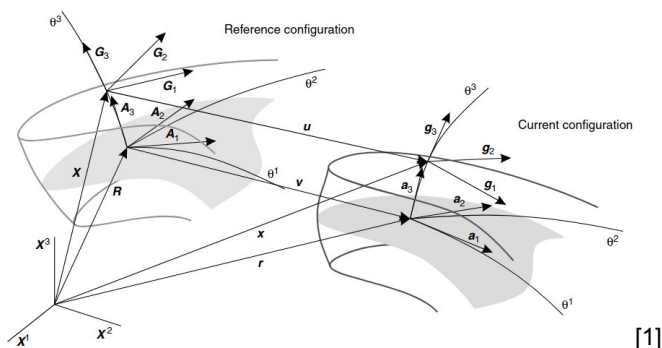


Master's Thesis:

Geometrically nonlinear shell finite elements: formulation, implementation, validation & modelling

Thin-walled structures, such as shells, are well-known and currently used in many engineering applications thanks to their load-carrying behavior and free-form lightweight shapes. The use of the finite element method (FEM) escalates throughout academia and industry, triggering the need for robust and reliable elements. In the case of shell, to solve problems involving large deformations and large strains, the 7-parameter shell models are elaborated [1] with various formulations regarding the seventh kinematic degree of freedom and the hybrid-mixed variational to avoid locking.

The goal of this master thesis is to study, implement and validate the higher-order models for the geometrically nonlinear shell elements in the open-source *Kratos Multiphysics* platform.



Prerequisites:

- Solid knowledge in continuum mechanics, non-linear and advanced FEM
- Solid knowledge in theory of plates and shells
- Background in C++ and Python

Language : English

Start date : Summer Semester 2026

Reference:

[1] Bischoff, Manfred, et al. "Models and finite elements for thin-walled structures." *Encyclopedia of computational mechanics* (2004).

Supervision: Ricky Aristio
ricky.aristio@tum.de