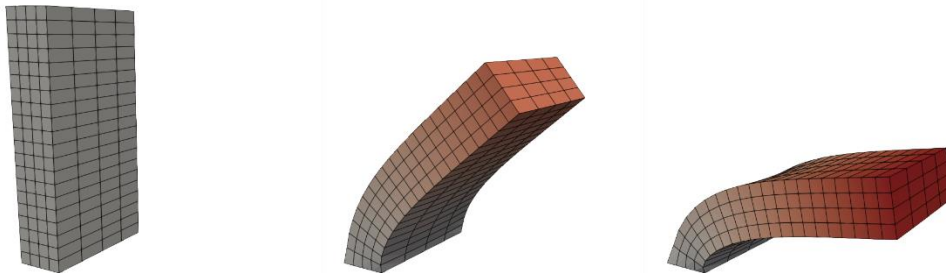


# Master Thesis

## An Updated Lagrangian finite element formulation with error estimation and adaptive remeshing for hyperelasticity problems

### Background

A stable, efficient, and accurate simulation of solids undergoing extremely large deformation is demanded in many engineering applications, but is still very challenging. One of the major difficulties in the Lagrangian finite element formulation is a severe mesh distortion due to the large deformation, which often requires a remeshing or local refinement process to avoid the numerical singularity (or break down of the simulation process). This additional process needs to be accompanied with an error estimation, and a data transfer scheme to connect the deformation states smoothly.



### Aim

- Simulation of very large deformation of solids using a tetrahedral or hexahedral elements, based on a displacement-based updated Lagrangian formulation.
- Discuss the advantages and disadvantages of the updated Lagrangian formulation in comparison to the total Lagrangian formulation.
- Implementation of an adaptive mesh refinement scheme, which includes
  - the incorporation of several existing error estimates, and the comparison of their effectiveness.
- MATLAB programming, and visualization of the solution field using .vtk file.

### Contact