

# Visualization of Robot Interaction Space

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## Motivation

- Robots are steadily taking their place in OR [1]
- They may hurt the staff or hit other devices while moving
- Positioning of the robot w.r.t. the patient is not easy
- Robots are not aware of their surroundings

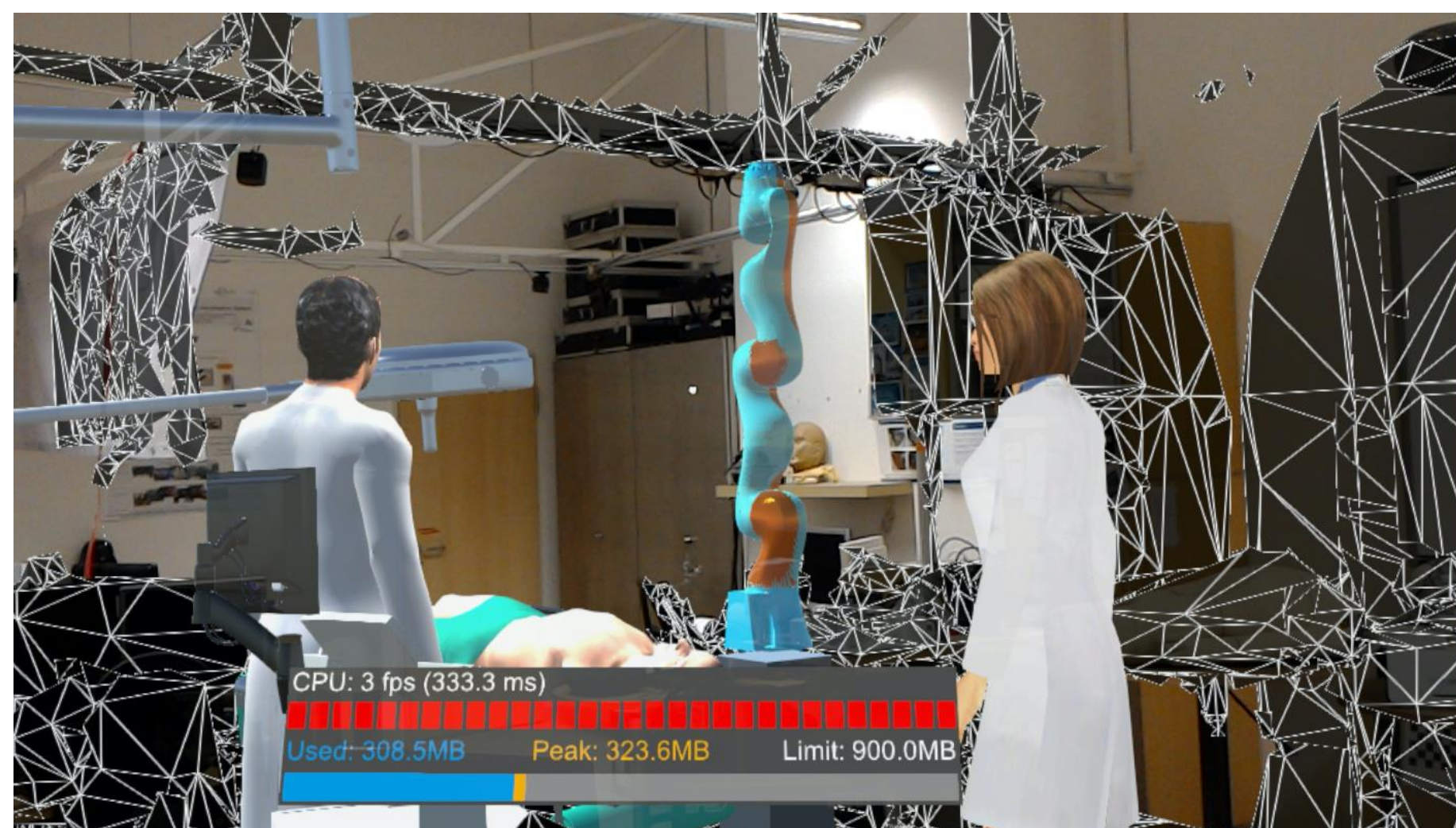


## Goal

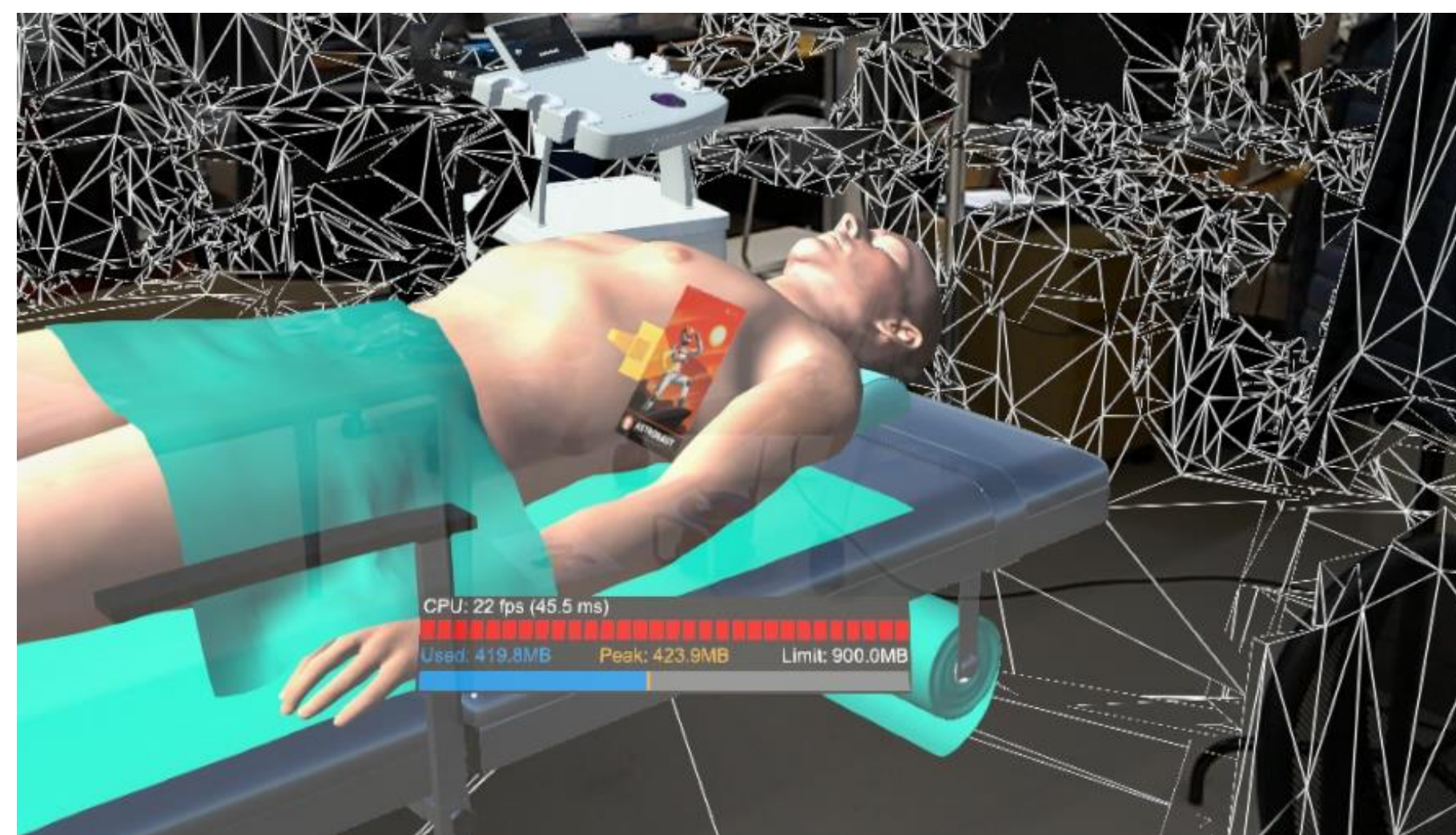
Creating a HoloLens – Robot system that

- Detects the objects and the people in the vicinity
- Allows the user to specify the destination point of the robot
- Calculates a safe trajectory and visualizes it on HoloLens
- Executes the movement if the trajectory is approved

