TASK 8: PROGRESS REVIEW 2

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 have tied the frames of the T265, D435i, and robot URDF together. This was achieved through first determining the displacement and orientation of the Realsense cameras in relation to where the cameras are installed on the robot. Once that information was determined, I created a static transform between the t265_link and world frames using the *tf* transform ROS package. Because the camera frames are tied to the URDF model now, depth map information from the D435i camera will originate from a relative point on the URDF model, as visualized in RViz.

The figure below (see Figure 1.1) shows the URDF tied to the D435i depth map as shown through RViz. The origin of the depth map is located at around the left shoulder of the URDF model.

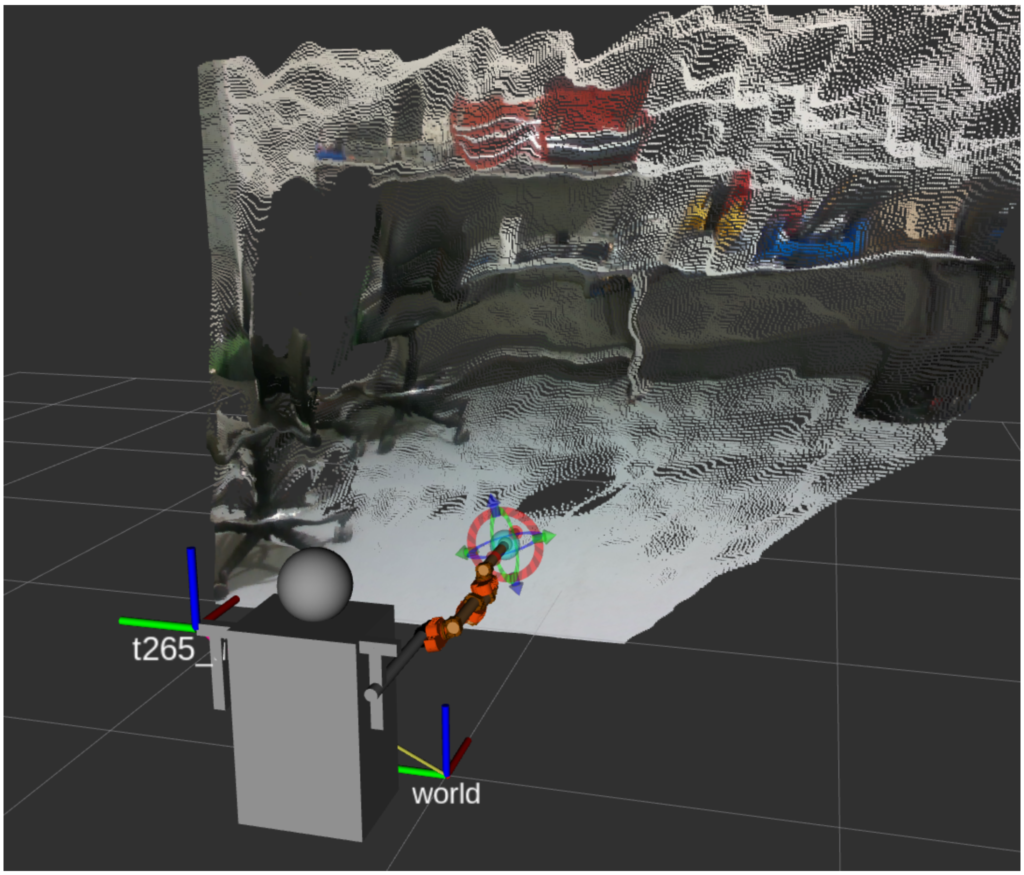

Figure 1.1: Rviz visualization aligning Realsense cameras and URDF relative frames

The figure below (see Figure 1.2) is similar to the previously mentioned figure with the inclusion of the global t265_odom_frame. The t265_odom_frame is static and is fixed to the position and orientation of the T265 camera when it is turned on. Moving the T265 camera around the environment will move the URDF model and statically attached D435 and t265_link frames as shown in RViz.

