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Generalized Newton–Euler Dynamic Equations

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Novel generalized Newton–Euler dynamic equations of rigid and flexible multibody systems are proposed. The inertia forces in the equations are with respect to the quasi-velocities and accelerations. Body mass properties are presented by generalized dense mass-matrices used in finite element discretization and other kinds of mass reduction. Lagrange's equations are applied. The kinetic energy is differentiated with respect to generalized co-ordinates, velocities and time. The final form of the generalized Newton–Euler equations is obtained substituting the generalized coordinates in the expressions so obtained by quasi-velocities and accelerations. Examples of modeling large flexible deflections are solved implementing different algorithms. The equations are consistent with any commercially available computer programs for finite element discretization and solve in general the problem for deriving the dynamic equations of rigid and flexible systems.

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