

Parametric Model Order Reduction for structures with arbitrary underlying meshes

Task

- Get familiar with methods to evaluate the displacement field of an arbitrary mesh at a reference mesh
- implement the methods investigated in the literature review
- apply them within the framework of (parametric) Model Order Reduction

Project Characteristics

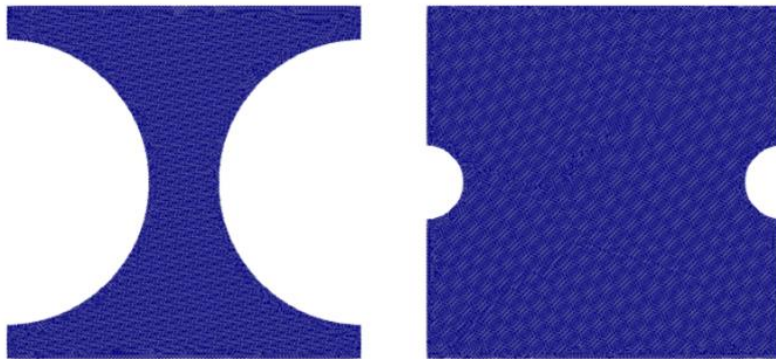
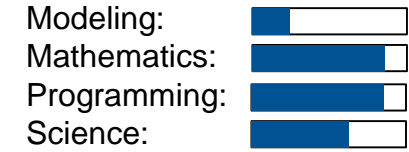


Fig 1: Two realizations of a geometrically parametrized structure discretized with different meshes, Figure adapted from [1]

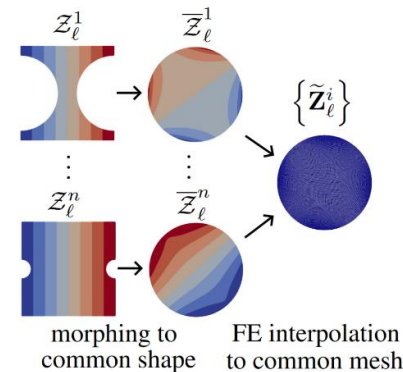


Fig 2: Morphing of the mesh to the unit disk and interpolation to a reference mesh, Figure adapted from [1]

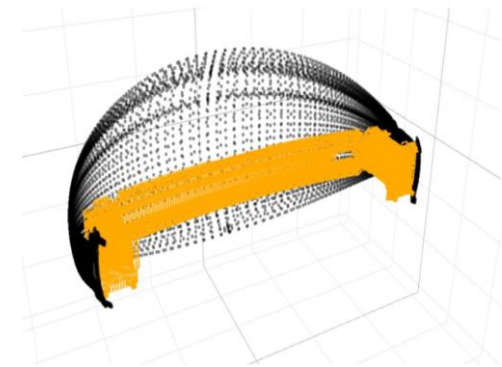


Fig 3: Projection of the FE nodes onto the sphere, Figure taken from [2]

[1] Casenave, Fabien, Brian Staber, and Xavier Roynard. "MMGP: a Mesh Morphing Gaussian Process-based machine learning method for regression of physical problems under non-parameterized geometrical variability." arXiv preprint arXiv:2305.12871 (2023).

[2] Kracker, David, et al. "Automatic analysis of crash simulations with dimensionality reduction algorithms such as PCA and t-SNE." 16th International LS-DYNA Users Conference. 2020.