

Public Abstract

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Graduation Term:SP 2009

Department:Mathematics

Degree:PhD

Title:Approximate Isometries and Distortion Energy Functionals

A fundamental mathematical problem underlying the subjects of medical imaging, minimal morphing in animation and movie making, and optimal development of surfaces in manufacturing, is the problem of minimal distortion bending and morphing of compact manifolds.

We look for maps between two manifolds (for example, two surfaces in the three dimensional space) that distort the geometry of the original manifold in the least possible way. We define several cost functionals that measure distortion of geometry produced by a map from the original manifold to the target. Also, we consider morphs between two manifolds. A morph can be described as a collection of manifolds and maps between them, each representing the state of evolution of the original manifold at a certain moment of time.

We prove the existence of minimal distortion maps and morphs between  $n$ -dimensional manifolds in certain admissible sets. Our cost functionals measure distortion due to change of volume, strain, or change in the curvature of the original surface produced by a map or a morph between two manifolds.