APPLIED MATHEMATICS COLLOQUIUM

SURPRISING ALGORITHMS FOR PERFORMING ROTATIONS, AND THEIR CONSEQUENCES

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ABSTRACT:

Objects on computer monitors can be made to appear to rotate in three dimensions when pulled by a mouse. We will explain a little known algorithm which provides the simplest method to implement this task. It leads us to a new description of SU(2) and SO(3) that helps us visualize the composition of three dimensional rotations as easily as we do translations with the parallelogram law or two dimensional rotations with angle addition. It provides a method for interpolating 3D rotations which is more efficient than conventional interpolation of unit quaternions. Finally, we will use these ideas and their connection to the topology of the 3-sphere to understand and demonstrate physically the following surprising fact: When an object in the center of a room is connected to the walls by strings, and the object is rotated one turn about an axis, the strings become tangled, but if the object is rotated another turn about that axis, they may be disentangled.

MONDAY, FEBRUARY 12, 2007
4:30 PM
Building 2, Room 105

Refreshments at 4:00 PM in Building 4, Room 174
(Math Majors Lounge)