Thaylon Souza de Oliveira

Institute of Mathematics, Statistics and Scientific Computing
Universidade Estadual de Campinas - Unicamp, Brazil
E-mail: thaylon@ime.unicamp.br

On the number of limit cycles of piecewise smooth vector fields on the torus with non-regular switching manifold

The main objective of this work is to study the maximum possible number of limit cycles of discontinuous vector fields, possessing first integrals, on torus. We consider the standard representation of the torus as the quotient of the square and consider the edges of the square, after the quotient, as the discontinuity set (switching manifold).

We consider two cases: one when the limit cycle makes a single turn vertically/horizontally, which we will denote by aa or bb and another case when the cycle makes a single turn vertically and another one horizontally over the torus, denoted by aba.

In both cases, using an application of the theory of intersection of algebraic curves, we obtain an expression for the maximum quantity of limit cycles. In particular, we show that for some families of vector fields, the maximum number of limit cycles of type bb is $n-1$ and $n(n-1)$ for limit cycles of type aba.

We also present examples to show that the quotas can be achieved.

Key words: fist integrals, non-smooth systems, maximum number of limit cycles.