Electronic Journal of Qualitative Theory of Differential Equations
2014, No. **60**, 1–43; http://www.math.u-szeged.hu/ejqtde/

Global configurations of singularities for quadratic differential systems with exactly two finite singularities of total multiplicity four

Joan C. Artés[1], **Jaume Llibre**[✉1], **Alex C. Rezende**[2], **Dana Schlomiuk**[3] and **Nicolae Vulpe**[4]

[1]Department of Mathematics, Universitat Autònoma de Barcelona, 08193 Barcelona, Spain
[2]Instituto de Ciências Matemáticas e de Computação, Universidade de São Paulo, Brazil
[3]Département de Mathématiques et de Statistiques, Université de Montréal, Canada
[4]Academy of Sciences of Moldova, 5 Academiei str, Chişinău, MD-2028, Moldova

Received 10 July 2014, appeared 17 December 2014
Communicated by Gabriele Villari

Abstract. In this article we obtain the *geometric classification* of singularities, finite and infinite, for the three subclasses of quadratic differential systems with finite singularities with total multiplicity $m_f = 4$ possessing exactly two finite singularities, namely: (i) systems with two double complex singularities (18 configurations); (ii) systems with two double real singularities (33 configurations) and (iii) systems with one triple and one simple real singularities (123 configurations). We also give here the global bifurcation diagrams of configurations of singularities, both finite and infinite, with respect to the *geometric equivalence relation*, for these subclasses of systems. The bifurcation set of this diagram is algebraic. The bifurcation diagram is done in the 12-dimensional space of parameters and it is expressed in terms of invariant polynomials, which give an algorithm for determining the geometric configuration of singularities for any quadratic system.

Keywords: quadratic vector fields, infinite and finite singularities, affine invariant polynomials, Poincaré compactification, configuration of singularities, geometric equivalence relation.

2010 Mathematics Subject Classification: 58K45, 34C05, 34A34.

1 Introduction and statement of main results

We consider here differential systems of the form

$$\frac{dx}{dt} = p(x,y), \qquad \frac{dy}{dt} = q(x,y), \tag{1.1}$$

✉Corresponding author. Email: jllibre@mat.uab.cat