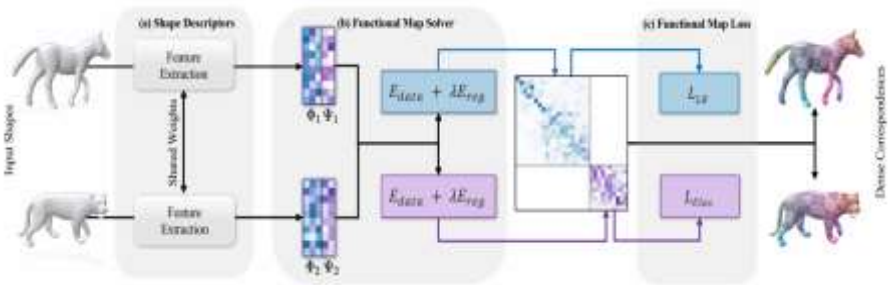
Hybrid Functional Maps for Crease-Aware Non-Isometric Shape Matching

What is the problem?

The primary problem addressed in the paper is **non-isometric shape correspondence**. In computer vision, this refers to finding correspondences between 3D shapes that have undergone non-isometric deformations, such as bending or creasing, where distances between points on the surface of the shape do not remain constant.

What has been done earlier?

Earlier work in shape correspondence, particularly using **functional maps**, heavily relied on the LBO eigenbasis, which is robust to isometric deformations but fails to account for extrinsic shape features like bending or creases. While this approach provides a stable and efficient method for many scenarios, it doesn't perform well in non-isometric situations where such extrinsic features are prominent.



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What are the remaining challenges?

Balancing Intrinsic and Extrinsic Properties: The LBO basis captures intrinsic properties well but ignores extrinsic details, while the elastic basis does the opposite. There was a need for a method that could effectively combine these strengths.

What novel solution proposed by the authors to solve the problem?

Hybrid Spectral Space: They create a joint vector space that combines the LBO eigenfunctions (capturing intrinsic, low-frequency information) with elastic eigenfunctions (capturing extrinsic, high-frequency details like creases).

Block-Diagonal Map Structure: To simplify the hybrid functional map, the authors use a block-diagonal structure, avoiding the complexity of inter-basis mappings. This structure helps in efficiently optimizing and regularizing the functional maps.

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