POINCARÉ-HOPF THEOREM FOR FILIPPOV VECTOR FIELDS AND FILIPPOV SINGULARITY INDICES

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The Poincaré-Hopf theorem relates an important topological invariant, the Euler characteristic, to differential geometry objects, the index of singularities of smooth vector fields.

In this work, we define a new index which coincides with the classical definition for smooth vector fields, but which also works for piecewise smooth vector fields. We proved that the Poincaré-Hopf theorem holds true also for Filippov systems whose discontinuity manifold has codimension one.

While in the smooth case the singularities are the critical points of the vector field, here the notion of singularities comprehend the critical points of the smooth parts of the Filippov vector field and also the Filippov singularities, namely the tangencies and pseudo-equilibria.

Furthermore, we classify the indices of low codimension pseudo-equilibria, that is, the generic and the codimension one singularities.

Joint work with: Douglas D. Novaes and Ricardo M. Martins.