

Lecture Notes in Computer Science

Edited by G. Goos and J. Hartmanis

117

Fundamentals of Computation Theory

Proceedings of the 1981 International
FCT-Conference, Szeged, Hungary
August 24–28, 1981

Edited by Ferenc Gécseg



Springer-Verlag
Berlin Heidelberg New York 1981

Editorial Board

W. Brauer P. Brinch Hansen D. Gries C. Moler G. Seegmüller
J. Stoer N. Wirth

Editor

Prof. Ferenc Gécseg
József Attila University, Bolyai Institute
Aradi vértanúk tere 1, H-6720 Szeged, Hungary

CR Subject Classifications (1981): 5.1, 5.2, 5.3, 4.2, 4.34

ISBN 3-540-10854-8 Springer-Verlag Berlin Heidelberg New York
ISBN 0-387-10854-8 Springer-Verlag New York Heidelberg Berlin

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically those of translation, reprinting, re-use of illustrations, broadcasting, reproduction by photocopying machine or similar means, and storage in data banks. Under § 54 of the German Copyright Law where copies are made for other than private use, a fee is payable to "Verwertungsgesellschaft Wort", Munich.

© by Springer-Verlag Berlin Heidelberg 1981
Printed in Germany

Printing and binding: Beltz Offsetdruck, Hemsbach/Bergstr.
2145/3140-543210

PREFACE

This volume constitutes the proceedings of the Conference on Fundamentals of Computation Theory (Algebraic, Arithmetic and Logical Methods in Computation Theory) held in Szeged, Hungary, August 24-28, 1981. The conference is the third in the series of the FCT-Conferences initiated by our Polish colleagues in Poznan, 1977.

The papers in this volume are the texts of invited addresses and shorter communications falling in one of the following three sections: A. Algebraic and Constructive Theory of Machines, Computations and Languages; B. Abstract Algebra, Combinatorics and Logic in Computation Theory, C. Computability, Decidability and Arithmetic Complexity. The shorter communications were selected by the Organizing and Program Committee out of more than 100 submitted papers.

This Third Conference was organized by the Institute of Mathematics of the József Attila University (Szeged) in co-operation with the Computer and Automation Institute of the Hungarian Academy of Sciences (Budapest). The Organizing and Program Committee consisted of J. Berstel, L. Budach, R.G. Buharajev, the late C.C. Elgot, Ju.L. Ershov, F. Gécseg (chairman), J. Hartmanis, G. Hotz, M. Karpinski, L. Lovász, O.B. Lupanov, I. Munro, M. Nivat, Z. Pawlak, A. Pultr, A. Salomaa and H. Thiele. J. Demetrovics held the post of organizing secretary.

Thanks are due to the members of the Organizing and Program Committee for their work in evaluating the submitted papers and for their kind co-operation in preparing the scientific program of the Conference. I would like to thank K. Dévényi, Z. Ésik and especially Gy. Horváth for their friendly assistance in all organizational matters.

-*-*-*-

Finally, I would like to commemorate most respectfully Professor Calvin C. Elgot who worked enthusiastically for the success of the FCT-Conferences. His decease is a heavy loss for computer scientists all over the world. I would like to devote this volume to his memory.

Szeged, May 1981

Ferenc Gécseg

CONTENTS

J. Adámek

Observability and Nerode equivalence in concrete categories ... 1

H. Andr  ka and I. N  meti

Some universal algebraic and model theoretic results in
computer science 16

G. Ausiello, A. Marchetti - Spaccamela and M. Protasi

Probabilistic analysis of the performance of greedy
strategies over different classes of combinatorial
problems 24

L. Babai

Moderately exponential bound for graph isomorphism 34

M. Bartha

An algebraic definition of attributed transformations 51

F.-J. Brandenburg

Analogies of PAL and COPY 61

VI

P. Burmeister

Quasi-equational logic for partial algebras 71

B. Csákány

Homogeneity and completeness 81

R.P. Daley

On the error correcting power of pluralism in inductive
inference 90

J. Dassow

Equality languages and language families 100

J. Demetrovics and G.O.H. Katona

Extremal combinatorial problems in relational data base 110

H.-D. Ehrich

Specifying algebraic data types by domain equations 120

Z. Ésik

An axiomatization of regular forests in the
language of algebraic theories with iteration 130

P. Goralčík, A. Goralčíková, V. Koubek and V. Rödl

Fast recognition of rings and lattices 137

VII

H. Huwig

A definition of the $P=NP$ -problem in categories 146

D. Janssens and G. Rozenberg

Generating graph languages using hypergraph grammars 154

J.W. Jaromczyk

Lower bounds for problems defined by polynomial
inequalities 165

H. Kaphengst

What is computable for abstract data types? 173

J. Karhumäki

On strongly cube-free ω -words generated by binary
morphisms 182

H.C.M. Kleijn and G. Rozenberg

On the role of selectors in selective substitution
grammars 190

H. Kleine Büning

Classes of functions over binary trees 199

B. Korte and L. Lovász

Mathematical structures underlying greedy algorithms 205

VIII

J. Kortelainen

Some properties of language families generated by commutative languages	210
--	-----

L. Kučera and V. Trnková

X

D. Seese

Elimination of second-order quantifiers for well-founded trees in stationary logic and finitely determinate structures	341
--	-----

P.H. Starke

Processes in Petri nets	350
-------------------------------	-----

M. Steinby

Some algebraic aspects of recognizability and rationality	360
---	-----

I.H. Sudborough

Pebbling and bandwidth	373
------------------------------	-----

Gy. Turán

On cellular graph-automata and second-order definable graph-properties	384
---	-----

J. Vinárek

Extensions of symmetric hom-functors to the Kleisli category	394
---	-----

APPENDIX

J. Beauquier

A new operation between languages 400

E. Börger

Logical description of computation processes 410

J. Grabowski

An algorithm to identify slices, with applications
to vector replacement systems 425

F. Hoffmann

One pebble does not suffice to search plane labyrinths 433

C. Meinel

About the by codings of environments induced posets
 $[\mathcal{U}_2, \leq]$ and $[\mathcal{L}_2, \leq]$ 445

A.W. Mostowski

The complexity of automata and subtheories of monadic
second order arithmetics 453

S. Waack

Tape complexity of word problems 467