# Implicit Surface Modeling Suitable for Inside/Outside Tests with Radial Basis Functions

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## Abstract

*We describe a method for computing an implicit function that represents a surface by its zero level set, given a set of points scattered over the surface and associated with surface normal vectors. This implicit function is defined as a linear combination of compactly supported radial basis functions. Our method is suitable for testing whether a given point is interior or exterior to the surface, previously only associated with globally supported or globally regularized radial basis functions. We use a two-level interpolation approach. In the coarse scale interpolation, we set basis function centers by a grid that covers the enlarged bounding box of the given point set and compute their signed distances to the underlying surface using local quadratic approximations of the nearest surface points. Then a fitting to the residual errors on the surface points and additional off-surface points is performed with fine scale basis functions. The final function is the sum of the two intermediate functions and is a good approximation of the signed distance field to the surface in the bounding box. Examples of surface reconstruction and set operations between shapes are provided.*

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