



Limit cycles of 3-dimensional discontinuous piecewise differential systems formed by linear centers

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Abstract

In this paper we deal with 3-dimensional discontinuous piecewise differential systems formed by linear centers and separated by one plane or two parallel planes. We prove that these systems separated by one plane have no limit cycles, besides the systems separated by two parallel planes have at most one limit cycle, and that there are systems having such a limit cycle. So we solve the extension of the 16th Hilbert problem to this class of differential systems.

Keywords Discontinuous piecewise differential systems · Periodic orbits · Linear centers · First integrals · Limit cycles

Mathematics Subject Classification 34C07 · 34C23 · 34C25 · 37C27 · 37G15

1 Introduction and statement of the main results

One of the main goals in the qualitative theory is to study the number of limit cycles of the differential systems. In part this problem was motivated by the 16-th Hilbert problem (1900), see [8, 16] for more details. Limit cycles play a main role for understanding the dynamics of many systems, see for instance [1, 2, 4, 9, 10].

On the other hand there are many problems that are modeled using discontinuous piecewise differential systems. These systems appear in various situations

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