

# Ros2

**@theconstruct.ai**

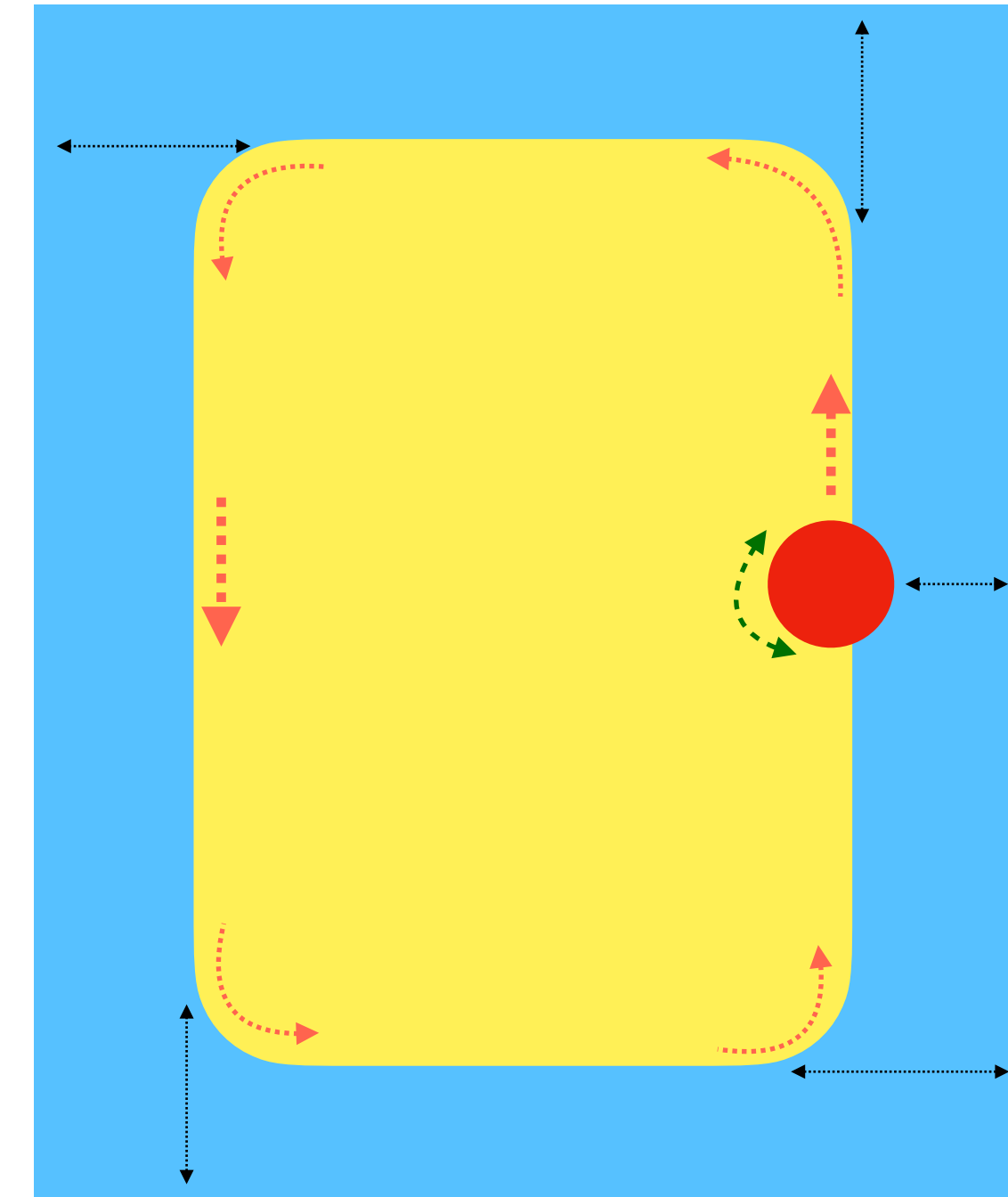
# Agenda

- Basics
  - Micro project
  - Pub sub model, Services, Actions
  - Demo
- URDF

# Basics

## Micro Project

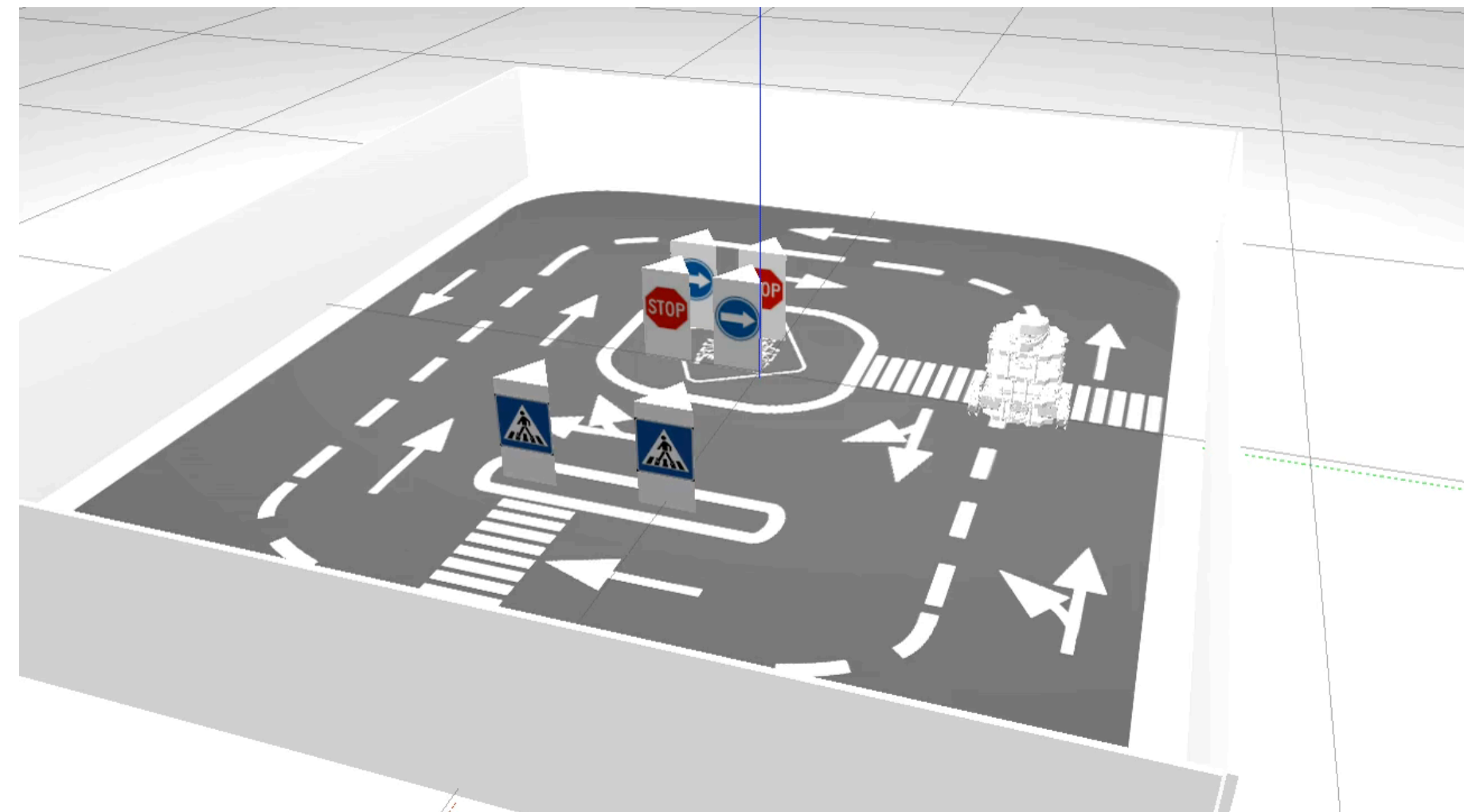
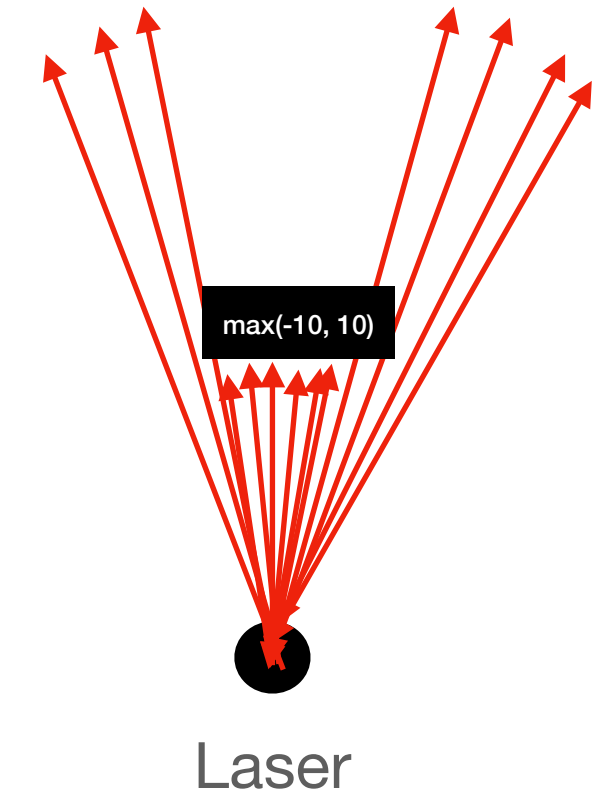
- Detect a wall using scan data
- Get near the wall
- Rotate for forward movement
- Move + detect obstacles
- Turn left where necessary
- Compute distance travelled
- Stop at 1 lap if near start point



# Basics

## Micro Project

- **Detects the nearest wall** using laser scan data and rotates to face it.
- **Moves forward** until it reaches a safe distance from the wall.
- **Aligns with the wall** by rotating to a  $270^\circ$  orientation.
- **Sends movement commands** to align with a detected wall using laser scan data.
- **Interacts with an action server** to record odometry and retrieve position data.
- **Publishes velocity commands** to navigate safely while maintaining an appropriate distance.
- **Records odometry data** and calculates total distance traveled using position updates.
- **Implements an action server** to track movement, provide feedback, and handle goal execution.
- **Detects laps based on distance** from the starting point and publishes updates accordingly.



