the solution of large-scale scientific and engineering problems. In addition, the ECE Department has its own computer facilities including an interactive TI 990/10 system and its associated network of 990/5 computers, and a DEC 11/70 plus 11/34 system, servicing all faculty offices. Additional computers include several HP 9636 and 9626, AT&T 3B2S, and an assortment of microcomputer development systems.

The Department offers the opportunity for both full-time and part-time study. In addition, courses leading to the M.S. degree are made available to qualified students in local industry via IIT/V, an interactive, instructional talk-back closed circuit TV delivery system. The Department presently includes approximately 600 full-time and 300 part-time undergraduate students, and 80 full-time and over 300 part-time graduate students. The faculty consists of 4 full professors, 1 research professor, 6 associate professors, 7 assistant professors, 3 adjunct associate professors, 5 instructors, and approximately 20 part-time instructors. In addition, there are 3 full-time faculty positions authorized for the 1986/87 academic year.

Illinois Institute of Technology, established in 1940 through the merger of Armour Institute of Technology and Lewis Institute, is a medium-sized, private, coeducational university that emphasizes professional career preparation in the sciences, engineering, the social and behavioral sciences, architecture, city and regional planning, design, business administration, and law. IIT's total enrollment is approximately 6,000 students. Graduate enrollment in engineering and computer science includes 300 full-time and 1,000 part-time students. The undergraduate engineering and computer science enrollment includes 1,400 full-time and 700 part-time students.

The university offers graduate and undergraduate programs in five schools and colleges. The School of Advanced Studies offers programs leading to the Master of Science degree in 21 fields of study and to the Doctor of Philosophy degree in 14 fields. In addition, the Professional Master's degree is offered in seven specialties. The IIT Chicago-Kent College of Law, grants the degrees of Juris Doctor and Master of Law. The Harold Leonard Stuart School of Management and Finance offers the Professional Master in Business Administration

(MBA) degree, the Master of Science in economics degree, the Master of Science in operations research degree, and the Doctor of Philosophy degree in management sciences.

The IIT campus community includes IIT Research Institute, one of the nation's largest research centers; the Institute of Gas Technology, educational and research facility of the nation's gas utility industry, and the Association of American Railroads Center. The library system includes the Galvin and the Chicago-Kent libraries. Most departments also maintain their own special collections and reading rooms.

The university is located on an open, 120-acre campus that is a Chicago landmark. The campus was designed by Ludwig Mies van der Rohe, one of America's most influential architects and Chairman of Architecture at IIT for 20 years. IIT is 10 minutes from the central Loop area. Chicago is a major hub of American business and industry. It is the capital of American architecture, the center of America's rail and air transportation network, and the site of some of the world's extraordinary engineering accomplishments. It is also an art, music, theater, sports, and museum center, and the home of outstanding research laboratories.

IIT Electrical and Computer Engineering

VACANCY ANNOUNCEMENT - CHAIRMAN

Department of Electrical and Computer Engineering
Armour College of Engineering
Illinois Institute of Technology
Chicago, Illinois 60616

Responsibilities: The chairman is responsible for the administration of the department including instruction, research, program development, personnel and budget. The full-time enrollment is 600 undergraduates, and 80 graduate students. There are 18 faculty, including an assistant chairman. Three additional faculty positions are authorized. Active areas of departmental research include communications, computer engineering, power systems and biomedical engineering. The department actively participates in the NSF sponsored University-Industry Cooperative Center in Integrated Information and Telecommunications Systems, and cooperates with the Pritzker Institute of Medical Engineering.

Qualifications:

a) An earned doctorate
b) Experience as a university educator
c) Research experience
d) Leadership potential as related to current trends in education and research.

Appointment Date: Preferred date of appointment is July 15, 1986.

Application: Applicants should submit a complete resume. Nominations should include complete address and telephone number.
Send all materials to:

Dr. James W. Patterson,
Chairman, ECE Search Committee,
Illinois Institute of Technology
Chicago, Illinois 60616

Closing Date: Applications are requested by April 15, 1986.

IIT is an Equal Opportunity/Affirmative Action Employer

Illinois Institute of Technology

IIT Electrical and Computer Engineering

VACANCY ANNOUNCEMENT - CHAIRMAN

Department of Electrical and Computer Engineering
Armour College of Engineering
Illinois Institute of Technology
Chicago, Illinois 60616

Responsibilities: The chairman is responsible for the administration of the department including instruction, research, program development, personnel and budget. The full-time enrollment is 600 undergraduates, and 80 graduate students. There are 18 faculty, including an assistant chairman. Three additional faculty positions are authorized. Active areas of departmental research include communications, computer engineering, power systems and biomedical engineering. The department actively participates in the NSF sponsored University-Industry Cooperative Center in Integrated Information and Telecommunications Systems, and cooperates with the Pritzker Institute of Medical Engineering.

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Dr. James W. Patterson,
Chairman, ECE Search Committee,
Illinois Institute of Technology
Chicago, Illinois 60616

Closing Date: Applications are requested by April 15, 1986.

IIT is an Equal Opportunity/Affirmative Action Employer

Illinois Institute of Technology

Zhang Yunhu
Optical Instrumentation Department
Wuhan Technical University
of Surveying and Mapping
23 Lo-Yu Road
Wuhan
People's Republic of China

November 1, 1986

Prof. Robert J. Marks II
Department of Electrical Engineering FT-10
University of Washington
Seattle, WA 98195
U.S.A.

Dear Prof. Marks:

Thank you very much for your letter of October 10 and the preprints of ye recent work. I wish I could tell you how grateful to you I am that you should have thought of me even before the publication of these papers.

Unfortunately, I am very sorry to say that I have not yet received any further information from my related Minister about my appointment of a Visiting Scholar. As soon as I get the answer I shall write you immediately.

The help you sent is sincerely valued.

Sincerely,

Zhang Yunhu

Zhang Yunhu

University of Washington Correspondence

INTERDEPARTMENTAL

ELECTRICAL ENGINEERING DEPARTMENT

DATE: October 17, 1986

TO: Karen Frank

FROM: Bob Marks

SUBJECT: Response to Memorandum of October 10, 1986

On warm days, the temperature of the offices on the east end of the fourth floor is sweltering - many times 15 to 20° hotter than outside. Electric fans help little. Professor Tsang moved from his initially assigned office because of the heat. Professor Atlas and I can't even work in our offices on what are pleasant summer days due to the heat.

The problem is poor ventilation and the green house effect. The answer is air conditioning.

RJM:jt

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING FT-10

DATE: October 15, 1986

TO: EE Faculty and Staff

FROM: Karen Frank Karen

SUBJECT: Structural/Mechanical Building Problems

In conjunction with planning for building improvements and renovations, Physical Facilities has asked our assistance in identifying problems existing in EEB. Part of their planning will include fire and safety systems.

I assume we have addressed most electrical concerns with the rewiring project. If you are aware of other problems needing correction (leaks, temperature, structure, etc.), please send me a note outlining these items so I can pass them on to the appropriate planners. Please respond by Wednesday, October 22.

University of Washington Correspondence

INTERDEPARTMENTAL

ELECTRICAL ENGINEERING DEPARTMENT

DATE: October 17, 1986

TO: Enrik Noges

FROM: Robert J. Marks II

SUBJECT: EE 595 T.A.

Cutting Stewart's time of EE 595 does hurt. The big problem is Jim Nelson who, due to his visual handicap, requires more T.A. assistance than most, e.g., homework is submitted orally. Even without Mr. Nelson, the work load is hardly manageable in seven hours per week.

I know of no T.A. other than Stewart Wu who has the background to work with this course. The only solution I came up with is the promise of a lighter T.A. load next quarter for Mr. Wu.

Any ideas?

RJM:jt

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT-10
Telephone: (206) 543-2150

October 24, 1986

Dr. Ellen Ochoa
Sandia National Laboratories
P.O. Box 969
Livermore, CA 94550

Der Dr. Ochoa:

I just missed the OSA meeting presentation of your paper on optical median filtering. The work sounds fascinating! If you have written anything further on the subject, I would deeply appreciate a paper pre- or reprint. If not, how about a copy of the OSA talk slides.

Congratulations on what seems to be a superbly clever optical processor.

Sincerely,

Robert J. Marks II
Associate Professor

RJM:jt

Texas Tech University
Optical Systems Laboratory
Department of Electrical Engineering/Computer Science

Copy

October 15, 1986

Mr. William J. Miceli
ONR-Boston Detachment
495 Summer Street
Boston, MA 02210-2109

Dear Bill:

Enclosed is another preprint of a paper submitted for publication relating to SDI/IST ONR Contract N00014-86-K-0709 ("Accuracy Limitations in Optical Computing"). The paper, entitled "Content Addressable Memories: A Relationship between Hopfield's Neural Net and An Iterative Matched Filter," by R. J. Marks II and L. E. Atlas, relates to the work Dr. Marks is directing at the University of Washington.

Dr. Marks visited Texas Tech for a week in September and there was good interaction relating to our joint effort. We're both looking forward to seeing you at the Seattle OSA Annual Meeting.

Sincerely,

John Walkup

John F. Walkup
Horn Professor
Project Director

jbd
Enclosure: preprint

xc: Dr. Marks

Lubbock, Texas 79409-4439/(806) 742-3465

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

April 14, 1986

Department of Electrical Engineering FT–10
Telephone: (206) 543–2150

Mr. Zhang Yunhu
Optical Instrumentation Department
Wuhan Technical University of Surveying and Mapping
23 Lo-Yu Road
Wuhan
People's Republic of China

Mr. Yunhu:

I am pleased to inform you that the faculty of the Dept. of Electrical Engineering at the University of Washington has approved your appointment as a Visiting Scholar here next academic year.

Please note that this appointment carries with it no salary commitment from our institution. I am assuming that your government will support you during your stay. I suggest you discuss living expenses with your collegue in our Mechanical Engineering Graduate program. I have been told that these expenses are many times underestimated by visiting scholars.

Under separate cover, I will send you preprints, and reprints of some of our groups recent papers. They should give you an idea of our present research directions.

Please feel free to contact me if I can be of any help in your relocation. I look forward to working with you.

Sincerely,

Robert J. Marks II

RJM/cmb
CC: Professors Robert Porter and John Bjorkstam

University of Washington Correspondence

INTERDEPARTMENTAL

Electrical Engineering Department - FT-10

DATE: June 24, 1986

TO: Robert Porter, Chair

FROM: Bob Marks

SUBJECT: Visiting Scholar Zhang Yunhu

At a recent faculty meeting, Mr. Yunhu was approved as a visting scholar in our department for the next academic year. Due to some unforeseen problems, he will not be arriving in Seattle until the beginning of winter quarter. If all proceeds as planned, I anticipate asking for a one quarter extension of his appointment through fall quarter 1987.

BM:cc

cc: Dan Dow, Support Services
John Bjorkstam, Visiting Scholar Coordinator
Youchi Huang (FX-10), U.S. contact

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT-10
Telephone: (206) 543-2150

August 12, 1985

Dr. Marion O. Hagler
Department of Electrical Engineering
Texas Tech University
Lubbock, Texas 79409

Greetings!

Per your request, I thought I'd drop you a line and let you know how things are on our end. Connie had her operation to straighten a deviated septum (The thing between her nose holes.) last Thursday. The operation went well. A second operation on her sinuses is a distinct possibility. We'll have to wait and see.

Although still possible, I'm somewhat pessimistic about January. Our deadline for leave application is November (although I've got around these deadlines before). Recovering from this and a second operation along with a Lubbock visit by then might be packing thinys too close. Its too early yet for a decision.

Thanks again for your patience and understanding Marion! Give my best to Tom and John.

Best personal regards,

Robert J. Marks II
Associate Professor and
All Round Swell Guy

RJM:pke

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering, FT-10
Telephone: (206) 543-2150

September 30, 1986

Rich Rubenstein,
Vice President for Microprocessor
and Signal Development
Sharp Microelectronics, Inc.
P.O. Box 1044
Camas, WA 98607

Dear Rich,

It was good to have met with you last week. I look forward to further mutually beneficial interaction in the future.

In response to your request, I have asked our Chairman, Dr. Robert Porter, to send you information concerning the department's Industrial Affiliate program. Under separate cover, I will to you information concerning our televised graduate courses.

Best personal regards,

Robert J. Marks, II
Associate Professor

RJM/dm
cc: Dr. Robert Porter

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering, FT-10
Telephone: (206) 543-2150

October 2, 1986

Rich Rubenstein,
Vice President for Microprocessor
and Signal Development
Sharp Microelectronics, Inc.
P.O. Box 1044
Camas, WA 98607

Dear Rich,

Enclosed is information about our televised graduate program. I hope you find it useful.

Best personal regards,

Robert J. Marks II
Associate Professor

RJM/dm
cc: Sharon Kromhout-Schiro
TIE Director

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering, FT–10
Telephone: (206) 543–2150

September 30, 1986

Prof. Dr. Adolf Lohmann
Physikalisches Institut
der Universitat Erlangen-Nurnberg
Erwin-Rommel-Str. I
D 8520 Erlanger
GERMANY

Dear Adolf,

Greetings! Enclosed is a preprint of an Optics Letters paper relating to the one you requested. Its a straightforward extension of some of your works. The paper corresponding to the OSA talk is not completed yet.

I hope to see you in Seattle!

Best personal regards,

Robert J. Marks II
Associate Professor

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering, FT-10
Telephone: (206) 543-2150

September 24, 1986

Dr. John F. Walkup, Director
Optical Systems Lab
Dept. of Electrical Engineering
Texas Tech University
Lubbock, Texas 79409

Dear John,

Here are the lists I promised. The copyright date on the report was 1985.

Preprints to follow!

Best regards,

Robert J. Marks II

RJM/dm

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING - FT-10

DATE: August 27, 1986

TO: L. Tsang
W. Moritz
R. Marks*

FROM: R. Porter

SUBJECT: Promotion/Tenure Review Committee

Will you please serve on the Promotion/Tenure Review Committee for L. Atlas, with L. Tsang acting as Chair of the Committee, to review the performance of Assistant Professor Atlas to consider whether he is a candidate for promotion with tenure to the rank of Associate Professor.

If you decide that Assistant Professor Atlas is a candidate for promotion, the executive committee suggests that you accumulate documentation to justify this recommendation:

-- Yearly activity report
-- Current vita
-- Publication list
-- Evidence of teaching effectiveness
-- 4 external letters of recommendation

To insure that the outside referees have adequate time and information for their evaluation, the executive committee recommends that you send them relevant documentation (publications and current vita) at least one month prior to October 10.

Your reviews must be completed and presented for a faculty vote by October 24.

*Member selected by candidate

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING - FT-10

DATE: August 22, 1986

TO: Bob Marks

FROM: Robert P. Porter RPP

SUBJECT: Promotion/Tenure Review Committee

Will you please serve on the Promotion/Tenure Review Committee for J. Ritcey. The other members of the committee are Dean Lytle, Chair, M. Afromowitz, and Robert Albrecht.

The Promotion/Tenure Review Committee is charged to carry out the annual performance review of this individual. The Executive Committee is of the opinion that Jim is not a candidate for promotion since he is only in the second year of his appointment, but of course the committee is free to reach its own conclusion.

Jim's updated Biographical Supplement and Summary of Activities 1985-86 will be available by the end of next week, August 29.

University of Washington Correspondence

INTERDEPARTMENTAL

College of Engineering, FH-10

February 13, 1986

Robert J. Marks II
Associate Professor,
Electrical Engineering, RT-10

Dear Bob:

I appreciated the opportunity to discuss your concerns about the critical market salary distribution and to review information you had gathered on citations of recent work. The frequency of citation of your work is noteworthy.

The value of the number of citations, as an indication of external recognition, can only be determined after a review of the relevant publications. Whether such a review should be made for members of the EE faculty is very properly the responsibility of the EE faculty committee which conducts annual assessment. That committee has other quantitative evidence (e.g. recent publications, research support graduate student supervision, teaching evaluations, evidence of public service and program development) to consider as well and may chose to attach greater weight to such evidence in the annual assessment.

In the absence of contrary evidence, I normally presume that all factors deemed relevant by the review committee have been considered in their deliberations. In the present case, I have not received any information that the EE committee operated improperly in the development of a ranked list based on merit.

Since the Legislature and Governor deemed that the salary distribution must be based on critical market disparity and explicitly rejected distribution on a merit basis and since the total allocation was inadequate to address the critical market disparity, the concept of vulnerability was introduced by the University administration. Of these faculty judged to be meritorious in the departmental review, those considered to be vulnerable to outside offers were to receive salary increments. The administration identified a vulnerability quota for each school or college.

As indicated to you in our discussion, the decision as to vulnerability of individual faculty was made, for each department, jointly by the department chair and me. For every department, the number of faculty judged to be meritorious exceeded the numerical quota for CMD salary increments assigned to the department. As a consequence, it was necessary to use a fairly quantitative measure to ensure that the limited salary funds allocated to the college were used to best advantage to ensure the retention of its most vulnerable faculty. For this purpose, I used the generation of research funding over a period of four plus years.

The selection of such a measure for engineering faculty at a research university is in my opinion quite justifiable, since it

would be difficult for a faculty member to stay at the forefront of his/her discipline without engaging in graduate instruction and research. Given the present level of state funding at the University, it is virtually impossible for a faculty member to mount an independent research program of any significance without extramural support.

As you have acknowledged, the levels of extramural support you have achieved were below the minimal standards which were required for faculty to be judged vulnerable.

In answer to your letter of January 21, 1986, your position seems to rest exclusively on the factor that you can cite an apparent recognition indicator in which you have a higher quantitative measure than other faculty who have been judged, on the basis of an evaluation of individual performance and contribution by your faculty peers, to be more meritorious. I do not find that to be a sufficiently convincing argument to make a statement concerning the distribution of future increments.

Sincerely yours,

J. Ray Bowen
Dean

JRB:mln

cc: Robert P. Porter

August 29, 1986

Dear Bob,

This is a rather tardy letter to let you know how my graduate school applications turned out and to thank you again for your assistance in writing recommendations for me.

I'll be heading out to Stanford next month. I received a research assistantship from Dr. Thomas Kailath of the Information Systems Laboratory at Stanford. I'm looking forward to working for him. His main interests are in Detection and Estimation Theory, although he has recently become involved with some VLSI issues - chip layout - and with beamforming for antenna arrays. I think that he is interested in my working on some of the beamforming problems. I'm not sure that I'll be able to find a dissertation topic in that area, but it should be interesting in its own right, as well as in its close relationship to spectral estimation - which is a little more in line with my interests.

I was also accepted at Rice, the University of Texas at Austin, and the University of Michigan at Ann Arbor, with all of those schools offering support. I wasn't accepted at MIT, however.

I left Massachusetts at the end of June. My last month or so at Lincoln Laboratory was spent documenting the precipitation tracking algorithms that I had been developing, as well as my results on filtering of time series with uneven intersample spacings. The latter report is not quite complete at this time, I hope to finish it up once I get out to Stanford and have access to computer facilities. Overall, I am pleased with my experience at Lincoln. I think that Lincoln was pleased with my experience too, as they have retained me as a consultant.

I've been spending the summer fishing, backpacking, lifting weights and generally taking things easy. This is the first summer that I haven't worked in a long time and I'm really enjoying the luxury of having no schedules imposed upon me.

How are things in Washington state? I hope that the summer has gone well for you. Does it look as though you may be going to Texas for the '87-'88 school year?

I am very appreciative of all that you have done for me over the past few years - sending me papers to review, writing recommendations for me and everything else. Thank you.

I won't know my California address until after I arrive, but I will drop you a line once I am settled in. Take Care,

MARC

Texas Tech University
Texas Tech University Health Sciences Center

Office of the President
Box 4349/Lubbock, Texas 79409-4349/(806) 742-2121

September 30, 1985

Dr. Robert Marks
Department of Electrical Engineering
University of Washington
Seattle, Washington 98195

Dear Dr. Marks:

This is to express appreciation for your involvement and the time and effort you invested in proposal preparation for the Advanced Technology Research competition in the State of Texas. I was particularly pleased with the quality of proposals submitted as well as the cooperation evident throughout the process.

This is an important statewide effort. Your assistance to principal investigators here is good evidence of the spirit of academic cooperation which exists for the betterment of scientific research. The proposal with which you were involved, whether or not it is funded, would provide an opportunity for the advancement of scientific knowledge and for assistance to the State. Thank you again for your involvement.

Sincerely,

Lauro F. Cavazos
President

photo number of office

HUANG

545-1796

Zhang Yunhu
Optical Instrumentation Dept.
Wuhan Technical University
of Surveying and Mapping
Wuhan
People's Republic of China

May 10, 1986

Prof. Robert J. Marks II
Dept. of Electrical Engineering FT-10
University of Washington
Seattle, Washington 98195
USA

Dear Prof. Marks:

I was so happy to learn from your letter of April 14 that my appointment as a Visiting Scholar in your Department had been approved. Your immediate attention to my request has given me great encouragement and has made me all the more devoted to you.

Unfortunately, I am afraid I can not arrive at your University this September, because I have to take an examination in September in order to get the financial support of my living expenses in the USA for a one-year period (total $ 4800) from Chinese government. As soon as I get the financial support I shall inform you

Bob - could you give me a copy of ~~you~~ the revision of the Dadi & Marks paper on ARE for Laplace noise. Maybe I'll write a short correspondence on computational methods by contour integration. I gave my copy to Kassam.

Thanks,

Jim Reilly

next spring (1987).

Moreover, I am inclined to study and work under your guidance for more than one year. May I ask you about the possibility of your granting me any financial aid from your University concidering my financial shortage of living expenses.

I am very much pleased to know that you will kindly send me your groups recent papers, I will study them with great eagerness and carefulness.

Thanking you for all the trouble you are going to take for me, I am .

Your sincerely

Zhang Yunhu

c/o Dr. Huang Youcai

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT-10
Telephone: (206) 543-2150

July 21, 1986

Dr. Leighton E. Sissom
Dean
College of Engineering
Tennessee Technological University
Box 5005
Cookeville, TN 38505

Dear Dr. Sisson:

This letter of recommendation is in support of Dr. Robert Marks' application for the position of Chairman in the Department of Electrical Engineering in your School.

Dr. Marks has been my colleague in the Department of Electrical Engineering for six years. During this time, we have both engaged in numerous technical and administrative assignments.

The following is my own opinion regarding Dr. Marks' activities in the areas of research, teaching and service in our Department.

1. Research:

Dr. Marks' research program consists of three activities: grants and contracts, supervision of graduate students and publishing in archival journals and reviewed technical conferences.

In the area of grants and contracts, he is currently the principal investigator for a highly competitive research grant sponsored by ONR.

He has supervised a large number of MSEE and Ph.D. students. In fact, in the past five years he graduated over 10% of the graduate students of our department. His graduate students always acknowledge his guidance and assistance.

In the area of publications, he has published numerous papers in archival journals. His work is often refered to by others in his field as unique and accurate.

