Contribution ID: **41**   Type: **not specified**

19-Integration Algorithms for Charged-Particle Dynamics in Magnetized Plasmas

Wednesday 16 February 2022 14:13 (13 minutes)

Plasma research has been conducted over a wide range of areas in physics. Due to the complexity of the physics that govern plasma behaviour, computer simulations have been used to bridge the gap between theoretical models and experimental results.

Some plasma simulations involve computing the full orbit of charged particles under the influence of electric and magnetic fields. Such is the case for Particle-In-Cell (PIC) simulations of magnetized plasmas. The integration algorithm is a crucial component in those simulations, as it is responsible for updating the particle positions across phase-space.

The purpose of my thesis is to develop, implement and test integration algorithms for non-trivial coordinate systems. In particular, integration algorithms with good conservation properties will be given a significant emphasis. The integration algorithms implemented in a particle-tracing code will be compared to those produced by standard approaches.

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