

1023-H5-406

Paul R Bouthellier* (pbouthe@pitt.edu), 504 East Main Street, Titusville, PA 16354. *Euler Angles, Rotation Matrices, Euler's Identity and Quaternions.*

In this talk the graphics package Flash will be used to create 2- and 3-dimensional objects which will be rotated about their axes and in space. The mathematics derived is used to write programs in the ActionScript language of Flash.

In the 2-dimensional case, where a is the rotation angle, Euler's identity $\exp(ia)=\cos(a)+i\sin(a)$ is used to rotate 2-dimensional objects about the plane via the standard 2×2 rotation matrix. Extending Euler's identity to quaternions: where v is a vector in R^3 , $\exp(v(a/2))=\cos(a/2)+\sin(a/2)v$ can be used to create rotations in 3-dimensional space. Three-dimensional objects are created in Flash and are rotated by rewriting quaternions, and their products, as rotation matrices.

Another way to rotate objects in space is to use Euler angles written as rotation matrices. Rotation of 3-dimensional objects will be accomplished by sequences of such matrices. The fact that a sequence of angular displacements is equivalent to a single angular displacement will also be illustrated by rotating objects in R^3 . (Received September 12, 2006)