Aloha Wash

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ROS Project

Mobile Window Washer

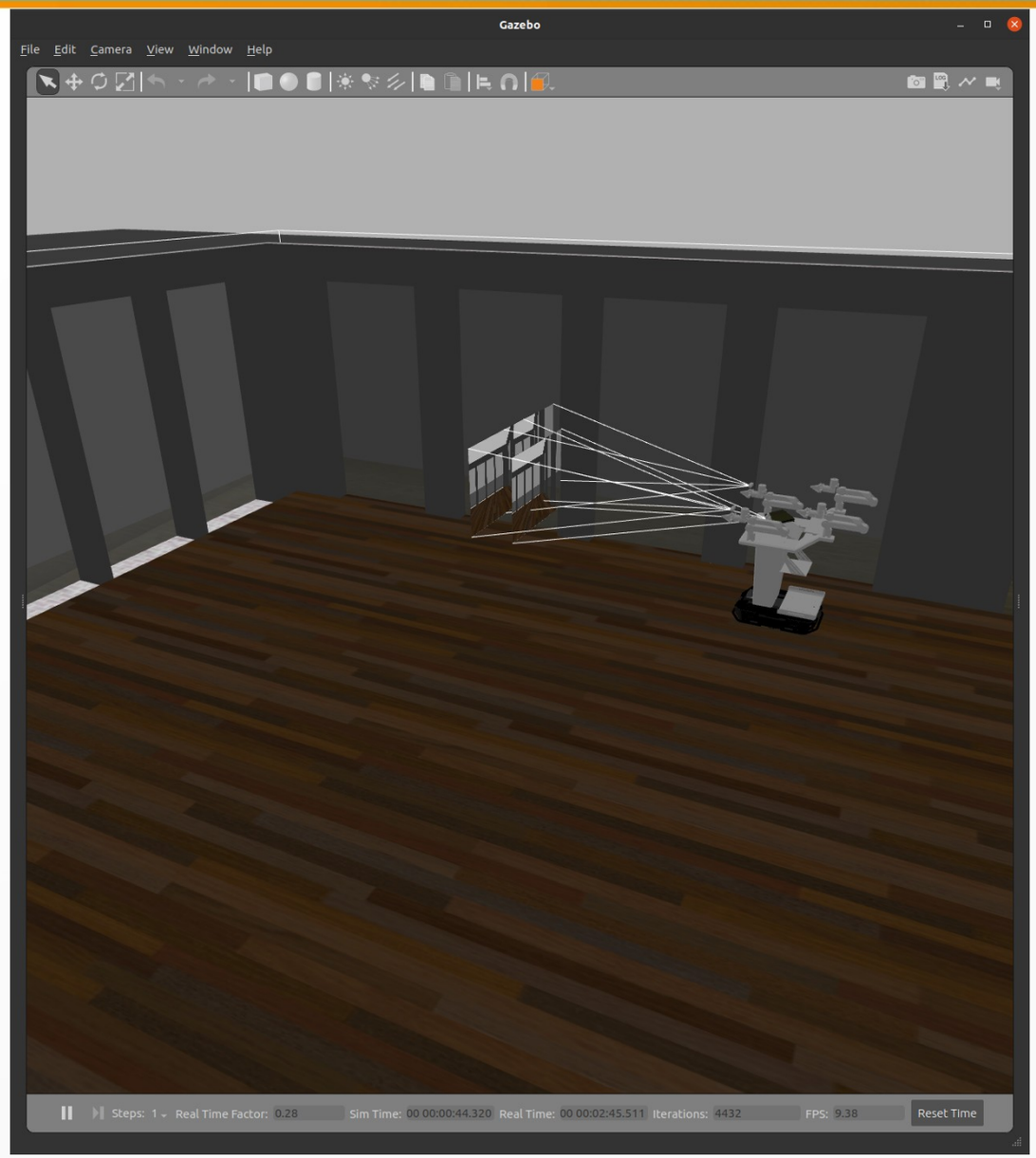
- Current robotic window washers designed to clean single pane of glass
- General purpose cobot could have window washing as a feature
- This could be deployed in various environments, offices and homes
- Example shown in Mobile Aloha with teleop for restroom mirror

Robot Platform

- Agile X Cobot Magic (recently in Mobile ALOHA)
- 4 robotic arms with 3 cameras
- Mobile base
- Recent use in RL with Imitation Learning

