Understanding the e-Drone Model

In this tutorial you will learn how to use the **e-Drone model** for Task 1.

Steps to understand the drone model:

1. Run roscore by typing the following command in your terminal:
   ≫ *roscore*

2. Now launch the simulator by typing the following command in the V-REP directory and also check if the RosInterface has been loaded successfully:
   ≫ *./vrep.sh*

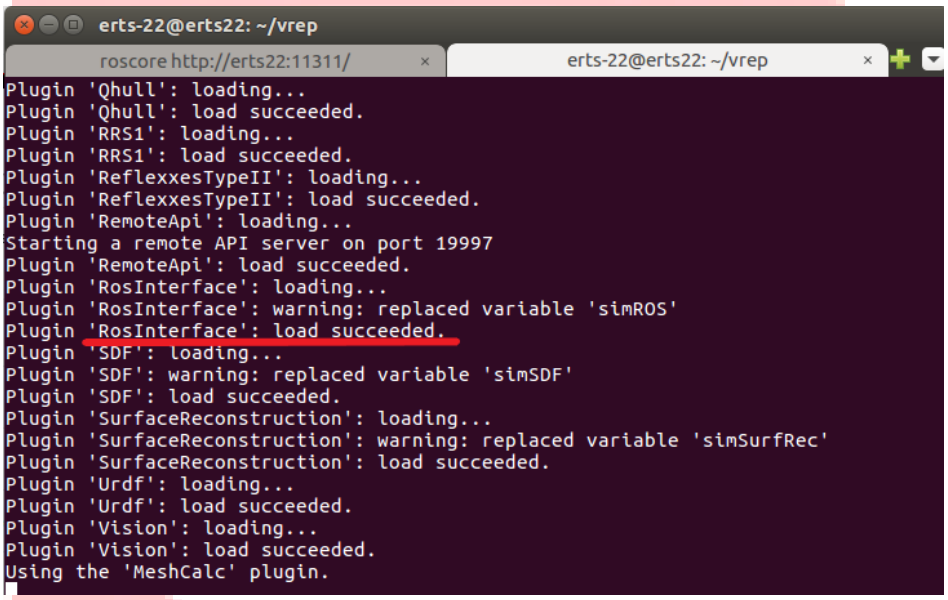

Figure 1: 'RosInterface' plugin load confirmation

If the 'RosInterface' has not been loaded then check if roscore is running before debugging further.

3. Open the "File" tab in V-REP. choose "Load Scene" and choose the following file from the Task 1.1 folder
   Scene.ttt

4. Run the simulation by clicking the play button in V-REP.

5. Make sure that in the top toolbar, Dynamics engine is set to **Bullet 2.78**, Dynamics Settings as **Accurate** (default), Simulation Timestep is **dt=50ms** (default), and the Simulation is in **Real-Time mode** as shown in Figure 2. For this competition, we instruct you to not change these parameters.

