NUCLEAR AND APPLIED ROBOTICS GROUP

THE UNIVERSITY OF TEXAS AT AUSTIN

TEXAS

The University of Texas at Austin

MICHAEL DIBONO

DOE-FIU SCIENCE AND TECHNOLOGY WORKFORCE DEVELOPMENT PROGRAM

APPLIED RESEARCH CENTER

FLORIDA INTERNATIONAL UNIVERSITY

SUMMER 2017 INTERNSHIP

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UNDERGRADUATE
MECHANICAL ENGINEERING

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NRG – UNIVERSITY OF TEXAS AT AUSTIN
SUMMER MENTOR

BACKGROUND

H-Canyon Air Exhaust (CAEX)

- 30+ mph air flow
- Acid vapors
- Alpha contamination
- High beta and gamma dose
- Uneven floor surfaces
- Obstacle debris
- “Muddy” paths
- 30+ cm of standing water
- Overhead obstacles

5 crawlers deployed since 2003

- Varying levels of success

BACKGROUND

Need for a system with:

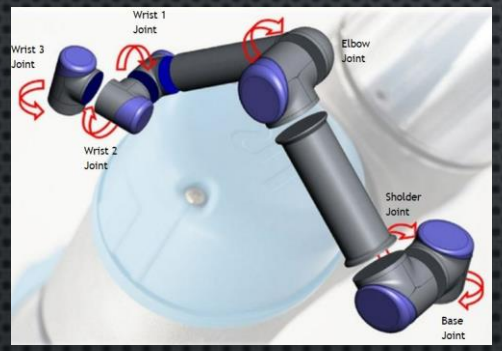
- Ability to right itself if tipped
- Better methods of inspection behind hanging ducts, pipes, and other obstacles
- A more robust method for overcoming obstacles
- The ability to be deployed in the existing port (30” diameter)

There is a desire to:

- Collect SLAM data from LIDAR and other sensors
- Collet core samples and possibly NDT of the tunnel walls
- Provide more data past video imaging (radiation survey data, collect soil/water samples, structural images via NDT techniques such as neutron radiography, etc.)

OBJECTIVES/SCOPE

UT has assembled a team to develop a hybrid mobile platform capable of maneuvering using wheels, treads, or articulated legs and provide video feedback

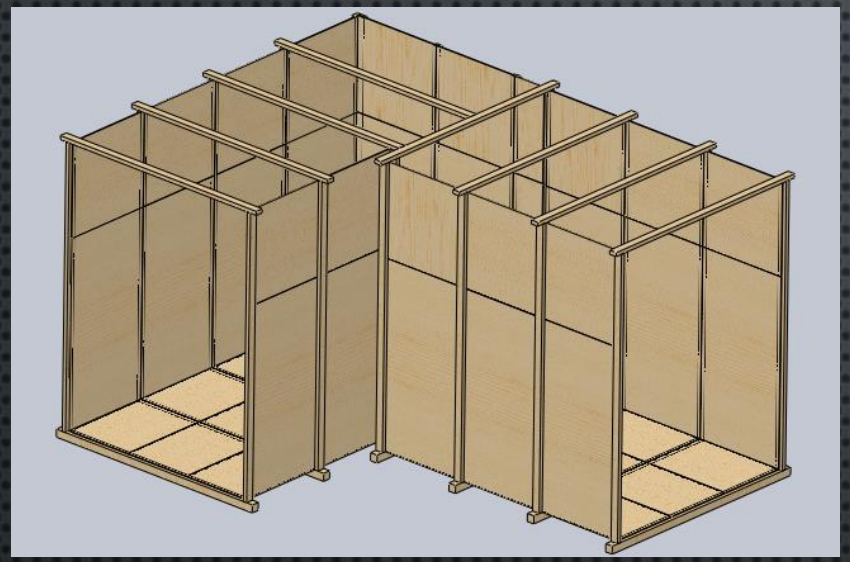


UT has previously developed a dual-arm mobile manipulator (Vaultbot) for inspection and radiation surveying

Assigned tasks:

