FRONTIERS OF COMPUTERS IN MEDICINE 1982

edited by
Michael Negin

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Proceedings — Fourth Annual Conference

IEEE Engineering in Medicine and Biology Society

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Michael Negin

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About the Cover

The picture on the cover shows the positron emission tomograph, "Super PETT," developed at the Edward Mallinckrodt Institute of Radiology at Washington University, St. Louis. The device is used for whole body studies and incorporates photon time-of-flight information in the image reconstruction process. Mr. Herb Weitman of Washington University was the photographer.

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Message from the President of the IEEE Engineering in Medicine and Biology Society

These national and international conferences are the highlight of our activities as a technical and professional society of the IEEE. This is our fourth conference year, and we hope it will contribute to the continuing emergence of engineers in health care delivery. As the organizer and sponsor of this conference, we have made every possible effort to have it serve as a focal point for the latest developments involving technology in health care. Members of our Society including those within the administrative committee (AdCom) have planned for the past year to bring together the relevant research efforts, the clinical developments, and the industrial applications. Key people have been invited to organize the sessions and workshops. Many invited papers have been included to ensure the proper balance in the sessions. Tutorials and workshops have been included as part of the regular conference program. The full conference papers are published in these Conference Proceedings, and the abstracts of each paper were published in the August issue of our *IEEE Transactions on Biomedical Engineering*.

It is a gratifying moment to see our EMBS Society meet and work together at our own annual conference. May I welcome you to our conference, and I hope that your interaction with the other participants will lead to a more effective communication for our Society.

I would like to express my gratitude to those who have labored to plan and organize the conference; and, in particular, to Al Potvin, Ph.D. for being the program chairman for Frontiers of Engineering in Health Care and Michael Negin, Ph.D. for being the program chairman for Frontiers of Computers in Medicine (COMPMED 82).

Lee Ostrander, Ph.D.
President, EMBS

The IEEE Engineering in Medicine and Biology Society

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Alliance for Engineering in Medicine and Biology
Drexel University
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Philadelphia Convention and Visitors Bureau

Preface

Where are the Frontiers of Computers in Medicine? . . . The philosophy behind the Computed Axial Tomography scanning methodology introduced several years ago provides the answer better than any long message or drawn out thesis: . . . use computers to accomplish tasks that cannot be done in any other way; use computers to obtain information not otherwise obtainable; use computers to provide services not otherwise available.

The tutorials, scientific papers, and workshops will illustrate these points. Many of the papers in COMPMED 82 are focused toward delivery of a product now, as opposed to offering a promise for the future. Most of these "now"-oriented papers illustrate the use of computers to process data or medical information in new, immediately practical ways. The creativity that is applied to the modern devices available off-the-shelf is impressive. Other papers are speculative of future applications but with speculation based on solid investigatory work. The themes of these papers will appear in future COMPMED meetings, but with more complete answers to the questions posed. As you review the papers, reflect on the past few years' developments, and I believe that you'll be impressed by these recent advances.

Tomorrow is a topic that is most safely discussed retrospectively, but allow me to speculate at my own risk. The obvious advances that will affect Computers in Medicine are smaller, faster, cheaper processors and memories. Not so obvious are new operating system architectures, languages, processing methodologies, and communications techniques that will be applied to or invented for medical applications. New devices designed and fabricated *de novo* using VLSI technology will be introduced so that functions currently impossible (at finite cost) will become commonplace. The impact of floating-point and high-speed multiplier chips illustrates this. One of the papers presents a pacemaker design with VLSI; why not VLSI QRS detector devices, or arrhythmia detectors, or signal averagers? These new devices will change our way of thinking about computer applications.

I hope that you enjoy the COMPMED 82 Conference and the Proceedings as much as I have in assembling the program and documents. One of the rewards of this activity is learning from the wealth of new materials I've read and reviewed in selecting papers for presentation. The other reward will come from knowing that the participants and attendees have been exposed to new, exciting developments, and that they have left the Conference better informed and with some new perspective of the current Frontiers of Computers in Medicine.

Michael Negin, Ph.D.
Program Chairman

IEEE Engineering in Medicine and Biology Society

The Engineering in Medicine and Biology Society (EMBS) of the Institute of Electrical and Electronics Engineers (IEEE) is an association of 8,000 members who utilize engineering science and methodology to understand, define, and solve problems in biology, medicine, and health care delivery systems. EMBS is a Society within the umbrella framework of the IEEE, offering identification with the world's largest professional engineering organization of 230,000 members. Activities of the IEEE/EMBS include:

Publications—*The IEEE Transactions on Biomedical Engineering* is a monthly publication of reviewed articles reporting original research and application and development, short communications to disclose new ideas, and tutorials and reviews. *The Engineering in Medicine and Biology Magazine is published quarterly* and contains news and events of current interest to biomedical engineering professionals. The *IEEE Transactions on Medical Imaging* is a quarterly publication of reviewed articles cosponsored by EMBS and 3 other IEEE societies.

Conferences—Conference Proceedings are widely distributed and indexed through IEEE and may be purchased at member's prices from IEEE. The Society also cosponsors and/or cooperates in other national and regional biomedical conferences.

