TASK 12: PROGRESS REVIEW 3

16-681 MRSD Project 1 (Spring 2021)
Carnegie Mellon University

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Notes

- N/A

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Contents

1 Individual Progress

Description Since the last ILR (i.e. Progress Review 1 ILR), I updated the actuated manipulation pipeline such that the robot is able to move to goal positions based on subscribed messages from a **rostopic** based on the frame of the camera link. To achieve this, I implemented a new **rostopic** publisher/subscriber and **tf** listener nodes.

For the purposes of the demo, random position messages were published to the *desired_pose* topic. A separate node will both listen to the topic and the **tf** transform topic between the robot URDF *world* frame and RealSense *camera_link* frame. The listener node will offset that goal position message based on **tf** rigid transformation information between the *camera_link* and the robot URDF *world* frames. This is because *MoveIt* interacts with the joints of the robot to reach goal positions that are based on the robot URDF *world* frame. With this updated goal position, *MoveIt* can then pass use the updated goal position to output appropriate configuration joint angles from the current state to the goal state. Those joint states are outputted to the *joint_states* topic.

Finally, the HEBI node listens into the *joint_states* topic and outputs those joint angles to the actual HEBI motors. What is observed is the robot arm actuating to a desired goal position in free space.

The figure shown below (see Figure 1.1) is a screenshot taken from a demo video of the robot arm moving to desired goal positions relative to relative frame on the robot URDF model. The main contents of this video were demonstrated live during Progress Review 3.

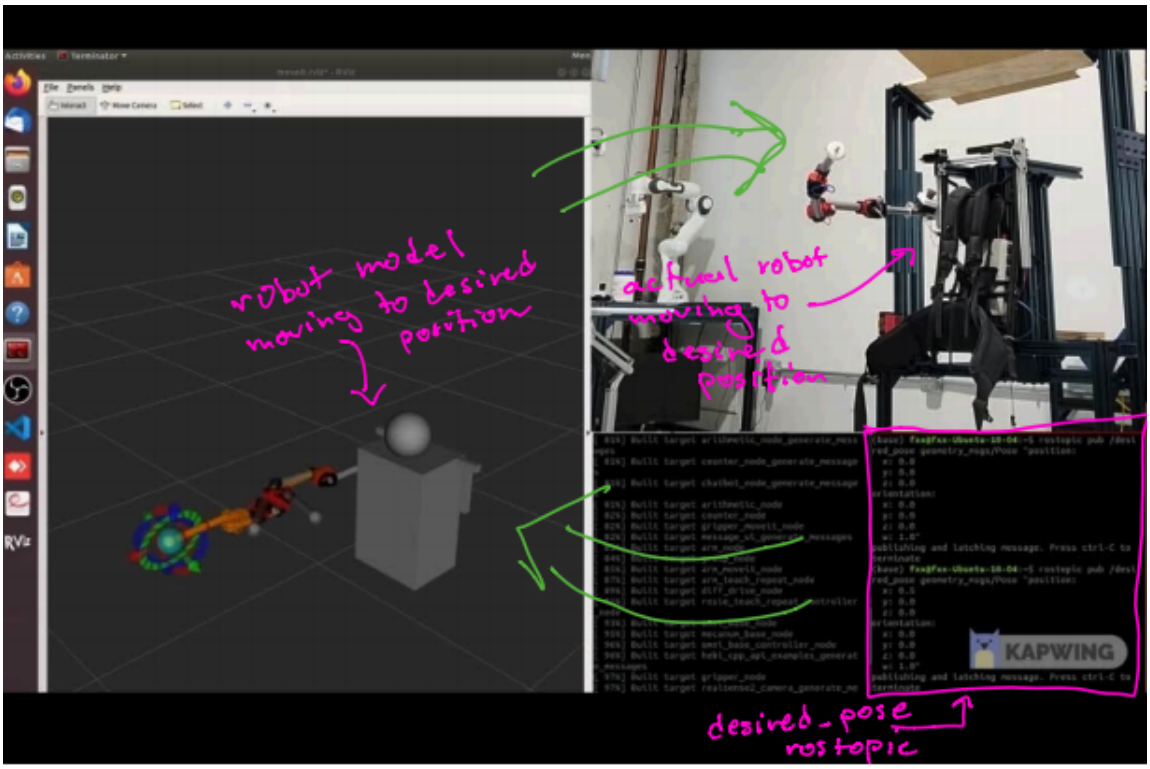

Figure 1.1: Robot arm moving to goal pose video screenshot

References

- N/A

2 Challenges

Description The challenges related to this progress review pertain to fine tuning the robot arm to move accurately and efficiently enough to desired goal positions.

The first challenge was to measure the static transform between the robot URDF *world* frame and the RealSense *camera_link* frame. Measurements had to be precise enough within a certain error in order for the robot arm to move to appropriate positions in free space.

The second challenge was adjusting the time constraint for *MoveIt* to calculate and plan a path for the robot arm. Too short of a time constraint meant that *MoveIt* may default to a fail state in an otherwise achievable path plan. Too long of a time constraint meant that *MoveIt* may take extended periods of time to determine paths before moving to them. Empirically, this time constraint was fine tune to be within a reasonable time frame. Though accomplishing these challenges may not be the main concern of Progress Review 3, performing these tasks now is crucial for Progress Review 4 demo and the Spring Validation Demonstration.

References

- N/A

3 Future Plans

Description My goal for the next progress review is to work with Jonathon Lord-Fonda to validate the precision of the robot arm in preparation for the Spring Validation Demonstration. Validating the precision of the robot arm will give both confidence in the actuated manipulation system as well as pave the way for accurate stabilization and torque/force control implementations to the subsystem.

References

- N/A

4 Teamwork

Description The division of work between each member of the team are as follows:

- **Husam Wadi**

  Husam's primary role is project/program manager. Recently he created launch files for the main node and voice node. He has also been working with Gerry on write-ups for the PCB design and layout.

- **Jonathon Lord-Fonda**

  Jonathon is leading the integration between subsystems and project validation process. He wrote the one-page plans for the SVD and FVD. Recently, he has begun discussions with the actuated manipulation system and other subsystems to verify validation plans for the SVD. Already, he worked with Gerry D'Ascoli to go through the validation tests for the voice subsystem.

- **Gerry D'Ascoli**

  Gerry is leading the voice subsystem of the project. Recently, he worked with Husam to design the PCB design and layout. He has also been performing trial runs with Jonathon on the voice subsystem validation tests in preparation for the SVD. The voice subsystem has also been improved and updated to resolve some of the false positive issues being experienced.

- **Yuqing Qin**

  Yuqing is leading the vision subsystem of the project. Recently, she designed and implemented post processing on the *goal_getter* node. She has also began setting up the validation environment for the vision subsystem as well as began implementing nodes that could calculate surface normal vectors based on point cloud data.

References

- N/A