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Kenneth R Ball* (ballkenneth@gmail.com). *Variational Integrators and Non-coordinate Frames in Velocity Space.*

The analysis of certain mechanical systems may be simplified by the introduction of a moving frame to velocity space that is not tied directly to configuration coordinates. Measuring velocity vectors against such a frame may simplify the equations of motion and provide insight into systems with symmetries and/or velocity constraints (Ball, Zenkov, and Bloch [2012] and Bloch, Marsden, and Zenkov [2009]). The development of numerical integrators for the simulation of such systems is of interest (Kobilarov, Marsden, and Sukhatme [2009]). In this presentation, recent developments will be presented that demonstrate a novel class of numerical integrators motivated by the form of the equations of motion with respect to a non-coordinate frame in velocity space. These discrete approximations of the continuous equations of motion are further demonstrated to be variational integrators, and thus result in update maps that preserve discrete analogues of physically meaningful quantities (Marsden and West [2001]). (Received January 20, 2014)