FE study to investigate the effect of new spine implants

- Bachelor Thesis – Master Project – Master Thesis -

Institute Profile

The Institute of General Mechanics is an educational and research institute, teaching core and elective courses in mechanical engineering, biomedical engineering, and international master programs. Moreover, the institute runs in-house testing structural and biomechanical laboratories as well as mechanical and electrical construction workshops to provide and deliver state of the art theoretical modeling, numerical simulations, and experimental validations.

Topic

Disc herniation and lumbar stenosis of the spinal column belong to the common age-related spinal diseases. Open decompression and rigid fixation have become popular surgical interventions, whereby reinforcing instrumentations may enhance adjacent segment disease (ASD). To counteract the onset of ASD, dynamic topping-off devices have been developed, which combine rigid fusion with an elastic rod system to prevent unphysiological stiffness discontinuities and increased mobility in the adjacent segment. Experimental data was assessed for a topping-off system (BalanC™, Medtronic Co.) to analyze the influence of the implant on the range of motion (ROM) of functional spinal units (FSU).

In this study, a finite element (FE) model will be developed using CT data and analyzed regarding several aspects. The model will be validated using experimental data of the same specimen.

Requirements

- Background:
  - Master Thesis and Master Project: Mechanical and material science or computational engineering, some background in computational software (Matlab, Abaqus etc.)
  - Bachelor Thesis: Good Mechanics and Math basics
- Curiosity, time, self motivation
- English or German; advanced or native

Topics

- Depending on background:
  - Convergence analysis
  - Mesh generation with Hypermesh software
  - Modelling of the implant
  - Matlab programming
  - Abaqus material models (basics in continuum mechanics)

Application

- Via email:
  - Short motivation letter
  - Curriculum vitae
  - Transcript of records

Contact Person: Agnes Beckmann, M.Sc. beckmann@iam.rwth-aachen.de