

Rolling heavy ball over the surface with arbitrary shape in real $Rn3$ spave

Katic R. (Stevanovic) Hedrih

Abstract: The research results of the rolling, without slipping, of a homogeneous heavy ball over the surface with arbitrary shape, in the real $Rn3$ space, are presented. The system is holonomic stationary, since the ball is subjected to geometric constraints, and has three degrees of freedom of movement. Two orthogonal unit vectors in the tangent plane to the surface of ball and surface along which ball rolls, are determined. The unit vector of the normal to the surface of the ball and the surface along which ball rolls without slipping, through the current contact point of ball and surface, and passes through the center of the ball. At each moment, fot the current position of the point of the contact between the ball and the surface, the position vector of the center of the ball is determined. Also, the corresponding vector of velocity of the center of the ball is determined. Using the velocity vector of the center of the ball, the current angular velocity of rolling the ball over the surface in the function of generalized coordinates is determined, as well as their direction. The direction of the elementary arch of the curvilinear trace through current contact point, of rolling the ball over the surface, as well as the direction of the momentary axis around which the ball is rolling without slipping, are determined. Katica (Stevanovic) Hedrih , (2019), "Rolling heavy ball over the sphere in real $Rn3$ space", Nonlinear Dynamics, Springer . in press, DOI: 10.1007/s11071-019-04947-1.

¹⁾ Katic R. (Stevanovic) Hedrih, Professor: Mathematical Institute of Serbian Academy of Science and Arts, 11000, Serbia (RS), katicah@mi.sanu.ac.rs.