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Mathematics in Computer Science

Foreword

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In the last years, the field of non-linear Computational Geometry has produced very relevant algorithmic advances, for instance, by adapting to low-degree curved objects techniques dealing with linear primitives. Moreover the introduction of new algorithms and approaches for dealing efficiently with curves and surfaces has shown a considerable impact in fields such as Computer-Aided Design where final users are continuously demanding more efficiency, accuracy, robustness, etc.

New approaches for solving geometric problems, coming from Computer Aided Geometric Design and involving curves and surfaces with a Computational Geometry flavour, are the main focus of this special issue. Contributions were asked in areas such as:

- Arrangements of low degree curves and surfaces
- Voronoi Diagrams and Medial Axes involving curved objects
- Computations of offsets and their topology
- Distance predicates for curves and surfaces
- Closed formulae for geometric queries involving curves and surfaces
- Intersection detection for moving curved objects
- Adapting algebraic or geometrical techniques for solving algorithmic problems involving curves and surfaces.

This special issue is a direct consequence of the Second International Conference on Mathematical Aspects of Computer and Information Sciences – MACIS 2007 (see http://www-spiral.lip6.fr/MACIS2007) held in Paris in December 2007 and where Computational Geometry and Computer Aided Geometric Design were one of the main topics (among other two, Polynomial System Solving and Algorithms and Complexity).

Finally six papers (out of eight papers submitted by the March 2009 deadline) were finally accepted. The two papers by C. D'Andrea et al. and I. Z. Emiris et al. deal with the problem of analyzing the Newton polygon of the implicit equation of a rational curve starting from its parameterization: both papers are devoted to study from different viewpoints the properties of the set of monomials appearing in the implicit equation of the considered curve without computing it. The two papers by E. Berberich et al. introduce a new approach to deal with the problem

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of determining the shape of an arrangement of curves on several classes of parametric surfaces which is then applied to compute, for example, the Minkowski sum of polytopes or the envelope of surfaces. The two papers by D. Lazard and J. Cheng et al. deal with the problem of computing the topology of a semialgebraic set (i.e. a set in $\mathbb{R}^n$ defined by polynomial equations and inequations): the first one shows how to deal with the general case by using the so called Cylindrical Algebraic Decomposition and the second one introduces an extremely fast algorithm computing the topology of a real algebraic plane curve defined implicitely.

We would like finally to thank all the reviewers who definitively helped with their work to improve the papers that appear into this special issue.