A Bigger Mathematical Picture for Computer Graphics

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ABSTRACT

Some of the most brilliant mathematical discoveries of the 1800s were pushed aside for over a century in favor of the vector analysis and linear algebra that we are all familiar with. However, these old ideas have recently been rediscovered in the field of computer graphics by researchers who understand how they can unify many of the geometric operations that are used every day.

This talk introduces the basic concepts of the exterior algebra and presents a bigger mathematical picture that enables a deeper understanding of the homogeneous representation of points, lines, and planes, as well as the operations that can be performed among them using the progressive and regressive products. Some emphasis is placed on the history of related mathematics and the past development of incomplete pieces of the bigger picture, such as Plücker coordinates. The goal is to help the audience unlearn some longstanding misnomers in 3D geometry and to provide the knowledge of a larger, unified world into which many familiar mathematical concepts fit together.

BRIEF BIOGRAPHY

Eric Lengyel is the founder of Terathon Software and the creator of the C4 Engine, a comprehensive technology platform for games and virtual simulations. He holds a Ph.D. in Computer Science from the University of California at Davis and a Masters Degree in Mathematics from Virginia Tech.

Eric is the best-selling author of the book *Mathematics for 3D Game Programming & Computer Graphics*, and he is the series editor for the new *Game Engine Gems* series. Eric is also a member of the editorial board for the *Journal of Graphics Tools*, and he is a major contributor to the successful *Game Programming Gems* series.

Eric previously worked in the advanced technology group at Naughty Dog where he developed the driver architecture for the Playstation 3. Prior to that, was the lead programmer for Sierra Studio's popular adventure game *Quest for Glory V*, and he worked on OpenGL in Apple's graphics and imaging department.