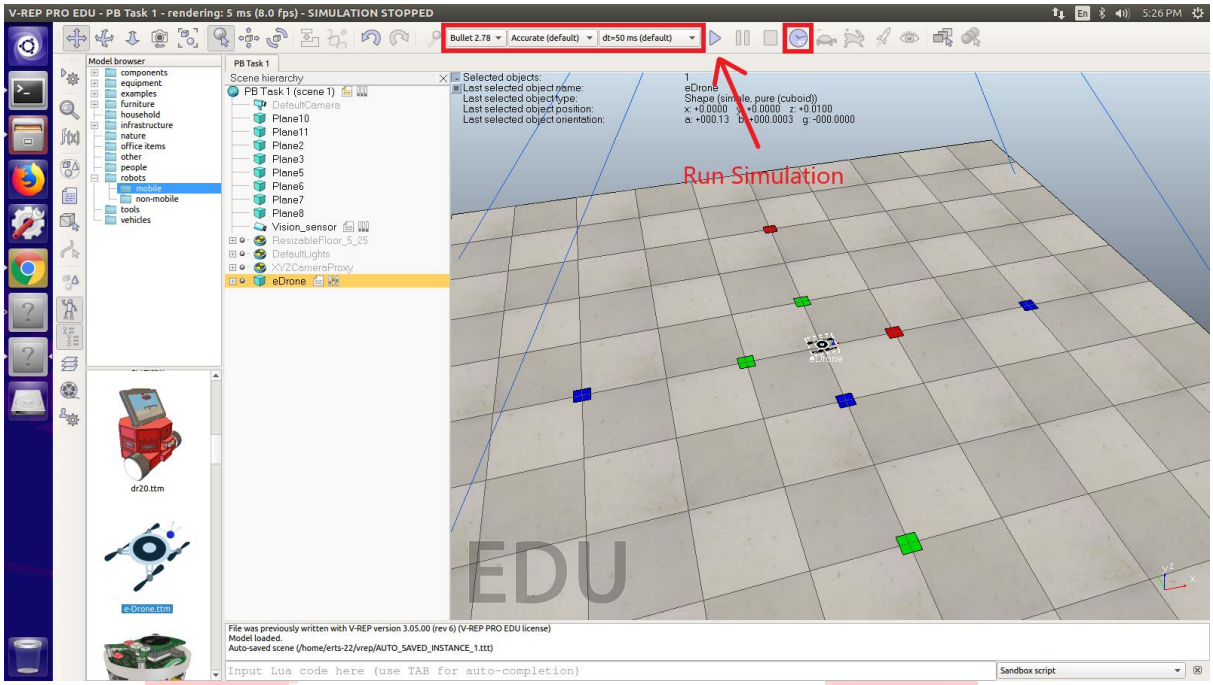

Figure 2: V-REP settings

6. Check all the topics published by V-REP. Run the following command in the terminal to check all the topics published by V-REP:

   ≫ *rostopic list*

   You should find the topics ***"/drone_command"*** and ***"/drone_yaw".***

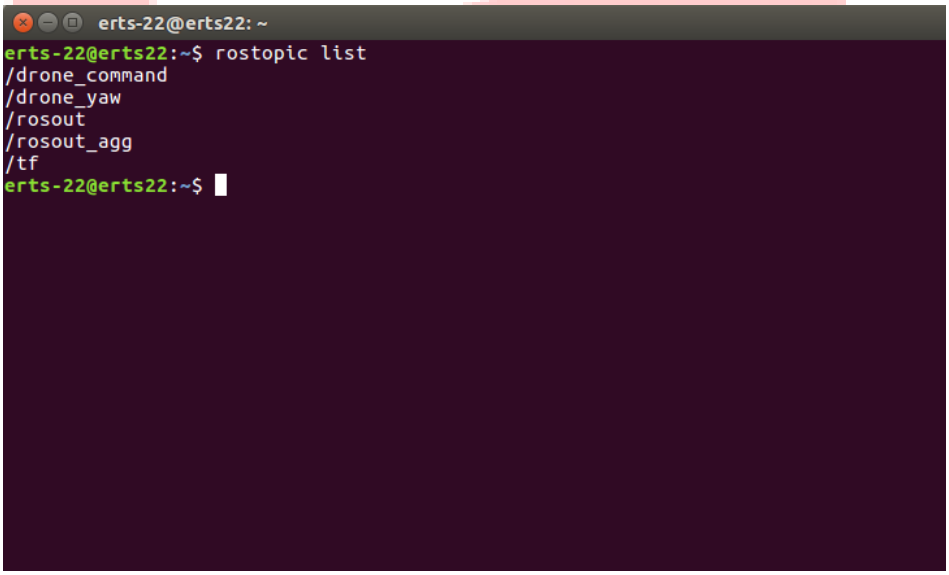

Figure 3: rostopic list output

"/drone_command" is a topic subscribed by the **e-Drone model.** It commands the drone's motion in terms of **roll, pitch, yaw and throttle.**

"/drone_yaw" is a topic published by the **e-Drone model.** It indicates the drone's orientation about the z-axis with respect to the V-REP world.

