

CYBERWORLDS

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“Geometric Algebra for Computer Graphics”

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Full-day Tutorial



Summary

This tutorial will cover the principles of geometric algebra in the context of 2D and 3D vector techniques employed in computer graphics. It will show how by adopting some simple axioms, a powerful algebra arises capable of computing intersections, reflections and rotations in 2D and 3D.

Geometric algebra develops the idea of vectors being oriented lines, and creates new objects for oriented planes and volumes. In so doing, the vector cross product becomes redundant and is replaced by a new outer product that works in space of any dimension. Also, as geometric algebra is naturally complex, in that some of its elements are imaginary, it performs all the operations of quaternions without requiring Hamilton's famous rules.

The tutorial begins by reviewing some elementary ideas of trigonometry and continues by introducing geometric algebra step-by-step. At each stage, examples will be given so that new ideas such as bivectors, trivectors, pseudoscalars, duals and rotors, are understood within a computer graphic context.

Since the first presentations on geometric algebra were given at SIGGRAPH, the presenter has investigated the algebra and has written two books on the subject. Delegates will receive a copy of the presenter's latest book: *Geometric Algebra: An Algebraic System for Computer Games and Animation*, published by Springer.

The objective of the tutorial is to provide a rapid overview of geometric algebra that will permit delegates to pursue the subject at a broader level. The tutorial will be of interest to students, researchers, academics and programmers.

