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ON MULTIPLE IMPACTS WITH FRACTIONAL TYPE OF DISSIPATION

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ABSTRACT:

Consider a system of three rigid bodies which are able to move without rotation along a line and could contact each other through a viscoelastic rods of negligible mass. Initially the first one is moving with constant velocity while two others are at rest and in contact. At certain moment the first body impinges against the second one. This in turn causes an internal impact between the second and the third body. In the analysis of contact forces during impact, the constitutive model that comprises fractional derivatives of stress and strain and restrictions on the coefficients that follow from Clausius-Duhem inequality was chosen. It was shown that the dynamics of the problem is governed by a sistem of two coupled integro-differential equations that involve the Mittag-Leffler functions. The post impact velocities were obtained numerically by use of the first-order fractional difference approximation. The proposed model could be used for the study of systems incorporating polymers, elastomers and other real materials.

Key words: multiple impact, damping, fractional derivatives

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