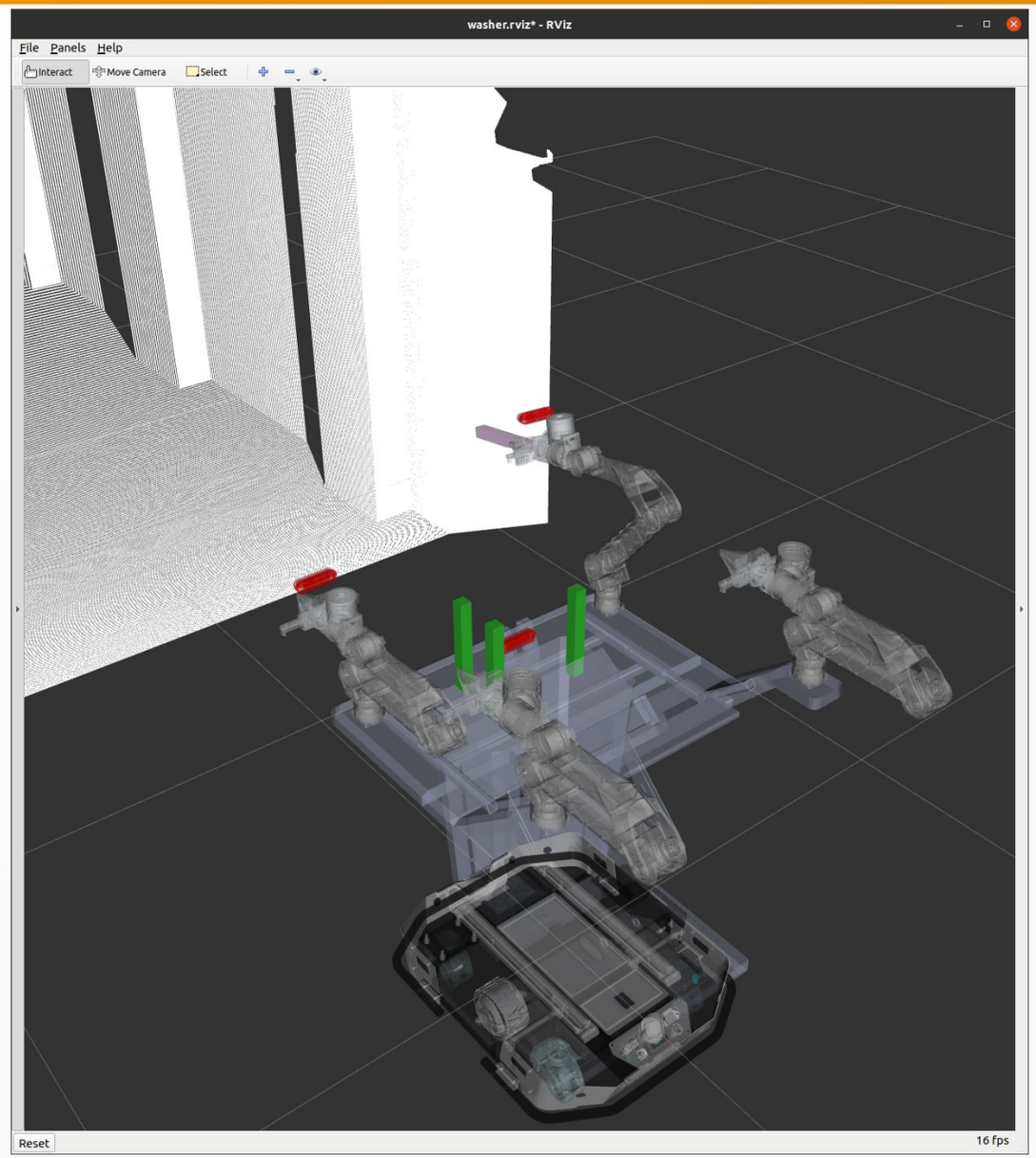
Aloha Drive

- Odometry wasn’t available
- Published commands to cmd_vel topic
- User input to pause between each window



Aloha Wash

- Robot Arm Logic
  - Setup to attach tools
  - Wash Cycle for each window
  - Teardown to detach tools
- Wash Cycle
  - Wash
  - Sweep
  - Spray
  - Dry



Challenges

- Arm movement would stop midway
  - GOAL_TOLERANCE_VIOLATED
  - Invalid Trajectory: start point deviates from current robot state more than 0.01
- Solutions:
  - Avoid robot arm singularities
  - Introduce a slight pause between two poses to lessen start point deviation

Conclusion

- Simulation of a mobile window washer was relatively straight forward
- Window detection and sizing needs to be implemented
- Control of robot base and arm movement needs to be fine tuned
- Actual prototype within controlled environments possible

