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Variational Convergence and Discrete Minimal Surfaces

A straightforward discretization of the least area problem for surfaces of fixed topological type under Dirichlet boundary conditions is by minimizing the area among triangle meshes with fixed combinatorics, spanned into a boundary of closed polygonal lines. We show Kuratowski convergence (under refinement) of discrete δ -minimizers to smooth minimizers if both the smooth and the discrete boundary value problems are solvable and if the solutions fulfill certain a priori assumptions (e.g., a uniform bound in the $W^{2,\infty}$ -norm for minimizers of the smooth problem). Therefore, we develop a shape space of unparameterized Lipschitz immersions, topologized by a certain metric. Apart from the problem of existence, the approach is independent of the genus, the orientability and the number of boundary components of the considered surfaces.