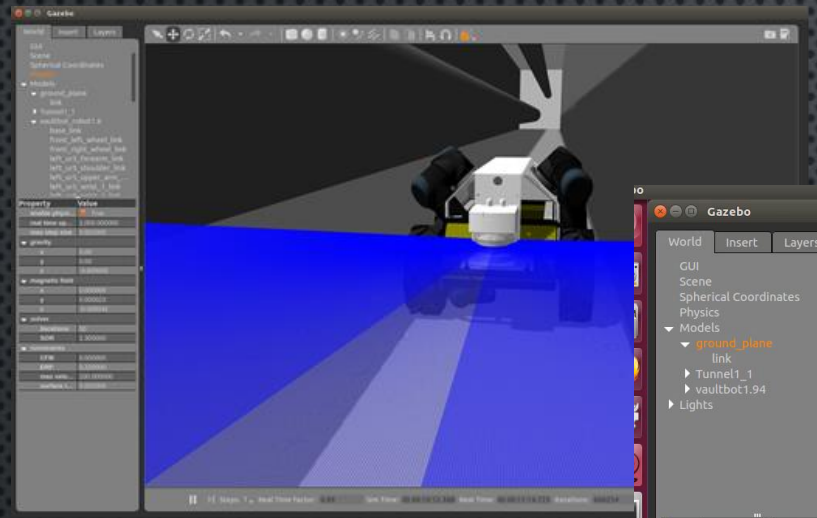
- Assist in the construction of a mock tunnel for testing
- Integrate Vaultbot in Gazebo for simulation using ROS
- Assist in the integration of FIU's miniature inspection tool with UT's current systems

