Lecture Notes in Computer Science 1105
Edited by G. Goos, J. Hartmanis and J. van Leeuwen

Advisory Board: W. Brauer D. Gries J. Stoer

Tuncer I. Ören George J. Klir (Eds.)

# Computer Aided Systems Theory – CAST '94

4th International Workshop
Ottawa, Ontario, Canada, May 16-20, 1994
Selected Papers

Springer

Volume Editors

Tuncer I. Ören
Ottawa Center of the McLeod Institute of Simulation Sciences
University of Ottawa
Ottawa, Ontario, Canada K1N 6N5

George J. Klir
Thomas J. Watson School of Engineering and Applied Science
State University of New York
Binghamton, NY 13902-6000, USA

Cataloging-in-Publication data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

**Computer aided systems theory** : 4th international workshop ; selected papers / CAST '94, Ontario, Canada, May 16 - 20, 1994. Tuncer I. Ören ; George J. Klir (ed.). - Berlin ; Heidelberg ; New York ; Barcelona ; Budapest ; Hong Kong ; London ; Milan ; Paris ; Santa Clara ; Singapore ; Tokyo : Springer, 1996
(Lecture notes in computer science ; Vol. 1105)
ISBN 3-540-61478-8
NE: Ören, Tuncer I. [Hrsg.]; CAST <4, 1994, Ottawa>; GT

CR Subject Classification (1991): J.6, I.6, I.2, J.7, J.3, C.1.m, C.3

ISSN 0302-9743
ISBN 3-540-61478-8 Springer-Verlag Berlin Heidelberg New York



Typesetting: Camera-ready by author
SPIN 10513380 06/3142 - 5 4 3 2 1 0 Printed on acid-free paper

# Preface

This volume consists of a selection of papers presented at the Fourth International Workshop on Computer Aided Systems Theory, CAST'94.

CAST'94 was organized by the Ottawa Center of the McLeod Institute of Simulation Sciences, the Department of Systems Science of the State University of New York at Binghamton, and the Master's Programme in Systems Science at the University of Ottawa. It was held on the campus of the University of Ottawa, May 16-20, 1994.

Out of the 82 abstracts/papers submitted, 58 have been included in the workshop program. Fully refereed, revised, and previously unpublished, 31 articles directly relevant to CAST are included in the book.

This volume, as a good representative of the state of the art of the CAST movement, provides in-depth knowledge on all three aspects of CAST, i.e., its foundations, methods, and tools and environments. Accordingly, the book is divided into three sections:

1. Foundations of CAST: Theory and Methodology (10 articles)
2. CAST Methods (7 articles)
3. CAST Tools and Environments (14 articles)

The efforts of the referees and the cooperation and patience of the authors are very much appreciated. We would also like to express our appreciation to Profs. F. Pichler and R. Moreno-Díaz for their contributions as the founders of the CAST movement as well as for their support of this CAST Workshop organized for the first time in North America.

May 1996

Tuncer I. Ören , George J. Klir
Canada; NY, USA

# Contents

## 1 Foundations of CAST: Theory and Methodology

## 2 CAST Methods



## 3 CAST Tools and Environments