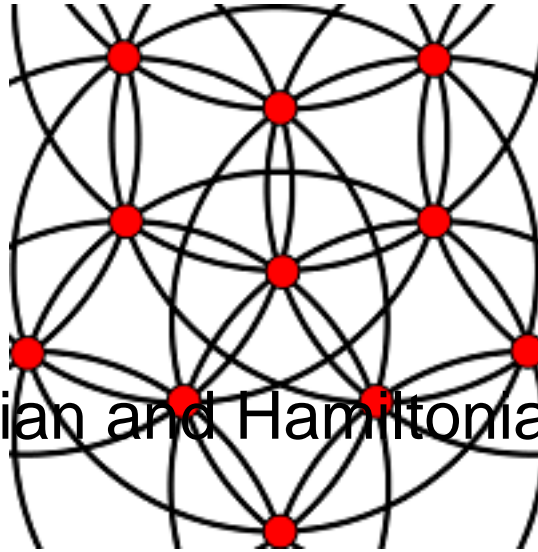


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Lagrangian and Hamiltonian duality

Content :

Lagrangian and Hamiltonian formalism certainly belong to the most useful and extensively used mathematical frameworks in physics. The relationship between these two theories is provided by the Legendre transformation, and is one-to-one when the Lagrangian is regular: in such a case the Legendre transformation is a local diffeomorphism. In the standard treatment of many important physical systems, like for example Dirac, Maxwell and Yang-Mills fields or gravity, the symmetry between the Lagrangian and Hamiltonian side is broken, and the theory of integrable Hamiltonian systems does not have a corresponding Lagrangian counterpart. In my talk I will present Lepage manifolds which extend symplectic and multisymplectic structures and provide a background for a more general covariant Hamiltonian formalism. For a number of traditionally singular Lagrangians we obtain a Hamiltonian system which is in a direct correspondence with the Lagrangian system, avoiding the use of Dirac constraints.

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