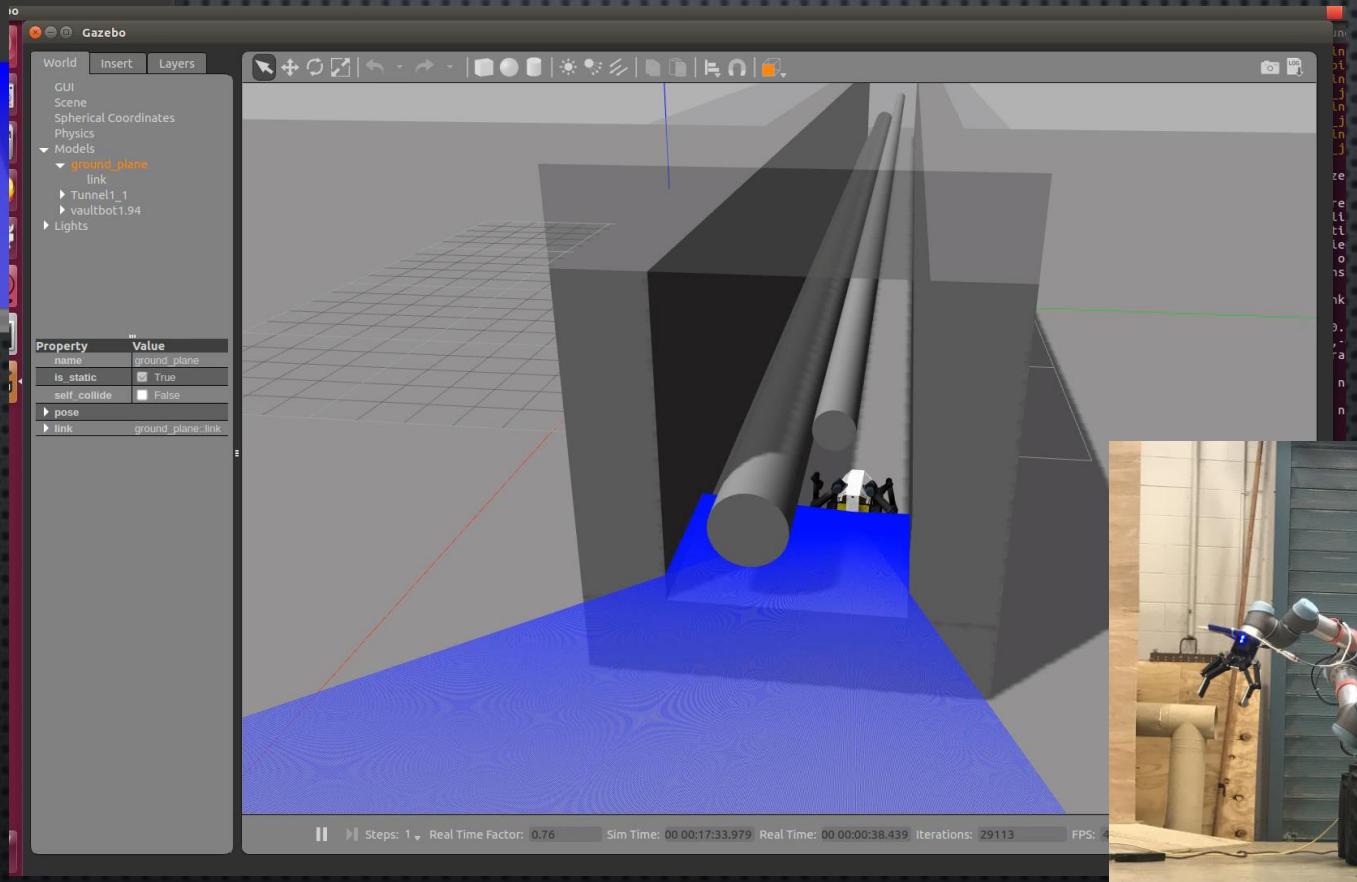
PROGRESS



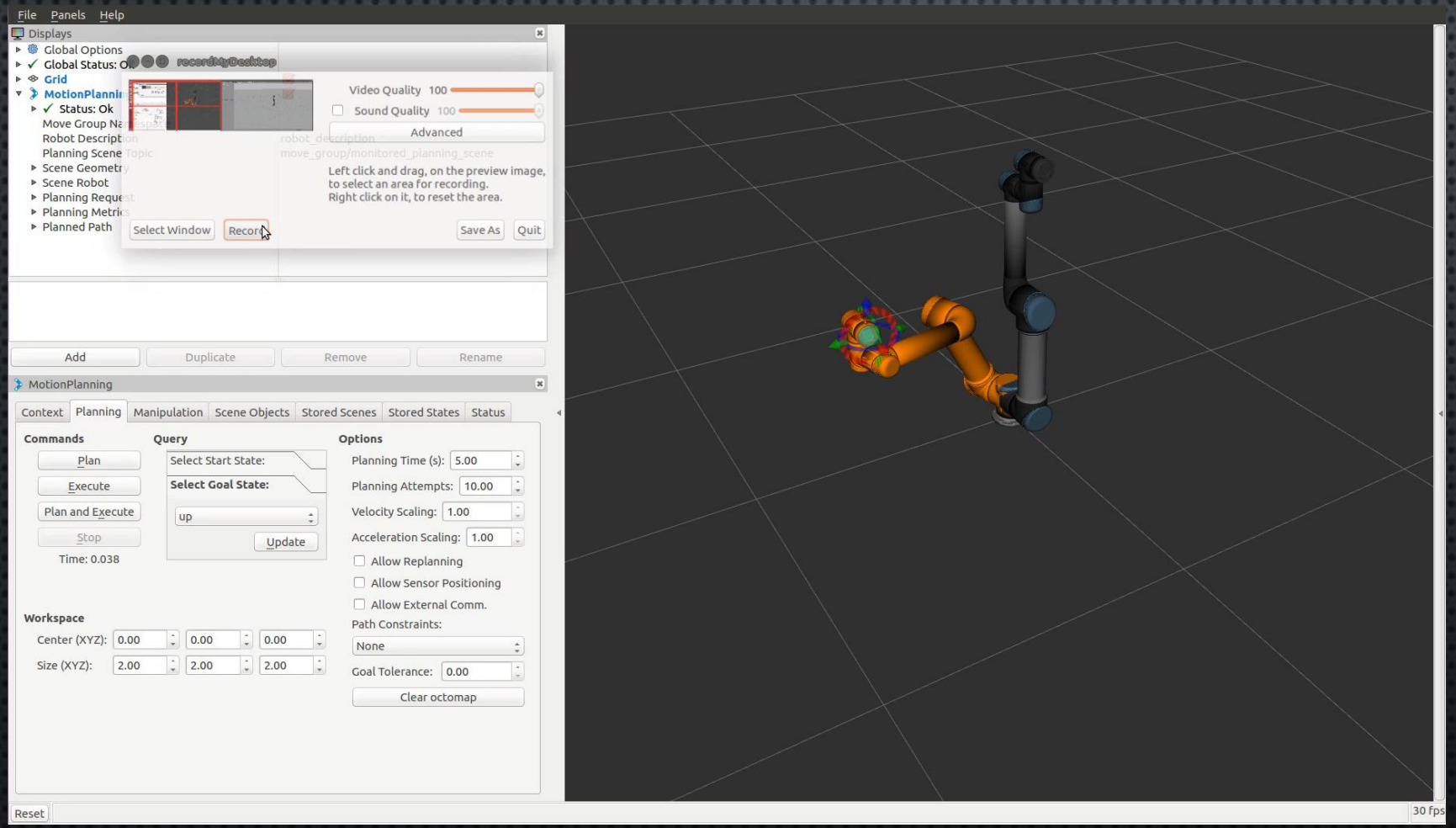
PROGRESS

GAZEBO SIMULATION





PROGRESS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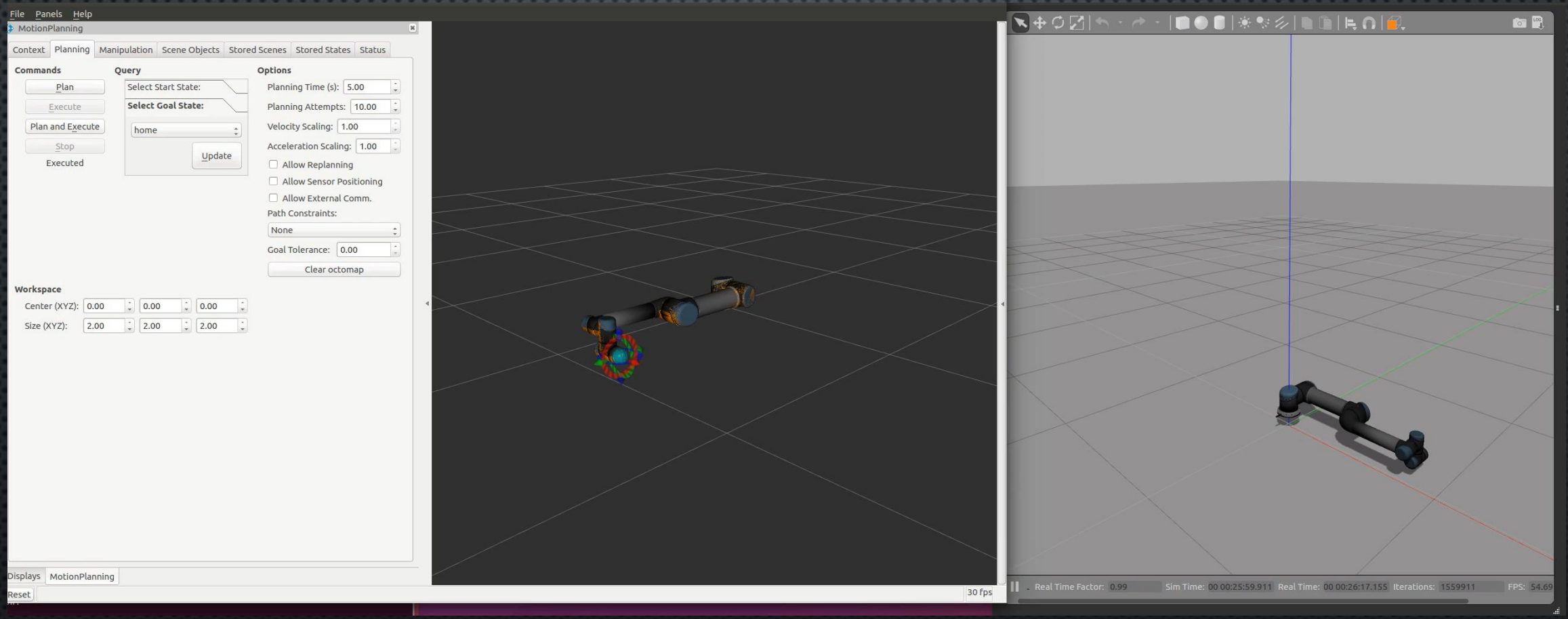
Goal Tolerance: 0.00
Clear octomap
Workspace
Center (XYZ): 0.00 0.00 0.00
Size (XYZ): 2.00 2.00 2.00
Reset
30 fps

PROGRESS


File Panels Help
MotionPlanning
Context Planning Manipulation Scene Objects Stored Scenes Stored States Status
Commands
Plan
Execute
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Planning Attempts: 10.00
Velocity Scaling: 1.00
Acceleration Scaling: 1.00
Allow Replanning
Allow Sensor Positioning
Allow External Comm.
Path Constraints:
None
Goal Tolerance: 0.00
Clear octomap
Workspace
Center (XYZ): 0.00 0.00 0.00
Size (XYZ): 2.00 2.00 2.00
Displays MotionPlanning
Reset
30 fps
Real Time Factor: 0.99 Sim Time: 00 00:25:59.911 Real Time: 00 00:26:17.155 Iterations: 1559911 FPS: 54.69

FUTURE WORK

- Continue working on Gazebo simulations

Integration of LIDAR and controllable arms

- Continue practicing ROS to apply at FIU

Become more knowledgeable of ROS

- Begin integration of FIU's systems with UT's

Miniature inspection tool deployable with UR5 arms

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  Robert Valner

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