RAIRO-Inf. Theor. Appl. **41** (2007) 1–2
DOI: 10.1051/ita:2007001

FOREWORD

This special issue contains a collection of papers selected from submissions received in response to a call for papers that followed the 6th conference on Real Numbers and Computers which took place in Dagstuhl, Germany, in November 2004.

Efficient manipulation of real numbers in computers is still a challenge. Many interesting theoretical and algorithmic problems are linked with that topic and belong to quite distant fields such as computer science, number theory, numerical analysis, computer algebra and logic. Specialists working in this domain come from various research areas, all concerned with problems related to theoretical computability or actual calculations based on real numbers. These computations use many number systems, they are implemented by a software package or in hardware, and they use arithmetic such as floating and fixed point, serial, on line, continued fractions, exact, multiple precision, interval and stochastic.

The first paper, *On the hierarchies of* Δ_2^0*-real numbers*, by Xizhong Zheng, is a survey on computably approximable reals. Here different levels of effectiveness arise, depending on the speed of convergence of the approximating rational sequences.

In the second contribution, *Automata, Borel functions and real numbers in Pisot base* by Benoît Cagnard and Pierre Simonnet, real numbers are considered as infinite sequences on a finite alphabet, and functions are supposed to be recognized by a Büchi finite automaton. The authors show that it is decidable wether such a function is Baire class 1 inside the Baire hierarchy of Borel functions.

Pseudo zeros are used to describe how a perturbation of polynomial coefficients affects its zeros. Stef Graillat and Philippe Langlois in *Real and complex pseudozero sets for polynomials with applications* study the set of real perturbations of a real polynomial, compared to the set of complex perturbations of a complex polynomial, and give some applications to control theory.

Computational geometry algorithms are very sensitive to numerical instability. Floating-point arithmetic is fast, but leads to geometrically incorrect results. In *Formally specified floating-point filters for homogenous geometric predicates*, Guillaume Melquiond and Sylvain Pion study an arithmetic filter, which is used to filter out the easy cases in some geometric predicates that are tractable by robust floating-point methods.

The three remaining papers are devoted to the problem of rounding, which is one of the most important challenges in computer arithmetic. In *Correct rounding of algebraic functions*, Nicolas Brisebarre and Jean-Michel Muller make a link between the correct rounding of algebraic functions and some diophantine approximation issues, which give some interesting bounds.

The next paper, *Fast and correctly rounded logarithms in double-precision*, by Florent de Dinechin, Christoph Lauter and Jean-Michel Muller, is a case study in the implementation of a correctly rounded elementary function in double precision.

The last contribution, *Multiple-precision correctly rounded Newton-Cotes quadrature*, by Laurent Fousse, is concerned by numerical integration in the context of multiple-precision arithmetic.

We thank all the authors, including the authors of submitted papers that could not be included in this issue. We would also like to warmly thank the reviewers for the time they did spend in writing helpful comments and suggestions to the authors.

Special thanks are due to the editor-in-chief Christian Choffrut, who kindly accepted to host this special volume.

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