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Efficient Generalized Speeds in a Recursive Formulation of Flexible Multibody Dynamics

Arun Banerjee, Mark Lemak

Lockheed Martin ATC, Palo Alto, USA

Certain choices of variables describing the motion rather than the configuration of a multibody system have been shown in recent literature to lead to simpler dynamical equations. These include generalized speeds for rigid bodies connected by revolute joints, Hooke's joints, and spherical joints, and those for elastic motions of flexible bodies undergoing large overall motion. This paper incorporates these generalized speeds in a recursive formulation for the dynamics of a system of flexible bodies connected by rotational and translational joints. The result is a set of dynamical equations with block-diagonal mass matrices that are not symmetric, and kinematical equations that are slightly more complicated than those for customary choice of variables. Overall numerical efficiency of the formulation is demonstrated by means of examples of large motions of a single flexible spacecraft and an articulated four-body spacecraft with three flexible appendages connected to the bus by three types of rotational joints

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