# Basics

## Micro Project

### sensor\_msgs/LaserScan

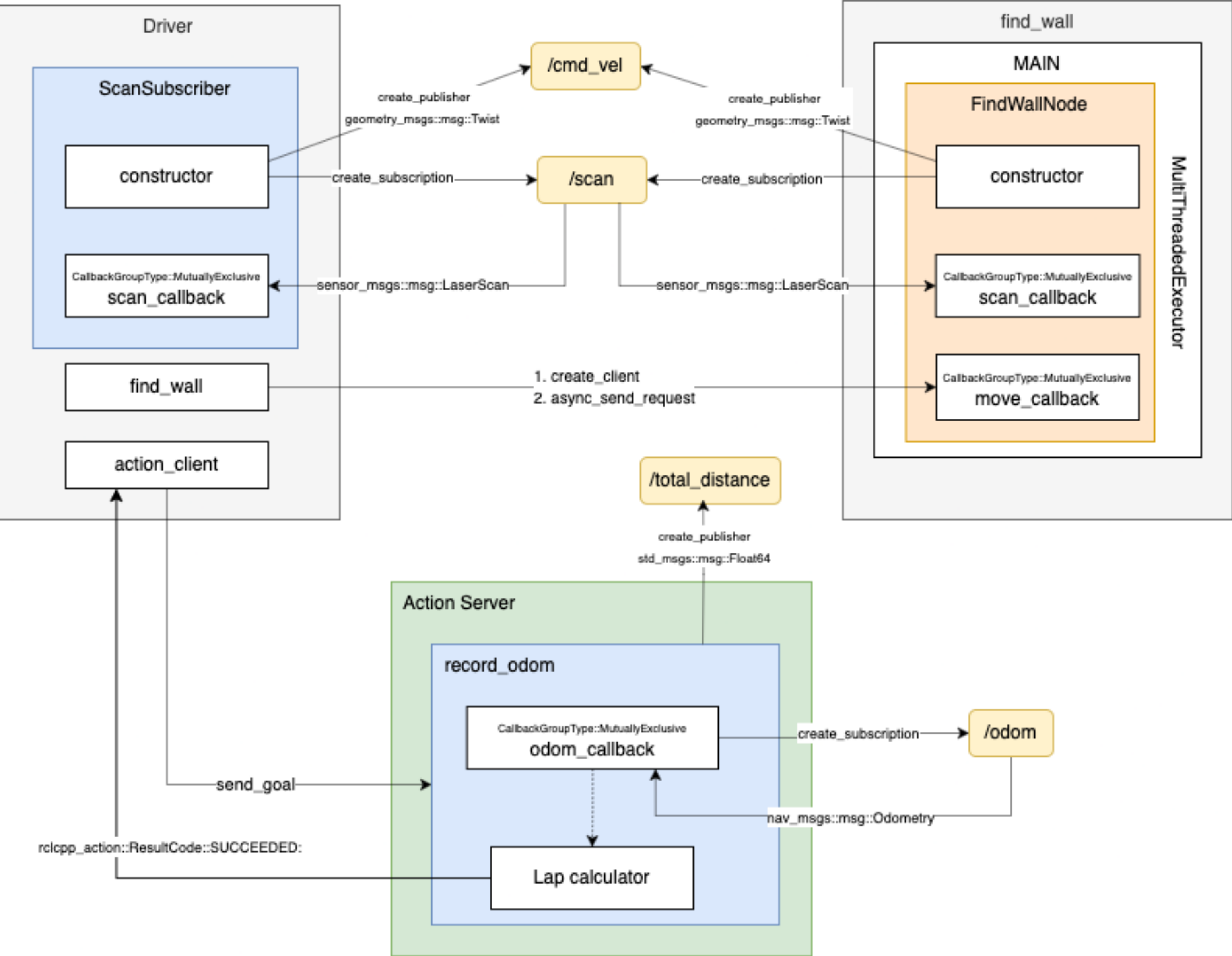
```
std_msgs/Header header
float32 angle_min
float32 angle_max
float32 angle_increment
float32 time_increment
float32 scan_time
float32 range_min
float32 range_max
float32[] ranges
float32[] intensities
```

### geometry\_msgs/Twist

```
geometry_msgs/Vector3 linear
geometry_msgs/Vector3 angular
```

### nav\_msgs/Odometry.msg

```
std_msgs/Header header
string child_frame_id
geometry_msgs/PoseWithCovariance pose
geometry_msgs/TwistWithCovariance twist
```

