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Intrinsic Formulation of Dynamics of Curvilinear Systems

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The paper concerns the dynamics of curvilinear systems which are often met in mechanical systems (robots, artificial satellites and so on). We only suppose that each section is rigid. Using Lie group theory, a general curvilinear system is then equivalent to a distribution $(\sigma,t) \mapsto D(\sigma,t)$ of displacements, elements of the Lie group D of Euclidean displacements the algebra of which may be identified with the Lie algebra of screws. The kinematics is enterely described by the lagrangian field of deformations $e^c(\sigma,t) = \mathbf{D}(\sigma,t)^{-1} \circ \frac{\partial D(\sigma,t)}{\partial \sigma}$ and the lagrangian field of velocities $v^c(\sigma,t) = \mathbf{D}(\sigma,t)^{-1} \circ \frac{\partial D(\sigma,t)}{\partial t}$ and with standard hypotheses about the distribution of external forces, the intrinsic equations are obtained, the displacements or deformations being small or large. Last, the elements to automatically obtain scalar equations are given.

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