In my opinion, Dr. Marks is unsurpassed by anyone I have known of comparable age and experience in his ability to combine innovative and inventive initiative together with sound scientific analysis and technical design.

2. Teaching

Dr. Marks has introduced a number of senior and graduate courses in our department that are now part of our curriculum. In the teaching evaluations by his students, he is always rated as excellent instructor who is willing to spend as much time as it takes to ensure the understanding of the students. Indeed he is one of our best teachers.

3. Service

Dr. Marks has been a member and chairman of a number of regular and ad-hoc committees. He has the capability of professionally and efficiently conducting the business of these committees. He also has the ability to arrive at a compromise when the other members of a committee cannot agree in making a decision. In my opinion, he has all the qualities of an outstanding administrator.

I hope that the above provides you with the information you need. However, should you have any questions, please do not hesitate to contact me at the above address or call me at (206) 545-2286.

Sincerely,

M. A. El-Sharkawi
Associate Professor

MAE:cl

University of Washington Correspondence

INTERDEPARTMENTAL

Electrical Engineering Department - FT-10

DATE: June 24, 1986

TO: Robert Porter, Chair

FROM: Bob Marks RJM

SUBJECT: Visiting Scholar Zhang Yunhu

At a recent faculty meeting, Mr. Yunhu was approved as a visting scholar in our department for the next academic year. Due to some unforeseen problems, he will not be arriving in Seattle until the beginning of winter quarter. If all proceeds as planned, I anticipate asking for a one quarter extension of his appointment through fall quarter 1987.

ok

BM:cc

cc: Dan Dow, Support Services
John Bjorkstam, Visiting Scholar Coordinator
Youchi Huang (FX-10), U.S. contact

ENVIRONMENTAL
RESEARCH INSTITUTE OF MICHIGAN
P.O. BOX 8618 • ANN ARBOR • MICHIGAN • 48107 PHONE (313) 994-1200

ELECTRO-OPTICS DEPARTMENT

15 January 1986

Dr. Robert J. Marks II
Department of Electrical Engineering
FT-10
University of Washington
Seattle, WA 98195

Dear Bob:

I am writing a chapter on optical feedback processing for a book on optical signal processing edited by Joe Horner of RADC. I would like to reproduce one figure from one of your papers. Please sign and return one of the enclosed permission forms to me. I am enclosing a copy of the figure concerned for your convenience.

Although I have made every effort to have a complete bibliography of significant publications in optical feedback, I would welcome reprints of any recent publications in this area by your group.

Sincerely yours,

Jack

Jack Cederquist

Enclosures: Permission forms

Dr. Robert J. Marks II
Department of Electrical Engineering
FT-10
University of Washington
Seattle, WA 98195

Dear Dr. Marks:

I am preparing a chapter on optical feedback processing which will appear in an edited work to be published by Academic Press under the tentative title, "Optical Signal Processing."

I should appreciate permission to reproduce the following:

Fig. 1 from Marks and Smith, Proc. SPIE 231, 106 (1980)

in this and any future editions of the above book. May I please have non-exclusive world rights in all languages?

Unless you indicate otherwise, I will use the complete reference entered above as a credit line.

For your convenience, a copy of this letter may serve as a release form; the duplicate copy is for your files.

Permission is being requested of the author and of the publisher separately.

Sincerely yours,

Jack Cederquist

Dr. Jack Cederquist
ERIM
P.O. Box 8618
Ann Arbor, MI 48107

We grant permission for the use requested above.

Signature:

Date:

PHOTON KINETICS INC

9350 SOUTHWEST GEMINI DRIVE
BEAVERTON, OR 97005
503/644 1960
TELEX: 4992356 ITT

October 22, 1985

Mr. Robert J. Marks, II
Dept. of Electronic Engineering
University of Washington F-10
Seattle, WA 98195

Dear Bob:

The Pacific Northwest is beginning to gain recognition as a center for activity in optics. We have a number of notable companies and institutions engaged in optics and electro-optics. The Pacific Northwest Section of the Optical Society of America can facilitate bringing together our optics community and bringing recognition of our accomplishments to the local communities.

Individually, we can join the Pacific Northwest Section and attend its meetings. Membership in the National OSA organization does not automatically give you membership in the local section. To become a member of the local section, please complete the enclosed form and return it along with the $5.00 membership fee.

One excellent way of bringing together those interested in optics is through interesting meetings. Our meeting on Wednesday, November 20, 1985, which focuses on Optics in the IC Industry, promises to be of great interest. The meeting features presentations by Donald W. Herriott of Perkin & Elmer, Barry Cox of ATEQ Corporation, and Joel Johnson of Electro Scientific Industries.

We wish to recruit new people into our optics community. Please review the enclosed list of people interested in optics and send me the names of others you think might wish to receive information about our activities.

We welcome and solicit your suggestions regarding how the Pacific Northwest OSA Section can best serve the community and your needs. You may contact by telephone any one of the officers listed below.

Sincerely yours,

Phil Schierer, President
Optical Society of America
Pacific Northwest Section
(503) 644-1960

Jen-Lih C. Hung, (503) 646-9171
Paul S. Angello, (503) 294-9314

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT–10
Telephone: (206) 543–2150

November 15, 1985

Phil Schierer, President
Optical Society of America
Pacific Northwest Section
9350 S.W. Gemini Drive
Beaverton, OR 97005

Dear Phil:

Thank you for your letter of October 22. I share your feelings. The Pacific Northwest could have a much more dynamic OSA chapter through increased member and industrial participation. Our visibility will be greatly increased when the Optical Society meets in Seattle next year for its annual meeting.

The fundamental reason why more of our Seattle colleagues (and myself) do not participate in the Northwest Section is that the focus of the organization is in Oregon. The long commute to meetings is too inconvenient. Is it possible that:

1. Local branches be established to be more sensitive to local needs? and/or

2. Section meetings be alternated among major centers of optical activity in the Northwest?

Best regards,

Robert J. Marks II
Associate Professor

RJM:saj

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT–10
Telephone: (206) 543–2150

November 7, 1985

Guy Lebreton
Chef de la Division Processeurs Optiques
Groupe d'Etudes Signaux et Systemes
Gessy, Universite du Var
639, Bd. des Armaris
83100 Toulon, FRANCE

Dear Guy:

It certainly was a joy to meet and talk with you during your visit to the Great Northwest. I look forward to further interaction at future optics meetings.

I have enclosed reprints of some of my more recent papers. I hope they prove useful in your work.

Best personal regards,

Robert J. Marks II
Assoc. Professor

RJM:saj

Enclosures

EVERETT

9.3.85

@ 11 35 AM

Dear Bob,

It was an experience & pleasure to have you as teacher for Comm. Systems. I really enjoyed your style & patience with "us" people.

Hope to run-into eachother some other time. In the meantime, wish you best of luck in your endavours & adventures. Till, then

Yours Sincerely,

Satpal

(SATPAL SAINI)

P.S: My Finial paper & self-addressed stamped is alongwith for the finial "shoot-down"!

Texas Tech University

Office of the Vice President for Academic Affairs and Research
Lubbock, Texas 79409 / (806) 742-2184

May 23, 1985

Robert Marks
16515 Ashworth Ave. N.
Seattle, Washington 98133

Dear Dr. Marks:

It is a pleasure for me to extend a formal invitation to you to join the faculty of Texas Tech University. The appointment for which you have been recommended is at the rank of Visiting Associate Professor in the Department of Electrical Engineering/Computer Science, College of Engineering, with a salary of $38,000.00 for the period September 1, 1985 through May 31, 1986.

Please let me know of your willingness to accept this invitation by June 12, 1985. Upon receipt of your acceptance, you will receive forms, including a confirmation of appointment and a data form from the Office of the Secretary of the Board of Regents. These forms will need to be completed and returned in order to conclude your appointment.

We look forward to your being on campus in September.

Sincerely yours,

Len Ainsworth

Len Ainsworth
Associate Vice President
for Academic Affairs

LA/ck

xc: Mason H. Somerville
Dr. Marion Hagler

I accept!
Bob Marks

Texas Tech University
Department of Electrical Engineering/Computer Science
Lubbock, Texas 79409-4439/(806) 742-3533

May 9, 1985

Dr. Robert Marks
16515 Ashworth Ave. N.
Seattle, Washington 98133

Dear Dr. Marks:

I am pleased to offer you a position as Visiting Associate Professor in the Department of Electrical Engineering/Computer Science at Texas Tech University. The appointment would be for the 1985-86 academic year at a salary of $38,000 for 9 months.

Sincerely,

Marion Hagler
P. W. Horn Professor
and Chairman

MH/sw

xc: Dr. Mason Somerville
Dean, College of Engineering

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING FT-10

DATE: May 30, 1985

TO: James S. Meditch,
Chairman

FROM: Robert J. Marks II,
Associate Professor

SUBJECT: Leave For Next Academic Year

I request leave for the 1985-86 academic year. This time will be spent as a Visiting Associate Professor in the Department of Electrical Engineering at Texas Tech University in Lubbock. My support will come from DOD grants and the state of Texas. Their initial salary offer was $50,700. for twelve months.

Other information requested in "Instructions for Applying for Professional Leave", such as publications, professional activities, and other scholarly work, can be found in the attached Faculty Biographical Supplement.

RJM:pke

Attachments

UNIVERSITY OF WASHINGTON

COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL ENGINEERING

FACULTY BIOGRAPHICAL SUPPLEMENT

Name: Robert J. Marks II Date of Birth: 8/25/50

EDUCATIONAL RECORD:

College or University:	Dates	Degree
Rose-Hulman Institute of Technology	7/72	B.S.
Rose-Hulman Institute of Technology	8/73	M.S.
Texas Tech University	12/77	Ph.D.

Honors and Awards:

IEEE Outstanding Branch Counselor/Advisor Award for 1982

Recipient of IEEE Centennial Medal and Certificate for 1984

Listed in "Who's Who in Technology Today"
"Outstanding Young Men of America"
"Personalities of the West and Midwest"
"The International Who's Who of Contemporary Achievement"
"Who's Who in the West"
"Dictionary of International Biography"
"Personalities of America"
"Who's Who Directory of Optical Scientists and Engineers"
"Who's Who in Frontiers of Science and Technology"

PROFESSIONAL APPOINTMENTS PRIOR TO UW APPOINTMENT: (Incl. both teaching & industrial)

Teaching Assistant, Dept. of Elec. Eng., Rose-Hulman Institute of Tech. (1972-73)

Reliability Engineer, Naval Weapons Support Center, Crane, Indiana (1973-74)

Research Assistant, Department of Electrical Engineering, Texas Tech University, Lubbock, Texas (1974-77)

Name: Robert J. Marks II

UNIVERSITY OF WASHINGTON RECORD:

Initial Appointment:	Rank:	Assistant Professor	Date: 12/77
Promoted to:	Rank:	Associate Professor	Date: 9/82

Administrative Appointments:

Date	Position	Fraction of Full Load	Remarks

Professional Leaves:

Date	Place	Purpose

CONSULTING OR PROFESSIONAL PRACTICE:

Applied Physics Lab, University of Washington, (Summer 1978).

Applied Physics Lab, University of Washington, (Spring and Summer quarter 1979)

APPA-Systems Inc., Bellevue, (Summer quarter 1981)
(Winter/Spring 1982).

Technical Arts Corp., Seattle, (Autumn 83/Winter 84).

Name: Robert J. Marks II

TEACHING:

a. Sections Taught

Quarter	Course, Brief Title, Credits	Student Opinion Surveys*
Winter 1978	EE 468A, Applied Optics (4)	yes (4.17)
Spring 1978	EE 333A, Cir. & Sys. II (4)	yes (4.48)
Spring 1978	EE 333U, Cir. & Sys. II (4)	yes (3.79)
Autumn 1978	EE 333A, Cir. & Sys. II (4)	yes (3.74)
Autumn 1978	EE 333B, Cir. & Sys. II (4)	yes (4.15)
Winter 1979	EE 468A, Applied Optics (4)	yes (4.17)
Spring 1979	EE 333A, Cir. & Sys. II (4)	yes (3.74)
Spring 1979	EE 333U, Cir. & Sys. II (4)	no
Autumn 1979	EE 381A, Electrophysics I (4)	yes (3.53)
Winter 1980	EE 468A, Applied Optics (4)	no
Spring 1980	EE 335, Linear Sys. Analysis I (4)	no
Autumn 1980	EE 335, Linear Sys. Analysis I (4)(shared)	no
Autumn 1980	EE 440, Linear Sys. Analysis II (3)	no
Autumn 1980	EE 306U, Elements of Electrical Engrg. (5)	no
Winter 1981	EE 468A, Applied Optics (4)	yes (4.58)
Spring 1981	EE 335, Linear Systems Analysis I (4)	yes (4.05)
Summer 1981	EE 383, Electrophysics II (4)	no
Summer 1981	EE 505, Intro. to Probability and Random Processes (4)	no
Autumn 1981	EE 312, Electrophysics Lab (2)	no
Autumn 1981	EE 231, Cir. & Sys. I (4)	no
Winter 1982	EE 468, Applied Optics (4)	yes (4.44)
Winter 1982	EE 417, Intro. to Comm. Theory I (4)	yes (4.26)
Spring 1982	EE 333, Cir. & Sys. II (4)	yes (3.97)
Spring 1982	EE 418, Intro. to Comm. Theory II (3)	yes (4.36)
Summer 1982	EE 505, Intro. to Probability and Random Processes (4)	yes (4.02)
Autumn 1982	EE 440, Linear Systems Analysis II (4)	no
Autumn 1982	EE 310, Electronics Laboratory I (3)	no
Winter 1983	EE 381, Electrophysics I (4)	no
Winter 1983	EE 468, Applied Optics (4)	yes (4.19)
Spring 1983	EE 335, Linear Systems Analysis I (4)	no
Spring 1983	EE 306, Elements of Electrical Engrg. (5)	no
Summer 1983	EE 505, Intro. to Probability and Random Processes (4)	yes (4.06)
Summer 1983	EE 306, Elements of Electrical Engrg. (5)	no
Autumn 1983	EE 310, Electronics Laboratory (3)	no
Autumn 1983	EE 440, Linear Systems Analysis II (4)	yes (3.75)
Winter 1984	EE 468, Applied Optics (4)	no
Spring 1984	EE 595, Advanced Topics in Comm. Theory (3)	yes (4.77)
Spring 1984	EE 381, Electrophysics I (4)	no
Summer 1984	EE 505, Intro. to Probability and Random Processes (4)	no
Summer 1984	EE 381, Electrophysics I (4)	
Autumn 1984	EE 440, Linear Systems Analysis II (4)	yes (4.17)
Winter 1985	EE 468, Applied Optics (4)	yes (4.36)
Spring 1985	EE 595, Advanced Topics in Comm. Theory (3)	yes
Spring 1985	EE 381, Electrophysics I (4)	no

*Survey average included in parenthesis.

Name: Robert J. Marks II

b. Textbooks Authored

c. Advising

Engineering Advising Center, Spring 1979

d. Course Supervision & Development

Winter 1978, EE 312, Electrophysics Lab - supervised
Spring 1978, EE 312, Electrophysics Lab - supervised
Autumn 1978, EE 312, Electrophysics Lab - supervised
Winter 1979, EE 312, Electrophysics Lab - supervised
Autumn 1979, EE 312, Electrophysics Lab - supervised
Winter 1980, EE 312, Electrophysics Lab - supervised
Spring 1980, EE 312, Electrophysics Lab - supervised
Summer 1980, EE 312, Electrophysics Lab - supervised
Autumn 1980, EE 312, Electrophysics Lab - supervised
Winter 1981, EE 312, Electrophysics Lab - supervised
Spring 1981, EE 312, Electrophysics Lab - supervised
Summer 1981, EE 312, Electrophysics Lab - supervised
Autumn 1981, EE 312, Electrophysics Lab - supervised
Autumn 1982, EE 312, Electrophysics Lab - supervised
Autumn 1982, EE 440, Linear Systems Analysis - participated in revising course content
Winter 1982, EE 312, Electrophysics Lab - supervised
Spring 1982, EE 312, Electrophysics Lab - supervised
Summer 1982, EE 312, Electrophysics Lab - supervised
Summer 1983, EE 312, Electrophysics Lab - supervised
Spring 1984, EE 595, Advanced Topics in Communication Theory: Multidimensional Signal Processing - special topics graduate course
Spring 1985, EE 595, Advanced Topics in Communication Theory: Signal Recovery - Special Topics Graduate Course.

RESEARCH ACTIVITIES

a. Student Research Supervision:

Course	No. of Students	Total Credits
EE 499 (Spr. 1978)	3	11
EE 700 (Sum. 1978)	1	4
EE 700 (Aut. 1978)	1	4
EE 499 (Aut. 1979)	1	2
EE 499 (Wtr. 1979)	1	3
EE 499 (Sum. 1979)	2	8
EE 499 (Aut. 1980)	1	3
EE 499 (Wtr. 1980)	1	4

Name: Robert J. Marks II

a. Student Research Supervision (Continued)

Course	No. of Students	Total Credits
EE 700 (Wtr. 1980)	1	3
EE 700 (Spr. 1980)	1	3
EE 700 (Sum. 1980)	1	3
EE 700 (Aut. 1980)	1	3
EE 499 (Wtr. 1981)	1	5
EE 499 (Spr. 1981)	2	7
EE 499 (Sum. 1981)	3	9
EE 499 (Aut. 1981)	4	10
EE 499 (Wtr. 1982)	3	6
EE 700 (Wtr. 1982)	1	2
EE 399 (Spr. 1982)	1	1
EE 599 (Spr. 1982)	1	3
EE 700 (Spr. 1982)	2	5
EE 499 (Sum. 1982)	1	2
EE 599 (Sum. 1982)	1	2
EE 700 (Sum. 1982)	2	6
EE 499 (Aut. 1982)	1	3
EE 599 (Aut. 1982)	1	2
EE 700 (Aut. 1982)	5	17
EE 499 (Wtr. 1983)	3	8
EE 700 (Wtr. 1983)	6	19
EE 399 (Spr. 1983)	1	1
EE 700 (Spr. 1983)	6	23
EE 700 (Sum. 1983)	2	7
EE 700 (Aut. 1983)	3	16
EE 599 (Aut. 1983)	1	5
EE 499 (Wtr. 1984)	1	2
EE 599 (Wtr. 1984)	1	3
EE 700 (Wtr. 1984)	4	11
EE 700 (Spr. 1984)	3	12
EE 600 (Spr. 1984)	1	2
EE 499 (Sum. 1984)	1	3
EE 700 (Sum. 1984)	3	17
EE 800 (Sum. 1984)	1	6
EE 600 (Aut. 1984)	1	3
EE 700 (Aut. 1984)	2	8
EE 800 (Aut. 1984)	1	5
EE 499 (Wtr. 1985)	1	4
EE 700 (Wtr. 1985)	3	14
EE 800 (Wtr. 1985)	1	6
EE 499 (Aut. 1985)	1	3
EE 700 (Aut. 1985)	3	18
EE 800 (Aut. 1985)	1	6

Name: Robert J. Marks II

a. Student Research Supervision (Continued)

EE 499, EE 599, and EE 600 Project Reports

D.M. Kawaguchi, "One Dimensional Density Modulation," (1982).

D.J. Stineman, "The Maximum Energy Transfer Through a Digital Filter Over a Finite Time Window," (1982).

J.J. Schilling, "Determination of Optimal Sampling Rates of Densitometric Tracings by Spectral Analysis," (1982).

P. Hartson, "The Sampling Theorem and Missing Samples," (1982).

K. Archer, "Toeplitz Matrix Solution and Inversion on the HP41C Calculator," (1982). [IEEE Student Paper Contest, First Prize, 1982.]

D. Kaplan, "Sensitivity and Posedness of Discrete Bandlimited Signal Extension," (1982). [IEEE Student Paper Contest, Second Prize, 1982.]

T. Reightley, "Maximum Energy Transfer Through a Digital Filter," (1984).

K.F. Cheung, "An Iterative Hilbert Transform Algorithm," (1984).

F. Salamat "Feasibility Study of Optical Speech Recognition," (1984).

Theses and Dissertations

D.K. Smith, "Extrapolation of Two-Dimensional Bandlimited Images," Thesis, (1980).

R.C. Hickey, "An Iterative Design Technique for Computer Generated Holograms," Physics Master's Project, (1982).

D. Radbel, "Noise and Truncation Effects in the Estimation of Sampled Band-limited Signals," Thesis (1983).

C.M. Maxey, "Optical Detection of Flaws in Thirty Five Millimeter Photographic Film," Thesis, (1983).

R.A. Spielmaker, "A Coherent Optical Implementation of an Algorithm to Restore Continuously Sampled Aliased Data," Thesis, (1983).

K.F. Cheung, "The Generalized Sampling Expansion: Its Stability, Posedness and Discrete Equivalent," Thesis, (1983).

Name: Robert J. Marks II

a. Student Research Supervision (Continued)

D. Kaplan, "Bandlimited Signal Interpolation: Continuous and Interlaced Sampling," Thesis, (1983).

M.H. Goldberg, "Signal Synthesis in the Presence of an Inconsistent Set of Constraints," Thesis, (1984).

F. Salamat, "Acousto-Optic Digital Filtering," Thesis, (1984).

Shiao-Min Tseng, "Noise Level Analysis for Linear Restoration Algorithms," Thesis, (1984).

M. Dadi "A Study of Relative Efficiency in Laplace Noise," Thesis (1985).

b. Individual Research Program

Coherent Optical Space Variant Processing
Generalized Shannon Sampling Theory
Coherent Optical Extrapolation
Digital Image Extrapolation
Iterative Signal Restoration Techniques
Data Restoration and its Stability
Digital Optical Processing
Multidimensional Signal Processing

Name: Robert J. Marks II

c. Publications:

JOURNAL ARTICLES

1. R.J. Marks II and T.F. Krile, "Holographic Representations of Space-Variant Systems: System Theory," Applied Optics, 15, pp. 2241-2245, (1976).

2. R.J. Marks II, J.F. Walkup and M.O. Hagler, "A Sampling Theorem for Space-Variant Systems," Journal of the Optical Society of America, 66, pp. 918-921, (1976).

3. R.J. Marks II, J.F. Walkup and M.O. Hagler, "Line Spread Function Notation," Applied Optics, 15, pp. 2289-2290, (1976).

4. R.J. Marks II, J.F. Walkup, M.O. Hagler and T.F. Krile, "Space-Variant Processing of One-Dimensional Signals," Applied Optics, 16, pp. 739-745, (1977).

5. R.J. Marks II, J.F. Walkup and M.O. Hagler, "Ambiguity Function Display: An Improved Coherent Processor," Applied Optics, 16, pp. 746-750, (1977).

6. T.F. Krile, R.J. Marks II, J.F. Walkup and M.O. Hagler, "Holographic Representations of Space-Variant Systems Using Phase-Coded Refeference Beams," Applied Optics, 16, pp. 3131-3135, (1977).

