Applied

Mathematics

McGill
Applied Mathematics Seminar Series
Nov. 23, 2001

Prof. Debra Lewis, U. of California at Santa Cruz

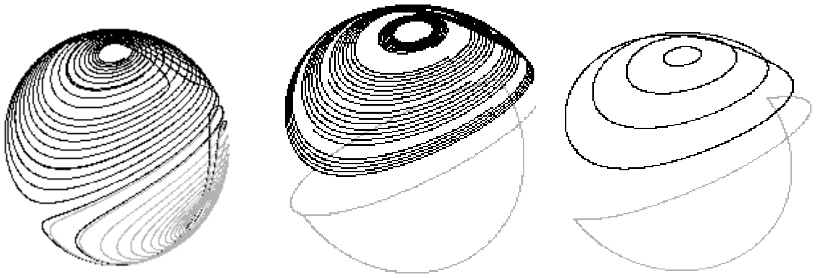
Title: Geometric Integration and rigid body dynamics

Friday, Nov. 23, 2001

Time: 2:30 pm

Room: Burnside 1205

Coffee and refreshments will be served after the seminar



Abstract: The configuration manifolds for many mechanical systems are either Lie groups or homogeneous manifolds, i.e. manifolds with a transitive group action. Lie group methods can be used to integrate initial value problems on such systems, yielding discrete trajectories lying exactly in the true configuration manifold. Given an ordinary differential equation on a homogeneous manifold, one constructs a "geometric integrator" by determining a compatible ordinary differential equation on the associated Lie group, using a Lie group integration scheme to construct a discrete time approximation of the solution curves in the group, and then mapping the discrete trajectories onto the homogeneous manifold using the group action. If the points of the manifold have continuous isotropy, a vector field on the manifold determines a continuous family of vector fields on the group, typically with distinct discretizations. If sufficient isotropy is present, an appropriate choice of vector field can yield improved capture of key features of the original system. Applications range from rigid body dynamics to the Landau-Lifschitz-Ginzburg equations for micromagnetic materials.