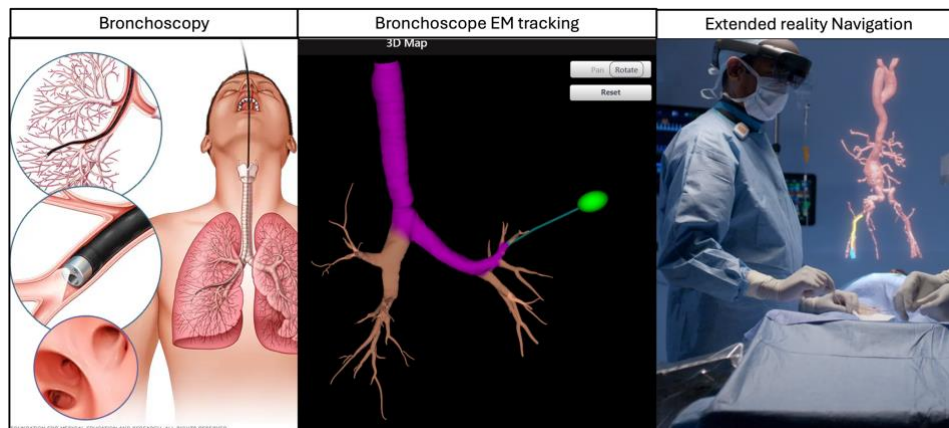


## Master thesis

# Extended reality bronchoscope navigation in dynamic lung environment

### Motivation

Bronchoscopy requires precise and adaptive navigation through complex airway structures, which are continuously influenced by patient movement and respiratory dynamics. Traditional navigation systems, relying on preoperative imaging and static models, often fail to account for these real-time anatomical changes, increasing the risk of misnavigation and procedural inefficiencies. Electromagnetic (EM) tracking, when registered directly to the patient, offers a powerful solution for real-time, sensor-based localization of the bronchoscope within a dynamically changing environment. This research aims to develop an extended reality (XR) navigation tool that integrates EM tracking with augmented reality visualization, providing intuitive, real-time guidance during bronchoscopy. By dynamically updating the navigation path based on patient-specific EM data, the system will enhance procedural accuracy, reduce cognitive load, and improve the safety and efficiency of airway interventions.



### Task

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

### Requirements

- Coding skills

### Good to have

- Unity 3D
- ROS

References: <https://onlinelibrary.wiley.com/doi/10.1111/1759-7714.14706>  
[https://journals.sagepub.com/doi/10.1177/15533506231160201?url\\_ver=Z39.88-2003&rfr\\_id=ori:rid:crossref.org&rfr\\_dat=cr\\_pub%20%20pubmed](https://journals.sagepub.com/doi/10.1177/15533506231160201?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%20%20pubmed)

### 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



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