Lab Guide
ROS 2 For QBot Platform

Description

This document focuses on the series of launch files and nodes currently designed for QBot Platfrom . Please review the User Manual – Connectivity for information on how to copy files onto the QBot Platfrom.

Getting Started:

All the examples provided for QBot Platfrom are compatible with **ROS 2 Humble**. To get started with ROS 2 please check the following link: https://docs.ros.org/en/humble/index.html. This guide assumes you have a basic understanding of the ROS 2 ecosystem and know how folder structures, packages and nodes work.

Files Provided:

QBot Platfrom ROS 2 nodes can be found as part of the available research examples provided by Quanser. Using file explorer, please navigate to the following resource directory: C:/User/<user>/Documents/Quanser/5_research/qbot_platform. Packages available for QBot Platfrom :

- qbot_platform

qbot_platform is a Quanser design QBot Platform package which configures the following information:

Sensor Centric Nodes
- **qbot_platform_driver_interface** (this node includes motor commands, LED values and publishes IMU data, battery level, joint states)
  This specific node interfaces with a custom QUARC executable called qbot_platform_driver_physical.rt-linux_qbot_platform. This QUARC executable sends commands directly to the QBot platform. It's recommended that you run the **qbot_platform_launch.py** launch file as this will run both the executable and the **qbot_platform_driver_interface.**
- **lidar** (publishes LiDAR info for the Leishen M10p)
- **csi** (publishes image for the downward facing camera on the QBot Platform)
- **rgbd** (publishes RGB and depth information for D435 Intel RealSense camera)

User Centric Nodes
- **Command (**This node allows a user to send manual commands to the QCar using a Logitech F710 joystick)

Auxiliary Nodes
- **fixed_lidar_frame** (Transforms and rotates the LiDAR frame to align correctly with the center of the QBot Platform).

Launch folder contains different applications to help you get started with the QBot Platfrom.
- **qbot_platform_launch.py** (Launch file designed to publish all the sensor centric nodes)
- **qbot_platform_manual_drive_launch.py** (Launch file includes sensor centric nodes and command node to manually drive the QBot Platfrom).
- **qbot_platform_cartographer_launch.py** (Launch file for mapping and QBot Platform without a command node)
- **qbot_platform_manual_map_launch.py** (Launch file manually driving a QBot Platfrom and generating a map of the environment)
- **qbot_platform_slam_and_nav_bringup_launch.py** (Launch file which uses Nav2 to generate commands for a QBot Platfrom to navigate in a desired space based on a goal pose given via Rviz2)

Running Examples

Prior to running any ROS 2 example, please make sure you have sourced **humble** as the desired ROS 2 distribution in your current terminal session.

```
source /opt/ros/humble/setup.bash
```

Navigate to the **ros2/src** folder on the QBot Platfrom root directory. Copy **qbot_platform** inside this directory.

Note: If this is the first time compiling the ros2 workspace navigate to the **/ros2** folder and use the command **colcon build** to compile the ros2 workspace. Once the workspace has compiled successfully it needs to be sourced as a ROS 2 package using the following command:

```
source install/setup.bash
```

Running nodes:
To run any ROS 2 node, use the following command:

```
ros2 run <package name> <node name(s)>
```

As an example, to run the Qbot Platform LiDAR node, use the following command:

```
ros2 run qbot_platform lidar
```

Note: Nodes should run 1 per terminal session although the ros2 run command does support running multiple nodes at the same time. As a standard practice, it's recommended to run multiple nodes using a launch file.

Running launch files:
Launch files combine a series of nodes into a unique application. To run any launch file use the following command:

```
ros2 launch <package name> <name of launch file.py>
```

As an example, if you want to run the QBot Platfrom manual drive example use the following command:

```
ros2 launch qbot_platform qbot_platform_manual_drive.py
```