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THE DISCONTINUOUS MATCHING OF TWO PLANAR LINEAR FOCI CAN HAVE THREE NESTED CROSSING LIMIT CYCLES

EMILIO FREIRE, ENRIQUE PONCE, AND FRANCISCO TORRES

Abstract: The existence and stability of limit cycles in discontinuous piecewise linear systems obtained by the aggregation of two linear systems of focus type and having only one equilibrium point is considered. By using an adequate canonical form with five parameters, a thorough study of some Poincaré maps is performed. Different bifurcations which are responsible for the appearance of crossing limit cycles are detected and parameter regions with none, one, two and three crossing limit cycles are found.

In particular, a first analytical proof of the existence, for certain differential systems in the considered family, of at least three homotopic crossing limit cycles surrounding the equilibrium point, is included. This fact has recently been numerically discovered in a particular example by S.-M. Huan and X.-S. Yang [13].

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Key words: Discontinuous piecewise linear systems, limit cycles, bifurcations.