Lecture Notes in Computer Science

Edited by G. Goos and J. Hartmanis

32

Mathematical Foundations of Computer Science 1975

4th Symposium, Mariánské Lázně, September 1–5, 1975

Edited by J. Bečvář



Springer-Verlag Berlin · Heidelberg · New York 1975

Editorial Board: P. Brinch Hansen · D. Gries C. Moler · G. Seegmüller · N. Wirth

Editor

Dr. Jíří Bečvář Mathematical Institute Czechoslovak Academy of Sciences Žitná 25, 11567 Prague 1 Czechoslovakia

Library of Congress Cataloging in Publication Data

Symposium on Mathematical Foundations of Computer Science, 4th, Marianské Lázně, Czechoslovak Republic, 1975. Mathematical Foundations of Computer Science 1975, 4th Symposium, Marianské Lázně, September 1-5, 1975.

(Lecture notes in computer science; 32)
"Organized by the Mathematical Institute of the Czechoslovak Academy of Sciences and is co-sponsored by the International Federation for Information Processing (IFIP)."
Bibliography: p.
Includes index.

1. Sequential machine theory--Congresses.
2. Formal languages--Congresses. I. Bečvář, J., 1926- II. Ceskoslovenská akademie věd. Matematický ústav. III. International Federation for Information Processing. IV. Series. QA267.5.54889 1975 001.614 0151 75-22406

AMS Subject Classifications (1970): 02 C99, 02 E10, 02 E15, 02 H10, 18 B 20, 68 A 05, 68 A 10, 68 A 20, 68 A 25, 68 A 30, 68 A 45, 94 A 25, 94 A 30 CR Subject Classifications (1974): 3.61, 4.12, 4.20, 4.30, 5.21, 5.22, 5.23, 5.24, 5.25, 5.26, 5.27, 5.5

ISBN 3-540-07389-2 Springer-Verlag Berlin · Heidelberg · New York ISBN 0-387-07389-2 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 the publisher, the amount of the fee to be determined by agreement with the publisher.

© by Springer-Verlag Berlin · Heidelberg 1975 Printed in Germany

Offsetdruck: Julius Beltz, Hemsbach/Bergstr.



FOREWORD

This volume contains papers which are to be presented at the 4th Symposium on Mathematical Foundations of Computer Science - MFCS'75, to be held in Mariánské Lázně, Czechoslovakia, September 1-5, 1975.

The Symposium is being organized by the Mathematical Institute of the Czecho-slovak Academy of Sciences and is co-sponsored by the International Federation for Information Processing (IFIP). The following institutions have cooperated in providing their support: The Computing Research Centre, United Nations D.P., Bratislava; the Faculty of Mathematics and Physics of the Charles University, Prague; the Institute of Computation Technique of the Technical University of Prague; the Faculty of Natural Sciences of the Komenský University, Bratislava; the Association of Czechoslovak Mathematicians and Physicists; the Association of Slovak Mathematicians and Physicists.

The MFCS'75 Symposium is the fourth in the series of annual international meetings held every even year in Poland and every odd year in Czechoslovakia, with the aim to bring together specialists in theoretical fields of computer science from various countries.

The present Proceedings include the texts of invited one-hour lectures and of short communications, the latter selected by the Program Committee among about 90 submitted papers. It was not possible to include a few manuscripts not received before the deadline.

The organizers of the Symposium are much indebted to all contributors to the scientific program, especially to authors of papers. Thanks are also due to all above mentioned cooperating institutions for their valuable and many-sided assistance. The organizational and editorial work has been done by the following staff: J. Bečvář (Symposium Chairman), M. Chytil, J. Gruska, P. Hájek, I. Havel, I.M. Havel (Executive Editor), J. Novák (Director of the Mathematical Institute of the Czechoslovak Academy of Sciences), M. Novotný (Program Chairman), J. Práglová, A. Rázek. Special thanks are due to I. M. Havel, without whose painstaking effort this volume would hardly exist.

We wish to express our appreciation to the Springer-Verlag which have produced these Proceedings within a very short period of time.