Technical and Professional Committees—EMBS Committees organize conference sessions, workshops and special activities on behalf of the Society. Technical Committees include: bioelectric phenomena, clinical engineering, medical instrumentation, prosthetic and sensory aids, signal processing and information handling, transducers and devices, and biomaterials. Professional Committees include: awards, biomedical coordination, education, ethics, membership, professional activities, publications, standards, government affairs, and industrial relations. In addition, EMBS participates, through appointed delegates, in other national bodies such as ANSI and NFPA as well as in broad-based IEEE Technical Committees addressing such issues as energy, ocean engineering, environmental quality, man and radiation, and social implications of technology.

Regional Councils and Chapters—Society members have the opportunity to exchange technical and professional information with colleagues in the same geographic area through meetings and activities of 7 EMBS Regional Councils and 33 Chapters. Membership in these geographically organized subdivisions is an automatic component of Society Membership.

Membership in IEEE/EMBS is open to all qualified persons in grades designated student, senior member, fellow, and affiliate. Biomedical professionals who wish to join EMBS but not join the IEEE umbrella organization may do so as affiliate members of EMBS. Affiliate members are accorded the opportunity to participate in all EMBS programs and activities as planned and administered by the EMBS elected Administrative Committee (AdCom).

Fourth Annual Conference
IEEE Engineering in Medicine and Biology Society

Frontiers of Computers in Medicine (COMPMED 82)

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Technical Program Matrix

Fourth Annual Conference of the IEEE Engineering in Medicine and Biology Society

FRONTIERS OF ENGINEERING IN HEALTH CARE

	TIME	BRANDYWINE A AND B	COMMONWEALTH H	COMMONWEALTH K	COMMONWEALTH L	COMMONWEALTH J
MONDAY	0830-1130	1 CLINICAL ENGINEERING MD Schwartz	2 EVOKED POTENTIALS AM Sherwood, BA Cohen, DG Childers	3 ARTIFICIAL HEARTS/ HEART ASST DEVICES D Jaron	4 MICROCOMPUTER APPLICATIONS IN MED WJ Tompkins	5 CARDIOVASCULAR DIAGNOSIS W Welkowitz
	1300-1630	6 ARRHYTHMIA MONITORING NV Thakor, RG Mark		7 CARDIOVASCULAR SYSTEM DYNAMICS WW von Maltzahn	8 MEDICAL INSTRUMENTATION KC Mylrea	9 ARTIFICIAL TACTILE COMMUNICATNS AYJ Szeto
	1630-1800	W1 BME EDUCATION DIRECTORS GRP PG Katona	W2 ARRHYTHMIA MONITORING NV Thakor			
	1900-2200	W3 CLINICAL ENGINEERING CAREERS WB Jarzembski	W4 GENERATION OF TUTORIAL BOOKS MD Schwartz	W5 EMBS PUBLICATIONS AM Hahn, TC Pilkington	W6 MICROPROCESSOR-BASED INSTRMNTN WJ Tompkins	W7 ASEE-BED WORKSHOP JD Bronzino, RJ Jendrucko
TUESDAY	0800-1200	10 COMPUTERS IN CLIN RESEARCH NH McAlister	11 BIOELECTRIC PHENOMENA RL Lux	12 MODELLING & CNTRL OF PHYSIOL SYSTS AJ Koivo	13 ELECTRODES JG Webster	14 MEDICAL IMAGING BN Feinberg, J Reid
	1300-1500	15 FUTURE DIRECTIONS OF CLINICAL ENG'G JD Bronzino	16 BIOMEDICAL TELEMETRY DC Jeutter		W8 ELECTRODES JG Webster	
	1530-1900	PLENARY SESSION (BUSINESS MEETING, AWARDS PRESENTATION, KEYNOTE ADDRESS, RECEPTION) — COMMONWEALTH H AND J Chair: LE Ostrander, President EMBS				

FRONTIERS OF COMPUTERS IN MEDICINE (COMPMED 82)

	TIME	BRANDYWINE A	BRANDYWINE B	BRANDYWINE C
WEDESDAY	0815-0930	T1 ROBOTICS IN MEDICINE DR Myers		
	0930-1030	T2A MEDICAL IMAGE PROCESSING OJ Tretiak		T2B NETWORKS AND OPERATING SYSTEMS EM Kwatny
	1030-1130	T3A ULTRASONICS RC Waag		T3B INTENSIVE CARE PS LaFollette, Jr
	1130-1230	T4A INSTRUMENTATION WJ Tompkins		T4B MEDICAL EDUCATION KW Scholz
	1330-1425	1 ANALYSIS OF VENTRICULAR FUNCTION WP Santamore	2 REAL TIME CONTROL, COLLECTION, AND PROCESSING BY MICROCOMPUTER RS Moberg	3 IMAGE PROCESSING OJ Tretiak
	1425-1505			4 SPECIAL SYSTEM DEVELOPMENTS EM Kwatny
	1520-1645			5 INFORMATION HANDLING SM Dunn
	1900-2200	W1 PROGRAMMING LANGUAGES SM Dunn	W2 REAL TIME PATTERN RECOGNITION JE Roehl	

W denotes Workshop; T denotes Tutorial.

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