Karlsruher Institut für Technologie

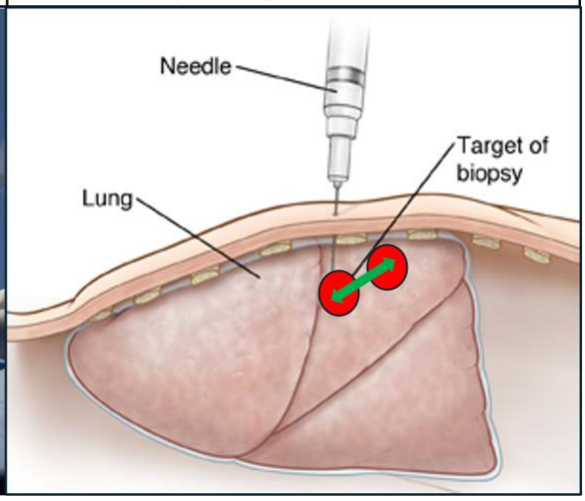
Institute of Biomedical Engineering

Master thesis

Extended reality needlescopy navigation in dynamic lung environment

Motivation

Needlescopy is a minimally invasive technique for diagnosing and treating lung tumors, but current methods often rely on fluoroscopy guidance, exposing patients and clinicians to ionizing radiation. Additionally, the dynamic nature of lung motion due to respiration makes accurate needle placement challenging, increasing the risk of complications or unsuccessful targeting. This research aims to develop an extended reality (XR) navigation system integrated with a dynamic lung model to enhance precision and safety in lung tumor targeting. By leveraging real-time anatomical adaptation and immersive XR visualization, the system will provide intuitive guidance, eliminating the need for fluoroscopy while improving procedural accuracy. This innovation will not only reduce radiation exposure but also optimize tumor accessibility, enabling safer and more effective needlescopy procedures for lung interventions.

Extended reality Navigation	Target moving due to respiration
	

Task

- Dynamic environment setup
- Digital twin setup
- Augmented reality implementation
- Optimization
- Performance comparison

Requirements

- Coding skills

Good to have

- Unity 3D
- ROS

References: https://doi.org/10.1177/15533506241290412

Field of research:
Surgical Navigation

Title of research project
XR surgical navigation with dynamic model

Program
3DSlicer – Unity 3D

Course of study
Electrical engineering
Computer Science
Mechanical Engineering
Mechatronics
Physics

Starting date
Possible at any time

Contact

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