The control polyhedron of a rational Bézier surface

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007 Kemeny Hall, 4:00 pm
(Tea 3:30 pm 300 Kemeny Hall)

Abstract

The work presented in this talk lies in the interplay between geometric modeling and algebraic geometry. Algebraic geometry investigates the algebraic and geometric properties of polynomials. Geometric modeling uses polynomials to build computer models for industrial design and manufacture from basic units, called patches, such as Bézier curves and surfaces. Bézier curves are governed by their control points. The polygon formed by connecting the control points with line segments is called the control polygon. This polygon is unique and determines many important features of the curve, thus validating its name.

A Bézier surface is also intuitively governed by control points; in particular, the surface lies within the convex hull of its control points. This convex hull is often indicated by drawing some edges between the control points, the resulting structure is called a "control mesh". Unlike curves, there is no unique choice of control mesh for a surface. So it is not clear in which way these meshes "control" the Bézier surface. In this talk, we will present one possible answer to this question. Our results rely upon algebraic geometry.

This is joint work with Frank Sottile and Chungang Zhu.

The talk should be understandable by graduate students and perhaps motivated undergraduates.

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