Prague, May 1975

The Editors

CONTENTS

INVITED LECTURES

J.M. Barzdin, J.J. Bičevskis and A.A. Kalninsh	
Construction of complete sample system for correctness testing	1
P. van Emde Boas	
Ten years of speedup	13
P. Hájek	
On logics of discovery	30
M.A. Harrison	
On models of protection in operating systems	46
J. Král and J. Demner	
Parsing as a subtask of compiling	61
A. Mazurkiewicz	
Parallel recursive program schemes	75
M. Novotný	
On some problems concerning Pawlak's	88

A. Salomaa	
Formal power series and growth functions of Lindenmayer systems	101
P.H. Starke	
On the representability of relations by deterministic and nondeterministic multi-tape automata	114
B.A. Trakhtenbrot	
On problems solvable by successive trials	125
V. Trnková	
Automata and categories	138
I.D. Zaslavskiř	
On some models of computability of Boolean functions	153
COMMUNICATIONS	
J. Adámek	
Automata and categories: finiteness contra minimality	160
A.V. Anisimov	
Languages over free groups	167
G. Ausiello and M. Protasi	
On the comparison of notions of approximation	172
M. Benešová and I. Korec	
Non-linear speed-up theorem for two register Minsky machines	179
E. Best and H.A. Schmid	
Systems of open paths in Petri nets	186

L. Boasson	
On the largest full sub-AFL of the full AFL of context-free languages	194
M.P. Chytil	
On complexity of nondeterministic Turing machines computations	199
A.Ja. Dikovskiř	
On closure properties of context-free derivation complexity classes	206
V.K. Evtimov	
Control structures in single block programs	212
R.V. Freivald	
Minimal Gödel numbers and their identification in the limit	219
F. Gécseg	
Isomorphic representation of automata	226
H.J. Genrich	
Extended simple regular expressions	231
G. Gini and M. Gini	
CONNIVER programs by logical point of view	238
J.W. Grzymala-Busse	
On the set of all automata with the same monoid of endomorphisms	2 4 6
I.M. Havel	
Nondeterministically recognizable sets of	257

T. Havránek	
The approximation problem in computational statistics	258
K. Indermark	
The continuous algebra of monadic languages	266
M.I. Kanovič	
On sets of complex-programmed numbers	271
M. Karpinski	
Decision algorithms for Havel's branching automata	273
V. Koubek and J. Reiterman	
Automata and categories - input processes	280
F. Kröger	
Formalization of algorithmic reasoning	287
G. Levi and F. Sirovich	
Proving program properties, symbolic evaluation and logical procedural semantics	294
J. Maluszyński	
A contribution to error recovery	302
O. Mayer	
On the analysis and synthesis problems for context-free expressions	308
K. Mehlhorn and Z. Galil	
Monotone switching circuits and Boolean matrix product	315
I. Mezník	
On some lattice-theoretic properties of	320

L.S. Modina	
On some formal grammars generating dependency trees	326
P.A. Ng, P. Hsia and R.T. Yeh	
Graph walking automata	330
J. Perl	
On finding all solutions of the partitioning problem	337
A. Pirická-Kelemenová	
Greibach normal form complexity	344
R.I. Podlovchenko	
On correctness and essentiality of some Ianov schemas equivalence relations	351
P. Pudlák	
Polynomially complete problems in the logic of automated discovery	358
V. Rajlich	
Relational definition of computer languages	362
W.P. de Roever	
First-order reduction of call-by-name to call-by-value	377
P. Ružička	
Local disambiguating transformation	399
D.A. Simovici	
On cardinal sequential outer measures	405
M.B. Trakhtenbrot	
On representation of sequential and parallel functions	41 1

G.E. Tseytlin The theory of the modified Post algebras and multidimensional automata structures 418 R. Turner An algebraic theory of formal languages 426 M.K. Valiev On polynomial reducibility of word problem under embedding of recursively presented groups in finitely presented groups 432 R. Valk On the synthesis of automata with several initial states 439 K. Wagner A hierarchy of regular sequence sets 445 W. Wechler R-fuzzy grammars 450 G. Wechsung Characterization of some classes of context-free languages in terms of complexity classes 457 R. Wiehagen Inductive inference of recursive functions 462 I. Winkowski Proving properties of programs by means of predicate logic 465 B. Wojdylo A generalization of Scott's flow diagrams 472