7. R.J. Marks II, J.F. Walkup and M.O. Hagler, "Sampling Theorems for Linear Shift-Variant Systems," IEEE Transactions on Circuits and Systems, CAS-25, pp. 228-233, (1978).

8. R.J. Marks II and S.V. Bell, "Astigmatic Coherent Processor Analysis," Optical Engineering, 17, pp. 167-169, (1978).

9. R.J. Marks II, G.L. Wise, D.G. Haldeman and J.L. Whited, "Detection in Laplace Noise," IEEE Transactions on Aerospace and Electronic Systems, Vol. AES-14, pp. 866-872, (1978).

10. R.J. Marks II, J.F. Walkup and M.O. Hagler, "Methods of Linear System Characterization through Response Cataloging," Applied Optics, 18, pp. 655-659, (1979).

11. R.J. Marks II and J.N. Larson, "One-Dimensional Mellin Transformation Using a Single Optical Element," Applied Optics, 18, pp. 754-755, (1979).

12. R.J. Marks II and M.W. Hall, "Ambiguity Function Display Using a Single 1-D Input," Applied Optics, 18, pp. 2539-2540, (1979).

13. R.J. Marks II, M.I. Jones, E.L. Kral and J.F. Walkup, "One-Dimensional Linear Coherent Processing Using a Single Optical Element," Applied Optics, 18, pp. 2783-2786, (1979).

14. R.J. Marks II, "Two-Dimensional Coherent Space-Variant Processing Using Temporal Holography," Applied Optics, 18, pp. 3670-3674, (1979).

Name: Robert J. Marks II

c. Publications (Continued)

15. R.J. Marks II, "Coherent Optical Extrapolation of Two-Dimensional Bandlimited Signals: Processor Theory," Applied Optics, 19, pp. 1670-1672, (1980).

16. M.O. Hagler, R.J. Marks II, E.L. Kral, J.F. Walkup and T.F. Krile, "Scanning Technique for Coherent Processors," Applied Optics, 19, pp. 4253-4258, (1980).

17. R.J. Marks II, "Sampling Theory for Linear Integral Transforms," Optics Letters, 6, 7-9, (1981).

18. R.J. Marks II and M.W. Hall, "Differintegral Interpolation from a Bandlimited Signal's Samples," IEEE Trans. Acoustics, Speech and Signal Processing, ASSP-29, pp. 872-877, (1981).

19. R.J. Marks II, "Gerchberg's Extrapolation Algorithm in Two Dimensions," Applied Optics, 20, pp. 1815-1820, (1981).

20. D.K. Smith and R.J. Marks II, "Closed Form Bandlimited Image Extrapolation," Applied Optics, 20, pp. 2476-2483, (1981).

21. R.J. Marks II and M.J. Smith, "Closed Form Object Restoration from Limited Spatial and Spectral Information," Optics Letters, 6, pp. 522-524, (1981).

22. R.J. Marks II, "Posedness of a Bandlimited Image-Extention Problem in Tomography," Optics Letters, 7, pp. 376-377, (1982).

23. D. Kaplan and R.J. Marks II, "Noise Sensitivity of Interpolation and Extrapolation Matrices," Applied Optics, 21, pp. 4489-4492, (1982).

24. R.J. Marks II, "Restoration of Continuously Sampled Bandlimited Signals from Aliased Data," IEEE Trans. Acoustics, Speech and Signal Processing, ASSP-30, pp. 937-942, (1982).

25. R.J. Marks II, "Restoring Lost Samples from an Oversampled Bandlimited Signal," IEEE Trans. Acoustics, Speech, and Signal Processing, ASSP-31, pp. 752-755, (1983).

26. R.J. Marks II, "Noise Sensitivity of Bandlimited Signal Derivative Interpolation," IEEE Trans. Acoustics and Signal Processing, ASSP-31, pp. 1029-1032, (1983).

27. R.J. Marks II and D. Kaplan, "Stability of an Algorithm to Restore Continuously Sampled Bandlimited Images from Aliased Data," J. Opt. Soc. Am., 73, pp. 1518-1522, (1983).

28. R.J. Marks II and D. Radbel, "Error in Linear Estimation of Lost Samples in an Oversampled Bandlimited Signal," IEEE Trans. Acoustics, Speech and Signal Processing, ASSP-32, pp. 648-654, (1984).

Name: Robert J. Marks II

c. Publications (Continued)

29. R.J. Marks II, "Linear Coherent Optical Removal of Multiplicative Periodic Degradations: Processor Theory," Optical Engineering, 23, pp. 745-747 (1984) (invited paper).

30. R.J. Marks II and S.M. Tseng, "Effect of Sampling on Closed Form Band-limited Signal Interval Interpolation," Applied Optics, 24, pp. 763-765 (1985).

31. F. Salamat and R.J. Marks II, "An Acousto-Optic Digital Filter," Applied Optics, 24, pp. 829-835 (1985).

32. K.F. Cheung and R.J. Marks II, "Ill-Posed Sampling Theorems," IEEE Trans. Circuits and Systems, CAS-32, pp. 481-484 (1985).

33. D. Radbel and R.J. Marks II, "An FIR Estimation Filter Based on the Sampling Theorem," IEEE Trans. Acoustics, Speech and Signal Processing ASSP-33, pp. 455-460 (1985).

34. M.H. Goldburg and R.J. Marks II, "Signal Synthesis in the Presence of an Inconsistent Set of Constraints," IEEE Trans. Circuits and Systems, (in press).

35. R.J. Marks II and T. Reightley, "On Iterative Evaluation of Extrema of Integrals of Trigonometric Polynomials," IEEE Trans. Acoustics, Speech and Signal Processing, (in press).

36. R.J. Marks II, "Multidimensional Signal Sample Dependancy at Nyquist Densities," J. Opt. Soc. Am., (in review).

Name: Robert J. Marks II

c. Publications (Continued)

PROCEEDINGS ARTICLES

1. R.J. Marks II, J.F. Walkup and T.F. Krile, "An Improved Coherent Processor for Ambiguity Function Display," Proceedings, International Optical Computing Conference, Capri, Italy, September 1976 (invited paper).

2. R.J. Marks II, G.L. Wise, D.G. Haldeman and J.L. Whited, "Some Preliminary Results on Detection in Laplace Noise," Proceedings, 1977 Conference on Information Sciences and Systems, Johns Hopkins University, Baltimore, Maryland, March-April 1977.

3. R.J. Marks II, J.F. Walkup and M.O. Hagler, "Sampling Theorems for Shift-Variant Systems," Proceedings, 1977 Midwest Symposium on Circuits and Systems, Texas Tech University, Lubbock, Texas, August 1977.

4. R.J. Marks II, G.L. Wise and D.G. Haldeman, "Further Results on Detection in Laplace Noise," Proceedings, 1977 Midwest Symposium on Circuits and Systems, Texas Tech University, Lubbock, Texas, August 1977.

5. T.F. Krile, R.J. Marks II, J.F. Walkup and M.O. Hagler, "Space-Variant Holographic Optical Systems Using Phase Coded Reference Beams," Proceedings, International Optical Computing Conference, San Diego, California, August 1977.

6. R.J. Marks II and J.F. Walkup, "Coherent Optical Processors for Ambiguity Function Display and One-Dimensional Correlation/Convolution Operations," Proceedings, SPIE Symposium/Workshop on the Effective Utilization of Optics in Radar Systems, Huntsville, Alabama, September 1977.

7. M.O. Hagler, E.L. Kral, J.F. Walkup and R.J. Marks II, "Linear Coherent Processing Using an Input Scanning Technique," Proceedings, 1978 International Computing Conference, London, England, 1978.

8. R.J. Marks II and D.K. Smith "An Iterative Coherent Processor for Bandlimited Signal Extrapolation," Proceedings, 1980 International Optical Computing Conference, Washington D.C., April 1980 (invited paper).

9. R.J. Marks II, "Superresolution via Analysis," Proceedings Limits of Passive Imaging Workshop, Mackinac Island, MI, May 24-26, 1983, pp. 45-55 (invited paper).

10. R.J. Marks II, "Processing Group Report," Proceedings Limits of Passive Imaging Workshop, Mackinac Island, MI, May 24-26, 1983, pp. 13-17.

Name: Robert J. Marks II

c. Publications (Continued)

BOOKS and BOOK CHAPTERS

1. R.J. Marks II, J.F. Walkup and M.O. Hagler, "Volume Hologram Representation of Space-Variant Systems," in Applications of Holography and Optical Data Processing, E. Marom, A.A. Friesem and E. Wiener-Aunear, editors, Oxford: Pergamon Press, pp. 105-113, 1977.

2. R.J. Marks II and D.K. Smith, "Gerchberg-Type Linear Deconvolution and Extrapolation Algorithms," in Transformations in Optical Signal Processing, W.T. Rhodes, J.R. Fienup and B.E.A. Saleh, eds., SPIE vol. 373, pp. 161-178, 1984.

ABSTRACTS

1. R.J. Marks II, J.F. Walkup, M.O. Hagler and T.F. Krile, "General One-Dimensional Space-Variant Coherent Optical Processors," Journal of the Optical Society of America, 66, p. 1130A, 1976.

2. R.J. Marks II, J.F. Walkup and C.A. Irby, "Techniques in One-Dimensional Space-Variant Processing," Journal of the Optical Society of America, 67, p. 1423A, 1977.

3. E.L. Kral, M.O. Hagler, J.F. Walkup and R.J. Marks II, "An Input Scanning Technique for Coherent Processing," Journal of the Optical Society of America, 68, p. 1414A, 1978.

4. M.W. Hall and R.J. Marks II, "Sampling Theorem Characterization of Variation Limited Systems at Reduced Sampling Rates," Journal of the Optical Society of America, 68, p. 1362A, 1978.

5. R.J. Marks II and D.K. Smith, "Technique for Coherent Optical Extrapolation of Two-Dimensional Band-Limited Signals," Journal of the Optical Society of America, 69, p. 1467A, 1979.

6. R.J. Marks II, "Space-Variant Processing Using Temporal Holography," Journal of the Optical Society of America, 69, p. 1467A, 1979.

BOOK REVIEWS

1. R.J. Marks II, Optical Information Processing by F.T.S. Yu, Applied Optics, 22, p. 3465 (1983).

Name: Robert J. Marks II

d. Research Proposals or Grants:

"Lensless Space-Variant Processing," Graduate School Research Fund, University of Washington, 1 July 1978 through 31 December 1978 (I.D. Code PSE-517, $5,824).

"Coherent Optical Extrapolation of Two-Dimensional Band-Limited Signals," NSF, 15 April 1979 through 30 September 1981 (Grant #ENG-7908009, $32,000).

"Coherent Optical Interpolation of Continuously Sampled Images," GSRF, 1 July 1982 through 30 June 1983 ($6,596, P.I.).

SERVICE ACTIVITIES

a. Professional Societies (Include Offices and Committees)

Institute of Electrical and Electronic Engineers. Faculty Advisor for U.W. student branch (1979-1982). Senior Member (1982-present).

Society of Photo-Optical Instrumentation Engineers

Optical Society of America

Sigma Xi

Eta Kappa Nu

Name: Robert J. Marks II

b. University or College (e.g., committees, etc.)

Graduate School Research Fund Physical Sciences and Engineering Travel Support Committee (member: 1978-80)

Student Affairs Committee: College of Engineering (member: 1979-84, chairman: 1984-85)

Engineering Student Council: Jr. Advisor (1982-83), Advisor (1983-85)

MITE Program Participant (Summer 1983, Summer 1984, Summer 1985)

Career Day Program Participant (Summer 1983, Summer 1984)

College of Engineering Coordination of Student Organization Activities (member: 1983-84)

College Council (member: 1984-85)

College of Engineering Career Day (Faculty Advisor: 1984)

Engineering Open House (Faculty Advisor: 1984)

MESA Program Participant (Summer 1984, Summer 1985)

MESA Industry Day, Faculty Coordinator (Spring 1985)

c. Department

Faculty Advisor to U.W. IEEE Student Chapter (1979-82)

Electrophysics Seminar Coordinator (1978, 1980)

Undergraduate Study Committee (1979-82, 1984-85)

Undergraduate Admissions Committee (1979-81, 1984)

Committee on Departmental Accreditation (1980)

Departmental Faculty Coordinator for Engineering Open House (1979, 1980)

Coordinator of Departmental Colloquia (1982-84)

Electrophysics Search Committee (1983)

Undergraduate Admissions Appeals Committee (Summer 85)

c. Professional Presentations

1. "Coherent Space-Variant Processing," Gordon Conference on Coherent Optics and Holography, Santa Barbara, CA June 1978 (invited presentation).

2. "Sampling Theorems for Shift-Variant Systems," 1977 Midwest Symposium on Circuits and Systems, Texas Tech University, Lubbock, Texas, August 1977.

Name: Robert J. Marks II

d. Professional Presentations (Continued)

3. "Further Results on Detection in Laplace Noise," 1977 Midwest Symposium on Circuits and Systems, Texas Tech University, Lubbock, Texas, August 1977.

4. "General One-Dimensional Space-Variant Coherent Optical Processors," 1976 Annual Meeting of the Optical Society of America, Tucson, Arizona, October 1976.

5. "Sampling Theorem Characterization of Variation Limited Systems at Reduced Sampling Rates," 1978 Annual Meeting of the Optical Society of America, San Francisco, CA October 1978.

6. "Technique for Coherent Optical Extrapolation of Two-Dimensional Band-Limited Signals," 1979 Annual Meeting of the Optical Society of America, Rochester, New York, October 1979.

7. "Space-Variant Processing Using Temporal Holography," 1979 Annual Meeting of the Optical Society of America, Rochester, New York, October 1979.

8. "An Iterative Coherent Processor for Bandlimited Signal Extrapolation," 1980 International Optical Computing Conference, Washington D.C., April 1980 (invited presentation).

9. Invited discussion leader for "Space-Variant Coherent Optical Processing," Workshop on Future Directions for Optical Information Processing, Lubbock, Texas, May 1980.

10. "Applications of Gerchberg's Algorithm to Bandlimited Signal Extrapolation," Gordon Conference on Holography and Optical Information Processing, Ventura, CA, June 1980 (invited presentation).

11. "Temporal Holography for Linear Coherent Processing," Gordon Conference on Holography and Optical Information Processing, Ventura, CA June 1980, (poster paper).

12. "Signal Extrapolation (How to Clone Signals)," Industrial Affiliates Program-Second Annual Research Review, Battelle Seattle Conference Center, January 19, 1981.

13. "Linear Deconvolution and Extrapolation Algorithms," Advance Institute on Transformations in Optical Signal Processing, Battelle Seattle Conference Center, February 24, 1981.

14. "Superresolution," Limits of Passive Imaging Workshop, Mackinac Hotel, Mackinac Island, MI, May 24-26, 1983 (invited presentation).

15. "Optics in Electrical Engineering," University of Washington, College of Engineering (a) MITE Program, Seattle, WA July 11-21, 1983 and (b) Career Day, Seattle, WA, August 18-19, 1983.

d. Professional Presentations (continued)

16. Chairman of Processing Group, Limits of Passive Imaging Workshop, Mackinac Island, MI, May 24-26, 1983.

17. "Speckle Suppression," Technical Arts Corp., Seattle, WA, November 28, 1983.

18. "Optical Processing," Corporate Associates Day, U.W. Campus, Seattle, WA, April 26, 1984 and College of Engineering Visiting Committee Meeting, University Towers, Seattle, Washington, May 10, 1984 (Poster Paper).

19. "Aspects of Electrical Engineering," University of Washington, College of Engineering, Seattle, Washington. (a) MESA Program, July 9, 1984, (b) MITE Program, July 10, 1984 and (c) Career Workshop, August 17, 1984.

20. "Superresolution by Coherent Optical Feedback" EE/CS Seminar, Texas Tech University, Lubbock, Texas, April 17, 1985.

e. Other

Referee for Applied Optics: 6 papers in 1979, 2 in 1980, 4 in 1981, 3 in 1982, 2 in 1983, 2 in 1984, 1 in 1985.

Referee for Journal of Optical Society of America: 2 papers in 1979, 4 in 1980, 2 in 1981, 1 in 1983, 1 in 1984, 1 in 1985.

Referee for Optical Engineering: 1 paper in 1979, 1 in 1981, 1 in 1984.

Referee for Proc. IEEE: 1 paper in 1980.

Referee for IEEE Trans. ASSP: 2 papers in 1981, 2 in 1983, 2 in 1984, 1 in 1985.

Referee for Optics Letters: 2 papers in 1981, 1 in 1983, 1 in 1984, 1 in 1985.

Referee for SPIE, 1981.

Referee for ONR: 1 proposal in 1981.

Referee for IEEE Trans. Circuits and Systems: 1 paper in 1982.

Participation in University's high school visitation program (1978, 1980).

ATTACHMENT 1

To: Department Chairpersons and Program Directors
College of Engineering

From: J. Ray Bowen
Dean

Subject: Applications for Professional Leave

It is anticipated that requests for sabbatical leave for 1984-85 will be reviewed by the Provost early in December of this year and again in the following March. To meet these deadlines, and to provide sufficient time to conduct the leave review procedures to assure that an equitable judgment is made on the basis of purpose of leave as well as longevity of service, past leaves, etc., I am asking the professional leave applications for 1984-85 be submitted to the Dean's Office by November 18, 1983 for the first review and by February 17, 1984 for the second review. Please be certain the application includes justification for the leave in terms of its value to the University teaching program. Please let your faculty know of the dates to submit their leave requests.

Attached is the Professional Leave policy as stated in the Handbook. Please note that the University will provide salary support for the period of leave at two-thirds salary for a leave of three quarters (or four quarters if the applicant's basic appointment is annual), three-fourths salary for a leave of two quarters, or full salary for a leave of one quarter. Also note that in unusual circumstances excess salary can be obtained in a particular high cost of living area.

If additional information is needed as to procedures to follow, or for calculating the University's contribution to salary when applied in conjunction with outside funding, please call Virginia Stringer, 3-6689.

INSTRUCTIONS FOR APPLYING FOR PROFESSIONAL LEAVE

The faculty member who wishes to take a professional leave shall file his application at least nine months before the date on which the leave is to begin. The application shall be submitted to the departmental chairperson in the following form:

A. The Application for Leave of Absence, Form No. UW 1038, which may be obtained from either the departmental office, Academic Personnel Records Office or the Dean's Office. Any information about outside funds which is available at the time that the application is prepared should be included on the form.

B. The original and five copies of a letter stating the following facts:

1. A detailed statement of the applicant's plans for utilizing the time requested. This statement should include such information as the time sequence for completion of any project or plan.

2. The names of foundations or institutions, if any, with which the applicant expects to be affiliated during the leave, an outline of special resources available for the proposed work, and the source and amount of any supplementary grants or salary.

3. A statement of evidences of productivity in scholarly or creative work and a brief review of professional activities.

4. A statement regarding the value of the applicant's project in terms of benefit to the institution upon return from professional leave.

C. Two copies of his/her bibliography of publications.

D. If the applicant so desires, he/she may submit supporting letters from faculty members of the rank of associate or full professor, or from any other appropriate individuals not necessarily associated with the University. These also should be submitted in five copies (original and four copies, in each case).

Upon receipt of an application for professional leave, the departmental chairperson shall prepare either a letter of recommendation approving of the leave and stating the merits of the applicant's program, his ability to accomplish it successfully, the benefits which will accrue to the University as a result of the proposed leave and the means for covering the increased work load in the unit; or a letter disapproving of the leave and stating his/her reasons for disapproval. The chairperson shall forward the first six copies of the application and the original and four copies of his recommendation to the Dean's Office, who in turn shall make a recommendation to the President for administrative action.

On the basis of information provided by the applicant about financial support from outside sources, the details of his/her financial supplement from the University will be worked out by the applicant's departmental chairperson. A Personnel Action Form should be submitted when details are available.

If, after approval of professional leave, a faculty member elects to cancel or postpone the leave, he/she should write a letter to the Chairperson stating the reasons for cancellation or postponement of the request for leave. Following the endorsement of the Chairperson, an original and one copy of the correspondence should be submitted to the Dean.

If the faculty person changes the terms of his leave request (for example, he/she requests two quarters instead of the approved three quarters), a new Leave of Absence Form should be prepared and submitted to the Chairperson along with his/her letter stating the reasons for the change. On the endorsement of the Chairperson, the Leave of Absence request form, along with an original and one copy of the correspondence, should be submitted to the Dean.

Research faculty requesting leave should direct their request to the Chairperson who is authorized to approve such requests.

Chapter 4

PROFESSIONAL LEAVE POLICY

Section 1. Purpose and Authority

A. The purpose of professional leave with pay is to increase the scholarship and professional development of members of the faculty and thereby enhance their capacity for service to the University. Leave of this type from academic duties is a privilege granted normally to those of professorial rank to afford them the opportunity for study, investigation, and research.

B. The authority to grant leave rests with the Regents of the University upon recommendation by the President. The responsibility for reviewing the merits of the applications and the administrative feasibility of the leave shall be determined by the department chairpersons, deans, and the President in accordance with procedures established by the President.

Section 2. Principles Governing the Granting of Professional Leave With Pay

A. The character of the applicant's plans, their application to teaching or research effectiveness, and the applicant's ability to carry them out are important considerations in the granting of leave.

B. Professional leave with salary may be granted for one, two, or three quarters or for a period of time equivalent to the applicant's basic annual appointment. The leave may be taken in consecutive quarters or in single quarters which ordinarily shall not exceed the period of the applicant's basic annual appointment during a seven-year period of service to the University.

C. The University will provide salary support, up to the maximum provided in Section D, for the period of the leave as follows:

(1) Two-thirds salary for a leave of three quarters (or four quarters if the applicant's basic appointment is annual);

(2) Three-fourths salary for a leave of two quarters; or

(3) Full salary for a leave of one quarter

If the applicant secures outside grant support, which is designated for salary purposes, such funds may be applied to increase the faculty member's remuneration for the period of the leave to full salary, and thereafter to reduce the University contribution. Except as provided in subsection E below, the combined remuneration of a person while on professional leave shall not exceed the individual's regularly established full salary.

D. The remuneration from state general funds and general local funds for any such leave granted for any academic year shall not exceed the average of the highest quartile of a rank order of salaries of all full-time teaching faculty holding academic year contracts or appointments. Remunerated professional leaves for a period of more or less than an academic year shall be compensated at rates not to exceed a proportional amount of the average salary as computed above.

E. In unusual circumstances, where the faculty member requests a professional leave in a particularly high cost-of-living area, or where the nature of the work to be performed while on professional leave requires extraordinary expense, the President may approve a combined salary, to be paid from state general funds and general local funds and from outside support, which may exceed normally contracted salary; provided, that the University shall not provide from state general funds and general local funds amounts in excess of those specified in subsection C or D above; and provided further, that such excess salary requests shall be granted only upon presentation of valid supporting documentation.

F. A member of the faculty on leave is not privileged to accept remunerative employment during the period of the leave except where the purpose of the leave is for professional practice or experience which cannot be obtained otherwise. The acceptance of a supplemental grant or fellowship should not carry with it duties or obligations which hinder the pursuit of the purpose for which the leave is granted.

