

Localizing Limit Cycles: From Numeric to Analytical Results



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Abstract This note presents the results of [4]. It deals with the problem of location and existence of limit cycles for real planar polynomial differential systems. We provide a method to construct Poincaré–Bendixson regions by using transversal curves, that enables us to prove the existence of a limit cycle that has been numerically detected. We apply our results to several known systems, like the Brusselator one or some Liénard systems, to prove the existence of the limit cycles and to locate them very precisely in the phase space. Our method, combined with some other classical tools can be applied to obtain sharp bounds for the bifurcation values of a saddle-node bifurcation of limit cycles, as we do for the Rychkov system.

1 Introduction

We consider real planar polynomial differential systems of the form

$$\dot{x} = dx/dt = P(x, y), \quad \dot{y} = dy/dt = Q(x, y), \quad (1)$$

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