Affine Lagrangians in the k-cosymplectic formulation of field theories

Xavier Gràcia Sabaté

Polytechnic University of Catalonia

xavier.gracia@upc.edu

Xavier Rivas Guijarro

Polytechnic University of Catalonia

xavier.rivas@upc.edu

Narciso Román Roy

Polytechnic University of Catalonia

narciso.roman@upc.edu

Field theories described by Lagrangians depending on space-time coordinates can be modelled using k-cosymplectic geometry. In particular, theories described by singular Lagrangians are of special interest because of their role in modern physics. Nevertheless there is a problem of consistency of the corresponding PDEs (Euler–Lagrange and Hamilton–de Donder–Weyl), and thus one needs to study the possible constraints arising in the space of solutions. Here we define the concept of k-precosymplectic manifold and show that they possess Darboux coordinates. We also prove the existence of Reeb vector fields for this structure. Then we define the notion of k-precosymplectic Hamiltonian system and develop a geometric constraint algorithm in order to find a constraint submanifold where one can assure the existence of solutions. We are going to apply this algorithm to the case of affine lagrangians in both the Lagrangian and the Hamiltonian formalisms.