

METR4202

Robotics & Automation

Week 4: Practical - Intro to RViz and TFs

Learning Outcomes

- What is RViz?
- Writing a ROS Node in OOP paradigm
- Writing Forward Kinematics in Python
- What are TFs in ROS?

What is RViz (Robot Visualiser)?

- 3D Visualisation software tool for robots, sensors and algorithms
 - View robots written in URDF (Unified Robotics Description Format)
 - Move robots written in URDF
 - Loads of community made plugins for additional functionality

Let's Visualise a 2R robot

Create a `catkin_ws` in your home directory if not present

```
cd ~  
mkdir -p catkin_ws/src
```

Install practical 4 ROS package from github

```
cd ~/catkin_ws/src  
git clone https://github.com/UQ-METR4202/practical_4.git
```

Building the package

```
cd ~/catkin_ws  
catkin build  
source ./devel/setup.bash
```

Let's Visualise a 2R robot

Launch the `practical_4` package

```
roslaunch practical_4 display.launch
```

What is the packages Node/Topic structure?

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ROS has inbuilt visualiser for figuring this out

```
roslaunch rqt_graph rqt_graph
```

Let's write a ROS Node to intercept joint angles

Create python file in `/scripts` dir of `practical_4` package

```
cd ~/catkin_ws  
mkdir -p ./src/practical_4/scripts/tf_demo.py  
code .
```


Let's Visualise the Node/Topic structure now

Use inbuilt ROS visualiser

Terminal 1

```
cd ~/catkin_ws  
catkin build  
source ./devel/setup.bash  
roslaunch practical_4 display.launch
```

Terminal 2

```
noetic  
cd ~/catkin_ws  
source ./devel/setup.bash  
roslaunch practical_4 tf_demo.py
```

Let's remap node and Visualise Node/Topic structure

Reroute `/joint_states` topic to `/tf_demo_joint_states` in `display.launch`

Let's write Forward Kinematics for Robot

- Use Product of exponentials
- Use RViz/URDF to obtain link lengths
- Joint angles are about +ve y axis

ROS already does the FK for us!

The power of **TF** in ROS

```
roslaunch tf_echo /base_link /top_link
```

Writing TF lookups in python

Using `tf.TransformListener()`

Next Week

- Continuation on TFs
- Continuation on ROS architecture and using OOP with ROS