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A new numerical method for planar multibody system with mixed lubricated revolute joint

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Abstract

A new method for modeling and analysis of planar multibody systems with lubricated revolute joints is presented. This method is established by coupling the lubrication model of lubricated revolute clearance joint with the dynamics model of multibody system. The lubrication model is solved by the Finite Element Method, while the multibody dynamics equations are established by Lagrange's method. In order to take into account the effects of the surfaces roughness on the hydrodynamic lubrication when the oil film between the mating surfaces has a very small thickness, the average Reynolds equation is adopted. The hydrodynamic forces built up by the lubricant fluid are evaluated from the knowledge of the system variables and then included into the dynamics equations of the multibody system. In the end, the proposed approach is applied to the piston–connecting rod–crank system in a four-stoke gasoline engine with lubricated clearance joint at the big end of the connecting rod. The clearance size and lubricant viscosity are investigated so as to reveal their influences on both the

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