1077-65-665 **James Brian Hall*** (j9hall@math.ucsd.edu), Department of Mathematics, University of California, San Diego (UCSD), 9500 Gilman Drive #0112, La Jolla, CA 92093. *Spectral Variational Integrators.* Preliminary report.

Variational integrators form a general class of structure preserving numerical algorithms for simulating Hamiltonian and Lagrangian dynamics. These methods offer numerical solutions to Hamiltonian and Lagrangian systems that are extremely stable, even over very large time scales and for large time steps. Because of these excellent properties, there has been significant recent interest in developing high order variational integrators. This talk will present a new variational integrator, which combines techniques from classical spectral methods with the Galerkin variational integrator framework. This integrator, in addition to being symplectic and momentum preserving, exhibits geometric convergence to the true flows of Hamiltonian and Lagrangian systems, and is stable even over time steps several orders of magnitude larger than typical time steps for standard symplectic methods. The theoretical properties of this method are verified through several standard benchmark numerical examples. (Received September 09, 2011)