

DOMAINS AND PROCESSES

Semantic Structures in Computation

Volume 1

Title of the Series:

Semantic Structures in Computation

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With the idea of partial information and approximation as the starting point, this bookseries focuses on the interplay among computer science, logic, and mathematics through algebraic, order-theoretic, topological, and categorical means, with the goal of promoting cross-fertilization of ideas and advancing interdisciplinary research.

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Preface

This volume is devoted to the Proceedings of the INTERNATIONAL SYMPOSIUM ON DOMAIN THEORY which took place from October 17 to 23 at the Shanghai Teachers University in China.

Domains emerged in the late nineteen sixties and early seventies in the seminal work of Scott on semantics of programming languages and lambda calculi as well as in the work of Ershov in his fundamental investigations on computable functionals of higher types. The subject of domain theory as we know today is founded by Scott and Plotkin. Domains are mathematical structures modelling the order of information contained in computation by approximating ideal objects by finite ones. Thus they combine order-theoretical and topological structures and provide a natural framework for modelling and reasoning about computation. The theory of domains has seen a rapid development. Not only has it proved to be a useful tool for the semantics of programming languages, in particular functional languages, it also has lead to interesting developments and applications in mathematics and other areas of computer science.

In China, the research in theory of domains has been developed since the nineteen eighties and has gained a surprising standard. Because of the lack of communication, this research did not become well-known in Europe and in North America. The Symposium on Domain Theory was the first international conference with the aim to provide an opportunity for scientists in China and in the world to join together for exchanging ideas and results of ongoing research, and to promote research in this interdisciplinary field. The program committee consisted of

Ying-Ming Liu, Chair, Sichuan University, China
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Klaus Keimel, Co-chair, Technische Universität Darmstadt, Germany
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who also serve as the editors of this volume. The conference was intended to be centered around the following themes: topological and logical aspects of domains, categories of domains and power domains,

programming language semantics, applications, process semantics, and the relation between domain theory and fuzzy logic.

The meeting was attended by more than 40 participants from China and by 10 scientists from other countries such as Great Britain, Germany, Italy, Norway, and USA. The scientific program of the Symposium was divided into four tutorial lectures and 29 contributed talks. The tutorial lectures gave an introduction and an overview about topological aspects of domain theory, on relations between analysis and domain theory, on domain-theoretical foundations for logic programming, and on the central problem of the continuity of function spaces between domains. In the contributed lectures, a great variety of topics were covered in depth. The scientific program was complemented by an evening session on research problems leading to a lively discussion on future directions of research in domain theory and its applications.

In the closing ceremony it was commonly agreed that the conference had fully succeeded in its goals. It was agreed to continue similar international symposia on domain theory every two years. They should be centered around domain theory and its applications inside mathematics, they should stress the links with computer science and semantics, and they should have a particular focus on a specific topic resulting from new developments and applications.

Included in this Proceedings are selected papers presented at the symposium, submitted to the editors after the conference and accepted after a rigorous refereeing process. The twelve published papers are representative for the themes of the workshop. A few of them, such as the contribution by Jimmie Lawson, have a survey character. Otherwise they present original research. The articles have been grouped according to these topics: domains and topology, domains and computability over the reals, domains and lattices, domains and computer science.

Acknowledgements. The Symposium has been sponsored by Sichuan University, Shanghai Teachers University and the Mathematical Center of the Educational Ministry of China. It has been supported by the National Natural Science Foundation of China and the Fuzzy Mathematics and Systems Association of the Systems Engineering Society of China. This Proceedings volume owes its existence to the support of these organizations for the Symposium.

Thanks are due to the staff personnel of the Mathematical Institute of Shanghai Teachers University and to De-Guang Yang, Mao-Kang Luo, and Guo-Rong Wang for their local arrangements which made the symposium an enjoyable experience.

The editors of this volume are indebted to the referees for their carefully reading, their advice, and their valuable suggestions. These have contributed to the quality of this publication.

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