Geometry Seminar
Tuesday, October 07, 2008
Room 613 WWH at 6:00 P.M.

Envelope surfaces

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Objects in CAGD are sometimes approximated by or modeled as the union of a finite set of balls in space. In general, the surface formed by the boundary is not smooth on the transition between spheres. We introduce envelope surfaces, which are tangent continuous and wrap tightly around the union of the balls. This class of surfaces is an extension of Edelsbrunner's skin surfaces, which have been used for modeling and visualization of molecules.

The surface is the boundary of the union of an infinite set of balls, obtained by interpolating the radii of the input balls. We show that, under certain conditions on this radius function, the approximating surface is tangent continuous. By a special choice of this radius function we obtain a piecewise quadratic envelope surface, the patches of which are defined by a clipping quadrics to the cells of an associated polyhedral subdivision of space. The construction is general, and works in any dimension.