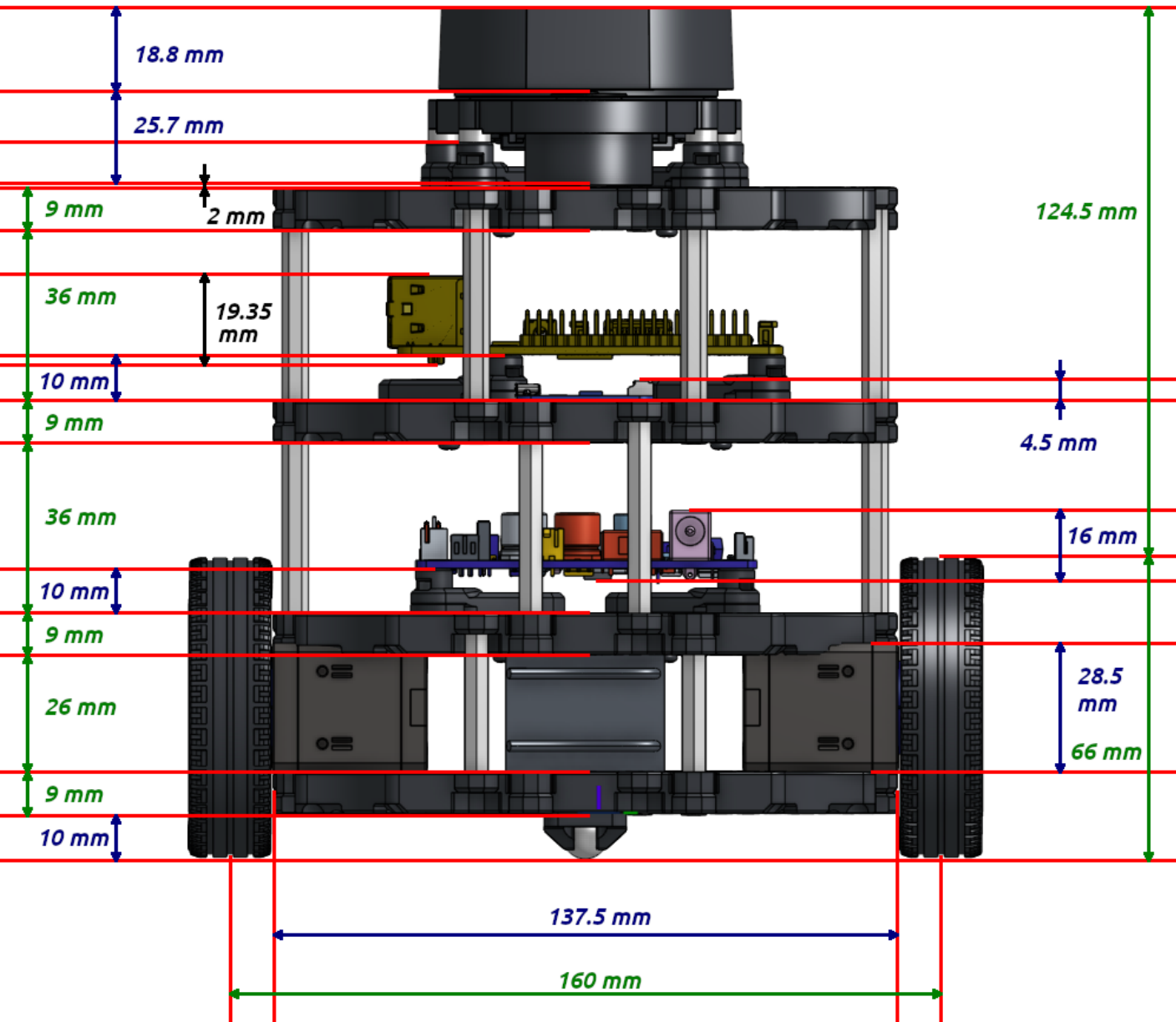




# URDF

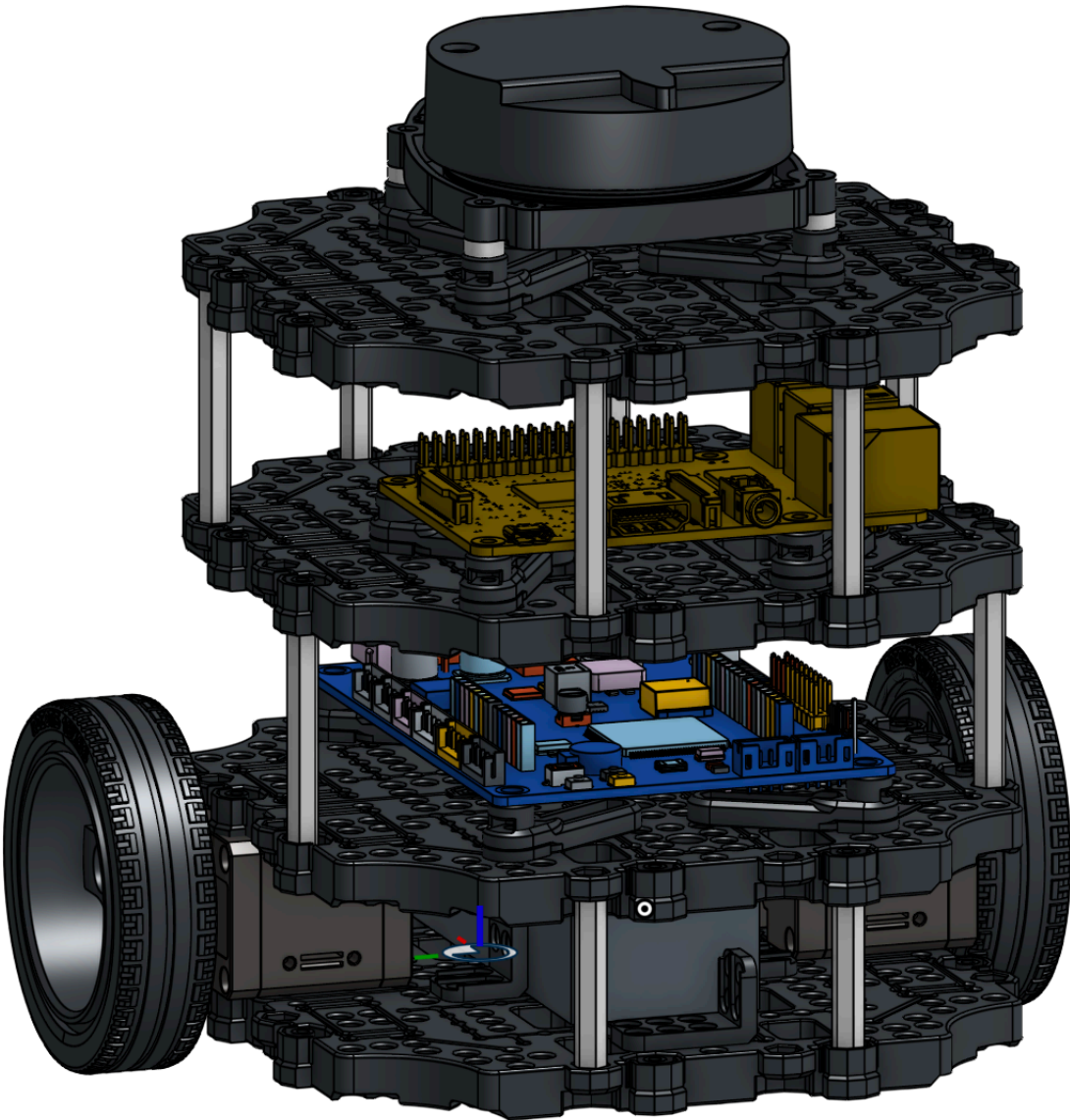
## Micro Project

- Construct the Turtlebot 3 in **UDRF/Xacro** using specs below
- **Conditionally load** Gazebo items based on launch paramters