G. A faculty member granted leave must agree, in writing, to return to the University after the leave for a period of one year. Normally, professional leave with pay will not be granted to a member of the staff who has fewer than three years of service remaining before mandatory retirement after return from leave.

H. Ordinarily, professional leave with pay will not be granted for the purpose of working toward an advanced degree. Under unusual circumstances, however, members of the faculty with tenure may be granted this privilege upon recommendation by the Dean to the President.

I. Professional leave regulations in no way affect financial arrangements approved by the President with respect to Fulbright Scholarship recipients.

Section 3. Application Procedures for Professional Leave

A. An instruction sheet and application form for professional leave with pay may be obtained from the Office of Academic Personnel Records or any academic dean's office.

B. A faculty member who wishes to take a professional leave should file the application at least nine months before the date on which the leave is to begin.

Section 4. Report of Leave

Upon completion of a leave, a faculty member is asked to send a brief report in quadruplicate to the Provost. The report should state where the leave was spent and what the principal accomplishments were, including their application to teaching or research effectiveness.

BR, January 1966; Executive Order No. 33 of the President, June 1, 1972; revised December 10, 1975; revised November 23, 1977; revised March 20, 1980

Dear Dr. Marks:

I have lived with my brother since the end of last semester. My new address after August 15 will be the following: Room 0354-2 Hawkins Graduate House, West Lafayette, IN 47906. Owing to my roommate's vocation and the re-delivery of the mail, I received your letter a couple of days ago. I appreciate your notice of the correction of our previous work.

My situation at Purdue is the following. The professors I would like to follow with got trouble with either their proposals or budget. The head of EE of our school also made it clear that T.A. is usually (or I should say always) not available for the foreign students because of the pressure from the state legislature.

The other four universities which I applied all turned my application down. Under such a circustance, I have no choice but to transfer to the physics department where T.A. was still available when I submitted my application during the final examination. I received a mail from them two days ago. It said that a T.A. was awarded to me in the coming fall semester. If I haven't done this, I would have given up my graduate study under the economy pressure.

The requirement for a M.S. degree of physics here is ten graduate-level courses in physics. Since I have taken seven of them, I can get my another M.S. degree at any time. I don't think, however, I'll pursue my Ph.D. in physics. A physics Ph.D. for what?

Experience told me I should always keep as many available roads as possible. So I will definitely apply other schools again. Your recommendation and evaluation is very very helpful and importment to me. Can you recommend me once more if asked?

Sincerely yours,

David Tseng David Tseng

Texas Tech University
Texas Tech University Health Sciences Center
Office of the Board of Regents

June 19, 1985

Dr. Robert Marks
16515 Ashworth Ave. N.
Seattle, Washington 98133

Dear Dr. Marks:

Pursuant to your appointment as: Visiting Associate Professor in

Electrical Engineering

we enclose a data sheet, which we kindly ask that you complete and return at your earliest convenience to the Office of the Board of Regents.

The Board of Regents and Administration deem this information vital to our files, and we urge you to be prompt in returning this form to this office.

We look forward to your association with our University.

Sincerely,

Freda Pierce

(Mrs.) Freda Pierce
Secretary

FP:ad
Enclosure

cc: Dr. Hagler

Box 4039/Lubbock, Texas 79409-4039/(806) 742-2161

TEXAS TECH UNIVERSITY

PERSONAL AND PROFESSIONAL DATA FORM

Read the entire form before filling out any part of it. Please type or print.

I. PERSONAL AND FAMILY DATA

Name Marks (Last) Robert (First) Jackson II (Middle)

Photo (Optional. Snapshot satisfactory)

Permanent Address 16515 Ashworth Ave. N. Seattle, WA 98133

Date of Submission of this Form 7/2/85

Date of Birth 8 (Month) 25 (Day) 50 (Year) Sex ☒M ☐F

Social Security No. [redacted] U. S. Citizen ☒Yes ☐No

If not a U. S. citizen, please explain status _____

Race ☒White ☐Black ☐Hispanic ☐Asian ☐American Indian ☐Other

If you have had military experience, please indicate branch of service _____, date of entrance _____

date of discharge _____, and the rank at discharge _____

Did you receive a disability discharge? ☐Yes ☐No

Name and address of someone other than your immediate family who will be able to contact you Robert & Lenore Marks
13008 Oakview Blvd, Garfield Hts, Ohio 44125

Marital Status Married if married, wife's maiden name or husband's name Jewett

No. of Children Two (2) Foreign Residence and Travel (including military) None

Physical or mental handicaps. If any, specify. (Answer is voluntary, information is confidential and will be used to make accommodations.) _____

II. ACADEMIC PREPARATION. Colleges and Universities attended — up to and including the one conferring your highest earned degree.

Institution Attended	*Dates*	*Major Subjects*	*Degrees, if any, With Dates*
Rose-Hulman Institute of Technology	7/72	Electrical Engineering	B.S.
Rose-Hulman Institute of Technology	8/73	Electrical Engineering	B.S.
Texas Tech University	12/77	Electrical Engineering	Ph.D.

If your highest earned degree is not the doctorate, list the number of semester hours of graduate credit earned after the highest degree was conferred.

Institutions	*Dates Sem. Hrs.*	*Institutions*	*Dates Sem. Hrs.*

III. SCHOOL AND COLLEGE TEACHING EXPERIENCE

Institutions	*Ranks*	*Fields Taught*	*Dates*
University of Washington	Assistant Professor	Electrical Engineering	1978-82
University of Washington	Assistant Professor	Electrical Engineering	1982-present

IV. **PROFESSIONAL EXPERIENCE OTHER THAN TEACHING:** Include any experience that is closely related to your academic duties (e.g., research for government or industry, etc.), number of years experience in directing graduate study (here or elsewhere).

Reliability Engineer, Naval Weapons Support Center, Crane, Indiana (1973-74)
Consulting: Applied Physics Lab, University of Washington,(Summer 1978&79, Spring 1979)
APPA-Systems Inc., Bellevue,(Summer quarter 1981 & Winter/Spring 1982)
Technical Arts Corp, Supervised the Thesis of 13 students (Autumn 83/winter 84, spring/
summer 1985. Seattle

V. **HONORS, AWARDS, ETC.** Include certificates, prizes, honorary degrees, distinguished professorships, and so on.

IEEE Outstanding Branch Counselor/Advisor Award for 1982
Recipient of IEEE Centennial Medal and Certificate for 1984
Listed in "Who's Who in Technology Today"
"Outstanding Young Men of America"
"Personalities of the West and Midwest"
"The International Who's who of Contemporary Achievement"
"Who's who in the West"
"Dictionary of International Biography"
"Personalities of America"
"Who's Who Directory of Optical Scientists and Engineers"
"Who's Who in Frontiers of Science and Technology"

VI. PROFESSIONAL ORGANIZATIONS. Please indicate the scope of the organization-whether local, district, regional (several states), national or international and the type of participation-whether merely holding membership or attending meetings or serving as an officer or presenting a paper. If the participation is confined to a local, district, or state branch of a national organization, the proper designation of scope is "local," "district," "state," etc. rather than "national." If your memberships and participations exceed the number of spaces provided, please select your major activities.

Organization	*Type of Participation*	*Dates*	*Scope*
Institute of Electrical and Electronic Engineers.	Faculty Advisor for U.W. Student branch (1979-1982). Senior Member (1982-present).		
Society of Photo-Optical Instrumentation Engineers	(member)		
Optical Society of America	(member)		
Sigma Xi	(member)		
Eta Kappa Nu	(member)		

VII. PUBLICATIONS. Exclude unpublished items (thesis, for example); exclude book reviews except those appearing in scholarly journals. "Bulletins" and "privately printed" books should be so indicated. Please give full bibliographical data for each item. If the space provided below is not adequate, please prepare a separate sheet.

Title	*Journal or Publisher*	*Vol.*	*Pages*	*Dates*
See Attached List				

VIII. MISCELLANEOUS ORGANIZATIONS. Service and fraternal organizations, local branches of AAUP and AAUW, social, faculty, religious groups, etc.

Christian

IX. MISCELLANEOUS INFORMATION. Non-Professional experience, general interests, hobbies, etc.

Hobbies: Songwriting, Radio Plays, Cartooning

X. SIGNIFICANT FACULTY COMMITTEE ASSIGNMENTS. Last five years (if at another institution, please so indicate). All UW

Dates

Electrophysics Search Committee (1983)
Undergraduate Admissions Appeals Committee (summer 85)
College Council (member: 1984-85)
College of Engineering Career Day (Faculty Advisor: 1984)
Engineering Open House (Faculty Advisor: 1984
Electrophysics Seminar Coordinator (1978, 1980)
Undergraduate Study Committee (1979-82, 1984-85)
Undergraduate Admissions Committee (1979-81, 1984)
Coordinator of Departmental Colloquia (1982-84)

XI. SPONSORSHIP OF STUDENT ORGANIZATIONS. Last five years (if at another institution, please indicate).

Dates

Student Affairs Committee: College of Engineering (member: 1979-84, chairman: 1984-85)
Engineering Student Council: Jr. Advisor (1982-83), Advisor (1983-85)
College of Engineering Coordination of Student Organization Activities(Member: 1983-84)

XII. STUDENT HONORS (Scholarships, Honor Societies, Clubs, Offices, etc.)

Undergraduate College

Graduate School

Date _____ Signature _____

FACULTY AND PROFESSIONAL APPOINTMENT FORM
TEXAS TECH UNIVERSITY
TEXAS TECH UNIVERSITY HEALTH SCIENCES CENTER

Date 5/9/85

F703

FIRST APPOINTMENT AT TTU/TTUHSC YES X NO ___

SOCIAL SECURITY NUMBER 292-48-2721

NAME Robert Marks (First Middle Last)

RECOMMENDATION FOR APPOINTMENT TO:

TITLE: Visiting Associate Professor

DEPT: Electrical Engineering/Computer Science

TOTAL SALARY FOR APPOINTMENT PERIOD: $ 38,000

PERIOD: 9/1/85 (Mo. Da. Yr.) THROUGH 5/31/86 (Mo. Da. Yr.)

PERCENT OF TIME THIS APPOINTMENT 100%

MALE X FEMALE ___

WHITE X ASIAN ___

BLACK ___ AMERICAN INDIAN ___

HISPANIC ___

Used for government reporting purposes only

PLACE OF BIRTH

(City State/Country)

DATE OF BIRTH 8/25/50 (Mo. Da. Yr.)

UNITED STATES CITIZEN X YES ___ NO

CITIZENSHIP APPLICANT ___ YES ___ NO

HIGHEST DEGREE EARNED: Ph.D.

INSTITUTION: Texas Tech University

YEAR CONFERRED: 77

Vita and transcripts should be filed with the Office of Statistics & Reports

For budgeting purposes only:

9-MONTH BASE SALARY: $ 38,000

or 12-MONTH BASE SALARY: $ ___

TOTAL PERCENT OF ALL APPOINTMENTS TTU/TTUHSC: ___

Please list other appointments not covered by this form in the SPECIAL COMMENTS section below.

CURRENT ADDRESS: 16515 Ashworth Ave. N (Street)

Seattle, Washington 98133 (City State Zip)

LAST APPOINTMENT AT TTU/TTUHSC ___ (Mo. Yr.) to ___ (Mo. Yr.)

TENURE STATUS

___ NOT APPLICABLE
___ NON TENURE ACQUIRING
___ TENURE PROBATION POSITION
___ YEARS CREDIT TOWARD TENURE
___ APPOINTMENT WITH TENURE
(Requires Board approval)
___ TENURED

June 19 1985

ACCOUNT DISTRIBUTION

Account Number	Budget Code	Line Item	Budget Page	Account Name	% Time Each Account	Total Dollars Each Account
0070-44-0375				Electrical Engineering	100%	38,000

SPECIAL COMMENTS

Principal Investigator (if applicable) date

Chairperson or Coordinator 5/20/85 date

Dean or Director 5/21/85 date

Graduate Dean 5-23-85 date

Vice President date

President (if applicable) date

Distribution: White (original), Payroll; Canary, Budget Office; Gold, Statistics & Reports; Pink, Board of Regents; White, Appointee; Blue, Personnel; Green, Chairperson; Buff, Dean

1984-85 Annual Report

ENGINEERING COLLEGE COUNCIL

The membership of the Council during the 1984-85 year consisted of:

Y.K. Rao, Chairman, Advisory Committee on Promotion and Tenure
N.J. McCormick, Chairman, Committee on Faculty Affairs
M.J. Pilat, chairman, Committee on Research Policy
D.K. Farkas, Chairman, Committee on Educational Policy
R.J. Marks, II, Chairman, Committee on Student Affairs
G.C. Oates, Chairman, College Council

The annual reports of the college committees, together with the listing of members is appended. Each committee report contains its own summary, so will not be further summarized here.

With regard to the activities of the council itself, the council met seven times during the year. Three major topics were considered by the committee.

I) The proposed B. Sc. Engr. Sc. program.

A memorandum of concern regarding the subject program was received in October, 1984. In response to the concerns expressed, the College Council requested Prof. W. Heideger and Prof. B. Finlayson to make informational presentations on the history of the proposal (Heideger) and on the expected resource impact of the proposal (Finlayson), at the Autumn College of Engineering faculty meeting. Subsequently it became evident that the faculty would appreciate the opportunity to voice its opinion in the form of a poll, and a formal poll was taken by mail in early May. The results of the poll in the form of a summary as well as the original copies of all response forms was transmitted to Dean R.C. Corlett in late May. A copy of the summary sheet is attached.

II) Procedural aspects of the Advisory Committee on Promotion and Tenure.

In response to a concern expressed to the committee by Dean J.R. Bowen, the committee considered several procedural aspects of the Advisory Committee on Promotion and Tenure. Recommended guidelines were drawn up, and a copy mailed to the College Faculty on 29 April, 1985.

It is to be noted that the recommended guidelines really clarified existing guidelines rather than introduced any substantive changes. It was noted also, during the deliberations, that the nature of the responsibilities of the Advisory Committee on Promotion and Tenure had changed somewhat in recent years. The primary reason for the change is that the committee now considers external applications for tenure positions. The effect of such consideration is two fold. The committee now has a substantially increased work load, and the committee must consider applications which are supported by a somewhat different informational data base than are the internal candidates for promotion or tenure. It is recommended by the College Council that future Committees on Promotion and Tenure be particularly aware of these changes in committee responsibilities, and continually review the adequacy of the present guidelines.

SUMMARY RESULTS OF POLL OF ENGINEERING FACULTY BY THE COLLEGE COUNCIL REGARDING THE PROPOSED PROGRAM "BACHELOR OF SCIENCE IN ENGINEERING SCIENCE" (May 1985)

Recently, supporting documentation and a response form were distributed to the Engineering Faculty to solicit faculty viewpoints on the subject program. The form included the questions:

i) In favor of college adoption of the BSES program as presently suggested.

ii) In favor of college adoption of the BSES program provided some minor changes are incorporated.

iii) In favor of college adoption of the BSES program only if major changes in the suggested program are incorporated.

iv) Not in favor of college adoption of the BSES program.

Sixty-five replies were received, with the distribution

i) 20 , ii) 3 , iii) 7 and iv) 35 .

Many of the faculty provided comments which can be summarized as

i) - Six comments .

Four comments were very favorable and urged adoption of the program. Suggestions for modest changes were included in these four and the remaining two comments.

ii) - Three comments .

Two responses identified specific changes to enhance the program. One response suggested that the students should be polled, and expressed concern that the university rules regarding course requirements be closely monitored.

iii) - Seven comments .

One comment suggested that the program should be administered only by Nuclear Engineering.

Two comments suggested that the program should be administered at the college level.

One comment expressed concern over the HSS requirements.

Three comments were directed to concerns about the resource requirements.

iv) - Twenty-two comments .

Approximately fourteen responses expressed great concern over the resource requirements. Several comments were made regarding the view that this program should not be the top priority if additional resources became available.

Approximately eight of the responses emphasized concern over the subject matter. Several comments were made regarding the possibility of providing such courses within the existing BSE framework. A view was expressed that the college should not encourage programs without substantial design content.

University of Washington Correspondence

INTERDEPARTMENTAL

June 26, 1985

TO: D. Bowden; SJ-50
D. Burns; WD-12
J. Callis; BG-10
Y. Choi; FT-10
A. Davis; SJ-50
J. DeVito; SJ-50
P.Goodwin; SM-30
J. Graham; SJ-50
A. Henkins; SJ-50
Y. Kim; FT-10
R. Marks; FT-10
R. Martin; SJ-50
M. Rosenfeld; SM-30
S. Schubert; FT-10
S. Schwartz; SJ-60
D. Vinter; SJ-60

FROM: F. Spelman; SJ-50

SUBJECT: Image Processing Seminar

A seminar about image processing and automatic microscopy will continue over the summer. After the meeting of June 24, we have established the following schedule of speakers:

DATE	SPEAKER	TOPIC
July 1	Dave Vinter	Stability of Video Cameras
July 8	Boyle instruments	Video Microscopy
July 15	Jim Callis	Calibration of Video cameras on microscopes
July 22	June DeVito	Preparation of biological material for analysis
July 29	Yongmin Kim	Quantitation of images
August 5	Arthur Davis	Data entry with the VICOM processor
August 12	Scott Schubert	Image detection
August 19	Open	
August 26	Open	
September 9	Sandy Spelman	Data outputontinuons

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

May 28, 1985

Mr. Bob Marks II
M/S FT-10

Dear Bob,

On behalf of the MESA Program, thank you for coordinating the day in engineering at the University of Washington for our six Franklin High School students. The students expressed a desire to learn more about current technology in electrical and bio-engineering.

To these potential engineers, we stress that education takes place both inside and outside the classroom. It was important for them to have this experience.

Please convey our appreciation to Mani Vadari, Les Atlas, and Samuel Simpson for supporting our pre-college program. It was a pleasure working with you.

Sincerely,

Penny Fukui

Penny Fukui
MESA Coordinator

cc: Mani Vadari
Les Atlas
Samuel Simpson

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT-10
Telephone: (206) 543-2150

May 6, 1985

Dr. Tom Krile
Department of Electrical Engineering
TEXAS TECH UNIVERSITY
Lubbock, Texas 79409

Dear Tom,

Greetings! It was certainly marvelous seeing you again. A splendid visit! I hope things work out to where we can work together again. At this writing, a decision has not yet been reached. Decisions are rough. They're so ... so final.

I received Lin's thesis and look forward to going through it in detail as soon as the storm quiets. A while ago, I wrote Lohmann the enclosed note. He never answered. I thought you and Lin might like to see it. I'm anxious to explore your variance model.

Connie has me working like a dog on our house. If we come to Tech for a year, we'll probably sell it. We were planning to do so anyway. I've done more work in the last week than in the last four years.

My best to all!

Sincerely,

Bob Marks

RJM:pke
Enclosure

Polytechnic Institute of New York, Route 110, Farmingdale, New York 11735

DEPARTMENT OF
ELECTRICAL ENGINEERING
AND COMPUTER SCIENCE
(516) 454-5070/5071

Polytechnic

November 18, 1983

Professor Robert J. Marks II
Department of Electrical Engineering
University of Washington
FT-10
Seattle, WA 98195

Dear Professor Marks:

It was a wonderful visit!

The book SYSTEMS AND TRANSFORMS WITH APPLICATIONS IN OPTICS by A. Papoulis was reprinted by:

Robert E. Krieger Publishing Co., Inc.
P.O. Box 9542
Melbourne, FL. 32901
(305)724-9542.

Sincerely,

A. Papoulis

AP:cw
Encls.

333 Jay Street, Brooklyn, New York 11201 212/643-5000
Route 110, Farmingdale, New York 11735 516/454-5111
456 North Street, White Plains, New York 10605 914/949-2338

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering

13 October 1978

Professor Dr. Adolf A. Lohmann
Physikalisches Institut
Universität Erlangen-Nürnburg
Erwin-Rommel Strasse 1
D 8520 Erlangen
West Germany

Dr. Lohmann:

Enclosed are preprints of two papers you have requested and reprints of papers on some similar topics.

I enjoyed our brief meeting at the Gordon Conference this year and hope to have time for a longer discussion with you in the near future.

As witnessed by the enclosures, I have studied the field of linear space-variant systems for quite some time. The point-spread function notation, introduced by you and Dr. Paris [1], has given me great mileage in this research. Its utility is fantastic!

There are, however, certain aspects of this paper of which I am not certain. The "degree of invariance" between two input points, p and q, is defined as

$$\sigma(p,q) = \frac{\int_{-\infty}^{\infty} h(x;p)\, h^*(x;q)\, dx}{\left[\int_{-\infty}^{\infty} |h(x;p)|^2\, dx \int_{-\infty}^{\infty} |h(x;q)|^2\, dx\right]^{\frac{1}{2}}} \tag{1}$$

$$= \frac{\int_{-\infty}^{\infty} H(f;p)\, H^*(f;q)\, df}{\left[\int_{-\infty}^{\infty} |H(f;p)|^2\, df \int_{-\infty}^{\infty} |H(f;q)|^2\, df\right]^{\frac{1}{2}}}$$

where h(x-p;p) is the system's line-spread function and H(f;p) is the corresponding instantaneous transfer function:

$$H(f;p) = \int_{-\infty}^{\infty} h(x;p)\, e^{-j2\pi fx}\, dx \tag{2}$$

From Schwarz's inequality,

$$0 \leq |\sigma(p,q)| \leq 1 \tag{3}$$

The "variance" of an isoplanatic patch extended from p to q was defined as

$$|1 - \sigma(p,q)| \tag{4}$$

Thus, in calibrating the input plane for application of a piecewise isoplanatic approximation [2], we require that for each pair of patch endpoints (p,q), that

$$|1 - \sigma(p,q)| \leq \varepsilon \tag{5}$$

where ε is the maximum "variance" allowed each patch.

I have found some apparent inconsistencies in this model. Three specific examples will be presented. I would deeply appreciate any comments you might have either on their validity or lack of insight on my part.

