



## AFFINE MODELS OF INTERNAL DEGREES OF FREEDOM AND THEIR QUANTIZATION\*

AGNIESZKA MARTENS

*Institute of Fundamental Technological Research, Polish Academy of Sciences  
5<sup>B</sup>, Pawińskiego Str., 02-106 Warsaw, Poland*

**Abstract.** We discuss some classical and quantization problems of infinitesimal affinely-rigid bodies moving in two-dimensional manifolds. Considered are highly symmetric models for which the variables can be separated. We follow the standard procedure of quantization in Riemannian manifolds, i.e., we use the  $L^2$ -Hilbert space of wave functions in the sense of the usual Riemannian measure (volume element).

*MSC:* 22E70, 37J15, 81R05

*Keywords:* affine models, internal degrees of freedom, quantization problems, highly symmetric models, separability problem, Riemannian manifolds, Hilbert space

### 1. Introduction

Discussed is an affine generalization of the test rigid body model [8]. The general formulae (concerning the kinetic energy, etc.) are presented and later on we concentrate on potential models, which are in some sense isotropic and admit analytical calculations based on the separation of variables method. In particular, we consider a special case, when the translational part of the potential energy has the Bertrand structure [8]. Our results may be physically applicable in mechanics of media with microstructure. We mean micromorphic media which are continua of infinitesimal affinely-rigid bodies. Namely, surfaces of such bodies will behave as two-dimensional continua with the effective microstructure induced by the usual

---

\*Reprinted from *Geometry, Integrability & Quantization* **16** (2015) 207-218  
doi: 10.7546/giq-16-2015-207-218.