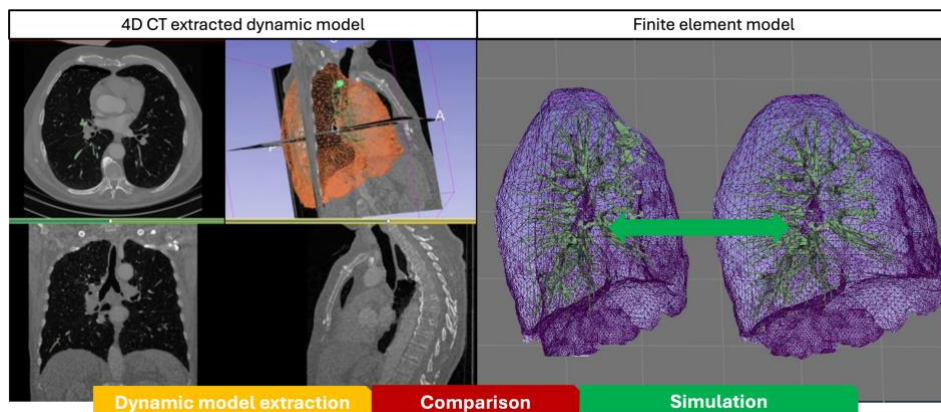


Internship + Bachelor /Master thesis

Finite element breathing lung models validation for physiological simulation

Motivation

In recent years, the demand for surgical simulation has significantly increased, driven by its proven benefits in training, preoperative planning, and intraoperative navigation. However, developing accurate lung models remains a major challenge due to the complex physiological and mechanical properties of the respiratory system. A promising solution lies in the Finite Element Method (FEM), which allows for detailed and realistic simulations of deformable structures. GetFEM is an open source library and it's a strong candidate for developing dynamic, patient-specific lung models. This project offers an exciting opportunity to bridge the gap between computational modelling and surgical applications, contributing to the development of next-generation simulation tools for thoracic surgery.



Task

This thesis aims to explore novel approaches to creating reliable lung simulations that can enhance surgical planning and training, paving the way for more advanced and personalized medical interventions.

- **Extracting dynamic lung model from 4D CT**
- **Integration of GetFEM with 3DSlicer**
- **Creating finite element lung model** that can mimic breathing motion
- **Validation with real patient data**

Requirements

- Python coding

Good to have

- Experience with 3DSlicer
- Mechanical modelling basics

References:

<https://www.frontiersin.org/journals/physiology/articles/10.3389/fphys.2022.984286/full>

Field of research:

Image processing and simulation

Title of research project

Surgical dynamic organ simulations for surgical navigation

Program

3DSlicer - python programming language

Course of study

Electrical engineering
Computer Science
Mechanical Engineering
Mechatronics
Physics
Mathematics

Starting date

Possible at any time



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