

Variational Integrators in Plasma Physics

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Abstract

The talk introduces variational integrators, a method of deriving structure preserving discretisation schemes. Here, not the equations of motion but the Lagrangian of the system is discretised, followed by the application of a discrete action principle that leads to discrete equations of motion directly. The basic theory for particle as well as field systems is described including the proof of discrete conservation laws via a discrete Noether theorem. Further, the theory of Ibragimov is introduced. It allows to find Lagrangians for a wide range of systems that traditionally do not possess a Lagrangian, like we often find them in plasma physics. The application of these methods to the Vlasov-Poisson system and ideal MHD is presented including numerical examples.