Electronic Journal of Differential Equations, Vol. 2020 (2020), No. 41, pp. 1–36.
ISSN: 1072-6691. URL: http://ejde.math.txstate.edu or http://ejde.math.unt.edu

CROSSING LIMIT CYCLES FOR A CLASS OF PIECEWISE LINEAR DIFFERENTIAL CENTERS SEPARATED BY A CONIC

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Abstract. In previous years the study of the version of Hilbert's 16th problem for piecewise linear differential systems in the plane has increased. There are many papers studying the maximum number of crossing limit cycles when the differential system is defined in two zones separated by a straight line. In particular in [11, 13] it was proved that piecewise linear differential centers separated by a straight line have no crossing limit cycles. However in [14, 15] it was shown that the maximum number of crossing limit cycles of piecewise linear differential centers can change depending of the shape of the discontinuity curve. In this work we study the maximum number of crossing limit cycles of piecewise linear differential centers separated by a conic.

1. Introduction and statement of the main results

The study of discontinuous piecewise linear differential systems in the plane started with Andronov, Vitt and Khaikin in [1]. After that these systems have been a topic of great interest in the mathematical community because of their applications in various areas. They are used for modeling real phenomena and different modern devices, see for instance the books [4, 24] and references therein.

In the qualitative theory of differential systems in the plane a *limit cycle* is a periodic orbit which is isolated in the set of all periodic orbits of the system. This concept was defined by Poincaré [20, 21]. In several papers as [3, 10, 25] it was shown that the limits cycles model many phenomena of the real world. After these works the non-existence, existence, the maximum number and other properties of the limit cycles have been extensively studied by mathematicians and physicists, and more recently, by biologists, economist and engineers, see for instance [4, 17, 18, 19, 26].

As for the general case of planar differential systems one of the main problems for the particular case of the piecewise linear differential centers is to determine the existence and the maximum number of crossing limits cycles that these systems can exhibit. In this paper we study the *crossing limit cycles* which are periodic orbits isolated in the set of all periodic orbits of the piecewise linear differential centers, which only have isolated points of intersection with the discontinuity curve.

To establish an upper bound for the number of crossing limit cycles for the family of piecewise linear differential systems in the plane separated by a straight line has been the subject of many recent papers, see for instance [2, 5, 7, 23]. In 1990 Lum

2010 *Mathematics Subject Classification.* 34C05, 34C07, 37G15.
Key words and phrases. Discontinuous piecewise linear differential centers; limit cycles; conics.

Submitted March 20, 2019. Published May 7, 2020.