1. Consider an ideal low-pass filter imaging system with magnification M. We will model the line-spread function as

$$h(x-\xi;\xi) = \operatorname{sinc} 2W(x - M\xi) \tag{6}$$

where W denotes the system's cut-off frequency and $\operatorname{sinc} x = \sin \pi x/\pi x$. Thus,

$$h(x;\xi) = \operatorname{sinc} 2W[x - (M-1)\xi] \tag{7}$$

and

$$H(f;\xi) = \frac{1}{2W} \exp[-j2\pi f(M-1)\xi] \operatorname{rect}\left(\frac{f}{2W}\right) \tag{8}$$

where

$$\operatorname{rect} x = \begin{cases} 1 \; ; & |x| \leq \tfrac{1}{2} \\ 0 \; ; & |x| > \tfrac{1}{2} \end{cases}$$

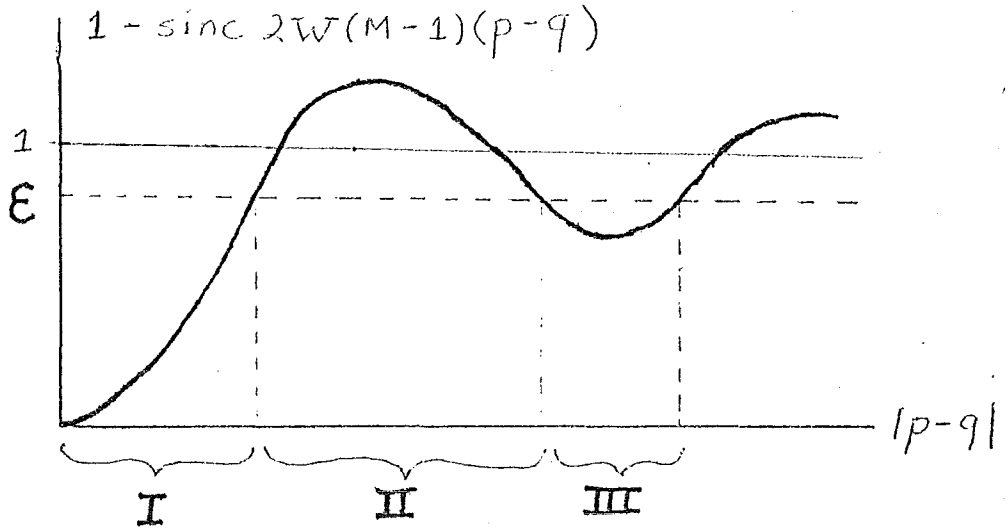
Substituting (8) into (1), followed by simplification, gives

$$\sigma(p,q) = \operatorname{sinc} 2W(M-1)(p-q) \tag{9}$$

If we wish to calibrate the input plane of this system according to (5), then

$$|1 - \operatorname{sinc} 2W(M-1)(p-q)| \leq \varepsilon \tag{10}$$

for all patch endpoints, p and q. A sketch of (10) vs. the patch width, $|q-p|$, is shown in the figure on the following page.



For the ε shown, the patch width axis, $|p-q|$, is here divided into three sections: I, II and III. The small patch widths in section I are allowed. The longer patch widths in section II do not satisfy the inequality in (10) and are thus not allowed. But the yet longer patch widths in section III are allowable according to the theory! This seems to violate the intuitive principle that the variance corresponding to an isoplanatic patch in a given system should increase as the patch width increases.

2. Arsenault and Brousseau [3] have noted the inapplicability of the model in measuring variance in certain "quasi-linear" systems (I prefer the term "quasi-invariant".) Such systems are space-invariant only for a given input class.

A simple example is a system with impulse response

$$h(x-\xi;\xi) = \text{rect}\left(\frac{x-\xi}{2a}\right)\ \text{rect}\left(\frac{\xi}{2b}\right) \qquad (11)$$

where a and b are given constants. Clearly, if our input class is limited to those signals identically zero outside of the interval $|\xi| \leq b$, then the resulting operation is space-invariant. Otherwise, the input is truncated and the operation is space-variant. In either case, we have

$$\sigma(p,q) = 1 \qquad (12)$$

The system is thus always ascribed space-invariant status by the model.

3. Consider the case where the line-spread function is separable:

$$h(x;\xi) = h_1(x)\, h_2(\xi) \tag{13}$$

This is a commonly used assumption (for example [4]). Such a system could be viewed as an invariant system with line-spread function $h_1(x - \xi)$ with a transmittance $h_2(\xi)$ placed on its input plane. (The previous example is a special case of this.)

If both h_1 and h_2 are positive and real, we again have the case

$$\sigma(p,q) = 1 \tag{14}$$

The system again is erroneously classified as space-invariant.

That's it! I truly look forward to hearing any comments and insights you have on these examples.

I realize, of course, that no model should be cast aside until a better one is formulated to take its place. I admit that I as of yet have no better scheme for measuring spatial invariance. I think you will agree that any such model, at best, will be somewhat subjective. It should, however, display the following characteristics:

- Predict spatial invariance without ambiguity.
- Result in a decreased measure of invariance for increasing patch widths for space-variant systems

One possible model might lie in the "variation bandwidth" parameter of variation limited space-variant systems [5,6]. Clearly, if a system can be characterized exactly by sample line-spread functions of the form $h(x - \xi_n;\xi_n)$, where

$$\xi_n = \frac{n}{\text{variation bandwidth}}$$

then the input interval corresponding to the reciprocal variation bandwidth would qualify as an excellent candidate for definition of the isoplanatic patch.

Unfortunately, all space-variant systems are not variation limited. The variation bandwidth (which is the supremum support of the variation spectrum), however, is recognized as a measure of the dispersion of the variation spectrum. Perhaps a more universal measure, such as the second moment, might be more generally applicable.

Thank you, Dr. Lohmann, for taking the time and effort to read and digest this letter. I hope you will share with me your thoughts on it.

Sincerely,

Bob

Robert J. Marks II
Assistant Professor

References

1. A. W. Lohmann and D. P. Paris, JOSA 55, 1007 (1965).
2. R. J. Marks II and T. F. Krile, Appl. Opt. 15, 2241 (1976).
3. H. H. Arsenault and N. Brousseau, JOSA 63, 555 (1973).
4. T. Kailath, "Channel Characterizations: Time-Variant Dispersive Channels," in Lectures on Communications System Theory, E. J. Baghdady, editor (New York: McGraw-Hill, 1960).
5. R. J. Marks II, J. F. Walkup and M. O. Hagler, JOSA 66, 918 (1976).
6. R. J. Marks II, J. F. Walkup and M. O. Hagler, IEEE Trans. on Circuits and Systems CAS-25, 228 (1978).

RM:bb
enclosures

aerodyne research, inc.

27 May, 1980

Professor R. J. Marks
University of Washington
Department of Electrical Engineering
Seattle, Washington 98195.

Dear Professor Marks,

I have just read your paper on "Coherent Optical Extrapolation Of 2-D Band-Limited Signals: Processor Theory". This is one of the cleverest things I have seen in several years. I feel dumb for not having done it myself. Congratulations!

Sincerely,

H. J. Caulfield

HJC:sf

bedford research park, crosby drive, bedford, massachusetts 01730 (617) 275-9400

DEPARTMENT OF ELECTRICAL ENGINEERING
University of Washington

Administrative Confidential

DATE: October 19, 1981

TO: Assistant Professor Robert J. Marks II

FROM: James S. Meditch, Chairman

SUBJECT: Review of Progress Toward Promotion and Tenure

The subject review was conducted at the October 16, 1981 executive session faculty meeting. I am pleased to report that the faculty has voted to recommend your promotion to Associate Professor of Electrical Engineering with Tenure effective 1982-83. The vote via secret ballot was 22 yes, 1 no, 0 abstain. I will strongly endorse this recommendation and submit it to the Dean of Engineering.

Please make an appointment to discuss this matter with me at your convenience.

James S. Meditch

JSM/dks

PUGET POWER

March 19, 1984

Robert Marks
University of Washington
Dept. of Electrical Engineering, FT-10
Seattle, WA 98195

Dear Mr. Marks:

The Institute of Electrical and Electronic Engineers (IEEE) is celebrating its 100th anniversary during 1984. Each year, the Seattle Section holds an awards banquet to gather local members of the IEEE together in a social atmosphere. This year, in celebrating the centennial anniversary, we wish to invite you to be one of our honored guests at our Awards Banquet. At this banquet, you will be presented with the IEEE Centennial Medal and Certificate in recognition of your outstanding support and service to the Electrical Engineering Profession and the Institute.

The 1984 Spring Awards Banquet will be held on April 27 at the Sandpoint Naval Officer's Club in Seattle. The schedule is as follows:

6:00 PM - No Host Bar
7:00 PM - Dinner
8:00 PM - Awards, Program

Other engineers being honored for their contributions include:

Andrew V. Smith, President, Pacific N.W. Bell
Malcolm T. Stamper, President, Boeing Co.
David H. Knight, Sr. Vice Pres., Puget Sound Power & Lt. Co.
Dr. Dixy Lee Ray, Former Governor, Former Head of Atomic Energy Commission
Dr. Irene Peden, Prof. of Elec. Engr. at Univ. of Washington
Senator Dan Evans, Washington State Senator

Senator Dan Evans and Dr. Irene Peden will be receiving their awards on other occasions.

We will be contacting you within the next two weeks to confirm your invitation.

Sincerely yours,

John L. Barnett, P.E.
Seattle Section Chairman

JLB:gc

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT-10
Telephone: (206) 543-2150

February 27, 1985

OPCON, Inc.
Human Resources
720 80th St. SW
Everett, WA 98203

Greetings!

I see from your recruiting ads in the Seattle Times that your company is growing rapidly. Possibly I can be of assistance in that growth.

I am an Associate Professor in the Electrical Engineering Department at UW with specialties in optical computing and signal analysis. Details are in the enclosed resume. I offer myself to you as a potential resource on a part time consulting basis.

If you have use for my services now or in the future--or if there are any questions, please contact me at the above address or 543-6990 (office) or 542-3950 (home).

Best regards,

Robert J. Marks, II
Associate Professor

RJM:lab
Enclosure: resume

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT–10
Telephone: (206) 543–2150

February 27, 1985

Boeing
P.O. Box 3707-R05
MS 31-13
Seattle, WA 98124

Greetings!

Boeing has continually demanded quality engineers. I have heard that presently this demand is quite high. Perhaps I can be of assistance.

I am an Associate Professor of Electrical Engineering at UW with specialities in signal analysis and optics. Details are in the enclosed resume. I offer myself to you as a potential resource on a part time consulting basis.

If you have use for my services now or in the future--or if there are any questions, please contact me at the above address or 543-6990 (office) or 542-3950 (home).

Best regards,

Robert J. Marks, II
Associate Professor

RJM:lab
Enclosure: resume

The University
Of Alabama
In Huntsville

Center for Applied Optics

Huntsville, Alabama 35899
Phone: (205) 895-6102

21 February 1985

Robert Marks
Dept. E. E. FT-10
University of Washington
Seattle, WA 98125

Dear Bob,

This letter is my way of telling you about the exciting new turn in my life. Beginning in May, I will be the Director of the Center for Applied Optics at The University of Alabama in Huntsville. It is their and my hope to form the third U.S. optics school. It appears to me to be quite possible, and indeed probable, that we can put together a magnificent staff. With the considerable government and industry optics efforts in Huntsville, we expect to make this the place to do optics in the 1990's and beyond.

I look forward to your advice and help as this progresses.

In the meantime, I am finishing up my Aerodyne career. Aerodyne and I will part warmly and incompletely. That is, I will still support them over the short term. You should continue to communicate with me there through April.

Some people have asked "Why?" You know me well enough to guess. I think this will be a very exciting opportunity, a good challenge, and (above all) fun. To me that's what it is all about.

Sincerely yours,

H. J. Caulfield

HJC:jkp

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING FT-10

July 12, 1984

TO: The Engineering Student Council HH-05

FROM: Professor Robert J. Marks II

Thank you again for the gift certificate for Stuarts. I am particularly touched by the meaning and feeling behind it. My wife and I used the certificate last week (July 2) and had a glorious time!

Have a great year. I am highly impressed with the leadership this year and know you will do great things!

RJM:lmt

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT–10
Telephone: (206) 543–2150

May 8, 1984

Dr. Dan Dudgeon
MIT Lincoln Labs
244 Wood Street
Lexington, MA 02173-0073

Dear Dan:

Greetings from the Northwest!

Congratulations on your book with Mersereau. It's great! We're using it this quarter for a graduate course here.

Apparently there is no solution book. If you have even an incomplete set of solutions, I would deeply appreciate a copy.

Thanks!

Best regards,

Robert J. Marks, II
Associate Professor

RJM:blj

aerodyne research, inc.

August 21, 1980

Dr. Robert J. Marks
University of Washington
Department of Electrical Engineering, FT-10
Seattle, Washington 98195.

Dear Bob,

My first attempt to arouse interest in additional support for your resolution improvement system was a flop. I am very sorry that the particular agency I talked to is so near sighted and I will keep plugging.

Sincerely,

H. J. Caulfield

HJC:sf

bedford research park, crosby drive, bedford, massachusetts 01730 (617) 275-9400

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT-10
Telephone: (206) 543-2150

July 1, 1980

Mr. John Caulfield
Aerodyne Research Inc.
Bedford Research Park
Bedford, MA 01730

Dear John:

Enclosed are copies of the pretty pictures I promised. We've just completed an annual progress report, so I enclose that too.

I sincerely hope you can turn these into money. There's yet a lot of fascinating work to be done.

If I can be of any help, contact me at the above address or at (206) 543-6990.

Best personal regards,

Robert J. Marks II
Professor

RJM:jjn

Enclosures

Texas Tech University
BOX 4439 / LUBBOCK, TEXAS 79409 / (806) 742-3533
DEPARTMENT OF ELECTRICAL ENGINEERING

May 22, 1978

Professor Robert J. Marks II
Department of Electrical Engineering, FT-10
University of Washington
Seattle, Washington 98195

Dear Bob:

I enjoyed our phone conversation last week, and wanted to let you know that I mailed you (insured) 190 slides on Friday 5/19. I will send some additional 2-D data slides as soon as Mike identifies for me the conditions for each. Hopefully you will have received these slides (at least the first shipment) when you get this letter.

Marion and I were discussing the possible contents of your Gordon Conference paper, and we wanted to say that we hope that you'll try to give a presentation which is somehow "balanced" between 1-D and 2-D material. I say this because based on some of our earlier conversations I had the feeling that you planned to mainly emphasize the 1-D material. I would like to see the 2-D material presented too as I think it has a lot of long term significance, plus I think we have had some interesting results to date. If, in preparing the talk, you want to run any ideas-or problem areas-by us please don't hesitste to call.

I was serious when I suggested that you consider calling Joe Goodman about allowing you at least 15 more minutes. I just don't want you to feel pinched for time when you plan the presentation. We plan to get together with Lee this week and talk about the various papers, so I hope to be talking to you again soon. I'll bet you and Connie are looking forward to the new house (you're not in it yet are you).

Best regards,

John

John Walkup

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT-10
Telephone: (206) 543-2150

July 1, 1980

Dr. Norman Caplan
Program Director for Automation
Bioengineering and Sensing Systems
Engineering Division
National Science Foundation
Washington, D.C. 20550

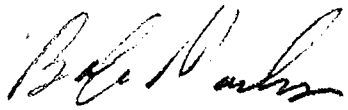
Norman:

Enclosed are two copies of the progress report on NSF Grant ENG-7908009, "Coherent Optical Extrapolation of Bandlimited Signals." As is reflected in the report, this last year's efforts were most fruitful in results.

The response of the optical processing community to last years work has been outstanding-resulting in two invited papers at major conferences and unsolicited comments of the type in the attached letter.

Next year looks even better.

Best regards,



Robert J. Marks II
Professor

RJM:jjn

Enclosures

GEORGIA INSTITUTE OF TECHNOLOGY
SCHOOL OF ELECTRICAL ENGINEERING
ATLANTA, GEORGIA 30332

OPTICAL INFORMATION PROCESSING LABORATORY
TELEPHONE: (404) 894-2929

12 August 1981

Prof. Robert J. Marks
Department of Electrical Engineering
University of Washington
Seattle, WA 98195

Dear Bob,

Many thanks for your review of Jim Fienup's paper for the Advanced Institute publication; I would have written sooner, but just returned from ten days vacation. I should have the other review back soon, will be sending them off to Jim as soon as possible.

Best wishes.

Sincerely,

William T. Rhodes
Professor

WTR:me

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING, FT-10

August 13, 1979

TO: Dr. Morris E. Childs, Chairman
Department of Mechanical Engineering, FU-10

FROM: Professor Robert J. Marks II
Department of Electrical Engineering, FT-10

SUBJECT: OER Research Assistantship for Micheal Hall.

The few months of OER support for Micheal Hall allowed for completion and polishing of much work initiated under a University of Washington Graduate School Grant. Included were:

1. Finalization of some lab work for inclusion in an NSF proposal "Coherent Optical Extrapolation of Two-Dimensional Bandlimited Signals." The grant, for $32,000, has been recently awarded.

2. Finalization of more lab work, the results of which are included in the paper "Ambiguity Function Display Using a Single 1-D Input" Applied Optics, vol. 18, p. 2539 (1979) by R. J. Marks II and M. W. Hall.

As you can see, OER support for Mr. Hall for these few months was extremely productive. I am very thankful to OER for this help.

RJM:ls

University of Washington Office of the President, AH-30

January 18, 1982

Assistant Professor Robert J. Marks II
Department of Electrical Engineering, FT-10
Campus

Dear Professor Marks:

I am pleased to inform you that Dean Bowen, with the advice of appropriate faculty advisory committees, has recommended your promotion from Assistant Professor to Associate Professor, with tenure, in the Department of Electrical Engineering, effective September 16, 1982. I am happy to approve this recommendation.

No decision in a university is more important to a faculty member or the institution than a tenure decision. Your colleagues have examined your professional credentials with great care, and you can take considerable pride in their decision. Please accept my congratulations and my hopes for your continued success. This is a proud day for the University of Washington and for you.

Sincerely yours,

William P. Gerberding
President

DEPARTMENT OF THE ARMY
U. S. ARMY RESEARCH OFFICE
P. O. BOX 12211
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

REPLY TO ATTENTION OF:

DRXRO-PH

25 September 1981

Professor Robert J. Marks II
Department of Electrical Engineering FT-10
University of Washington
Seattle, WA 98195

Dear Bob:

Thanks for your letter on "Restoration of Aliased Data from Continuously Sampled Signals." Unfortunately the fellow who supports image processing work has no interest in this work. Since you have not had a high success rate with our office, may I recommend that you talk with Bill Sander (image processing) and Paul Boggs (applied math-numerical analysis) to see if you can adjust your interest so that it better overlaps their interest. They can be reached at the same telephone number as I can.

Thank you for your interest in the Army Research Program. I am interested in continuing to hear of your research interest. Maybe in the future we can find an area of mutual interest.

Sincerely,

Bob

B. D. GUENTHER
Physics Division

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT-10
Telephone: (206) 543-2150

May 7, 1981

Dr. Tapan K. Sarkar
Dept. of Electrical Engineering
Rochester Institute of Technology
Rochester, N.Y. 14623

Dr. Sarkar:

I have read with great interest your paper on inverse problem stability in the August'81 issue of IEEE Trans. on antennas and propagation. Your example of the ill-conditioned matrix on page 375 is great! I have used it in lecture.

It is because of this example I write. The sentence prior to Equation (22) states the matrix is symmetric. Yet the upper right and lower left elements have a transposition. I would deeply appreciate if you would drop me a short note stating whether this is correct or a typo. Your response will be of great help.

Best regards,

Bob Marks
Professor

University of Washington Correspondence

INTERDEPARTMENTAL

Electrical Engineering Department FT-10

Date: November 10, 1982

To: J. Ray Bowen, Dean

From: Robert J. Marks II, Associate Professor

Subject: Engineering Student Council Junior Advisor Nomination

I am honored to have been nominated by the students of the Engineering Student Council for the Junior Advisor appointment. I accept the offer and look forward to interacting with the Council.

RJM:lac

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING FT-10

DATE: May 17, 1983

TO: Professors Ward J. Helms, David L. Johnson, Dean W. Lytle, and Robert J. Marks, II

FROM: James S. Meditch, Chairman

Bob —

I am writing to express to each of you my sincere appreciation for your service on the 1983-84 Salary Review Committee for the Assistant Professors. Although the time allocated for the review was extremely short, it is clear to me that you did a thorough and thoughtful review of each case before you. The input you provided played a major role in the assignment of salary adjustments for next year. I am quite convinced that the resulting salaries accurately represent the contributions of each person who was reviewed.

Thank you again.

JSM

JSM:jjn

DEPARTMENT OF ELECTRICAL ENGINEERING
University of Washington

Date: July 27, 1983

To: Professors M.A. El-Sharkawi, R.J. Marks II, and W.E. Moritz

From: James S. Meditch, Chairman JSM/sa

Subject: Admissions Appeals Committee

It is my understanding that each of you is willing to serve on the subject committee to review and act upon appeals submitted in connection with the 1983 Autumn Quarter undergraduate admissions. Unless I hear to the contrary from you by July 29, 1983, I will assume that you agree to serve. Please note that your agreeing to serve at this time does not bind you to also serve next spring.

The deadline for submission of appeals is August 5, 1983, and the committee should plan to meet as soon thereafter as is convenient.

Thank you.

JSM:sa
cc: Profs. D.L. Johnson, D.W. Lytle, I.C. Peden, and P.F. Swaszek
Mr. G.M. Worley

Texas Tech University

Department of Electrical Engineering

April 2, 1980

Professor Robert J. Marks II
Department of Electrical Engineering
University of Washington
Seattle, Washington 98195

Dear Bob:

I would like to invite you to be the discussion leader for my talk on "Space-Variant Coherent Optical Processing" at the workshop on "Future Directions for Optical Information Processing" at Texas Tech University, May 20-22, 1980. Your extensive background in the topic area based on your research work at Texas Tech and the University of Washington suits you well for this task, and I hope you will be able to accept. Due to my limited travel budget beyond that provided for the ten invited speakers, I can't pick up all of your expenses, but will pledge $100 toward them and hope that the University of Washington can assist you in participating in the workshop.

As you know, the workshop is by invitation only, and we are limiting it to approximately forty participants, including representatives of the top U.S. universities engaged in optical information processing research, industrial firms active in the field, and representatives of the major Department of Defense and other government funding agencies. I anticipate that the discussions taking place at the workshop will have a significant impact on the future direction of research funding in the field of optical information processing. Consequently I think that the contacts you will be able to make at the workshop will aid you in your efforts to gain additional funding for your expanding research program.

Due to the need I have to line up the discussion leaders in the near future, I hope that you will be able to respond at your earliest convenience. I do hope that your will be able to attend and look forward to the possibility of seeing you there.

Sincerely,

John F. Walkup
Associate Professor
Workshop Co-Director

Box 4439 / Lubbock,Texas 79409 / (806) 742-3533

ENVIRONMENTAL
RESEARCH INSTITUTE OF MICHIGAN
P.O. BOX 8618 • ANN ARBOR • MICHIGAN • 48107 PHONE (313) 994-1200

ELECTRO-OPTICS DEPARTMENT

26 November 1979

Robert J. Marks
Department of Electrical Engineering, FT-10
University of Washington
Seattle, Washington 98195

Dear Bob:

You are invited to submit a paper on your work in the area of extrapolation of band-limited signals to the 1980 International Optical Computing Conference, April 7-10, 1980 in Washington, D.C. Your research is of great interest and fits in extremely well with the session I am chairing, which will be on Iterative Methods for Reconstructing Images from Incomplete Data. I would appreciate your sending me a title and a 200 word abstract by 3 December 1979 or soon after. Complete papers are due on 11 February 1980.