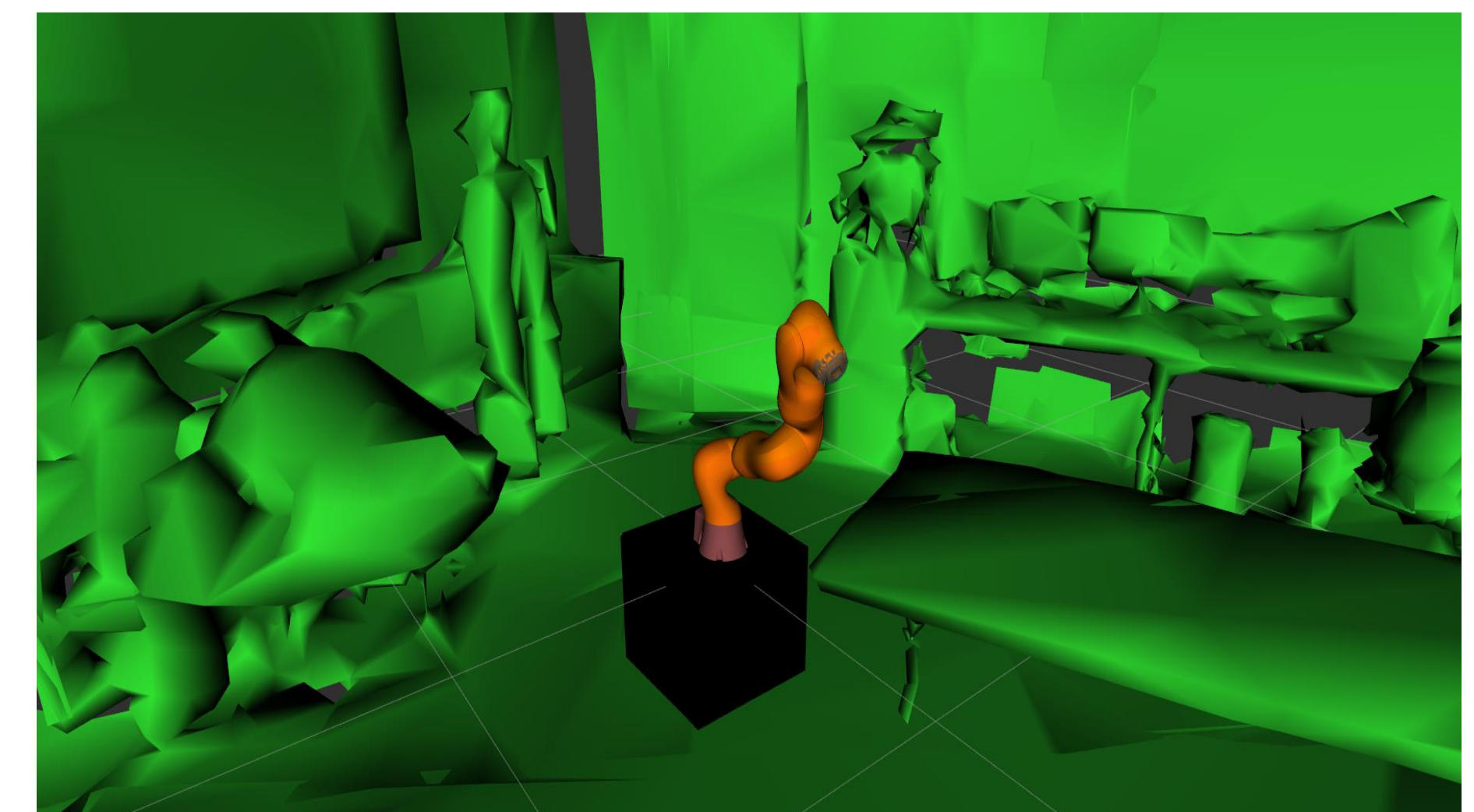
Initial scene



Specifying the destination point

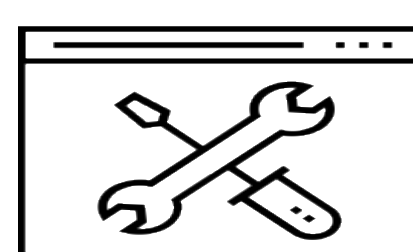


Spatial awareness

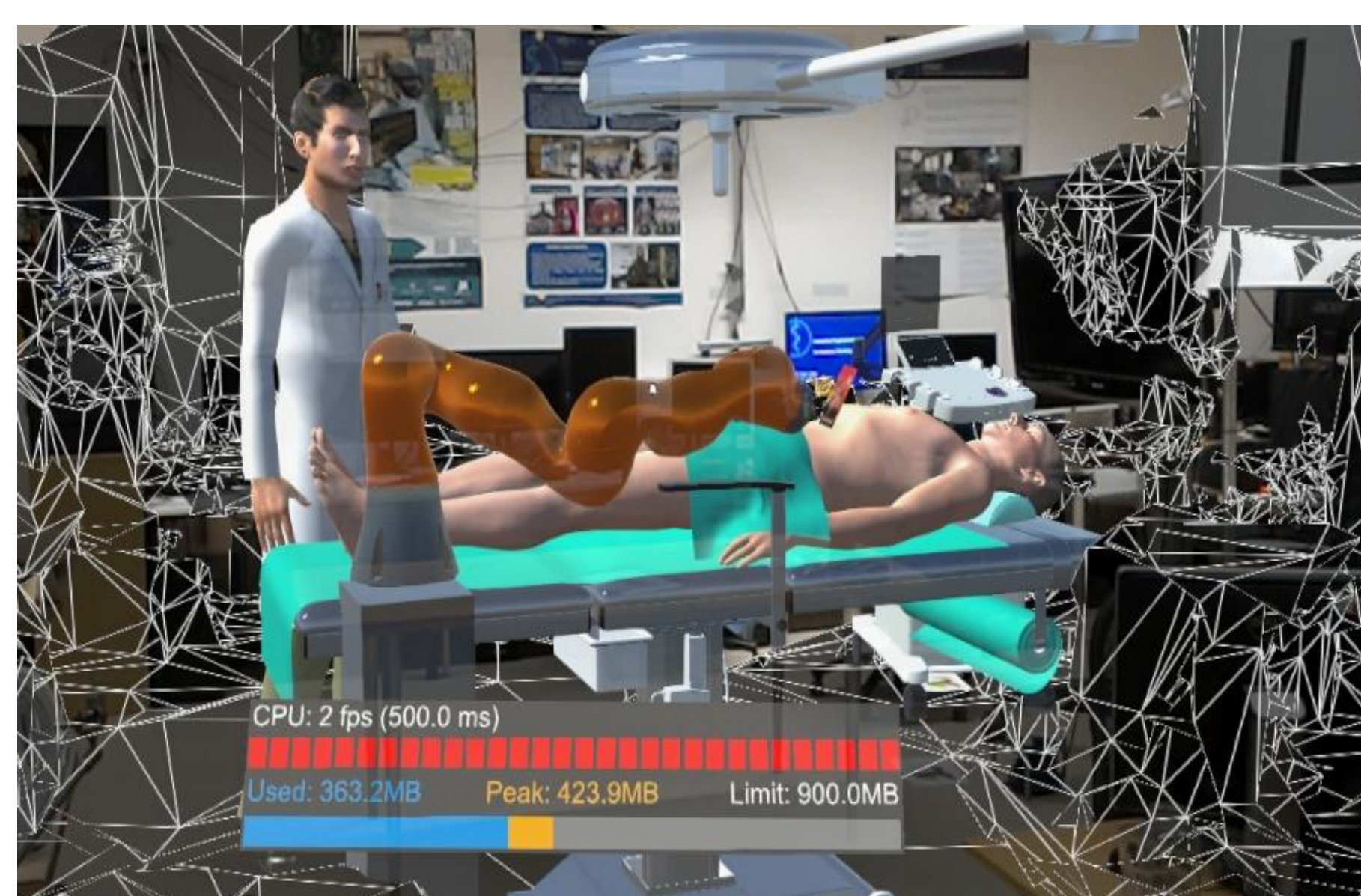


Trajectory calculation

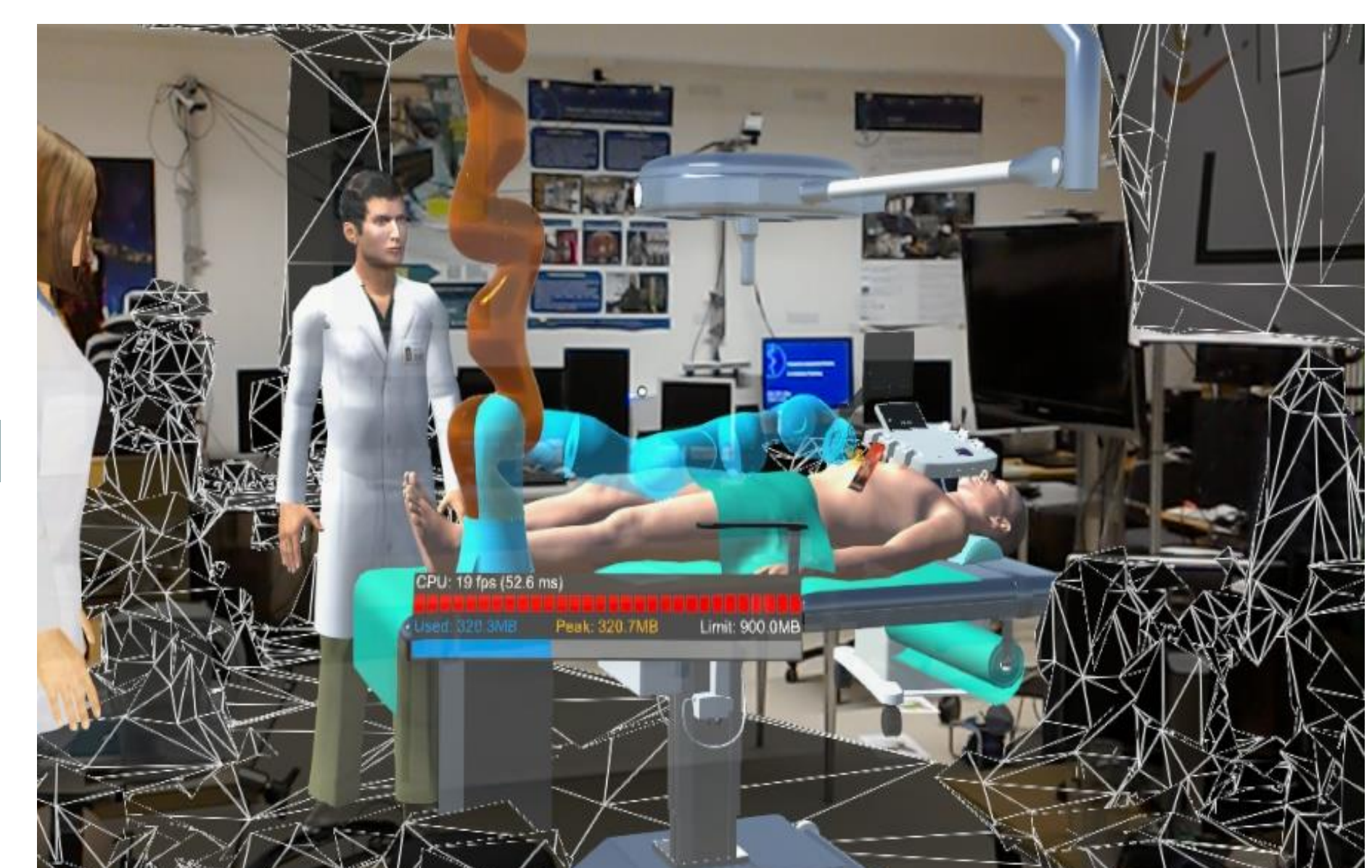
## Features



- ROS-Integration
- Spatial Awareness
- Tracker Detection
- Voice Command



Moving the actual robot to destination



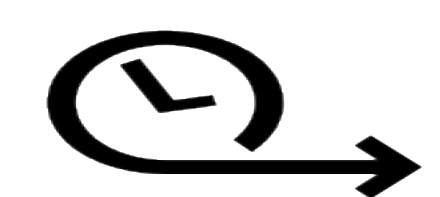
Trajectory visualization as hologram



## Conclusion

- A HoloLens application that allows control and safe manipulation of a robot is developed
- The robot is made aware of its surroundings through HoloLens
- Planning is made simpler

## Future work



- Get feedback from surgeons to improve the design and visualizations
- Implement connection with an actual Kuka robot
- Find a more practical solution for specifying the destination point of the robot

## Keywords



- “Plan trajectory” → Visualizes the computed safe path
- “Execute trajectory” → Moves the robot in the shown path

## References



- [1] H.P. Ganapathi, G. Ogaya-Pinies, T. Rogers, V.R. Patel. Surgical Robotics: Past, Present and Future. Operative Atlas of Laparoscopic and Robotic Reconstructive Urology, 2017

- [2] RosSharp Documentation. <https://zoetrope.github.io/RosSharp>