

OPTIMIZATION OF COMPUTER ECG PROCESSING

edited by
h. k. wolf & p. w. macfarlane

OPTIMIZATION OF COMPUTER ECG PROCESSING

Proceedings of the IFIP TC 4 Working Conference on
Optimization of Computer ECG Processing

edited by

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1980

NORTH-HOLLAND PUBLISHING COMPANY
AMSTERDAM • NEW YORK • OXFORD

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ISBN: 0 444 85413 4

Published by:

NORTH-HOLLAND PUBLISHING COMPANY—AMSTERDAM • NEW YORK • OXFORD

Sole distributors for the U.S.A. and Canada:

ELSEVIER NORTH-HOLLAND, INC.

52 Vanderbilt Avenue

New York, N.Y. 10017

Library of Congress Cataloging in Publication Data

IFIP TC 4 Working Conference on Optimization of Computer
ECG Processing, Halifax, N. S., 1979.
Optimization of computer ECG processing.

Includes indexes.

1. Electrocardiography--Data processing--Congresses.

I. Macfarlane, Peter W. II. Wolf, Hermann K.

III. Title.

RC683.5.E5I217 1979 616.1'2'0754 79-26424

ISBN 0-444-85413-4

PRINTED IN THE NETHERLANDS

IFIP Working Conference on
Optimization of Computer ECG Processing
Halifax, Nova Scotia, Canada, June 5-7, 1979

organized by
IFIP Technical Committee 4,
Information Processing in Health Care and Biomedical Research
International Federation for Information Processing

Program Committee
J. van Bemmelen (Chairman), Chr. Zywiets (Co-Chairman),
H. V. Pipberger, R. Leblanc, M. Ikajima, J. Michaelis



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PREFACE

This book presents the proceedings of an International IFIP TC4 Working Conference on computer-assisted electrocardiography. Previous meetings were held in Hannover in 1971 and Amsterdam in 1976. This meeting focused on the "optimization" of software and hardware used in computer ECG processing; consequently, proceedings from previous meetings will complement this volume. Rapid advances in technology and, in particular, the advent of the microprocessor have had profound implications in the field of computerized ECG interpretation and are reflected in these papers. The principal topics discussed were:

- a) Data acquisition, including selection of lead systems; utilization of microprocessor technology; digital recording techniques.
- b) data reduction strategies for archival storage and digital transmission.
- c) Extraction of wave form features and parameters for clinical classification.
- d) classification strategies, including statistical methods, fuzzy set theory and linguistic concepts.
- e) systems optimization, including organizational, economical and technical concepts.

Leading experts from Europe, North America and Japan participated in the Conference. Problems of mutual concern were discussed and it was apparent that similar difficulties were encountered in each country, regardless of its particular type of health care system.

Most of the presentations and discussions dealt with problems at the leading edge of the field and this book should, therefore, be of particular interest to those involved in research or development of computer processing of ECGs or related areas of medical computing.

Since the format of a working conference emphasizes discussions in favour of formal presentations, the editors considered it important to include in the proceedings as much of the discussion as possible. It is hoped that the transcription of extemporaneous discussion contributions has, in the final editing process, retained the points of value to the majority of the readers.

The editors are grateful to those discussion participants who reviewed transcripts of their contributions within hours of the sessions to facilitate speedy publication. A number of papers have been extensively revised to improve clarity. The editors have not refereed the papers for scientific content in the usual way and are therefore not always in agreement with the statements made by the authors.

Our one regret is that our own participation in the working discussions was curtailed by our editorial duties.

We are most grateful to our colleagues and co-workers at Dalhousie University who patiently helped in the preparation of the manuscript.

The editors

Peter W. Macfarlane Hermann K. Wolf

ACKNOWLEDGEMENT

IFIP TC4 Working Conference and associated Satellite Symposium on Optimal Use of ECG Processing Systems in Clinical Trials and Epidemiological Studies was made possible through contributions by:

HEALTH ORGANIZATIONS AND FOUNDATIONS

Canadian Heart Foundation

Faculty of Medicine, Dalhousie University

International Federation For Information Processing

Japan Heart Foundation

New Brunswick Heart Foundation

Nova Scotia Heart Foundation

INDUSTRY

Astra Chemicals Ltd.

Ciba-Geigy Canada Ltd.

Electronics for Medicine

Honeywell Ltd.

International Business Machines Corporation

Marquette Electronics, Inc.

Parke, Davis & Co. Ltd.

Roche Medical Electronics, Inc.

Siemens-Elema

Smith Kline & French Canada Ltd.

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PART I

Working Group 4.3 Report

PART I

Working Group 4.3 Report

IFIP TC-4 (IMIA) WORKING GROUP 3
(Guidelines for testing and validating ECG-analysis programs)

BACKGROUND AND INTERIM REPORT

At the IFIP Hannover Conference in 1971, the participants recognized the need for systems evaluation and close cooperation in the field of ECG processing. Thereafter, activities for standardization and collection of validated ECG data were initialized on national bases.

During several national and international conferences, i.e. the 1972 conference in Halifax and the 1973 conference in Turku, it was suggested to seek sponsorship of an international organization for such a cooperative effort. Because of the close connection of IFIP TC-4 to WHO and the resemblance in the basic aims, IFIP TC-4 was chosen and in October 1974, in Toronto, the IFIP general assembly accepted the establishment of the Working Group 4.3.

Several meetings held independently or in connection with other congresses have discussed common problems of computer ECG processing. A monograph entitled "Procedures and Recommendations for Standardized Computer Electrocardiography" has been prepared. It is intended as a reference for system designers and users of computerized ECG analysis.

The purpose of monograph is:

- to identify problem areas in instrumentation, electrocardiographic methods, ECG analysis programs and system evaluation,
- to present up to date standards and recommendations for equipment and methods used in electrocardiography,
- to stimulate the further specification of necessary definitions and standards, especially in measurement and diagnosis,
- to promote the exchange of electrocardiographic data for system evaluation and further development of computerized ECG analysis systems,
- to provide user protection by establishment of minimum performance guidelines and by encouragement of manufacturers, to produce in accordance with these guidelines.

The content of the monograph is organized according to system components: data acquisition, ECG analysis, system evaluation, and ECG-data base.

Each chapter consists of:

- a) an introductory comment on the subject together with identification of problem area,
- b) a bibliography with key papers which could be used as a basis for more detailed studies,
- c) references to established standards, recommendations and proposals,
- d) examples of protocols for collection of clinical data for validated electrocardiograms.

The establishment of a data base for testing of ECG signal processing and the development of standards for ECG measurements are now the subject of EEC concerted action projects. Both are directed by Dr. J.L. Willems, Leuven, Belgium (see also these Proceedings).

For the monograph, special position papers on

- (1) Selection and Implementation of a Lead System
- (2) Methodological Aspects of ECG/VCG Program Evaluation
- (3) The Diagnostic-Interpretative Process in the Automated Analysis of Electrocardiograms and Collection of Validated ECGs

have been contributed by (1) H. Ritsema van Eck, Rotterdam; (2) J.L. Willems, Leuven, Ph. Smets, Brussels, J.L. Talmon, Utrecht; (3) J. Michaelis, Mainz, Chr. Zywiets, Hannover, respectively.

The monograph shall be updated as soon as relevant new standards or recommendations are proposed or established. It will be available on request from:

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Participation in the work of IFIP TC-4, Working Group 4.3 is on a voluntary basis. The group has been an international composition and currently consists of:

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PART II
Data Acquisition

PART II
Data Acquisition