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Setting Up TurtleBot3 Simulation in ROS 2 Humble Hawksbill



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Requirements -

- a. Ubuntu 22.04 (Jammy Jellyfish)
- b. ROS 2 Humble Hawksbill

1. Set up the ROS 2 Environment Variables

Sourcing ROS 2 setup files will set several environment variables necessary for operating ROS 2.

Source the ROS2 Humble Environment by typing the following command in every terminal to have access to the ROS 2 commands:

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

If you don't want to have to source the setup file every time you open a new shell, then you can add the command to the shell startup script:

```
echo "source /opt/ros/humble/setup.bash" >> ~/.bashrc
```

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```
source ~/.bashrc
```

2. Install Gazebo Simulator

Install Gazebo11 and its associated ROS 2 meta-packages by typing the following command in a shell script:

```
sudo apt install gazebo11  
sudo apt install ros-humble-gazebo-ros-pkgs
```

3. Install ROS 2 Dependent Packages

3.1. Cartographer

Cartographer is a system that provides real-time simultaneous localization and mapping (SLAM) in 2D and 3D across multiple platforms and sensor configurations.

Type the following command in a shell to install the ROS 2 Cartographer packages:

```
sudo apt install ros-humble-cartographer  
sudo apt install ros-humble-cartographer-ros
```

3.2. Navigation Stack for ROS 2

The ROS 2 Navigation Stack is a set of packages that helps the robot move from start position to the goal position.

Type the following command in a shell to install the ROS 2 Navigation Stack packages:

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```
sudo apt  
sudo apt install ros-humble-nav2-bringup
```

4. Create a ROS2 Workspace

A workspace is a set of directories which contains all our ROS 2 packages.

Type the following command to create a new workspace directory:

```
mkdir -p ~/turtlebot3_ws/src
```

5. Install Turtlebot3 Packages

5.1. Navigate inside the `src` directory of the workspace:

```
cd ~/turtlebot3_ws/src
```

5.2. Clone the Turtlebot3 packages:

```
git clone https://github.com/ROBOTIS-GIT/turtlebot3_simulations.git -b humble-d  
git clone https://github.com/ROBOTIS-GIT/turtlebot3.git -b humble-devel  
git clone https://github.com/ROBOTIS-GIT/turtlebot3_msgs.git -b humble-devel  
git clone https://github.com/ROBOTIS-GIT/DynamixelSDK.git -b humble-devel
```

6. Build the Packages

From the root of the workspace (`turtlebot3_ws`), run the following command to

build your ROS 2 packages using colcon

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```
cd ~/turtlebot3_ws  
  
colcon build
```

Source the `turtlebot3_ws` workspace

```
source ~/turtlebot3_ws/install/setup.bash
```

7. Running the Turtlebot3 Gazebo Simulation

Navigate inside the workspace (`turtlebot3_ws`), run the following command to source the workspace

```
source ~/turtlebot3_ws/install/setup.bash
```

TurtleBot3 has three models, `burger` , `waffle` , and `waffle_pi` , so you have to set which model to use before using.

To do this on Ubuntu, we specify the model to be used with the `export` command.

Type the following commands in a shell to add `TURTLEBOT3_MODEL` as `burger` to the `.bashrc` file. After that, source the `.bashrc` file:

```
echo 'export TURTLEBOT3_MODEL=burger' >> ~/.bashrc  
source ~/.bashrc
```

7.1. Launching Turtlebot3 Simulation World in Gazebo

Open a new

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```
source ~/turtlebot3_ws/install/setup.bash
```

Launch the Turtlebot3 robot in the TurtleBot3 World by typing the following command:

```
ros2 launch turtlebot3_gazebo empty_world.launch.py
```

You can change the simulation world by launching other simulation launch files:

TurtleBot3 World:

```
ros2 launch turtlebot3_gazebo turtlebot3_world.launch.py
```

TurtleBot3 House:

```
ros2 launch turtlebot3_gazebo turtlebot3_house.launch.py
```

7.2. Running Turtlebot3 Teleoperation Node

Open a new shell window and source the turtlebot3 workspace:

```
source ~/turtlebot3_ws/install/setup.bash
```

