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Discrete Dirac Structures and Nonholonomic Integrators for Lagrange-Dirac Systems

Much effort has been devoted to developing numerical integrators for nonholonomic mechanical systems. There is no doubt that the variational integrator which preserves a discrete structure of system dynamics is an essential tool for the numerical analysis of such nonholonomic systems. In recent years, the continuous and discrete settings of Dirac structures and associated Lagrangian and Hamiltonian dynamical systems have been developed for modeling and analysis of nonholonomic mechanical systems. In this talk, we propose a discrete Dirac structure and associated Lagrange-Dirac dynamical systems which is slightly different from previous works. In particular, we will show the property of preserving the discrete Dirac structure. Then we show the link between the discrete Dirac dynamical systems and the discrete Lagrange-d'Alembert-Pontryagin variational structures. We illustrate our theory by some illustrative examples together with numerical computations. This research is a joint work with Linyu Peng.