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On the Limit Cycles of a Class of Discontinuous Piecewise Differential Systems Formed by Two Rigid Centers Governed by Odd Degree Polynomials

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We provide an upper bound for the maximum number of limit cycles for the class of discontinuous piecewise differential systems formed by two differential systems separated by the straight line $x = 0$, one of which is a linear rigid center while the other is a rigid center formed of a linear part plus a homogeneous polynomial of odd degree. We solve the extended 16th Hilbert problem for this class of discontinuous piecewise differential systems.

Keywords: Piecewise smooth vector fields; rigid center; limit cycle.

1. Introduction

The investigation of the existence of limit sets is one of the most important objectives in the qualitative theory of ordinary differential equations. Particularly, the isolated periodic orbits, also known as limit cycles, are of great importance both from a theoretical point of view and for their various applications. See [Hilbert, 1902; Hirsch *et al.*, 2004].

As for the smooth differential systems the study of limit cycles in discontinuous piecewise differential systems is also of great importance, see for instance [Carmona *et al.*, 2005; Freire *et al.*, 1998; Kuznetsov *et al.*, 2003]. The study of discontinuous piecewise differential systems, also called Filippov systems, has attracted the attention of the mathematicians during these past decades due to their applications. These piecewise differential systems in the plane are formed by different differential systems defined in distinct regions separated by a curve. A pioneering work on this subject was due to Andronov, Vitt

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