TurtleBot3 Burger Parts Specification

Part Name	Units	Unit Weight	Total Weight	Dimensions
Chassis Plate	4x	35g	140g	137.5mm x 137.5mm x 9mm
35mm Spacer	4x	7g	28g	5mm dia x 35mm
45mm Spacer	10x	9g	90g	5mm dia x 45mm
PCB Mounts	12x	5g	60g	37.82mm x 10mm x 10mm
Drive Motor	2x	50g	100g	46.5mm x 34mm x 28.5mm
Drive Wheel Axle	2x	10g	20g	20.5mm dia x 9.35mm
Drive Wheel & Tire Set	2x	25g	50g	66mm dia x 17.8mm
Caster Wheel Support	1x	10g	10g	30mm x 18mm x 8mm
Caster Wheel	1x	10g	10g	10mm dia
Control Board	1x	60g	60g	105mm x 75mm x 16mm
IMU Chip ( <i>imu_link</i> )	1x	2g	2g	5mm x 5mm x 2.5mm
Raspberry Pi Board	1x	50g	50g	58mm x 90mm x 19.35mm
Lidar USB Board	1x	10g	10g	18mm x 30mm x 4.5mm
Camera Support	1x	10g	10g	5mm x 30mm x 15mm
Camera	1x	10g	10g	5mm x 30mm x 30mm
Lidar Support	1x	100g	100g	94.7mm x 72.7mm x 25.7mm
Lidar Spinner	1x	50g	50g	65.4mm dia x 18.8mm
Battery	1x	200g	200g	100mm x 35mm x 27.5mm
---	---	Total:	1000g	---



