

Minimum Distance Queries For Polygonal And Parametric Models

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Abstract

Calculation of the minimum distance to a geometric object or the minimum separation between objects is a fundamental problem that has application in a variety of arenas. Minimum separation queries for sculptured surfaces are believed particularly difficult, yet are increasingly important as modeling problems grow larger and interactivity demands grow more stringent. We present a set of algorithms based on easy to compute bounds that allows efficient solution of minimum separation queries for many types of surface representations. These algorithms have simple and robust implementations and have average case performance matching the most efficient theoretical algorithms. These algorithms are tested in an interactive application designed to be the front-end of a haptic display system for virtual prototyping of assemblies.