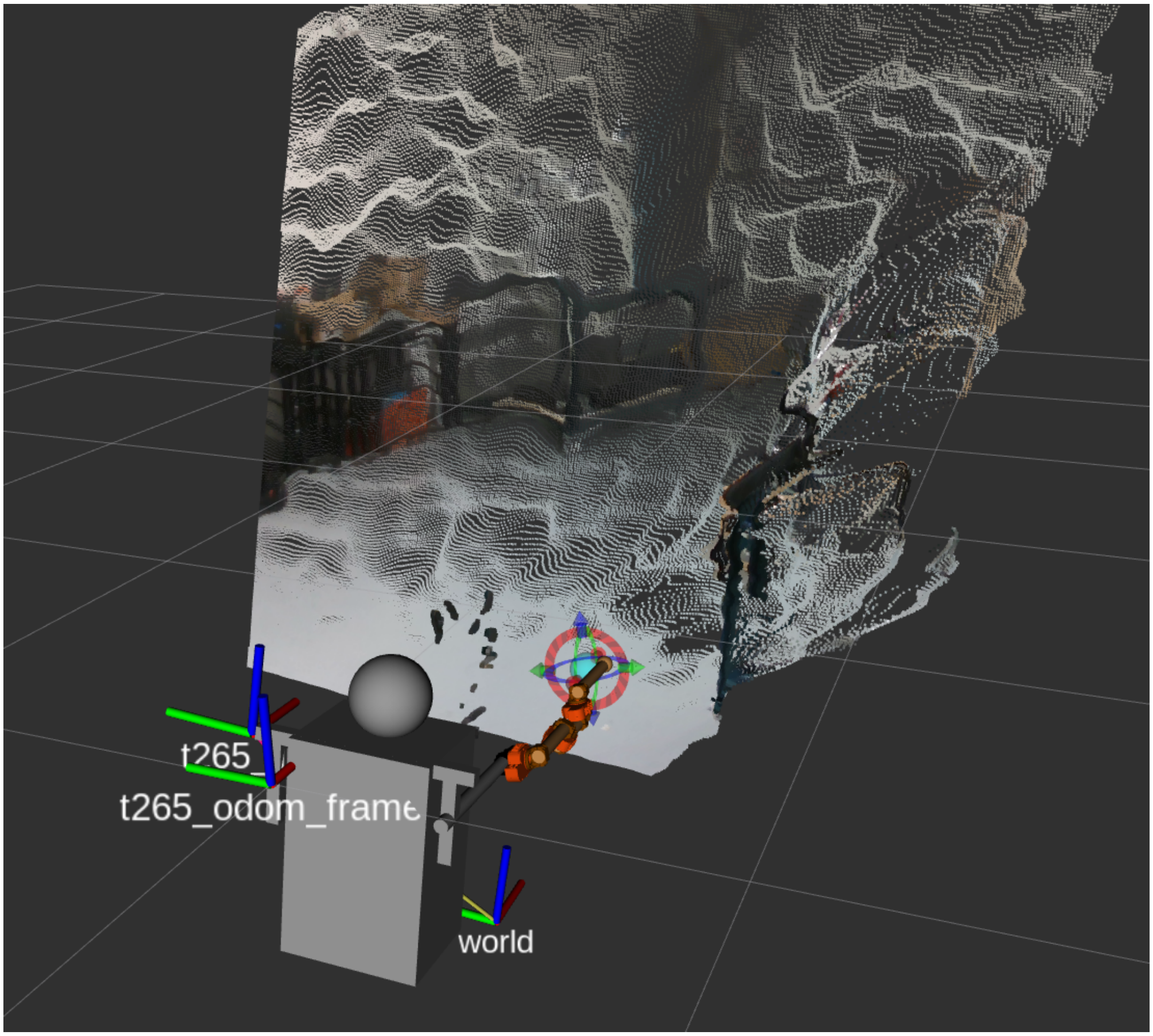

Figure 1.2: Rviz visualization aligning global t265_odom_frame and URDF relative frames

The figure below (see Figure 1.3) shows the axis frame graph (i.e. TF Tree) between the camera and URDF frames as shown through RQT. The two ”trees” were manually connected via static transform between the t265_link and world frames.