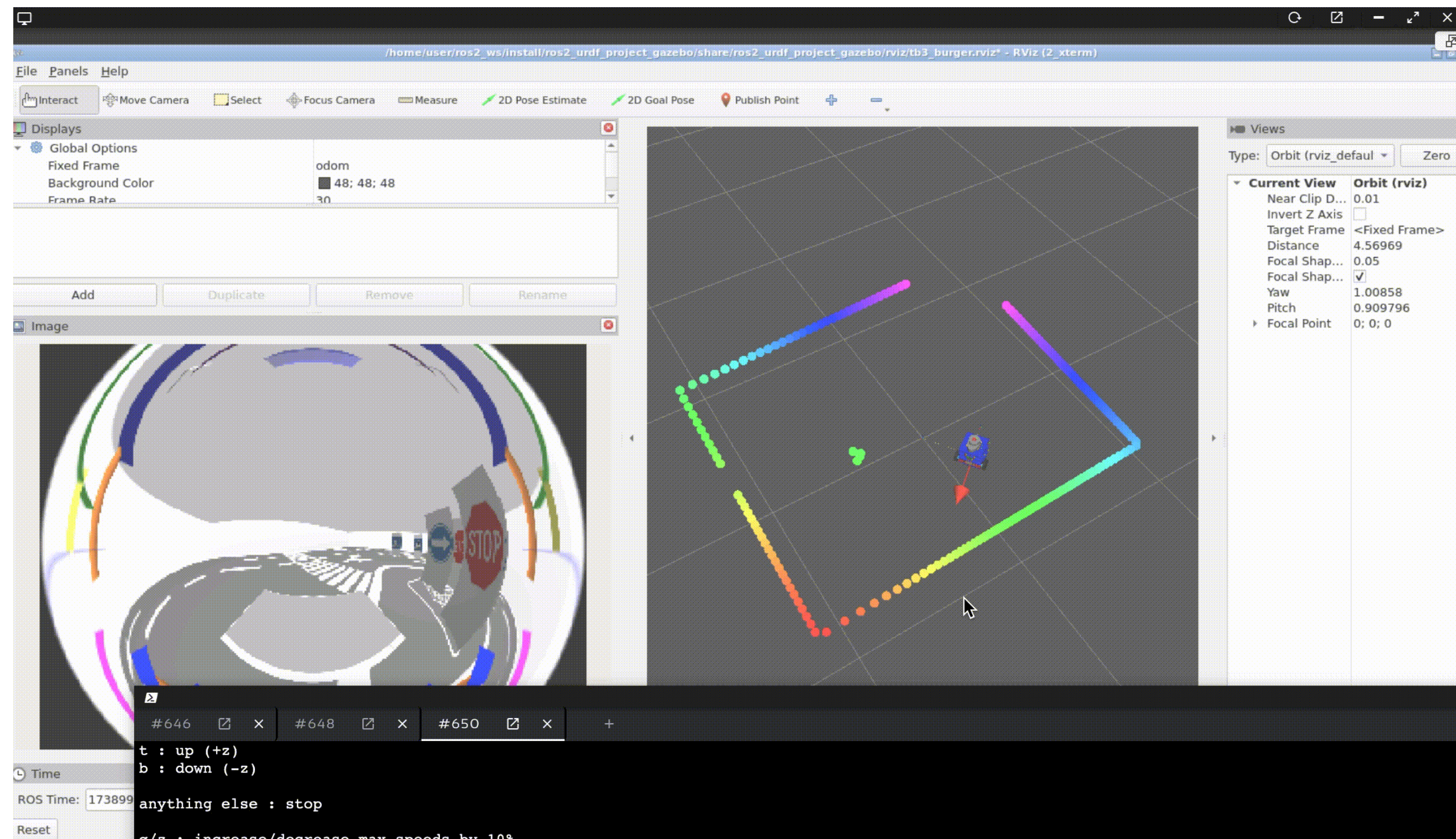


# URDF

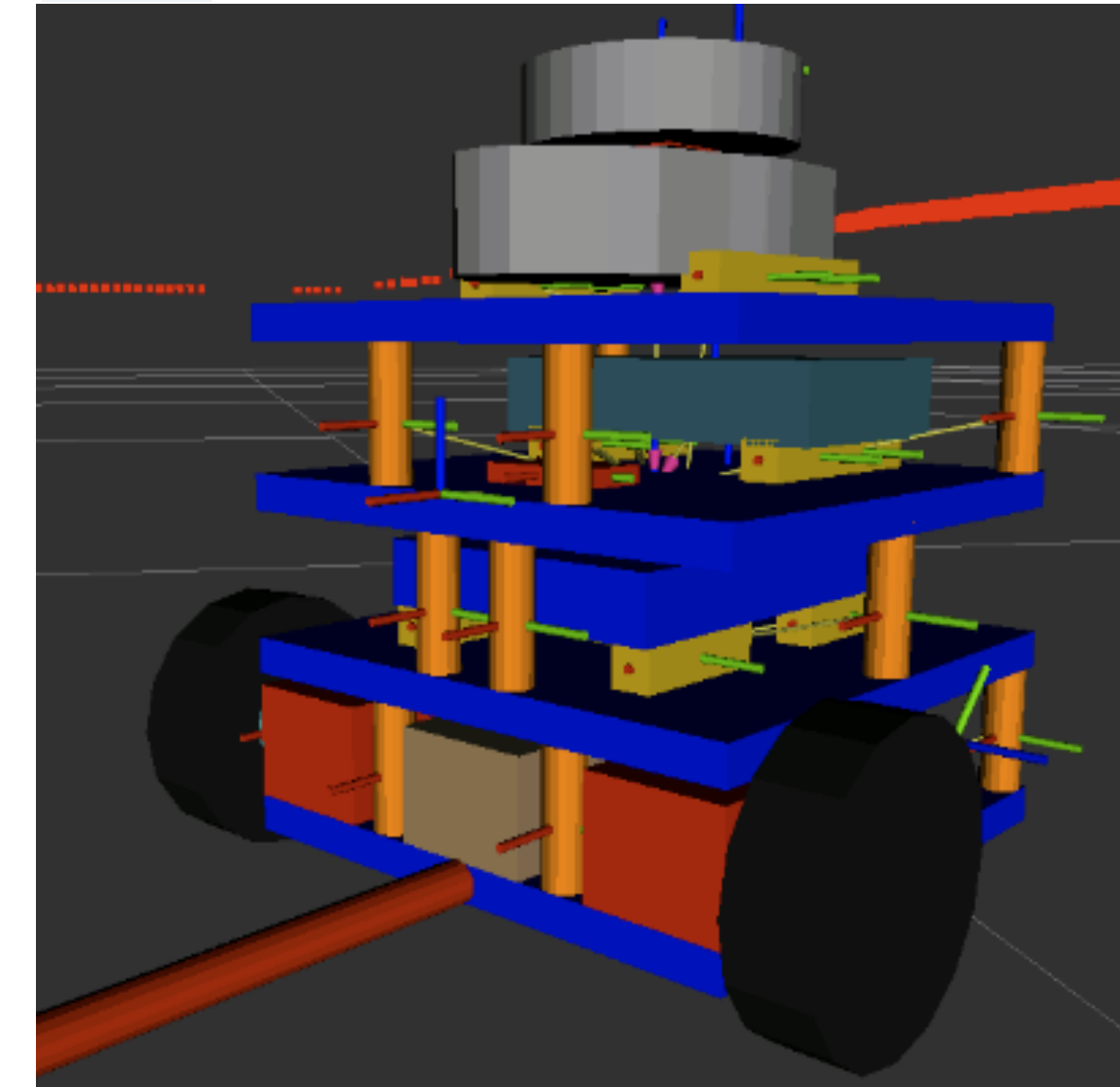
## Micro Project

- Final model in RVIZ2 and Gazebo along with demo on simulator

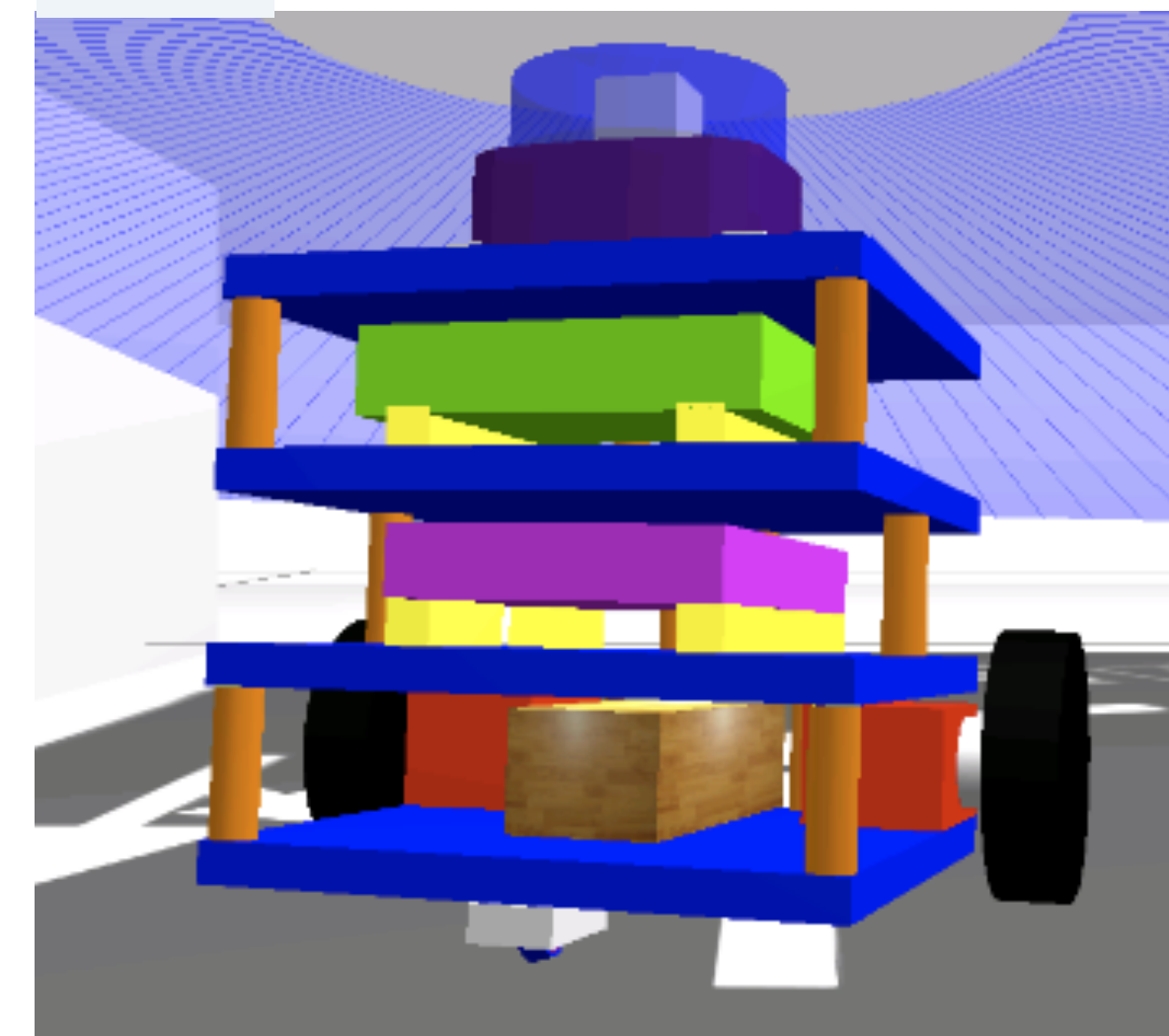
