Printable PDF

Department of Mathematics,
University of California San Diego

* *

Computational Geometric Mechanics Research Seminar

Kevin Ostrowski

UCSD

A Structure-Preserving Approach to Maxwell-Vlasov Dynamics

Abstract:

The Maxwell-Vlasov equations model the evolution of a plasma and can be derived from a suitably chosen Lagrangian. That Lagrangian decomposes as the sum of terms associated with the motion of the particles, the energy stored in the electromagnetic field, and the interaction of the particles with the field. Previous structure-preserving approaches to modeling fluid dynamics, using the group structure of the configuration space, and electromagnetic fields in vacuum, using the de Rham complex, have proved effective, raising the question whether these results could be leveraged to obtain well-behaved numerical solutions of the Maxwell-Vlasov system, thought of as a composite. With this goal in mind, we write the Maxwell-Vlasov Euler-Poincaré equations in a weak, variational form, then use approximation spaces suggested by the referenced works to obtain a semidiscrete version of the problem. We then present work done towards solving the fully discrete problem and indicate future directions.

January 24, 2023

2:00 PM

APM 7321

* *

9500 Gilman Drive, La Jolla, CA 92093-0112

(858) 534-3590