# QUADRATIC DIFFERENTIAL SYSTEMS WITH A FINITE SADDLE–NODE AND AN INFINITE SADDLE–NODE $(1,1)SN$ - (A)

JOAN C. ARTÉS

*Departament de Matemàtiques, Universitat Autònoma de Barcelona,*
*08193 Bellaterra, Barcelona, Spain*
*E–mail: artes@mat.uab.cat*

MARCOS C. MOTA

*Instituto de Ciências Matemáticas e de Computação, Universidade de São*
*Paulo,*
*13566–590, São Carlos, São Paulo, Brazil,*
*E–mail: coutinhomotam@gmail.com*

ALEX C. REZENDE

*Departamento de Matemática, Universidade Federal de São Carlos,*
*13565–905, São Carlos, São Paulo, Brazil,*
*E–mail: alexcr@ufscar.br*

Our goal is to make a global study of the class $\mathbf{QsnSN_{11}}$ of all real quadratic polynomial differential systems which have a finite semi–elemental saddle–node and an infinite saddle–node formed by the coalescence of a finite and an infinite singularities. This class can be divided into two different families, being $(A)$ possessing the finite saddle–node as the only finite singularity and $(B)$ possessing the finite saddle–node and also a finite simple elemental singularity. In this paper we provide the complete study of the geometry of family $(A)$. The family $(A)$ modulo the action of the affine group and time homotheties is four–dimensional and we give the bifurcation diagram of its closure with respect to a specific normal form, in the four–dimensional real projective space $\mathbb{RP}^4$. As far as we know, this is the first time that a complete family is studied in the four–dimensional real projective space. The respective bifurcation diagram yields 36 topologically distinct phase portraits for systems in the closure $\overline{\mathbf{QsnSN_{11}(A)}}$ within the representatives of $\mathbf{QsnSN_{11}(A)}$ given by a specific normal form.

*Keywords:* Quadratic differential systems; finite saddle–node; infinite saddle–node; phase portraits; bifurcation diagram; algebraic invariants.