

## Discrete Mathematics Seminar

Time: Friday, 2 December 2011, 12:30-1:30 PM

Room: 238 Derrick Hall

Title: The Control Polyhedron of a Rational Bezier Surface

Speaker: Dr. Luis Garcia-Puente, Department of Mathematics and Statistics,  
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Abstract:

Geometric modeling builds computer models for industrial design and manufacture from basic units, called patches, such as, Bézier curves and surfaces. The control polygon of a Bézier curve is well-defined and has geometric significance—there is a sequence of weights under which the limiting position of the curve is the control polygon. For a Bezier surface patch, there are many possible polyhedral control structures, and none are canonical.

In this talk, I will present a not necessarily polyhedral control structure for surface patches, regular control surfaces, which are certain  $C^0$  spline surfaces. While not unique, regular control surfaces are exactly the possible limiting positions of a Bezier patch when the weights are allowed to vary.

While our primary interest is to explain the meaning of control nets for the classical rational Bezier patches, we work in the generality of Krasauskas' toric Bezier patches. Toric Bezier patches are multi-sided parametric patches based on the geometry of toric varieties and depend on a polytope and some weights. Our results rely upon a construction in computational algebraic geometry called a toric degeneration.