Preface

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The first six papers of this issue correspond to the proceedings of the meeting: “3rd Symposium on planar vector fields” organized by the group of dynamical systems “Seminari de sistemes dinàmics” held in Lleida in September 6–10, 2010. The meeting was organized by I.A. García, J. Giné, M. Grau, S. Maza (Universitat de Lleida, UdL) and J. Llibre (Universitat Autònoma de Barcelona, UAB). The format of the Symposium was of 20 invited lectures of 50 min and the event had near 50 participants.

The aim of the symposium was to present recent advances and open problems in the field of planar vector fields or related topics.

This was done in an atmosphere of informal discussion and interchange of ideas and the language of the symposium was the Spanish.

The previous editions of this symposium were in 1996 and 2000. In 1996 the meeting was organized by J. Chavarriga (UdL) and J. Llibre (UAB), and in 2000 the meeting was organized by J. Chavarriga, J. Giné (UdL) and J. Llibre (UAB).

The main interest of this 3rd symposium was the qualitative theory of planar vector fields and related topics, as the bifurcation analysis, limit cycles, periodic limit sets, singularities, desingularization, algebraic invariant curves, integrability, center-focus problem, isochronous centers, period maps, finite cyclicity, foliations, etc.

Some of the main problems approached in the three editions of the symposium were:

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The center problem incited Poincaré at the end of the nineteenth century. The center problem can be formulated as follows: determine within the class of real planar polynomial vector fields, all the systems possessing a center, i.e. a singular point surrounded by close phase curves.

The algebraic integrability problem developed by Darboux and Poincaré also at the end of the nineteenth century. Darboux in 1878 established the integrability in terms of invariant algebraic curves of a planar polynomial system. Inspired in this work Poincaré formulated the problem of determining within the class of planar polynomial systems those systems which are algebraically integrable, i.e., those which admit a rational first integral.

The Hilbert's 16th problem was stated by Hilbert at the International Congress of Mathematicians in Paris in 1900. The second part of the Hilbert's 16th problem is to give a uniform upper bound of the maximum number and position of limit cycles for a planar polynomial differential system. The second part of Hilbert's 16th problem is extremely hard. For example it is still unsolved even in its simplest case, which is for polynomial differential systems of degree 2. However it generated much research on weaker versions of this problem such as for example the infinitesimal Hilbert's 16th problem, and in the context of Abel or Liénard equations. In this way Smale focus the problem in the Liénard systems in his list of the open problems for the twenty-first century.

The purpose of this workshop was to share new knowledge and disseminated in the community working in the field the new developments of the area. Deep connections of this area with other areas of mathematics as algebra, algebraic-geometry, complex analysis, topological methods, computer algebra were discussed at the workshop. The meeting helped in strengthening relationships and also establishing new collaborations among the participants in a cordial atmosphere.

Editors-in-Chief of QTDS
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