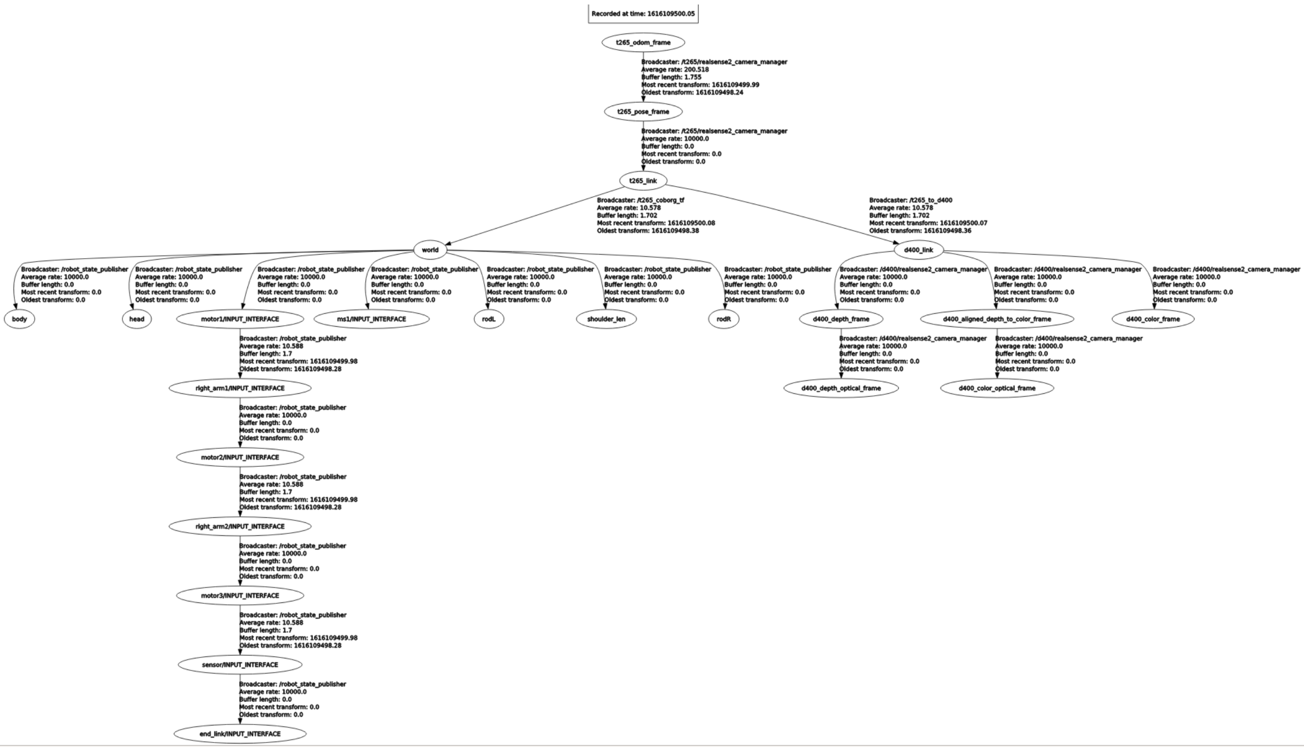

Figure 1.3: RQT TF Tree Diagram

References

- N/A

2 Challenges

Description The next challenge for the actuated manipulation system is to develop a pipeline for the robot arm to make contact with the intended part and provide a constant force to a 3D global goal position. There are multiple design avenues to choose from to achieve this goal, but the design must compensate to the user's shifting motions and be robust enough to provide a meaningful force on the part and hold it in place.

In essence, the pushing and stabilization model must answer several questions:

- How frequently should the robot arm update its position relative to the global t265_odom_frame?
- How much "shifting" should the user do during the demo? This will play a role into how robust the stabilization algorithm should be.

References

- N/A

3 Future Plans

Description My goal for the next progress review is to move the robot arm relative to the 3D goal position of the D435i camera frame. The goal setter node from the vision subsystem will output 3D goal positions relative to the D435i frame, so the actuated manipulation subsystem must be able to translate that 3D position to be relative to the world frame of the URDF model, in order for MoveIt to transmit appropriate joint targets to the HEBI motors.

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 assisted me with tying the T265 camera frame to the URDF model. He also worked with Gerry and Jonathon with developing the main state node and tie the main state node to the voice subsystem node, as demonstrated during the Progress Review 2 demo. He also worked with Gerry on the PCB design and write-up.

- **Jonathon Lord-Fonda**

  Jonathon is leading the integration between subsystems and project validation process. Recently, he has given research and development help with the actuated manipulation subsystem. In addition, he updated the ROS node map as further progress is made on the other subsystems. He also worked with Husam and Gerry to tie the main state node with the voice subsystem node.

- **Gerry D'Ascoli**

  Gerry is leading the voice subsystem of the project. Recently, he integrated a newer microphone model into the vision system node in order to get better single user performance. He worked with Jonathon and Husam to integrate the main state node with the voice system node. In addition, he worked with Husam to develop PCB design and writeup.

- **Yuqing Qin**

  Yuqing is leading the vision subsystem of the project. Recently, she has developed the 3D YOLO model in ROS to be able to output 3D position targets of detected hands as seen through the D435i camera. She has also developed several post processing methods to the outputted bounding boxes from the YOLO hand detection model.

References

- N/A