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Explicit conformal parametrization of Delaunay surfaces in space forms

"Delaunay surfaces" are translationally-periodic constant mean curvature (CMC) surfaces of revolution. We compute explicit conformal parametrizations of Delaunay surfaces in each of the three space forms Euclidean 3-space $\mathbb{R}^3$, spherical 3-space $\mathbb{S}^3$ and hyperbolic 3-space $\mathbb{H}^3$ by using the generalized Weierstrass type representation for CMC surfaces established by J. Dorfmeister, F. Pedit and H. Wu. This method is commonly called the DPW method, and is a method based on integrable systems techniques. We show that these parametrizations are in full agreement with those of the more classical approach. The DPW method is certainly not the simplest way to derive such parametrizations, but the DPW gives a means to construct other CMC surfaces (such as trinoids and perturbed Delaunay surfaces) that the classical methods have not given. The Delaunay surfaces are an important base for constructing other CMC surfaces using the DPW method, so explicitly understanding how the DPW method makes Delaunay surfaces is valuable.