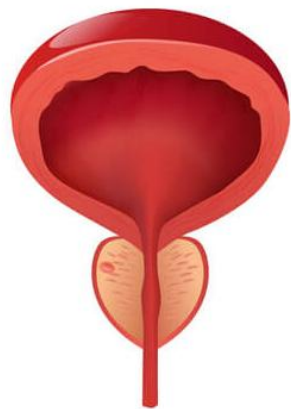# Trajectory simulation for robot-assisted prostate biopsy system

Presented by

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Introduction

- Prostate cancer is one of the major causes of cancer-related death for US men

- Early detection can help to improve survival rate of patients

- Biopsy is the golden standard for cancer detection

I stage   II stage   III stage

Introduction

- Challenges: prostate is very small and deformable

- Contributions: Robot-assisted prostate biopsy

https://www.kuka.com/en-be/company/press/news/2017/02/kuka-leichtbauroboter-lbr-med-geht-in-serienfertigung
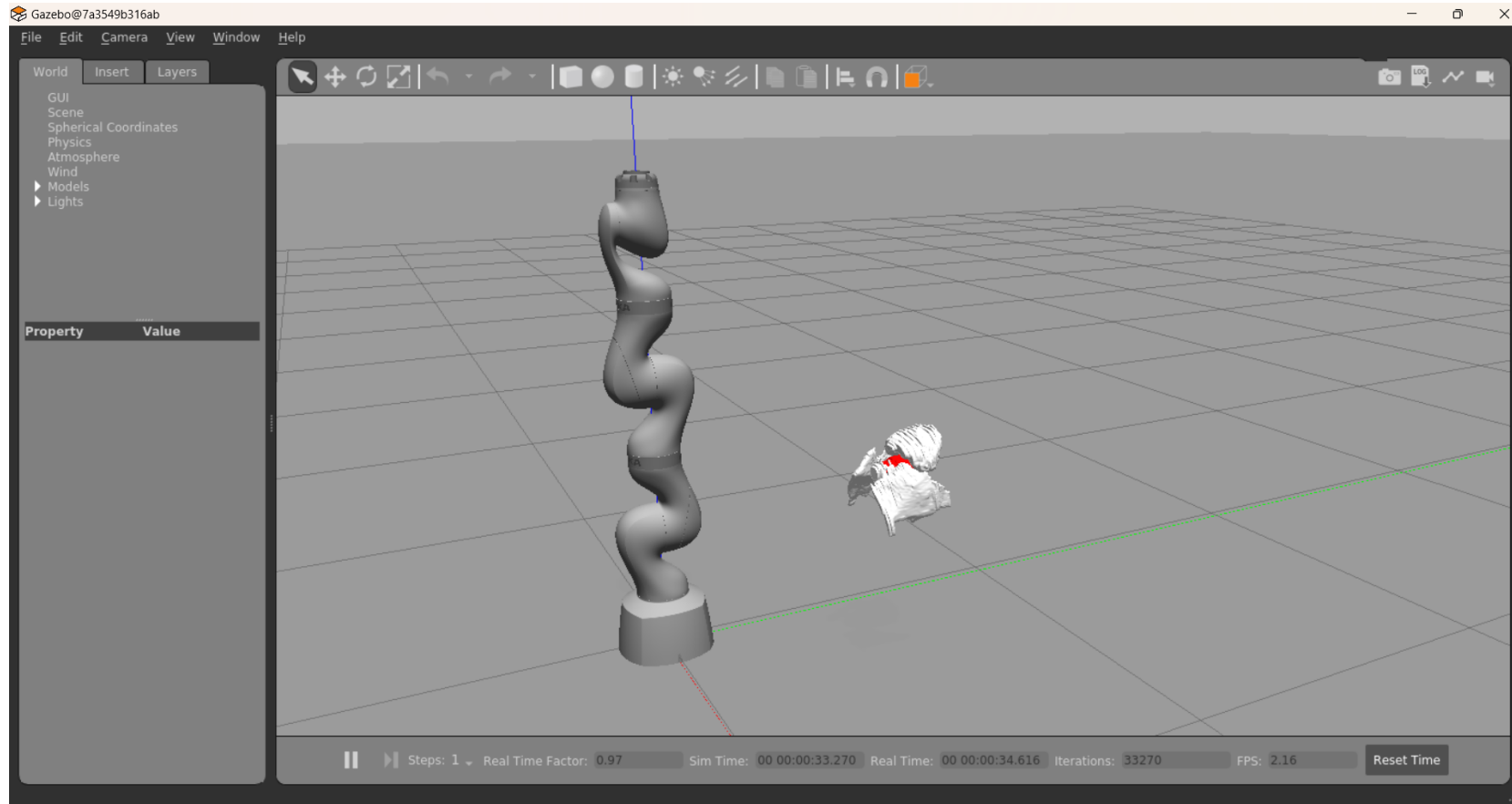
Methods

