Generic analytical embedding methods for nonstationary systems based on control theory

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Abstract

We investigate by embedding methods a class of nonholonomic and forced systems arising in particular from the rolling pneumatic tire. For these systems the existing embedding theorems of Takens-type are not applicable due to the nonholonomic constraints, the time-dependence of the forces, and the noncompactness of the phase space. To overcome these difficulties we interpret the given mechanical system as a vector field on a nontrivial fiber bundle with time-dependent Riemannian fiber metric.