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Are Points the Better Graphics Primitives?

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Abstract

Since the early days of graphics the computer based representation of three-dimensional geometry has been one of the core research fields. Today, various sophisticated geometric modelling techniques including NURBS or implicit surfaces allow the creation of 3D graphics models with increasingly complex shape. In spite of these methods the triangle has survived over decades as the king of graphics primitives meeting the right balance between descriptive power and computational burden. As a consequence, today's consumer graphics hardware is heavily tailored for high performance triangle processing. In addition, a new generation of geometry processing methods including hierarchical representations, geometric filtering, or feature detection fosters the concept of triangle meshes for graphics modelling.

Unlike triangles, points have amazingly been neglected as a graphics primitive. Although being included in APIs since many years, it is only recently that point samples experience a renaissance in computer graphics. Conceptually, points provide a mere discretization of geometry without explicit storage of topology. Thus, point samples reduce the representation to the essentials needed for rendering and enable us to generate highly optimized object representations. Although the loss of topology poses great challenges for graphics processing, the latest generation of algorithms features high performance rendering, point/pixel shading, anisotropic texture mapping, and advanced signal processing of point sampled geometry.

This talk will give an overview of how recent research results in the processing of triangles and points are changing our traditional way of thinking of surface representations in computer graphics - and will discuss the question: Are Points the Better Graphics Primitives?