Sincerely,

Jim

James R. Fienup

JRF:lw

Enclosure

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING

23 March 1978

TO: Professor James S. Meditch

FROM: W. Louis Barrett

Dear Jim:

It was my pleasure to sit in on the E.E. Applied Optics course taught by Dr. Robert Marks last quarter. He did a superb job; a person with many years of teaching experience would have been hard pressed to improve on this course. He challenged the class with weekly graded homework assignments, two one-hour quizzes, one overnight take-home test, and a final exam.

A congenial learning environment prevailed in the class and even though this demanding course was an elective only about 5 students dropped out of the near 50 enrolled.

Sincerely,

Lou

W. Louis Barrett

WLB:mk
cc: Prof. Robert Marks ✓
Prof. David Auth

THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

OPTICAL SCIENCES CENTER

May 5, 1980

Dr. Robert Marks
Dept. of Electrical Engineering
Mail Stop FP-10
University of Washington
Seattle, WA 98195

Dear Bob:

Thank you for agreeing to speak at the Gordon Conference. I have tentatively scheduled your presentation for Tuesday morning, June 17. You will have about 40-45 minutes for the talk and another 10-15 minutes for discussion. I'm sure you can give a good introduction to Saxon-Gerchberg processing as well as the specifics of your optical implementation in that time. Please send me a title for your talk.

As we discussed, I am allotting $270 from conference funds to cover your registration and residence fees.

I look forward to seeing you again in Ventura.

Sincerely,

Harry

H. H. Barrett
Chairman, 1980
Gordon Conference on Holography
and Optical Information Processing

HHB:jw

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT-10
Telephone: (206) 543-2150

January 29, 1981

Mr. John A. Neff
Program Manager
Electronic and Material Sciences
Department of the Air Force
Air Force Office of Scientific
Research (AFSC)
Bolling Air Force Base, DC 20332

Dear John,

Thank you for your letter of January 15 concerning our work in image extrapolation and enhancement. At your suggestion, we are presently working on an unsolicited formal proposal. Thanks for the guidelines literature.

Your point about low S/N ratio is well taken. Indeed, implementation of the extrapolation algorithm in present form requires an incredibly low S/N ratio. Four updating remarks are in order: (1) there do exist extrapolation algorithms that are "well-posed" - i.e., the output error can be analytically bounded. An example is the case where an image is not known only a finite area, (2) Apriori knowledge of a bandlimited signal's energy bounds the signal. This can be used to "clip" the signal in each iteration thus hopefully reducing high energy oscillations in the result, (3) if a portion of the image's spectrum is known, the algorithm effectiveness can be greatly enhanced, (4) we have determined that Gerchberg's algorithm can be altered to solve a large class of image deconvolution problems. The effects of noise are not yet known, but it seems that less degradation will result. Items (1), (2) and (4) have promise of implementability on an iterative coherent optical processor. Further elaborations on these points will be contained in the proposal.

Thanks again for your time and interest.

Best personal regards,

Robert J. Marks II

P.S. As requested by your secretary, I've enclosed a copy of your recent letter.

RJM:sm
Enclosure

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT-10
Telephone: (206) 543-2150

January 28, 1981

Dr. Bob Guenther
Department of the Army
U. S. Army Research Office
P. O. Box 12211, Attn: DRXRO-PH
Research Triangle Park, NC 27709

Bob:

Thanks for your effort in the reviewing the reprints of our work on extrapolation. Your positive comments on the results were well received.

I am sorry that necessary resources do not presently exist for such project funding in this area. Thank you, though, for your time and interest in our work.

Best personal regards,

Bob Marks

Robert J. Marks, II
Professor

RJM:jjn

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT–10
Telephone: (206) 543–2150

January 28, 1981

Dr. Keith Norsworthy
10906 NE 17th
Bellevue, WA 98004

Keith:

Thank you for your interest in our Industrial Affiliates program presentations. Unfortunately, I was not able to interact with your representative though I was informed of their attendance.

I enclose a summary of some of our research results in hopes that it proves useful to you in your work. Two comments are in order. First, although titled "Coherent Optical Extrapolation. . .," we have performed a number of digital implementations with some fascinating results (pp. 49-81). Secondly, the results are presented in the time (and spatical) domains. The techniques, however, are equally applicable in the frequency domain - specifically to that case where a signal of finite duration is low pass filtered. The people in optics refer to extrapolation in the frequency domain as super-resolution. The net effect is to enhance (sharpen) the filtered signal by inclusion of attenuated or deleted high frequency information.

Again, I hope this report is of use to you. If I can be of any assistance in concept clarification or solution of your particular problem in this area, please do not hesitate to contact me at the above address or at (206) 543-6990.

Best regards,

Robert J. Marks, II
Professor

RJM:jjn

DEPARTMENT OF THE AIR FORCE
AIR FORCE OFFICE OF SCIENTIFIC RESEARCH (AFSC)
BOLLING AIR FORCE BASE, DC 20332

15 January 1981

Dr. Robert J. Marks II
Department of Electrical Engineering
University of Washington
Seattle, Washington 98195

Dear Bob,

I wish to acknowledge receipt of your letter of December 19, 1980. The goals of the research that you describe are of interest to the Air Force and are concordant with AFOSR's Research Objectives. Of special interest would be investigations into optical implementations of the extrapolation algorithms. My major concern after reviewing the material that you sent is the seemingly high signal-to-noise ratios required to yield good performance. Military systems are required to work in environments of very low S/N as would be the case when operating in the presence of jamming.

We have a formal review process at AFOSR for evaluating the supportability of research proposals. The review process cannot be initiated without the receipt of a formal proposal; therefore, I am enclosing the AFOSR Proposer's Guide.

If you have any questions, I may be reached at (202) 767-4933.

Sincerely,

JOHN A. NEFF
Program Manager
Electronic and Material Sciences

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

December 19, 1980

Department of Electrical Engineering

Dr. John Neff
Program Manager
AFOSR/NE
Bolling AFB
Washington, D. C. 20332

John,

Greetings from the great Northwest!

I write to seek your opinion on the potential interest of ARO in the development of a newly emerging technique in image enhancement and extrapolation and the advisability of proposal submission. Copies of four papers on some preliminary results in this area are enclosed. Reformulating the results of these papers in the frequency domain reveals a potentially powerful technique for enhancement of images (or signals) with compact support that are degraded by vignetting type effects.

Global extrapolation of bounded image spectrums has been shown by several authors not to be possible. These results are nothing more than mathematical proofs of a common sense conclusion. Empirical results, however, strongly suggest that extrapolation techniques can be effectively utilized locally to extend a spectrum "close" to where the spectrum is known.

Investigative avenues in this fresh look at extrapolation are numerous, including: (1) quantification of "close" (2) incorporation of further apriori image information such as positivity and energy constraints into extrapolation algorithms (3) coherent optical and digital implementations of various forms of extrapolation algorithms, and (4) formulating a better understanding of the effects of both input and algorithms serturbations. There also exists an as of yet unpublished more powerful closed form algorithm for 2-D extrapolation than that reported in the enclosed paper by Smith and Marks.

If I can shed any more light on this inquiry, please contact me at the above address or (206) 543-6990. Irrespective, I look forward to hearing from you.

Best personal regards,

Robert J. Marks II

RJM/kj

Enclosures

DEPARTMENT OF THE ARMY
U. S. ARMY RESEARCH OFFICE
P. O. BOX 12211
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

REPLY TO ATTENTION OF:
DRXRO-PH

9 January 1981

Professor Robert J. Mack II
Department of Electrical Engineering
University of Washington
Seattle, WA 98195

Dear Bob:

A number of people read over the material you sent to me. We all found your work interesting but unfortinately the necessary resources needed to fund a project are not available this fiscal year.

For your information Bill Sander in the Electronics Division supports all of the digital image processing work funded out of this office.

Thanks for your interest in the Army research program and the reprints of your work.

Sincerely yours,

Bob

B. D. GUENTHER
Physics Division

Optics Letters

R.W. Terhune, *Editor*
Research Laboratories, S-2076
Ford Motor Company
P.O. Box 2053
Dearborn, Michigan 48121

January 13, 1981

Professor Robert J. Marks II
Department of Electrical Engineering FT-10
University of Washington
Seattle, Washington 98195

Dear Professor Marks:

In going over the January issue of Optics Letters in which your article appears, I note that you, as an author, are not listed as a reviewer in our files. If you would be willing to occasionally review papers for us, please fill out the attached form and return it to us.

Sincerely,

R. Terhune

R. W. Terhune

jlm

Enclosures

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT–10
Telephone: (206) 543–2150

August 5, 1981

Captain John A. Neff, Program Manager
Department of the Air Force
Air Force Office of Scientific Research (AFSC)
Bolling Air Force Base
Washington, D.C. 20332

Dear John:

Enclosed are seven copies of a research support proposal entitled, "Optical Processors for Extending and Restoring Bandlimited Images." The proposed research is in the topic area we discussed by correspondence earlier this year.

Looking forward to the outcome of the review, I am

Sincerely yours,

Robert J. Marks, II
Assistant Professor

RJM:jjn

Enclosures

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT–10
Telephone: (206) 543–2150

August 6, 1981

Dr. H. Stark
Department of Electrical and Systems Engineering
Rensselaer Polytechnic Institute
Troy, NY 12181

Dear Henry:

I thoroughly enjoyed your recent papers in JOSA and OL. I was particularly impressed by the iterative restoration algorithms and their implementations! Your inclusion of a somewhat detailed description of some of Youla's results in terms that one well versed in Fourier analysis can readily understand was also a most noteworthy contribution.

Prompted by Sabri and Steenaart's closed form treatment of Gerchberg's linear iterative algorithm, we wondered if a corresponding closed form algorithm existed for your linear iterative algorithm. After some calculations, Mike Smith went to the computer and the enclosed letter was generated. As it is simply a corollary to your more substantive work, we thought you might like to see it. Any comments or suggestions would be most appreciated. We recently submitted the note to OL.

Best personal regards,

Robert J. Marks II
Assistant Professor

enclosure

RJM:hb

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT–10
Telephone: (206) 543–2150

August 6, 1981

Dr. B. D. Guenther
Physics Division
Department of the Army
U.S. Army Research Office
P.O. Box 12211
Research Triangle Park, NC 27709

Dear Bob:

I write to seek your opinion on the potential interest of ARO in the development of a new technique to optically restore aliased data from continuously sampled data and the advisability of proposal submission. Enclosed is a description of the basic problem - its solution and corresponding optical implementation.

If I can be of any assistance in concept clarification or in any other way, please contact me at the above address or at (206) 543-6990. Looking forward to your response I am.

Sincerely yours,

Robert J. Marks II
Assistant Professor

enclosure

RJM:hb

University of Washington Correspondence

INTERDEPARTMENTAL

COLLEGE OF ENGINEERING FH-10

June 1982

Professor R. J. Marks, II
Electrical Engineering
FT-10

Dear Professor Marks:

I want to thank you for your contribution to the College by serving on the College Student Affairs Committee for 1981-1982 for the effective participation in the governance of the College. Your advice and counsel in matters of policy and administration during the past year, and most of all, your willingness to sacrifice your time for these efforts, are greatly appreciated.

Sincerely,

Ray

J. Ray Bowen
Dean

JRB:yy

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING FT-10

DATE: January 21, 1986

TO: J. Ray Bowen, Dean
College of Engineering FH-10

FROM: Robert J. Marks II, Associate Professor
Electrical Engineering FT-10

SUBJECT: Critical Market Disparity Raises

Thank you for taking the time to meet with me last month concerning my grievance. An update:

1. Due to present national budget uncertainties, the monitor for my grant says that awards will not be announced until mid March. As you requested, I will inform you when the award is made.

2. Now that you have had a chance to review my case further, I would be interested in your conclusions. Specifically, do you believe that the basis for my grievance is valid and would you support an appropriate salary adjustment when further funds are available?

I look forward to your response.

RJM:pke

THE DAILY

July 15, 1983

University of Washington
144 Communications, DS-20
Seattle, Washington 98195
Telephone: (206) 543-2670

Robert J. Marks II, PhD
Associate Professor, Electical Engineering
FT-10

Dear Professor Marks:

Thank you for submitting your cartoons for consideration of publication in the Daily of the University of Washington.

I am returning your work as we have chosen not to publish any of the submissions. The Daily endeavors not to print material that may be perceived as racist or sexist.

Sincerely,

Michael Sande
Managing Editor, the Daily

cc: Ann Powers, Editor-in-Chief
Barbara Krohn, Publisher

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT-10
Telephone: (206) 543-2150

May 5, 1983

Richard C. Reinhold
Senior Staff Engineer
Advanced Systems
Teledyne Electronics
649 Lawrence Drive
Newbury Park, CA. 91320

Dear Rick:

Thank you for the paper copies! It sounds like you've really found a position at Teledyne that is exciting and fulfilling. Congratulations!

As an expression of my thanks, you will find enclosed two episodes on cassette of "Gunsmoke" starring Bob Marks as Matt Dillon. Listen to them some evening when you're doing nothing else. Enjoy!

Best personal regards,

Robert J. Marks, II
Associate Professor

RJM:sa
enc. cassette

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT–10
Telephone: (206) 543–2150

March 7, 1983

Dr. Lowell Burnett
Chairman, Department of Physics
San Diego State University
San Diego, CA 92182

Dear Lowell:

I write to confirm our phone conversation concerning your department's proposal to NOSC. I agree to participate in the effort assuming, of course, we arrive at mutually agreeable conditions. The material you requested is enclosed.

Sincerely yours,

Robert J. Marks, II
Associate Professor

RJM:jjn

Enclosures

CABLE EXPERIENCE

Robert J. Marks, II has authored over thirty refereed and proceedings articles primarily in the areas of statistical communication theory, signal analysis and optical processing. Recent research interests include restoration and estimation of contaminated or lost signal components from adjacent data. He has presented two invited papers and is co-author of a book-chapter on this topic (see publication list).

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT-10
Telephone: (206) 543-2150

January 20, 1983

Jim Schroeder
Harris Corporation
MS 22/2501
Government Systems Sector
P.O. Box 37
Melbourne, Florida 32902

Jim,

Thank you for your kind letter. You did indeed attack the same problem! I have given your paper to one of my graduate students to review. He is working on noise sensitivity of the restoration algorithm. We will write if he comes up with any findings.

I possibly would like to reference your thesis in any future papers. I would appreciate it if you could send me the title, institution (University of Iowa?) and date.

As for your inquiry about our department - it is one of the best in the country. I personally do not presently have money to support a graduate student in signal processing, but there are many other options available for financing a Ph.D. degree. I have asked our graduate secretary, Karen Bradford, to forward the appropriate information to you.

If I can be of further help, contact me at the above address or (206)543-6990.

Sincerely,

Robert J. Marks II
Associate Professor

RJM/dkm

years ago I attempted reconstruct in the frequency domain utilizing the FFT, assuming a first order aliased spectrum, but the results were very poor. As it turned out, the higher order aliasing effects were quite significant and should not have been ignored.

One final note. I am looking for a University that strongly supports research in the areas of signal analysis and digital signal processing that I could earn a PhD at. Judging by your published work, U of W may be a good school for me and I would appreciate any info you could send me concerning faculty research interests there.

I am looking forward to a response from you and hope that the info I enclosed can be of some use.

Sincerely yours,

Jim Schrock

Jan-11, 1983

Professor Marks:

I read with interest a recent publication of yours in IEEE Trans. on Acoustics, Speech, and Signal Processing, December 1982 entitled, "Restoration of Continuously Sampled Bandlimited Signals from Aliased Data."

Enclosed is an excerpt from a master's paper (non-thesis, non-published) I wrote while at the University of Iowa, Iowa City, Iowa concerning the reconstruction of band-limited, aliased spectrums, that may be of interest to you. The frequency domain reconstruction equations should be credited to Prof. Steve Collins, Dept. of Electrical and Computer Engineering, University of Iowa, Iowa City, Iowa 52242 and the corresponding time domain equations were developed by myself. I am confident

Jan-11, 1983

Professor Marks:

I read with interest a recent publication of yours in IEEE Trans. on Acoustics, Speech, and Signal Processing, December 1982 entitled, "Restoration of Continuously Sampled Bandlimited Signals from Aliased Data."

Enclosed is an excerpt from a master's paper (non-thesis, non-published) I wrote while at the University of Iowa, Iowa City, Iowa concerning the reconstruction of band-limited, aliased spectrums, that may be of interest to you. The frequency domain reconstruction equations should be credited to Prof. Steve Collins, Dept. of Electrical and Computer Engineering, University of Iowa, Iowa City, Iowa 52242 and the corresponding time domain equations were developed by myself. I am confident

years ago I attempted reconstruct in the frequency domain utilizing the FFT, assuming a first order aliased spectrum, but the results were very poor. As it turned out, the higher order aliasing effects were quite significant and should not have been ignored.

One final note. I am looking for a University that strongly supports research in the areas of signal analysis and digital signal processing that I could earn a PhD at. Judging by your published work, U of W may be a good school for me and I would appreciate any info you could send me concerning faculty research interests there.

I am looking forward to a response from you and hope that the info I enclosed can be of some use.

Sincerely yours,

Jim Schroeder

the frequency domain equations are correct, but I harbour doubts about the validity of the time domain equations. It would please me greatly if you would consider reviewing this work and any comments, criticisms you may have can be directed to me:

Jim Schroeder MS 22/2501
Harris Corp.
Gov't Systems Sector
PO Box 37
Melbourne, FL 32903

(305) 727-6782

Also, your time domain equations do not agree with mine, further increasing doubts about my development since I feel we should have arrived at the same solution. Your development has a simple elegance that I admire and wish I had thought of myself to say the least.

Currently I am attempting to extend the frequency domain reconstruction to higher dimensions inorder to take advantage of FFT speed advantages. Several

II. Non-Ideal Sampling Natural

As true impulse sampling does not occur in practical situations, it is instructive to look at non-ideal sampling. A non-ideal sampler operates much the same as an impulse sampler, except that the sampling waveform has a finite pulse width (fig. 2a). Basically there are two types of non-ideal sampling; natural and instantaneous. Natural sampling retains information about f(t) during the sampler pulse width since the amplitude of p(t) is propotional to f(t) during the sampling interval. Instantaneous sampling samples f(t) at only one instant. The amplitude of p(t) remains constant throughout the sampling interval.

As with impulse sampling, the frequency domain provides the most information about the sampling process. To determine the spectrum of the sampled waveform, we will once again first find the spectrum of p(t) and then convolve the spectrum of p(t) with the spectrum of f(t). To find the spectrum of p(t) express p(t) as a Fourier series and use equation 2.

$$p(t) = A_m e^{jm\omega_s t} \qquad \omega_s = \frac{2\pi}{T}$$

$$A_m = \frac{1}{T}\int_{-P/2}^{P/2} e^{-jm\omega_s t}\, dt$$

$$A_m = \frac{1}{T}\left[\frac{-1}{jm\omega_s} e^{-jm\omega_s t}\Big|_{-P/2}^{P/2}\right]$$

$$A_m = \frac{1}{T}\left[\frac{e^{jm\omega_s P/2} - e^{-jm\omega_s P/2}}{jm\omega_s}\right]$$

$$A_m = \frac{1}{T}\left[\frac{2\,SIN\,(m\,W_S\,P/2)}{m\,W_S}\right]$$

$$A_m = \frac{2}{T}\left[\frac{SIN\,(m\pi\,P/T)}{m\,\frac{2\pi}{T}}\right]$$

$$A_m = \frac{P}{T}\,\frac{SIN\,(m\pi\,P/T)}{m\pi\,P/T}$$

$$A_m = P/T\;\;Sa\,(m\pi\,P/T)$$

From equation 2,

$$P(w) = 2\pi \sum_{m=-\infty}^{\infty} A_m\,\delta(\omega - m\omega_s)$$

P(ω) is shown in figure 2a.

$$f^*(t) = p(t)\;\;f(t)$$

$$F^*(\omega) = \frac{1}{2\pi}\left[P(\omega) * F(\omega)\right]$$

And convolving P(ω) with F(ω) results in

$$F^*(\omega) = \sum_{m=-\infty}^{\infty} A_m\,F(\omega - m\omega_s)$$

as shown in figure 2b.