**Next : Demo on real robot**



## RViz2



## Gazebo



URDF for ROS2

<https://github.com/vadhri/cps-notebook/tree/main/ros/urdf-real-robot>

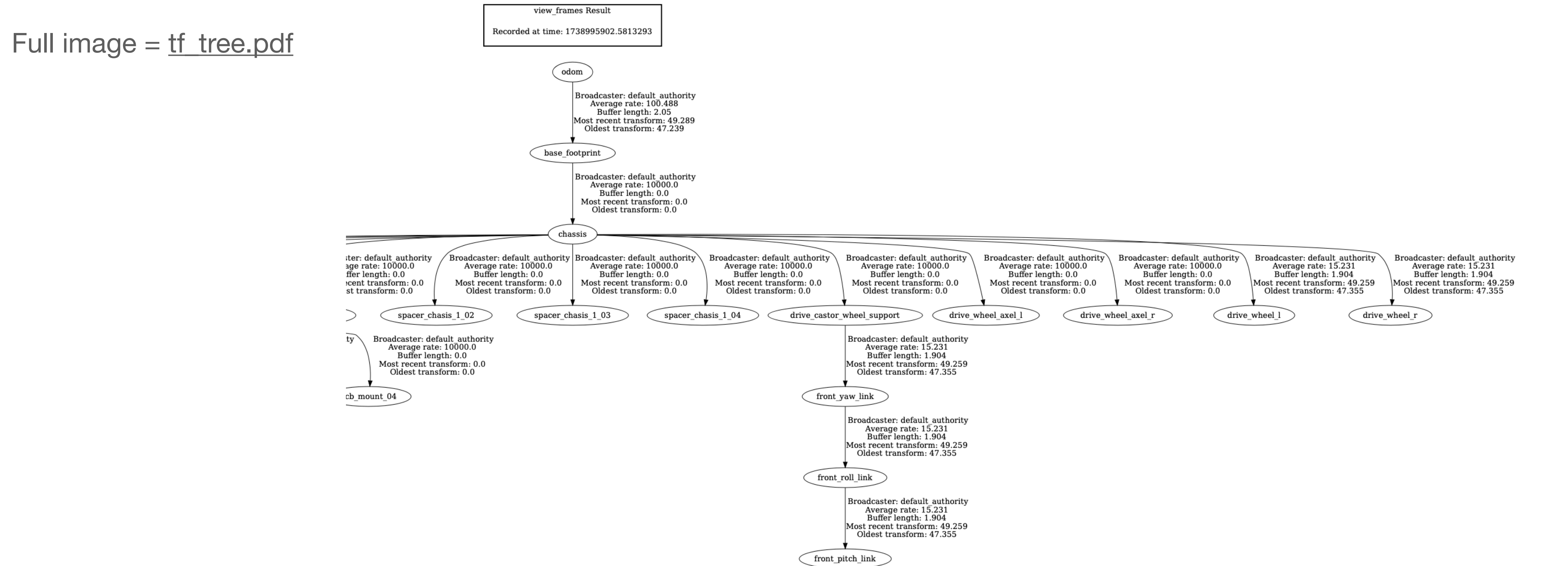


# URDF

## Micro Project

- TF tree

Full image = [tf\\_tree.pdf](#)



