

Renka, R. J.; Neuberger, J. W.

Minimal surfaces and Sobolev gradients. (English) Zbl 0857.35004
SIAM J. Sci. Comput. 16, No. 6, 1412-1427 (1995).

The authors treat the problem of computing triangle-based piecewise linear approximations to parametric minimal surfaces in the Euclidean 3-space. They employ the Sobolev metric method to descend the surface-area functional at each iteration. Test results show that, starting with extremely poor initial estimates, a few descent iterations produce approximations in the vicinity of the solution. They also introduce a new characterization of minimal surfaces that eliminates the potential problem of triangle area approaching zero. In place of the surface area functional, they minimize a functional whose critical points are uniformly parametrized minimal surfaces. This leads to both rapid convergence of the descent method and simplifying the expressions for gradients and Hessians.

Reviewer: [Ma Li \(New Brunswick\)](#)

MSC:

- [35A15](#) Variational methods applied to PDEs
- [65N06](#) Finite difference methods for boundary value problems involving PDEs
- [65M99](#) Numerical methods for partial differential equations, initial value and time-dependent initial-boundary value problems
- [65N99](#) Numerical methods for partial differential equations, boundary value problems

Cited in **12** Documents

Keywords:

[preconditioning](#); [parametric minimal surfaces](#); [Sobolev metric method](#)

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