IV. Reconstruction Equations

As long as $\omega_s > 2\omega_c$ the frequency spectra of a sampled waveform do not overlap and no aliasing occurs. Therefore in theory the waveform can be recovered by lowpass filtering. Now we want to consider a sample rate $\omega_c < \omega_s < 2\omega_c$ which causes overlap (aliasing) of the spectral components. We will consider a waveform f(t) sampled by a natural sampler (non-ideal). The spectrum of $f^*(t)$ was calculated previously and is shown in figure 2b. If $\omega_c < \omega_s < 2\omega_c$ only two sidebands are affected by aliasing. Referring to figure 4, it can be seen that the region of overlap is $\omega_s - \omega_c < \omega < \omega_c$. The center of the overlap region is $\omega_o = \omega_s/2$. Since the first two envelopes of the sampled waveform are scaled by A_o and A_1 (recall: $A_n = P/T\ Sa(n\pi\ ^P/T)$) we have in the region of overlap:

$$F^*(\omega_o) = A_o\ F(\omega_o) + A_1\ F(\omega_o - \omega_s) \qquad \omega_s = 2\omega_o$$

$$F^*(\omega_o) = A_o\ F(\omega_o) + A_1\ F(-\omega_o)$$

If f(t) is real we know that $F(-\omega) = F\hat{(}\omega)$, where $F\hat{(}\omega)$ is the complex conjugate of $F(\omega)$. For the case that f(t) is real then:

3. $F^*(\omega_o) = A_o F(\omega_o) + A_1 F\hat{(}\omega_o)$

Since $F^*(\omega_o)$ and $F(\omega_o)$ are in general complex quantities, we can write:

$$F^*(\omega_o) = F_R^*(\omega_o) + j\ F_I^*(\omega_o)$$

Writing equation 3 in terms of real and imaginary components and separating the real and imaginary parts results in:

$$F_R^*(\omega_0) + j\, F_I^*(\omega_0) = A_0 \left[F_R(\omega_0) + j\, F_I(\omega_0) \right] + A_1 \left[F_R(\omega_0) - j\, F_I(\omega_0) \right]$$

$$F_R^*(\omega_0) = A_0\, F_R(\omega_0) + A_1\, F_I(\omega_0)$$

$$F_I^*(\omega_0) = A_0\, F_I(\omega_0) - A_1\, F_I(\omega_0)$$

Now in the region of overlap, $\omega_c < \omega_s < 2\omega_c$, consider $\omega = \omega_o + \Delta\omega$ and proceed as before.

$$F^*(\omega_0 + \Delta\omega) = A_0\, F(\omega_0 + \Delta\omega) + A_1\, F(\omega_0 + \Delta\omega - \omega_s)$$

$$F^*(\omega_0 - \Delta\omega) = A_0\, F(\omega_0 - \Delta\omega) + A_1\, F(\omega_0 - \Delta\omega - \omega_s)$$

$$F^*(\omega_0 + \Delta\omega) = A_0\, F(\omega_0 + \Delta\omega) + A_1\, F(-\omega_0 + \Delta\omega)$$

$$F^*(\omega_0 - \Delta\omega) = A_0\, F(\omega_0 - \Delta\omega) + A_1\, F(-\omega_0 - \Delta\omega)$$

$$F^*(\omega_0 + \Delta\omega) = A_0\, F(\omega_0 + \Delta\omega) + A_1\, \hat{F}(\omega_0 - \Delta\omega)$$

$$F^*(\omega_0 - \Delta\omega) = A_0\, F(\omega_0 - \Delta\omega) + A_1\, \hat{F}(\omega_0 + \Delta\omega)$$

4. $$F_R^*(\omega_0 + \Delta\omega) = A_0\, F_R(\omega_0 + \Delta\omega) + A_1\, F_R(\omega_0 - \Delta\omega)$$

$$F_R^*(\omega_0 - \Delta\omega) = A_0\, F_R(\omega_0 - \Delta\omega) + A_1\, F_R(\omega_0 + \Delta\omega)$$

5. $$F_I^*(\omega_0 + \Delta\omega) = A_0\, F_I(\omega_0 + \Delta\omega) - A_1\, F_I(\omega_0 - \Delta\omega)$$

$$F_I^*(\omega_0 - \Delta\omega) = A_0\, F_I(\omega_0 - \Delta\omega) - A_1\, F_I(\omega_0 + \Delta\omega)$$

In the region of overlap, equations 4. and 5. show how the aliased components add together producing distortion. Now we can solve equation set 4 simultaneously and equation set 5 simultaneously then reconstruct the real and imaginary components of F(ω). The simultaneous solution yields:

$$F_R(\omega_0+\Delta\omega) = \frac{A_0 F_R^*(\omega_0+\Delta\omega) - A_1 F_R^*(\omega_0-\Delta\omega)}{A_0^2 - A_1^2}$$

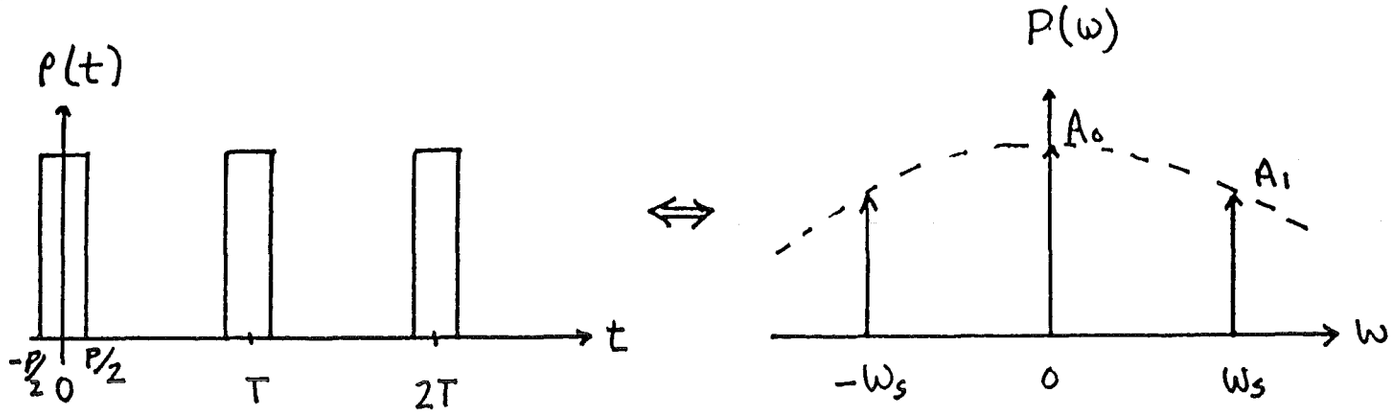
$$F_R(\omega_0-\Delta\omega) = \frac{A_0 F_R^*(\omega_0-\Delta\omega) - A_1 F_R^*(\omega_0+\Delta\omega)}{A_0^2 - A_1^2}$$

$$F_I(\omega_0+\Delta\omega) = \frac{A_0 F_I^*(\omega_0+\Delta\omega) + A_1 F_I^*(\omega_0-\Delta\omega)}{A_0^2 - A_1^2}$$

$$F_I(\omega_0-\Delta\omega) = \frac{A_0 F_I^*(\omega_0-\Delta\omega) + A_1 F_I(\omega_0+\Delta\omega)}{A_0^2 - A_1^2}$$

These equations are valid in the region, $\omega_c < \omega_s < 2\omega_c$ and can be used to reconstruct an aliased spectrum. Note that the denominator goes to zero for $A_o = A_1$ so that the equations can not be used with impulse sampling. The envelopes must be scaled to recover the information.

To illustrate the use of the reconstruction equations, an example was calculated. In this example $f(t) = te^{-t}u(t)$ was used as a test waveform. f(t) is bandlimited to approximately -40db @ f = 1.5Hz $f(t) = te^{-t}u(t)$ has a Fourier transform $F(\omega) = \frac{1}{(1 + j\omega)^2}$


p(t)
t
-P/2
0
P/2
T
2T
P(ω)
A0
A1
ω
-ωs
0
ωs

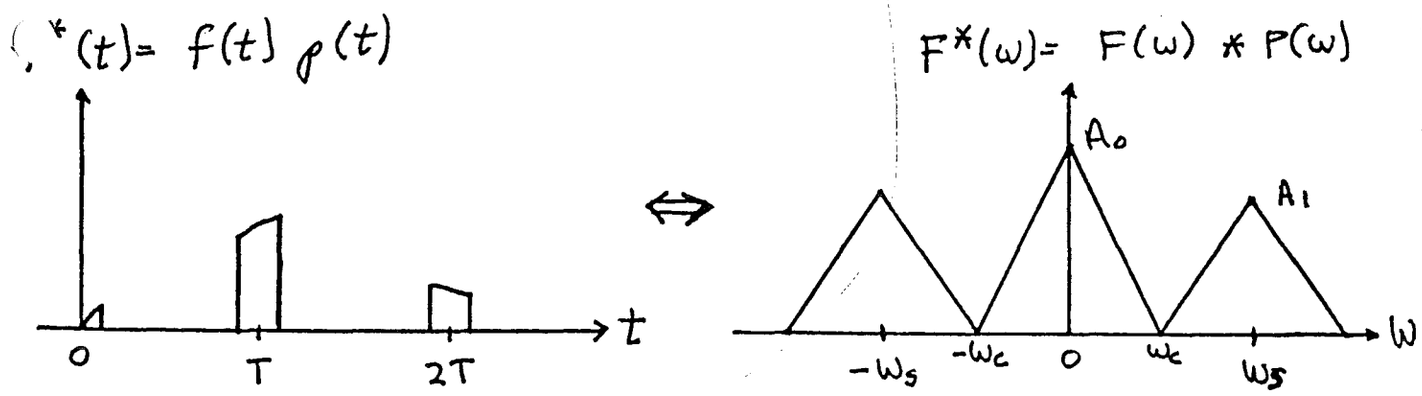

f*(t) = f(t) p(t)
t
0
T
2T
F*(ω) = F(ω) * P(ω)
A0
A1
ω
-ωs
-ωc
0
ωc
ωs

FIGURE 2.

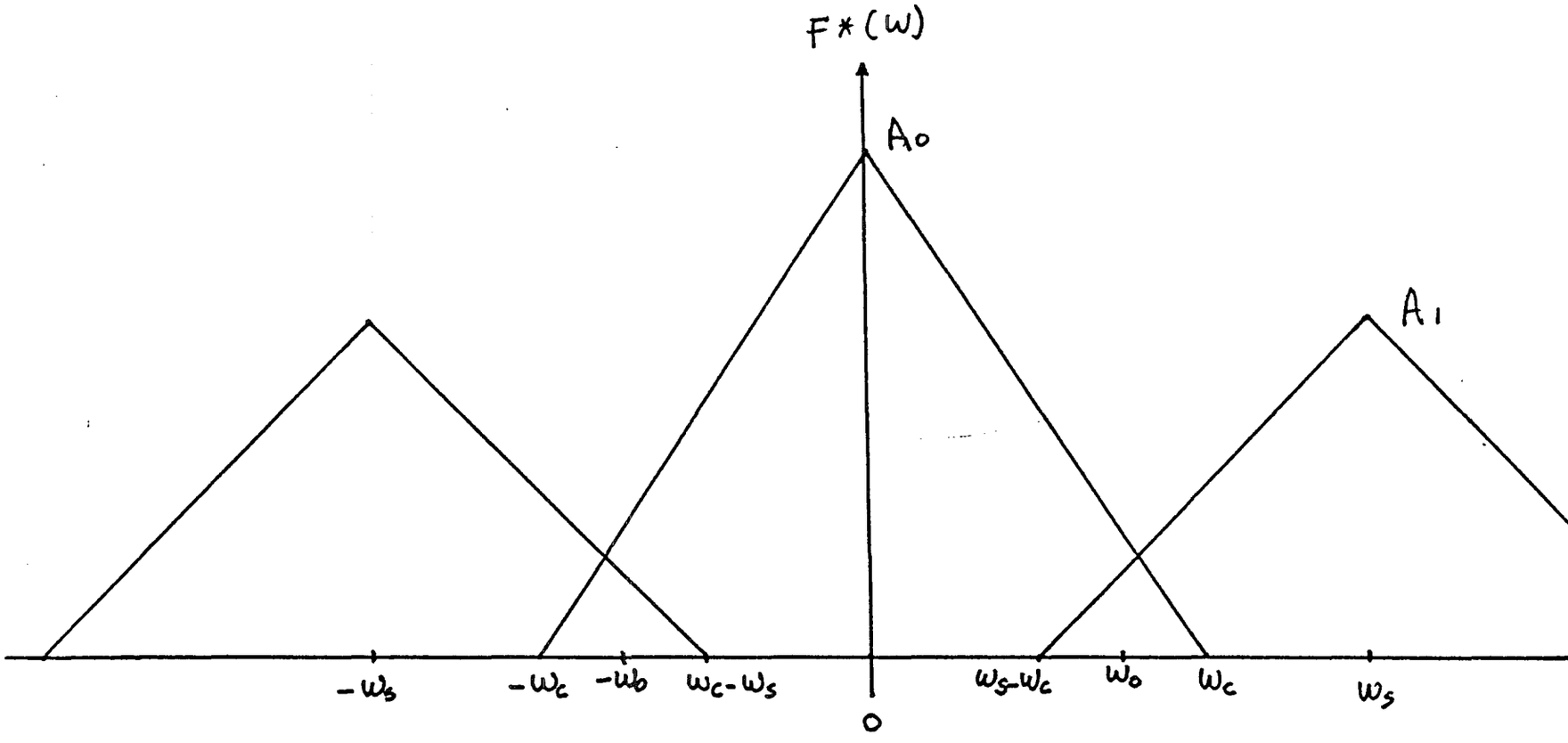


FIGURE 4.

FIG. 1 SHOWS A PULSE SAMPLED LOW PASS SPECTRUM SUCH THAT $W_c < W_s < 2W_c$. THE REGION OF OVERLAP IS DEFINED BY:

$$(W_s - W_c) < W < W_c$$

FIG'S 2, 3, 4 SHOW GATE FUNCTIONS THAT WILL BE REQUIRED IN THE FOLLOWING DEVELOPEMENT.

THE RECONSTRUCTION EQUATIONS VALID IN THE REGION $(W_s - W_c) < W < W_c$ ARE:

$$F_R(W_o+\Delta W) = \frac{A_o F_R^*(W_o+\Delta W) - A_1 F_R^*(W_o-\Delta W)}{A_o^2 - A_1^2} \qquad (1)$$

$$F_R(W_o-\Delta W) = \frac{A_o F_R^*(W_o-\Delta W) - A_1 F_R^*(W_o+\Delta W)}{A_o^2 - A_1^2} \qquad (2)$$

$$F_I(W_o+\Delta W) = \frac{A_o F_I^*(W_o+\Delta W) + A_1 F_I^*(W_o-\Delta W)}{A_o^2 - A_1^2} \qquad (3)$$

$$F_I(W_o-\Delta W) = \frac{A_o F_I^*(W_o-\Delta W) + A_1 F_I^*(W_o+\Delta W)}{A_o^2 - A_1^2} \qquad (4)$$

THE FIRST STEP IS TO RECAST THE RE-CONSTRUCTION EQUATIONS INTO A MORE USEABLE FORM.

BY MAKING THE SUBSTITUTION $\omega = \omega_0 + \Delta\omega$ EQN's 1 & 3 BECOME :

$$F_R(\omega) = \frac{A_0 F_R^*(\omega) - A_1 F_R^*(\omega_s - \omega)}{A_0^2 - A_1^2}$$

$$F_I(\omega) = \frac{A_0 F_I^*(\omega) + A_1 F_I^*(\omega_s - \omega)}{A_0^2 - A_1^2}$$

THE SUBSTITUTION $\omega = \omega_0 - \Delta\omega$ IN EQN's 2 & 4 LEADS TO:

$$F_R(\omega) = \frac{A_0 F_R^*(\omega) - A_1 F_R^*(\omega_s - \omega)}{A_0^2 - A_1^2}$$

$$F_I(\omega) = \frac{A_0 F_I^*(\omega) + A_1 F_I^*(\omega_s - \omega)}{A_0^2 - A_1^2}$$

NOTE THAT THESE SUBSTITUTIONS LEAD TO THE SAME SET OF EQUATIONS,

SO FAR WE HAVE :

$$F_R(\omega) = \frac{A_0 F_R^*(\omega) - A_1 F_R^*(\omega_S - \omega)}{A_0^2 - A_1^2} \qquad (\omega_S - \omega_c) < \omega < \omega_c$$

$$F_I(\omega) = \frac{A_0 F_I^*(\omega) + A_1 F_I^*(\omega_S - \omega)}{A_0^2 - A_1^2}$$

FORMING $F(\omega) = F_R(\omega) + j F_I(\omega)$ RESULTS IN :

$$F(\omega) = \frac{A_0 F_R^*(\omega) - A_1 F_R^*(\omega_S - \omega)}{A_0^2 - A_1^2} + j \frac{A_0 F_I^*(\omega) + A_1 F_I^*(\omega_S - \omega)}{A_0^2 - A_1^2}$$

$$F(\omega) = \frac{A_0}{A_0^2 - A_1^2} F_R^*(\omega) + j \frac{A_0}{A_0^2 - A_1^2} F_I^*(\omega) - \frac{A_1}{A_0^2 - A_1^2} F_R^*(\omega_S - \omega) + j \frac{A_1}{A_0^2 - A_1^2} F_I^*(\omega_S - \omega)$$

$$F(\omega) = \frac{A_0}{A_0^2 - A_1^2} \left[F_R^*(\omega) + j F_I^*(\omega) \right] - \frac{A_1}{A_0^2 - A_1^2} \left[F_R^*(\omega_S - \omega) - j F_I^*(\omega_S - \omega) \right]$$

$$F(\omega) = \frac{A_0}{A_0^2 - A_1^2} \left[F_R^*(\omega) + j F_I^*(\omega) \right] - \frac{A_1}{A_0^2 - A_1^2} \left[F_R^*(\omega - \omega_S) + j F_I^*(\omega - \omega_S) \right]$$

RECALL $F(-\omega) = \hat{F}(\omega)$ (CONJUGATE)

EQUATION 5 IS A REFORMULATION OF EQUATIONS 1-4; DEFINED OVER $(\omega_s-\omega_c)<\omega<\omega_c$. NOTE THAT $0<\omega<(\omega_s-\omega_c)$ IS UNALIASED AND THEREFORE REQUIRES NO RECONSTRUCTION. BY APPROPIATE USE OF THE GATE FUNCTIONS DEPICTED IN FIG 2-4 WE CAN DEFINE A FREQUENCY SPECTRUM FOR THE ENTIRE RANGE OF INTEREST. i.e. $0<\omega<\omega_c$. THIS SPECTRUM COMPLETELY DEFINES THE ORIGINAL UNSAMPLED SIGNAL, $f(t)$.

$$F(\omega)= G_1(\omega)F^*(\omega) + G_2(\omega-\omega_0)\left[\frac{A_0}{A_0^2-A_1^2}F^*(\omega)-\frac{A_1}{A_0^2-A_1^2}F^*(\omega-\omega_s)\right]$$

$$+ G_2(\omega+\omega_0)\left[\frac{A_0}{A_0^2-A_1^2}F^*(\omega)-\frac{A_1}{A_0^2-A_1^2}F^*(\omega+\omega_s)\right]$$

DEFINING $C_1 = \frac{A_0}{A_0^2-A_1^2}$, $C_2 = \frac{A_1}{A_0^2-A_1^2}$, & EXPANDING:

$$F(\omega) = G_1(\omega)F^*(\omega) + G_2(\omega-\omega_0)\,C_1F^*(\omega) - G_2(\omega-\omega_0)\,C_2F^*(\omega-\omega_s)$$
$$+ G_2(\omega+\omega_0)\,C_1F^*(\omega) - G_2(\omega+\omega_0)\,C_2F^*(\omega+\omega_s)$$

RECOMBINE TERMS:

$$F(\omega) = G_1(\omega)F^*(\omega) + \left[G_2(\omega-\omega_0)+G_2(\omega+\omega_0)\right]C_1F^*(\omega)$$
$$-G_2(\omega-\omega_0)\,C_2F^*(\omega-\omega_s)-G_2(\omega+\omega_0)\,C_2F^*(\omega+\omega_s)$$

SINCE MULTIPLICATION IN THE FREQUENCY DOMAIN CORRESPONDS TO CONVOLUTION IN THE TIME DOMAIN, WE CAN FIND $f(t)$. THE SYMBOL, $\circledast$, DENOTES CONVOLUTION.

$$f(t) = g_1(t) \circledast f^*(t) + \left[\left(e^{j\omega_0 t} + e^{-j\omega_0 t}\right) g_2(t)\right] \circledast \left[C_1 f^*(t)\right]$$

$$- \left[e^{j\omega_0 t} g_2(t)\right] \circledast \left[C_2 e^{j\omega_s t} f^*(t)\right] - \left[e^{-j\omega_0 t} g_2(t)\right] \circledast \left[C_2 e^{-j\omega_s t} f^*(t)\right]$$

USING : $2\cos\theta = e^{j\theta} + e^{-j\theta}$, GIVES :

$$f(t) = g_1(t) \circledast f^*(t) + 2\left[\cos(\omega_0 t) g_2(t)\right] \circledast \left[C_1 f^*(t)\right]$$

$$- \left[e^{j\omega_0 t} g_2(t)\right] \circledast \left[C_2 e^{j\omega_s t} f^*(t)\right] - \left[e^{-j\omega_0 t} g_2(t)\right] \circledast \left[C_2 e^{-j\omega_s t} f^*(t)\right]$$

NEXT, USE $e^{\pm j\theta} = \cos\theta \pm j \sin\theta$ TO EXPAND.

$$f(t) = g_1(t) \circledast f^*(t) + 2\left[\cos(\omega_0 t)\, g_2(t)\right] \circledast \left[C_1 f^*(t)\right]$$

$$- \left\{\left[\cos(\omega_0 t) + j \sin(\omega_0 t)\right] g_2(t)\right\} \circledast \left\{\left[\cos(\omega_s t) + j \sin(\omega_s t)\right] C_2 f^*(t)\right\}$$

$$- \left\{\left[\cos(\omega_0 t) - j \sin(\omega_0 t)\right] g_2(t)\right\} \circledast \left\{\left[\cos(\omega_s t) - j \sin(\omega_s t)\right] C_2 f^*(t)\right\}$$

USING THE DISTRIBUTIVE LAW OF CONVOLUTION.

$$f(t) = g_1(t) \circledast f^*(t) + 2\left[\cos(\omega_0 t) g_2(t)\right] \circledast \left[C_1 f^*(t)\right]$$

$$- \left[\cos(\omega_0 t) g_2(t)\right] \circledast \left[\cos(\omega_s t) C_2 f^*(t)\right] - \left[\cos(\omega_0 t) g_2(t)\right] \circledast \left[j\sin(\omega_s t) C_2 f^*(t)\right]$$

$$- \left[j\sin(\omega_0 t) g_2(t)\right] \circledast \left[\cos(\omega_s t) C_2 f^*(t)\right] - \left[j\sin(\omega_0 t) g_2(t)\right] \circledast \left[j\sin(\omega_s t) C_2 f^*(t)\right]$$

$$- \left[\cos(\omega_0 t) g_2(t)\right] \circledast \left[\cos(\omega_s t) C_2 f^*(t)\right] + \left[\cos(\omega_0 t) g_2(t)\right] \circledast \left[j\sin(\omega_s t) C_2 f^*(t)\right]$$

$$+ \left[j\sin(\omega_0 t) g_2(t)\right] \circledast \left[\cos(\omega_s t) C_2 f^*(t)\right] - \left[j\sin(\omega_0 t) g_2(t)\right] \circledast \left[j\sin(\omega_s t) C_2 f^*(t)\right]$$

$$f(t) = g_1(t) \circledast f^*(t) + 2\left[\cos(\omega_0 t) g_2(t)\right] \circledast \left[C_1 f^*(t)\right]$$

$$- 2\left[\cos(\omega_0 t) g_2(t)\right] \circledast \left[\cos(\omega_s t) C_2 f^*(t)\right]$$

$$- 2\left[j\sin(\omega_0 t) g_2(t)\right] \circledast \left[j\sin(\omega_s t) C_2 f^*(t)\right]$$

$$f(t) = g_1(t) \circledast f^*(t) + 2\left[\cos(\omega_0 t) g_2(t)\right] \circledast \left[C_1 f^*(t)\right]$$

$$- 2\left[\cos(\omega_0 t) g_2(t)\right] \circledast \left[\cos(\omega_s t)\, C_2 f^*(t)\right]$$

$$\omega_0 = \frac{\omega_s}{2} \qquad C_1 = \frac{A_0}{A_0^2 - A_1^2} \qquad C_2 = \frac{A_1}{A_0^2 - A_1^2}$$

$$f(t) = g_1(t) \circledast f^*(t) + 2\left[\cos\left(\tfrac{\omega_s}{2}t\right) g_2(t)\right] \circledast \left[\frac{A_0}{A_0^2 - A_1^2} f^*(t)\right]$$

$$-2\left[\cos\left(\tfrac{\omega_s}{2}t\right) g_2(t)\right] \circledast \left[\frac{A_1}{A_0^2 - A_1^2} \cos(\omega_s t) f^*(t)\right]$$

$$+2\left[\sin\left(\tfrac{\omega_s}{2}t\right) g_2(t)\right] \circledast \left[\frac{A_1}{A_0^2 - A_1^2} \sin(\omega_s t) f^*(t)\right]$$

$$f(t) = g_1(t) \circledast f^*(t)$$

$$+ 2\frac{A_0}{A_0^2 - A_1^2}\left[\cos\left(\tfrac{\omega_s}{2}t\right) g_2(t)\right] \circledast \left[f^*(t)\right]$$

$$- 2\frac{A_1}{A_0^2 - A_1^2}\left[\cos\left(\tfrac{\omega_s}{2}t\right) g_2(t)\right] \circledast \left[\cos(\omega_s t) f^*(t)\right]$$

$$+2\frac{A_1}{A_0^2 - A_1^2}\left[\sin\left(\tfrac{\omega_s}{2}t\right) g_2(t)\right] \circledast \left[\sin(\omega_s t) f^*(t)\right] \qquad (6).$$

