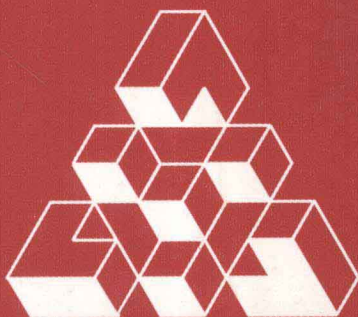


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Mathematical Foundations of Computer Science 2007

32nd International Symposium, MFCS 2007
Český Krumlov, Czech Republic, August 2007
Proceedings



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Mathematical Foundations of Computer Science 2007

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Preface

This volume contains the proceedings of the 32nd International Symposium on Mathematical Foundations of Computer Science (MFCS 2007). The purpose of the MFCS symposia is to encourage high-quality research in all fields of theoretical computer science. This year's conference was held in Český Krumlov, Czech Republic, during August 26–31.

The conference program of MFCS 2007 consisted of 61 contributed papers selected by the Program Committee from a total of 167 submissions. All submissions were read and evaluated by at least four referees, and the resulting decision was based on electronic discussion which often included help from outside experts. A selection of contributed papers will appear in the journal *Theoretical Computer Science*.

Complementing the contributed papers, the program of MFCS 2007 included invited lectures by Vašek Chvátal (Montreal, Canada), Anuj Dawar (Cambridge, UK), Kurt Mehlhorn (Saarbrücken, Germany), Luke Ong (Oxford, UK), and Leslie Valiant (Cambridge, USA). We are grateful to the invited speakers for accepting our invitation and sharing their knowledge and skills with all MFCS 2007 participants.

As the editors of these proceedings, we would like to thank everyone who contributed to the success of the symposium. First of all, we thank the authors of all submitted papers for considering MFCS 2007 as an appropriate platform for presenting their work. Since the number of submissions was very high, many good papers could not be accepted. We also thank the Program Committee members for their demanding and responsible work, the referees for careful reading of all the submissions, and the staff at Springer for the professional support in producing this volume.

June 2007

Luděk Kučera
Antonín Kučera

Organization

The 32nd International Symposium on Mathematical Foundations of Computer Science (MFCS 2007) was held in *Hotel Růže*, Český Krumlov, Czech Republic, during August 26–31, 2007. The conference was organized by the Faculty of Mathematics and Physics, Charles University, Prague in cooperation with other institutions in the Czech Republic.

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- Vol. 4563: R. Shumaker (Ed.), *Virtual Reality. XXII*, 762 pages. 2007.
- Vol. 4562: D. Harris (Ed.), *Engineering Psychology and Cognitive Ergonomics. XXIII*, 879 pages. 2007. (Sublibrary LNAI).
- Vol. 4561: V.G. Duffy (Ed.), *Digital Human Modeling. XXIII*, 1068 pages. 2007.
- Vol. 4560: N. Aykin (Ed.), *Usability and Internationalization, Part II. XVIII*, 576 pages. 2007.
- Vol. 4559: N. Aykin (Ed.), *Usability and Internationalization, Part I. XVIII*, 661 pages. 2007.

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