DIFFERENTIAL GEOMETRY/PDE SEMINAR

MONDAY, January 12
Padelford C-401
3:45 pm

Constant mean curvature surfaces with Delaunay ends

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The role of Delaunay surfaces in the theory of complete CMC surfaces is analogous to the role of catenoids in the study of complete minimal surfaces of finite total curvature. For example, paralleling the fact that any end of a complete minimal surface of finite total curvature must be asymptotic to a catenoid or a plane, is the fact that any end of a CMC surface of the type we consider must be asymptotic to one of these rotationally symmetric Delaunay surfaces. The fact that such CMC surfaces exist in abundance was first proved by Kapouleas. The general analysis of the moduli space $\mathcal{M}_{g,k}$ of k-ended CMC surfaces with genus g was considered by Mazzeo, Kusner and Pollack.

Our result is simply that CMC surfaces may be constructed out of certain building blocks which are : Delaunay surfaces (or more precisely, halves of Delaunay surfaces) and minimal k-noids. A minimal k-noid is by definition a complete minimal surface Σ of finite total curvature and with k ends, the moduli space of minimal k-noids of genus g is denoted by $\mathcal{H}_{g,k}$.

We may now state the main result :

Fix any $\Sigma_0 \in \mathcal{H}_{g,k}$, which is nondegenerate. Then there exists a family of CMC surfaces $\Sigma_\epsilon \in \mathcal{M}_{g,k}$ constructed by gluing half-Delaunay surfaces onto each end of the dilated surface $\epsilon\Sigma_0$. The surfaces Σ_ϵ have the property that for any $R > 0$, the dilated surface $\epsilon^{-1}\Sigma_\epsilon$ restricted to the ball $B_R(0)$ converges in the $\mathcal{C}^\infty$ topology to the restriction of Σ_0 to $B_R(0)$. In addition all of these Σ_ϵ are nondegenerate points of $\mathcal{M}_{g,k}$.

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