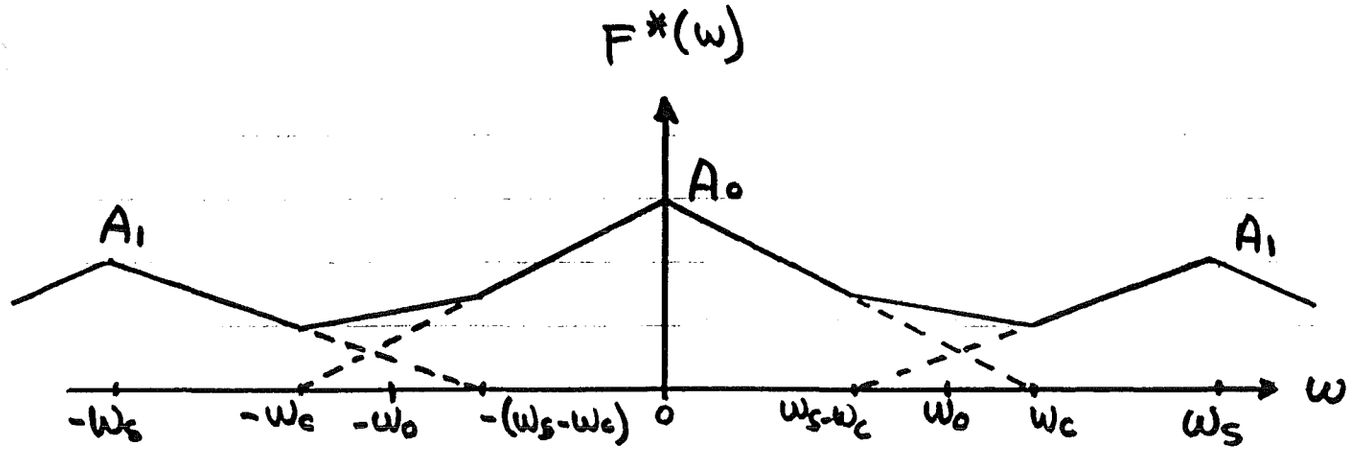


FIG. 1

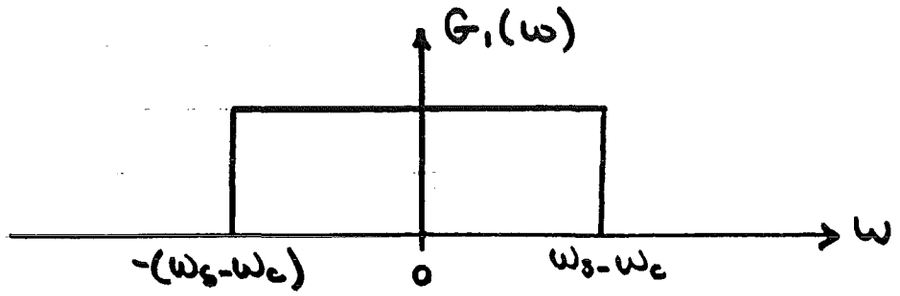


FIG. 2

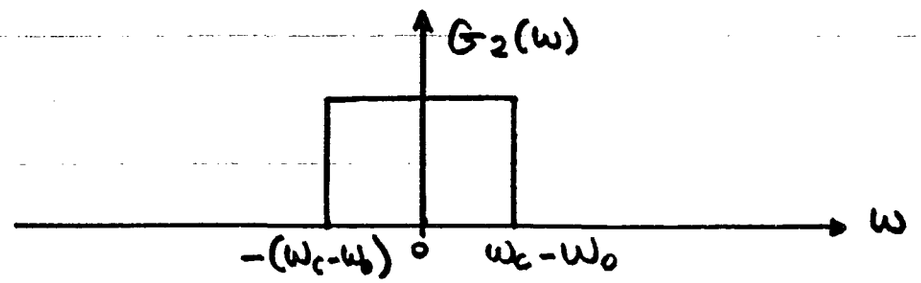
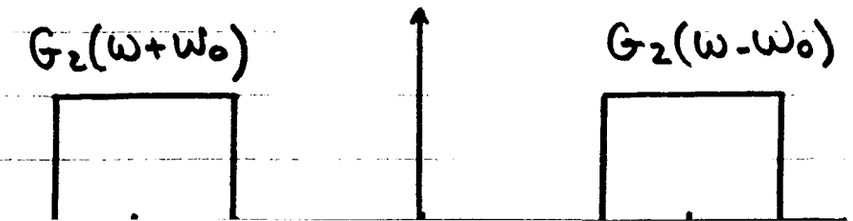


FIG. 3



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12/14/82

Dear Bob,

Thanks for the solution. It is very elegant. Unfortunately the bet was that I could not find a solution with area greater than $\pi/2 + 2/\pi$. Your student must have found the same solution that Bracewell did.

It is hard to see how to modify your approach to do any better. It may be that exceeding $\pi/2 + 2/\pi$ is impossible, and so Bracewell had a sure bet all along. Anyway, it has been fun trying.

Best regards
+ Merry Christmas
Jim Fienup

P.S. The calendar has one year left on it.
P.P.S. Hope you can make it to Lake Tahoe in January for the Signal Recovery meeting.

3 February 1983

Professor Robert J. Marks II
Department of Electrical Engineering
University of Washington
Seattle, Washington 98195

Professor Marks:

Thank you for your prompt response concerning this research and I wish you the best of luck in your continuing efforts. I am sorry that I do not have more time to devote to this problem, but that is life in the "real world".

Enclosed is the information you requested concerning the origins of my work. I very much appreciate your desire to reference me on this and would definitely enjoy hearing of any results you come up with. Feel free, of course, to use any of the information I sent you.

Again, good luck.

Sincerely yours,

Jim Schroeder

Jim Schroeder

attach

SAMPLING THEORY AND RECONSTRUCTION

OF ALIASED SPECTRAL COMPONENTS

Jim Schroeder

547:198 Masters Project June 1978
Completed under supervision of
Dr. Steve Collins
Dept. of Electrical & Computer Engr.

11/23/82

Dear Professor Marks,

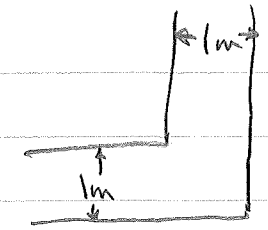
I SOLVED IT!

You gave this puzzle to our Fourier Optics class in winter of '81, and after working in industry (General Dynamics/Electronics Division) for 1½ years now, I finally had enough spare time one afternoon to get back to this.

Enjoy,

Sincerely
Jerry Jorgensen
c/o General Dynamics/Elect. Div
Mail Zone 7234-P
P.O. Box 85310
San Diego, Ca. 92138

P.S. Do I earn my brownie point?



Question: What is larges area of an object that can be slid around the corner?

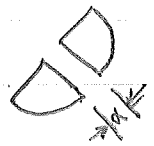
for example - a 1x1 square has area of 1 and will slide around the corner.

a ½ circle of radius 1 will rotate around the corner and has area $\frac{\pi}{2}$.

---

use a hybrid from a ½ circle;

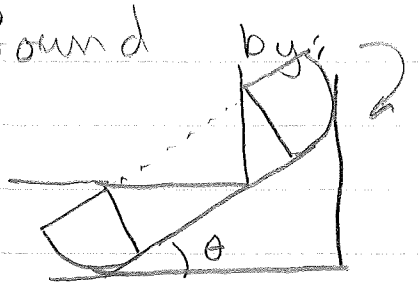
- split it in half again,
- separate the two halves by α,



- each ¼ circle can be rotated a full 90° in each "hall", so by connecting them by a bar, thus:

will not contradict the restrictions

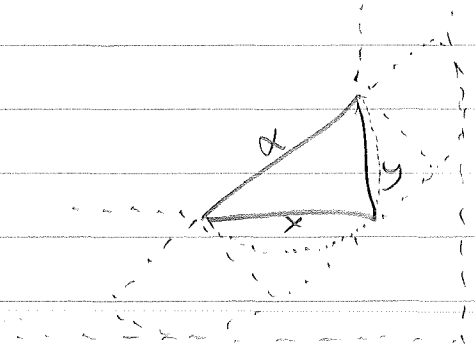
- the maximum separation α can be found by:



when $\theta = 45°$

or $\alpha_{max} = 4$

- the arc scribed by the inside corner of the hall on the plane of the object as it is rotated and translated around the corner is given by:

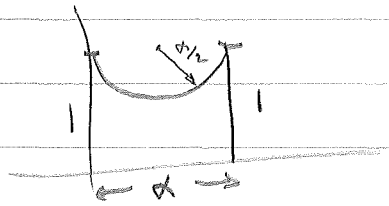


α : constant

$$x^2 + y^2 = \alpha^2$$

So the points x and y scribe a <u>circle</u>.

- the area bounded by the two 1/4 circles and the tangent between them with the arc described above is given by



$$1 \cdot \alpha - \frac{1}{2}\pi\left(\frac{\alpha}{2}\right)^2 = A$$

$$A = \alpha - \frac{\pi\alpha^2}{8}$$

- take the derivative with respect to α gives

$$\frac{dA}{d\alpha} = 1 - \frac{\pi}{4}\alpha \qquad \text{set} = 0 \Rightarrow \alpha = \frac{4}{\pi}$$

- this yields an area of

$$A\left(\frac{4}{\pi}\right) = \frac{4}{\pi} - \frac{\pi}{8}\left(\frac{4}{\pi}\right)^2 = \frac{4}{\pi} - \frac{2}{\pi} = \boxed{\frac{2}{\pi}}$$

- So the maximum area given by this particular configuration is $\frac{\pi}{2} + \frac{2}{\pi}$

↑ from $\frac{1}{4}$ circles

from separation piece.

- however, this is not a proof, so there might be some rigorous way of showing what the maximum area will be without describing the object itself. Since the answer was given as $\frac{\pi}{2} + \frac{2}{\pi}$, I'm confident I'd get full credit on an engineering exam, but only partial credit on a mathematician's exam.

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Electrical Engineering FT-10
Telephone: (206) 543-2150

January 5, 1982

Mr. Jerry Jorgensen
c/o General Dynamics/Elect. Div.
Mail Zone 7234-P
P.O. Box 85310
San Diego, CA 92138

Dear Jerry:

Greetings!

I have good news and bad. The bad news is that the original "piano movers" question was misunderstood by me. The bet was for finding an area greater than $\frac{\pi}{2} + \frac{2}{\pi}$ that could be moved around the corner (sigh).

The good news is that your answer was considered "eloquent." As a consolation prize, I have been asked to forward you the enclosed nifty half used calendar. I am sure you will enjoy it.

Your solution was indeed eloquent. Congratulations!

Best personal regards,

Bob/Jr

Robert J. Marks, II
Associate Professor

RJM:jjn

Enclosure

Professor Bjorkstam
associated Dean of Academic Affairs
College of Engineering
University of Washington

July 29,1982

Dear Professor:

Recently, you approved a rescheduling of the final exam for all of EE312 sections. In accordance with university procedures, I believe this rescheduled exam is inappropriate. Procedures' state that there must be a good reason for the rescheduling and that the instructor must guarantee that there will be no adverse effects to the students involved. The final is being rescheduled because it is convenient for the two teaching assistants. These teaching assistants have not even told all of the students involved about the rescheduling of this exam, so how can you be sure there will be no adverse effects to the students?

The teaching assistants involved have been notified. In fact it was because of my inquiry into this matter that led to the instructor to seek your approval for the rescheduling. I believe it was improper for you to approve this rescheduling for the above reasons. If convenience to the instructors is a good reason for the rescheduling, what about any inconvenience to the students?

Sincerely,

Henry Leal

Henry Leal
student, Department of Electrical Engineering
Phone # 634-3625

Professor Marks
Department of Electrical Engineering
University of Washignton

29 July, 1982

Dear Professor:

This letter is to address certain facts pertaining the rescheduling of the final exam for EE312 ZR. I was yold this week that the final exam would probably be held Friday (Aug 20) or Saturday (Aur21). The last scheduled meeting of our class is Tuesday Aug 17; and the summer schedule states final exams will ordinarily be given during the last class meeting. Due to these facts and because we were not told until the sixth week of this nine week quarter, I felt this change to be improper.

I therefore discussed these points with the teaching assistant for our class. I told him of a personal consideration I had and that Friday might cause some adverse effects for me. It was then determined that this matter be brought to your attention.

I then discussed this matter with you. We discussed my problem with Friday and the fact that rescheduling the exam required approval from the Dean of the college. You offered an individual solution for my problem (which I appreciate) and subsequently got approval to reschedule the exam. In fairness to all concern, I have decided to take the exam with the other students in my EE 312 section. Our exam is scheduled for Tuesday Aug 17 at 2:30. As per university policy, that can not be changed until a written application is made and approved. When this written application is approved and a copy is posted on the EE bulletin board, I will accept university procedures and take the exam when scheduled.

In all fairness, I want to add that university procedures require a good reason for the rescheduling of a final exam and that certain guarantees must be made by you to the Dean. I believe university policy has been violated during this matter; and I am pursuing this matter to the Dean of the College of Engineering.

It may appear that I am trying to be unreasonable in this matter, but I have tried very hard to be fair. I feel you are rescheduling this exam for the convenience of making the grading easier for the teaching assistants; and are ignoring any effects it may have on the students. I am not taking any of this action because of any ill-feelings I have for you. On the contrary, I have respect for you and your work. However, in regards to this matter, I am taking action that I feel must be taken. Please don't take any offense by my actions. You are a good professor.

I request that you reevaluate the facts pertaining to this issue and consider giving the exam as originally scheduled.

Sincerely,

Henry Leal

Henry Leal
Student, Department of Electrical Engineering
Phone # 634-3625

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING FT-10

TO: Robert J. Marks, II

FROM: Andrew Hammoude
Kwan Cheung

DATE: August 30, 1982

SUBJECT: EE 312 Laboratory

Several students went to the trouble to include comments and suggestions as part of their formal laboratory reports, which we would like to pass on to the EE 312 laboratory supervisor. Among the most frequent comments were:

1) 2 credits is insufficient for the amount of work involved in this course, and many students thought 3 would be more appropriate.

2) The syllabus is in acute need of a re-write. There are frequent spelling and notational errors throughout the syllabus, and the fact that these have survived several re-printings is somewhat discreditable. More important, the text is occasionally ambiguous or misleading and could be clarified in a number of places.

3) Some of the equipment in the lab is unreliable, and in need of replacement or maintenance.

We endorse all of the above comments.

We understand that time and budgetary constraints may make it impractical to remedy these problems, and we write simple to pass on the students' comments.

Yours sincerely,

Andrew Hammoude

Andrew Hammoude
EE 312 Teaching Assistant

Cheung kwan Jai

Kwan Cheung
EE 312 Teaching Assistant

AH:jjn

University of Washington Correspondence

INTERDEPARTMENTAL

11 August 1982

To: Professor Robert J. Marks
Electrical Engineering FT-10

From: John L. Bjorkstam, Associate Dean
College of Engineering FH-10

John L. Bjorkstam

Subject: Rescheduling of Spring Quarter EE 312 Final Exams

I herewith give approval for your request to reschedule all Spring Quarter '82, EE 312 laboratory final exams for 3:30 p.m., Friday, August 20th. It is my understanding that students in all the EE 312 laboratory sections have been notified of this change and informed that any evidence of "undue adverse impact on the student" could be brought to my attention. I have received no input to that effect.

One student has complained about procedures. While I understand the advantage of giving one exam to students in all sections in order to have a common basis for grading, I would urge that henceforth all sections be informed at the beginning of the quarter with respect to final examination scheduling.

JLB:md
cc: Steven G. Olswang, AH-20

University of Washington Correspondence

INTERDEPARTMENTAL

DEPARTMENT OF ELECTRICAL ENGINEERING FT-10

DATE: August 16, 1982

TO: Professor Dan Dow
New EE 312 Lab Supervisor

FROM: Bob Marks, Old EE 312 Lab Supervisor

SUBJECT: Scheduling of EE 312 Final Examinations

For the last few years, the EE 312 lab final has been given to all sections at the same time. There are two basic reasons for this:

1. A common final provides an equivalent data base from which all students' grades are determined. This reduces the variance in grades from section to section.

2. A reduction in time commitment for the T.A.'s. If a common final were not given, a separate final must be given for each section. Indeed, there have been complaints made by T.A.'s to the Associate Chairman that the workload imposed by the lab is excessive. The common final obviously helps lighten the load.

Until this (summer) quarter, the rescheduling of the final was done informally. Officially, however, changing the time of a final requires the approval of the Dean. A single complaint this quarter prompted official action. As a result of the incident, the following recommendations are made:

1. Announcement of the finals time change should be made as early in the quarter as possible. The approximately four week notice given to the students this summer was not considered sufficient. As a result of the official complaint, Dean Bjorkstam requested also that each student be informed that any evidence of "undue adverse impact on the student" should be brought to his attention. Delay in a student's completion of the quarter was not considered a valid complaint as long as completion was still within the quarter.

2. The EE 312 lab text states in the introduction that "the final exam may be given at the last class meeting." At the earliest time possible this sentence should be appropriately revised. The (unrevised) texts for next quarter have already been ordered.

BM/dkm

cc: John Bjorkstam, Assoc. Dean
Jim Meditch, Chairman
and
A. Hammoude and K. Cheuns, Summer 312 lab T.A.'s

Rochester Institute of Technology

Department of Electrical Engineering

One Lomb Memorial Drive
P.O. Box 9887
Rochester, New York 14623
716-475-2165

13 may 1982

Dear Prof. Marks,

Thank you for your nice letter. I guess it is in anticipation for letters like this, that makes an author write a paper.

You are correct. There is a typo. The top right-hand element is correct. The bottom left hand corner should read 50.49425.

If you are interested in the stability of variational methods and also on the discussion of the various equations used to analyze wire antennas, you may wish to contact Prof Ishimaru of your department. He is the editor of Radio Science. We have presently two papers on this subject under review. If you are interested in this area, I would definitely like to get your comments.

Sincerely yours,

Tapan K. Sarkar

Personal Data Sheet

Name: Li, Wan-Hao
Applying for: Ph.D. Program in Computer Engineering
Expected Entrance Date: Fall, 1982
Present Status: Graduate student at Lamar University
Expecting to get M.S. degree in August, 1982.
Graduated from: National Taiwan University
Undergraduate Major: E.E.(in Computer Engineering)
Undergraduate Major Courses taken:

1. Introduction to Computing
2. Computer Programming and Practice(FORTRAN)
3. Programming Language (Assembly)
4. Switching Circuit and Logic Design
5. Data Structure
6. Computer Organization
7. Computer Technology
8. Sequential Machine
9. Principles of Communication System
10. Engineering Mathematics 3 (Probability Theory)
11. Statistics
12. Control System

Graduate Major Courses(Have taken or is taking)

1. Digital Hardware Design
2. Information Theory
3. Control Theory
4. Computer Graphics and Computer Aided Design
5. Instrumentation
5. Design of Experiment
7. Microcomputer Based Design

Familiar small computer systems: Intel 8080 8085 systems
Motorola 6800, 68000 systems
PDP-11 minicomputer system
TI TM 990, 9900 systems

Familiar Computer Languages: PASCAL
FORTRAN
BASIC
ASSEMBLY

TOEFL Score: 577

GRE Score:	Verbal	Quantitative	Analytical	Totall
	420	780	660	1860

Research Experience: 2 years in 202 Arsenal, Taiwan
1 year in Electronics Industry
Now am Research Assistant at Lamar University

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BASIC
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Research Experience: 2 years in 202 Arsenal, Taiwan
1 year in Electronics Industry
Now am Research Assistant at Lamar University

Li, Wan-Hao
P.O. Box 10493
Beaumont, TX 77710

May 16, 1982

Dr. Robert J. II Marks
Department of Electrical Engineering
University of Washington

Dear Dr. Marks:

I take the liberty to introduce myself. My name is Wan-Hao Li. I have been accpted into the Graduate Program in Electrical Engineering which will start from Autum, 1982.

Now I am looking for an advisor to help me to progress in my chosen field. My major interest is in Image Processing and Digital Signal Processing. Among the Graduate Faculty, I believe that you are one of the major researchers in this field . Your research achivement in this field is also greatly admired.

As your published papers are abundent in recent years. I assume that you may need some Ph.D. students to work for you. If that is the case, I will be delighted to be one of them. To work with you and learn from you will be my most pleasure.

Enclosed is my Personal Data Sheet. I hope that you will be interested in it. And wish that I could hear from you in the near future. Your kind attention will be highly appreciated.

Sincerely Yours

Wan-Hao Li

Wan-Hao Li

GSRF-2
7/23/81

UNIVERSITY OF WASHINGTON
Graduate School Research Fund

Request for Honorarium

A. The information requested in this form must be typed.
B. Submit original and two copies to Dianne Zimmer, The Graduate School AG-10.
C. A copy of your form will be returned when the honorarium request has been approved.
D. Allow four weeks for preparation and delivery of honorarium check.
E. The check will be mailed to the requesting faculty member.

Requested by:
(Faculty Member) Robert J. Marks II Date: 4-20-82

Department: Electrical Engineering Mail Stop: FT-10

Departmental contact: Mary I. Gray Phone: 3-1845

1. Consultant: W. Thomas Cathey Title: Professor
2. Complete mailing Address/Affiliation: University of Colorado
Department of Electrical Engineering
Denver, Colorado
3. Social Security Number: 282-48-2721 (SS#, if applicable, must be submitted in order to process request.)
4. Date(s) of Seminar/Wkshop: 4-23-82 (Month, day(s), & year)
5. Amount Requested: $ 50.00 (Maximum of $150 per day not to exceed three days.)
NOTE: the consultant must give at least one seminar for each day of reimbursement.
6. Title(s) of Seminar(s): 1) Optical Matrix Inversion Techniques
2)
3)
7. Approximate attendance or contact: 15 faculty and/or 25 grad. students.
8. Short summary of Consultant's achievements, honors, and special qualifications:
NO ATTACHMENTS... NO VITAE SHEETS...
Author of widely used text: Optical Information Processing and Holography,
Fellow of the Optical Society of America

Signature of requesting faculty member (required): Robert J. Marks II

Chairperson, Director or Dean's Signature (required): James S. Meditch
(of Unit to which allocation was made)
Printed name of Chairperson, Director or Dean (of above): James S. Meditch

APPROVED: _____ Date: _____
Grad. School Representative