Run the teleoperation node with the following command to teleoperate the

TurtleBot3 with the keyboard

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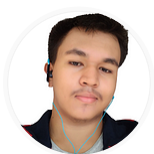
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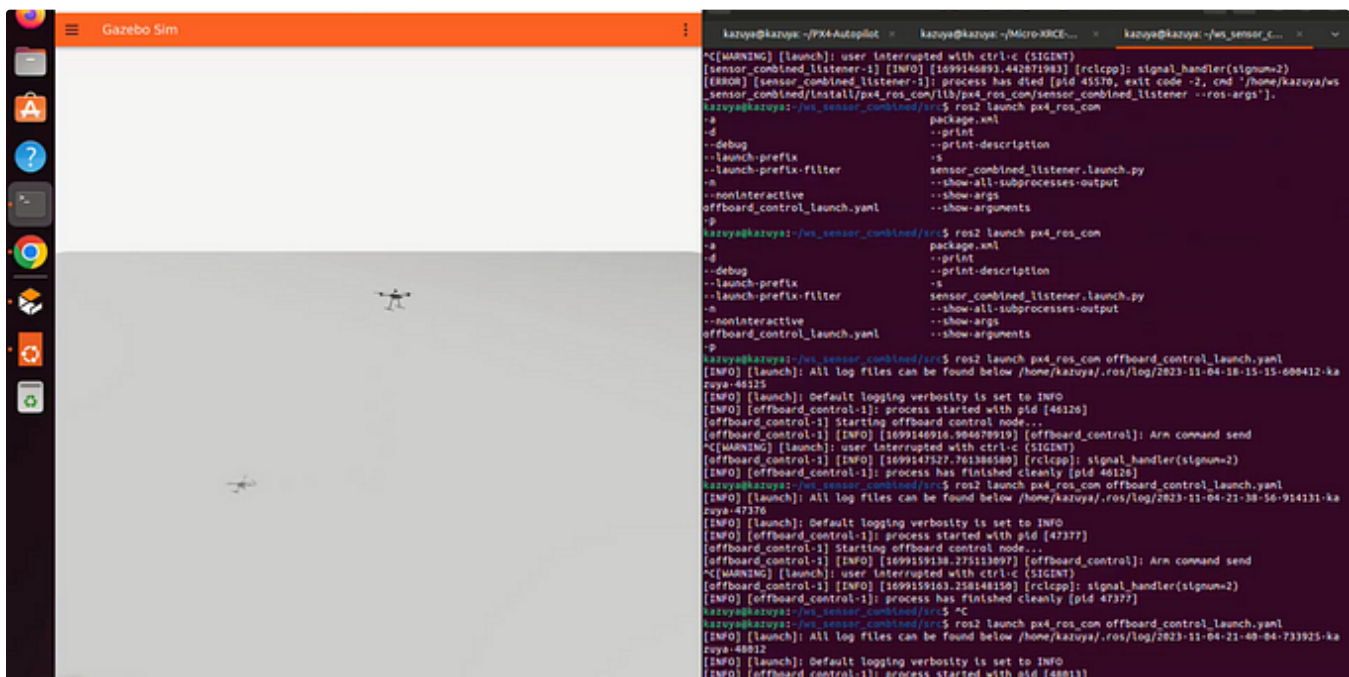
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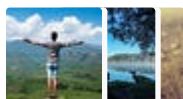
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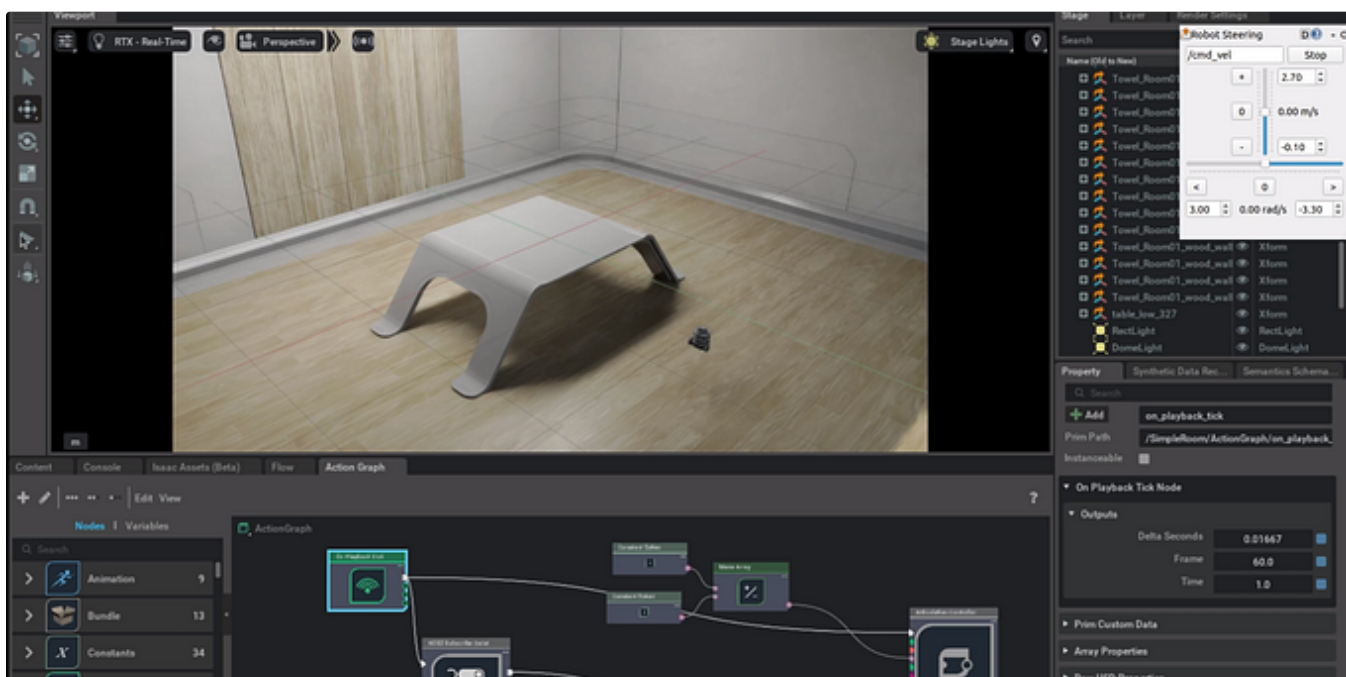
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