THE INFLUENCE OF THE ENERGY-MOMENTUM PARADIGM ON THE DEVELOPMENT OF COMPUTATIONAL CONTACT MECHANICS

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Among Michael Crisfield's many influential contributions is his work examining the energy and momentum pathologies inherent to traditional time stepping in nonlinear structural dynamics, and his exploration of energy-momentum algorithms as a remedy for these difficulties. In this talk, I summarize the effect the energy-momentum paradigm has had on the way we formulate and solve contact/impact problems in nonlinear mechanics. Examples of this influence include: the reformulation of contact constraints to ensure linear and angular momentum conservation; the development of an energy consistent framework for simulation of impact events, such that model dissipation is preserved by the temporal discretization process; and the use of velocity updates within the energy-momentum framework to provide enhanced accuracy in simulation of impact events. Very recent applications of these ideas to preserve conservation properties within the mortar-finite element contact framework will also be explored.