

## SOME CONSTRAINTS AND SYMMETRIES IN DYNAMICS OF HOMOGENEOUSLY DEFORMABLE ELASTIC BODIES

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**Abstract.** Our work has been inspired among others by the work of Arnold, Kozlov and Neihstadt. Our goal is to carry out a thorough analysis of the geometric problems we are faced with in the dynamics of affinely rigid bodies. We examine two models: classical dynamics description by d'Alembert and vakonomic one. We conclude that their results are quite different. It is not yet clear which model is practically better.

### 1. Introduction

One of the examples, which was very interesting for us, was an affinely rigid body, i.e., a body rigid in the sense of affine geometry, in other words, homogeneously deformable body. So, the subject of our interest is the case of uniformly deformable objects. There are usually some groups responsible for the geometry of the physical space or space-time. Mostly it is such groups like the isometry group, affine group, conformal group, Poincare group, Galilei group, etc. Configuration spaces of various constrained continua very often happen to be homogeneous spaces of those groups. One of the examples, which was very interesting for us, was a body rigid in the sense of affine geometry. Such a body we call affinely rigid body. It can be for instance the model of internal degrees of freedom in Eringen's micro-morphic continuum. There are also other interesting examples like, e.g., molecular vibrations. Let us notice there is plenty of misunderstandings here. Often one does not distinguish between two procedures: the first one of finding special solutions of continua in terms of affine motion and the second one of the dynamically restricted problem of affine motion. We are looking for the special solutions of unconstrained problems, rather than of the constrained dynamics with its characteristic reaction