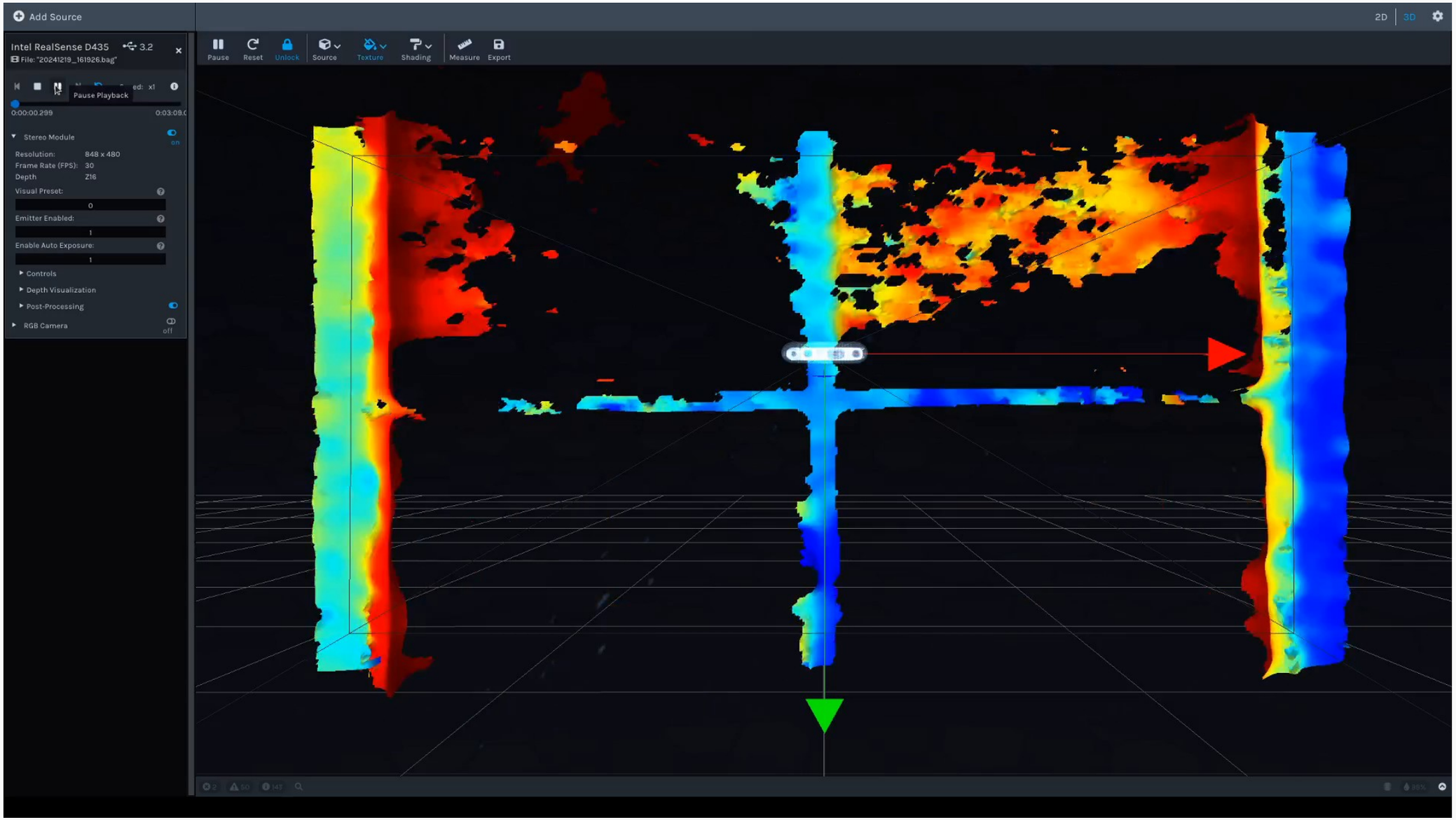
Future Work

- Intelligent Navigation for unseen environments
  - Wall following or SLAM could be utilized with the depth camera on the mobile base
- Force sensors for gripper feedback
  - Prevent too much tool force on windows with pressure sensors
- Waste water collection for recycling

Future Work

- Intelligent Navigation for unseen environments
  - Capture pointcloud of new environment for modeling
  - Camera must have IMU to integrate traveling camera frame within environment
  - Best to utilize robot platform for rosbag recording
- Force sensors for feedback on windows
  - Utilize more sophisticated robot arms
  - Incorporate joint torque sensors

SCDI with RealSense D435



References

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- https://github.com/MarkFzp/mobile-aloha
- https://global.agilex.ai/products/cobot-magic
- https://github.com/agilexrobotics/mobile_aloha_sim
- https://github.com/IntelRealSense/realsense-ros/wiki/SLAM-with-D435i
- https://support.intelrealsense.com/hc/en-us/community/posts/4407076814483/comments/4407123159955

Thanks!