**Self Functional Maps**

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**Abstract**

A classical approach for surface classification is to find a compact algebraic representation for each surface that would be similar for objects within the same class and preserve dissimilarities between classes. We introduce self functional maps as a novel surface representation that satisfies these properties, translating the geometric problem of surface classification into an algebraic form of classifying matrices. The proposed map transforms a given surface into a universal isometry invariant form defined by a unique matrix. The suggested representation is realized by applying the functional maps framework to map the surface into itself. The key idea is to use two different metric spaces of the same surface for which the functional map serves as a signature. Specifically, in this paper, we use the Euclidean and the scale-invariant surface Laplacian operators to construct two families of eigenfunctions. The result is a matrix that encodes the interaction between the eigenfunctions resulted from two different Riemannian manifolds of the same surface. Using this representation, geometric shape similarity is converted into algebraic distances between matrices.

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**Self Functional Map is a surface signature**

For each surface in 3D we calculate the Self Functional Map matrix. We measure the distance between the surfaces by measuring the distance between the matrices. Then we can perform 3D object classification by using k-means algorithm. In the resulting classification, different classes correspond to different “identities”, and each class contains articulated objects at different poses. Functional Maps provide means to measure the distance between the surfaces by measuring the distance between the matrices. Then we can perform classification of articulated objects at different poses. Self Functional Maps can be expanded in the basis of Self Functional Map matrices. For each surface in 3D we calculate the Self Functional Map matrix. We use the Euclidean and the scale-invariant metric and non-isometric with respect to the Euclidean metric.

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**References**
