

Cartesian and Lagrangian momentum

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Abstract

Historical, physical and geometrical relations between two different momenta, characterized here as Cartesian and Lagrangian, are explored. Cartesian momentum is determined by the mass tensor, and gives rise to a kinematical geometry. Lagrangian momentum, which is more general, is given by the fiber derivative, and produces a dynamical geometry. This differs from the kinematical in the presence of a velocity-dependent potential. The relation between trajectories and level surfaces in Hamilton-Jacobi theory can also be Cartesian and kinematical or, more generally, Lagrangian and dynamical.

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