ANALYTICAL MECHANICS OF A RELATIVISTIC PARTICLE IN A POSITIONAL POTENTIAL

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We discuss the Lagrangian and Hamiltonian formulation of the dynamics of a classical particle subject to a potential that depends only on its position. In particular, consistency requires that time reparametrization invariance be preserved. First quantization of the model leads to a Klein-Gordon equation coupled to a scalar potential. The approach proposed in this letter can be useful in the study of phenomenological models where the potential is not derived from first principles.