SPHERICAL BALL BEARINGS

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Abstract. We construct nonholonomic systems of n homogeneous balls with the same radius r that are rolling without slipping around a fixed sphere with center O and radius R. In addition, it is assumed that a dynamically nonsymmetric sphere of radius $R + 2r$ and the center that coincides with the center O of the fixed sphere rolls without slipping over the moving balls. We prove that these systems possess an invariant measure. Also, we consider the limit, when the radius R tends to infinity. We obtain a corresponding planar problem consisting of n homogeneous balls with the same radius r that are rolling without slipping over a fixed plane, and a moving plane that moves without slipping over the homogeneous balls. We prove that this system possesses an invariant measure and that it is integrable in quadratures according to the Euler–Jacobi theorem.

This is joint work with Vladimir Dragović and Božidar Jovanović

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