Poisson structures on manifolds with singularities

Maria Sorokina maria.sorokina.spb@gmail.com
Saint-Petersburg State University, Russia

Abstract

The configuration spaces of many real mechanical systems appear to be manifolds with singularity. A singularity often indicates that a geometry of motion might change at the point. We face the conceptual problem describing even ideal models mechanics since the configuration space isn't a smooth manifold, thus, the fully developed means of Hamiltonian mechanics cannot be applied.

In this report we present a way of conquering the aforementioned conceptual problem by considering a certain algebra instead of the configuration space whose real spectrum it is. The structure of this algebra is completely determined by the geometry of the singularity. For a broad class of singularities, the desired algebra can be declared directly since its the pullback of two already known algebras which can be easily declared. Availability of the algebra enables to use Differential operator theory.

The elementary examples of mechanical systems to which this algorithm is applicable, are flat linkages.

In this report, in the frames of the presented approach, a Poisson structure is built on a manifold with a one-dimensional singularity. The same result can be obtained for some other kinds of singularities.

At the end of this report, the specific results for the case of a configuration space consisting of two curves having random order of contact, on a plane, is presented.

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