LIMIT CYCLES OF DISCONTINUOUS PIECEWISE DIFFERENTIAL SYSTEMS FORMED BY LINEAR CENTERS IN $\mathbb{R}^2$ AND SEPARATED BY TWO CIRCLES

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Abstract. We show that discontinuous planar piecewise differential systems formed by linear centers and separated by two concentric circles can have at most three limit cycles. Usually is a difficult problem to provide the exact upper bound that a class of differential systems can exhibit. Here we also provide examples of such systems with zero, one, two, or three limit cycles.

1. Introduction and statement of the main result

In the qualitative theory of the differential systems in $\mathbb{R}^2$ one of the main difficult objects to study are the limit cycles. Recall that a *limit cycle* is an isolated periodic solution in the set of all periodic solutions of the differential systems, see for instance the second part of the famous 16th Hilbert problem [5, 7, 9].

The study of piecewise linear discontinuous differential systems started with Andronov, Vitt and Khaikin in [1]. Due to the fact that these systems model many real phenomena and different modern devices, they have became a topic of great interest these last twenty years. For more details see for instance the books [2, 19] and the references therein.

In recent years many authors have been widely interested in solving the second part of the 16-th Hilbert's problem for continuous and discontinuous piecewise linear differential systems in $\mathbb{R}^2$, that is to determine an upper bound for the maximum number of limit cycles for these class of differential systems.

The easiest continuous piecewise linear differential systems are formed by two linear differential systems separated by a straight line. It is known that such systems have at most one limit cycle, see [4,13,17,18]. But if both linear differential systems are linear centers, then it is known that the continuous piecewise linear differential systems have no limit cycles, see [11, 15].

Also the easiest discontinuous piecewise linear differential systems are formed by two linear differential systems separated by a straight line. It is known that this class of differential systems can have three limit cycles, but at this moment it is unknown if three is the maximum number of limit cycles that this class can

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