- Utilize Gazebo + Moveit to simulate robot-assisted prostate biopsy procedure

- Create 3D models of prostate and surrounding organs from medical images
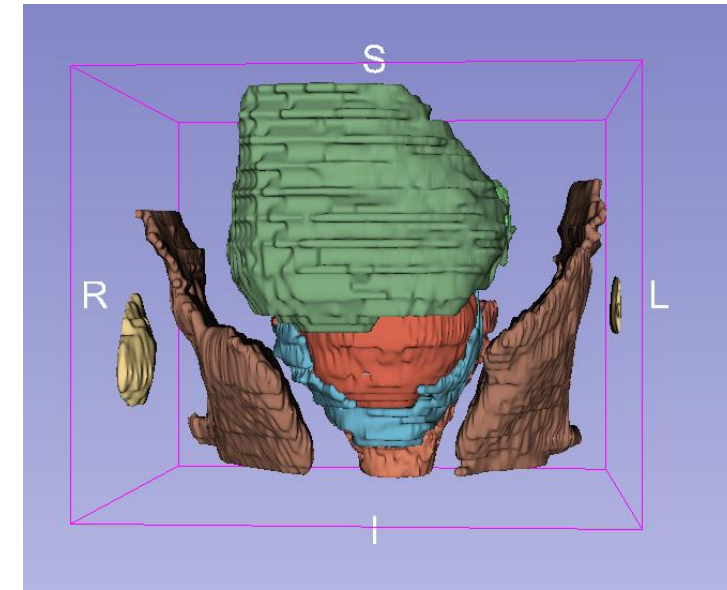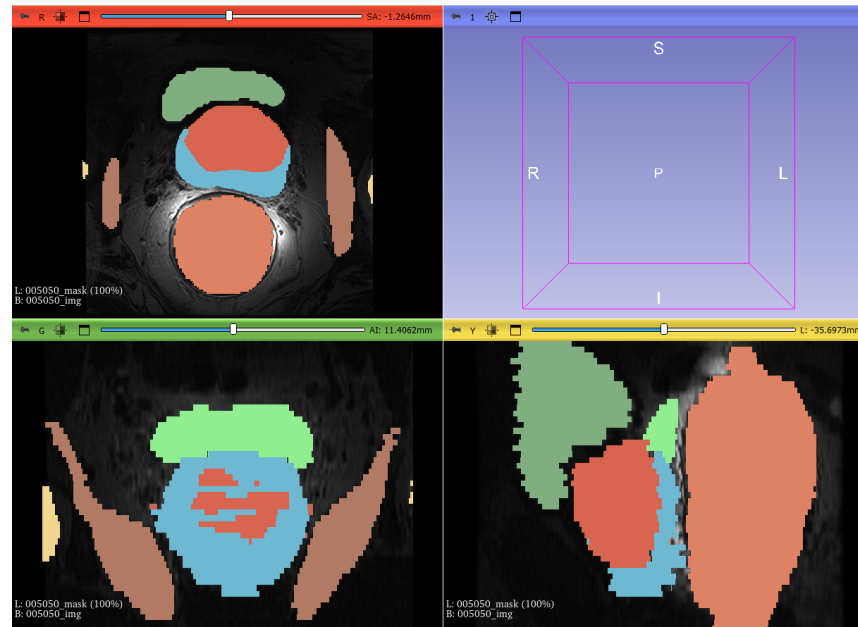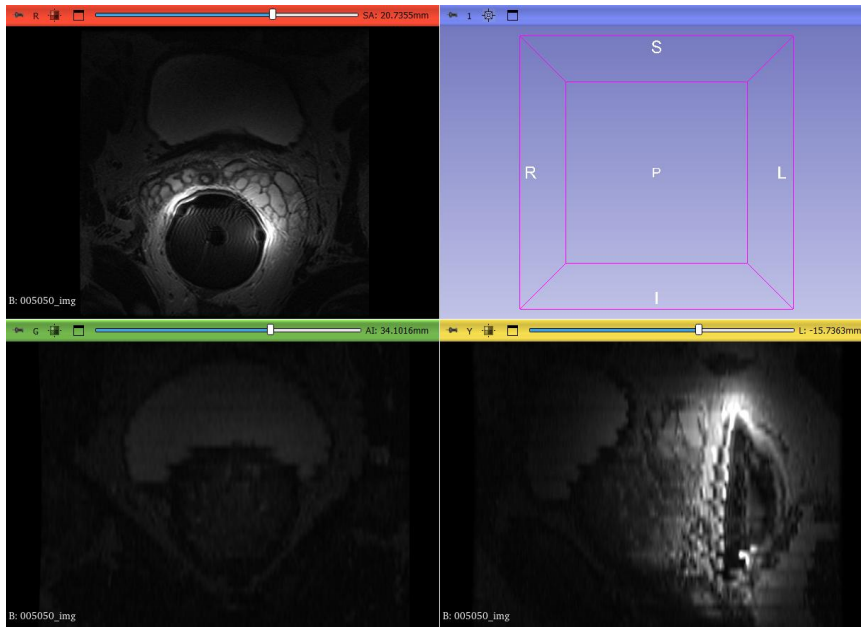
Methods

- Create a virtual surgical scene in Gazebo
  - prostate is highlighted in red

Methods

- Query a pose of the prostate

- Apply RRT* algorithm through Moveit for motion planning of the robot

```
process[lbr/rrt_motion_planning-1]: started with pid [25054]
[ INFO] [1733124666.527120721]: Loading robot model 'med7'...
[ INFO] [1733124666.528348000]: No root/virtual joint specified in SRDF. Assuming fixed joint
[ WARN] [1733124667.348863686, 35.395000000]: Could not identify parent group for end-effector 'ee'
[ INFO] [1733124668.549432758, 36.585000000]: Ready to take commands for planning group arm.
[INFO] [1733124668.581286, 36.615000]: Pose of prostate: position:
  x: 0.5
  y: 0.5
  z: 0.5
orientation:
  x: -0.706825181105366
  y: 0.0
  z: 0.0
  w: 0.7073882691671998
[INFO] [1733124668.583306, 36.618000]: Planning motion using RRT*...
[INFO] [1733124678.602551, 46.519000]: Plan found. Executing motion...
[INFO] [1733124696.010663, 50.939000]: Motion execution complete.
[lbr/rrt_motion_planning-1] process has finished cleanly
log file: /root/.ros/log/4af1dba8-b07f-11ef-a88b-0242ac110002/lbr-rrt_motion_planning-1*.log
```

Experiments

- It took about 10 s to calculate the proper trajectory to prostate

Experiments