

The family of quadratic differential systems with invariant ellipses: a complete classification in the space \mathbb{R}^{12}

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Consider the class **QS** of all non-degenerate planar quadratic systems. Note that each quadratic differential system can be identified with a point of \mathbb{R}^{12} through its coefficients. In this work we provide necessary and sufficient conditions for a system in **QS** to have at least one invariant ellipse. We give the global “bifurcation” diagram of the family **QS** which indicates where an ellipse is present or absent and in case it is present, the diagram indicates if the ellipse is or it is not a limit cycle. The diagram is expressed in terms of affine invariant polynomials and it is done in the 12-dimensional space of parameters. This diagram is also an algorithm for determining for each quadratic system if it possesses an invariant ellipse and whether or not this ellipse is a limit cycle. This is a joint work with Regilene D.S. Oliveira, Dana Schlomiuk and Nicolae Vulpe.