On the maximum number of limit cycles for discontinuous piecewise linear differential systems with non-regular separation line

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Abstract The maximum number of limit cycles for a class of planar discontinuous piecewise linear differential systems with two zones separated by a non-regular line are considered. More precisely, The non-regular line is formed by the positive x-half-axis union the positive y-half-axis. This non-regular line of discontinuity separates the plane into two regions, the positive quadrant Q and the complement to the positive quadrant P. Assume that there is a linear system with a center (C) in one region, and in the other region there is a linear system with either a center, or a saddle (S), or a diagonalizable node (N) with different eigenvalues, or a non-diagonalizable node ($N^{'}$). Among all seven cases treated here, we obtain the maximum number of limit cycles for CC, CS, SC, CN, NC (resp. $CN^{'}, N^{'}C$) cases is 3 (resp. 6). Moreover, this bound is sharp.

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1 Introduction and statement of main results

Planar non-smooth differential systems have received considerable attention in recent years since they are capable to model a wide variety of phenomena in applied dynamical systems problems, see for instance the book [2] and the reference therein.

An interesting class within this field is formed by the piecewise linear differential systems. The simplest piecewise linear differential systems are those defined in two half-planes separated by a straight line. Lum and Chua [28, 29] first studied the continuous piecewise linear differential systems separated by a straight line and

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