URDF for ROS2

<https://github.com/vadhri/cps-notebook/tree/main/ros/urdf-real-robot>

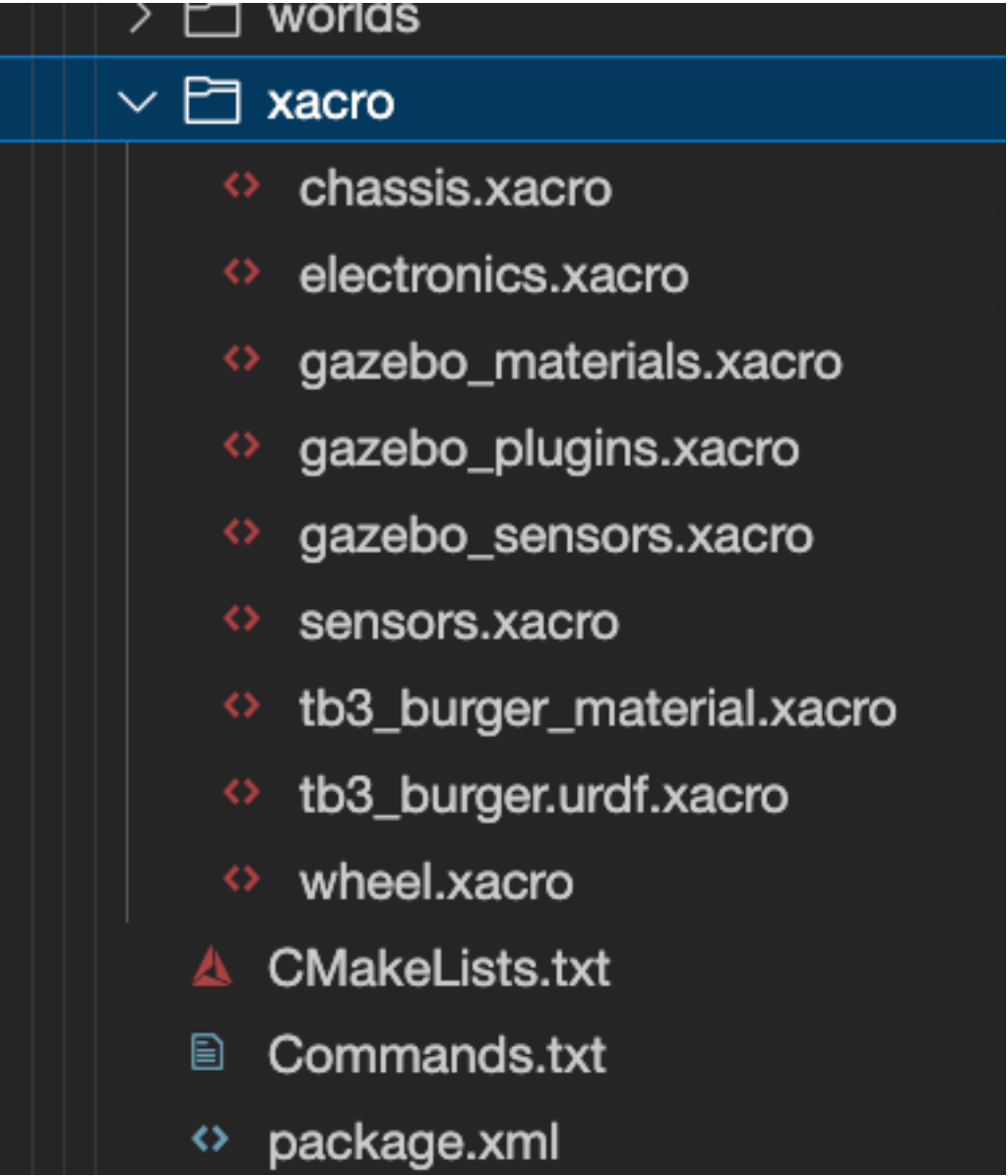
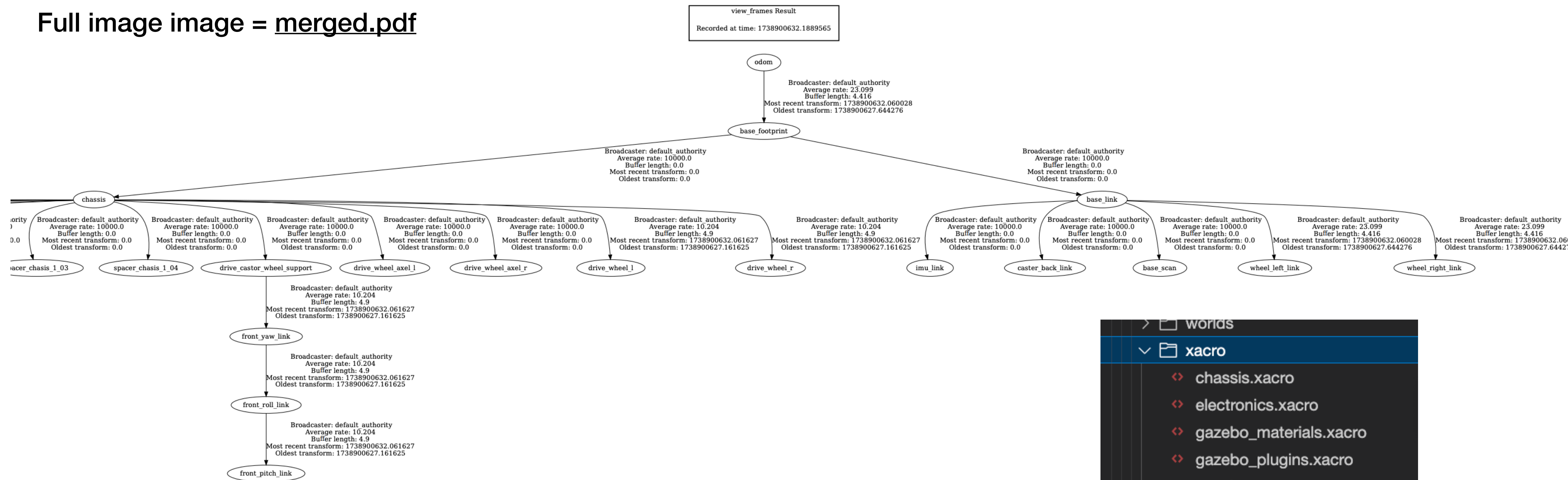


# URDF

## Micro Project

- Merged TF tree

Full image image = [merged.pdf](#)



URDF for ROS2

<https://github.com/vadhri/cps-notebook/tree/main/ros/urdf-real-robot>

Thank you !