

Variational non-holonomic systems in physics

Lenka Czudková

Within the variational physical theories constrained systems are frequently studied. However, only the theory of holonomic constraints is satisfactorily elaborated. Recently, the new geometrical theory of first order mechanical systems with non-holonomic constraints was developed by Krupková and the corresponding reduced second order equations of motion were derived. The new concept of variationality of non-holonomic systems was introduced and the corresponding conditions of variationality (called the constraint Helmholtz conditions) for reduced equations were obtained (Krupková and Musilová).

In this contribution the results of these theories are applied to physics. Some appropriate situations (a relativistic particle, a system with Stokes frictional force etc.) are studied. The constraint Helmholtz conditions are examined under the influence of concrete choices of constraints and the corresponding constraint forces are obtained.