The Limit Cycles of Discontinuous Piecewise Linear Differential Systems Formed by Centers and Separated by Irreducible Cubic Curves II

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Abstract

In this paper we provide a lower bound for the maximum number of crossing limit cycles of some class of planar discontinuous piecewise linear differential systems formed by centers and separated by an irreducible algebraic cubic curve. First we prove that the systems constituted by three zones can exhibit 0, 1, 2, 3 or 4 crossing limit cycles having four intersection points with the cubic of separation. Second we prove that the systems constituted by two zones can exhibit 0, 1, or 2 crossing limit cycles having four intersection points with the cubic of separation.

Keywords Limit cycles · Discontinuous piecewise linear differential systems · Linear differential centers · Irreducible cubic curves

Mathematics Subject Classification 34C29 · 34C25 · 47H11

Introduction

We can summarize the 16th Hilbert problem (see [11, 13, 17]) as follows: What are the possible configurations of limit cycles and an upper bound for their maximum number that the polynomial differential systems in the plane of a given degree can exhibit? In fact the possible configurations of limit cycles has been partially solved in [21], but for the moment there is no answer for such upper bound.

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