7. Check the type of messages accepted by the ***"/drone_command"*** topic. Run the following command in the terminal to check:

   ≫ *rostopic info /drone_command*

   Your output will display the topic type as ***"plutodrone/PlutoMsg"***.

   Check the structure of the message by typing the following command in the terminal:

   ≫ *rosmsg show plutodrone/PlutoMsg*

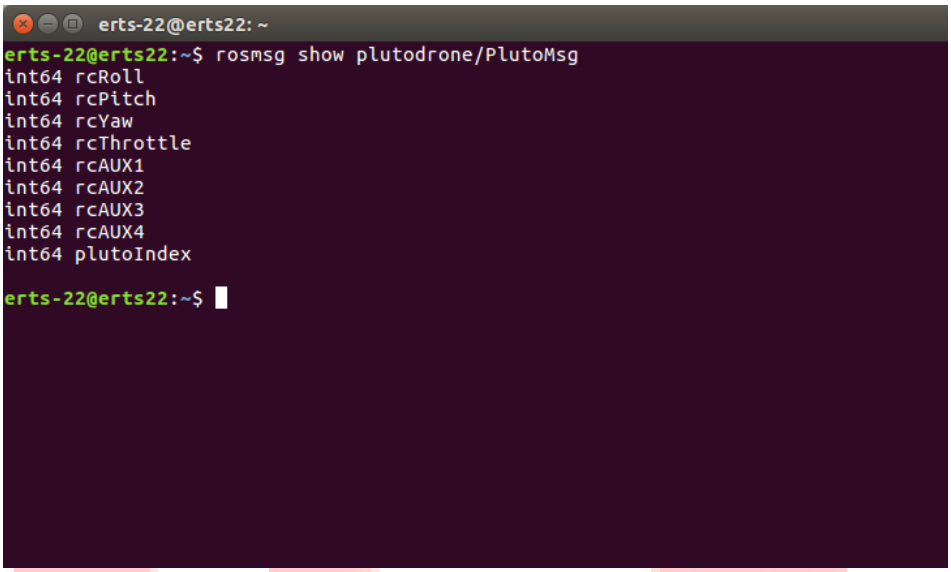

Figure 4: drone_command message structure

   The values for *rcRoll*, *rcPitch*, *rcYaw* and *rcThrottle* range from 1000 to 2000.

8. Do the same for the ***"/drone_yaw"*** topic to check the type of messages published by it. Run the following command in the terminal to check:

   ≫ *rostopic info /drone_yaw*

   Your output will display the topic type as ***"std_msgs/Float64"***.

   Check the structure of the message by typing the following command in the terminal:

   ≫ *rosmsg show std_msgs/Float64*

   The values for '*data*' ranges from -179 to 179.

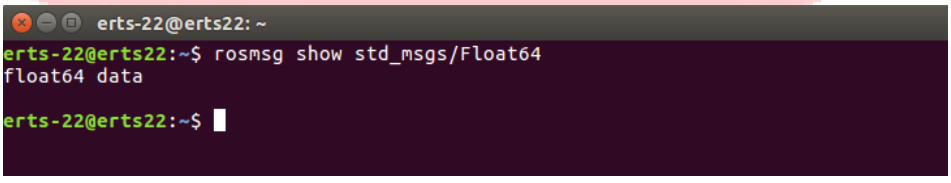

Figure 5: drone_yaw message structure

Arming the Drone:

An armed drone means the drone is ready to take commands from a user or software to fly.

The condition to arm the drone is rcThrottle = 1000 (minimum value) and rcAUX4 ≥ 1300. To test arming the drone model, publish the following message to the topic ***"/drone_command"*** by typing the command:

≫ rostopic pub /drone_command plutodrone/PlutoMsg "{rcRoll: 1500, rcPitch: 1500, rcYaw: 1500, rcThrottle: 1000, rcAUX1: 0, rcAUX2: 0, rcAUX3: 0, rcAUX4: 1500}"

This should now arm the drone. A message should pop on the V-REP window which says **"ARMED"** and the propellers should start rotating.

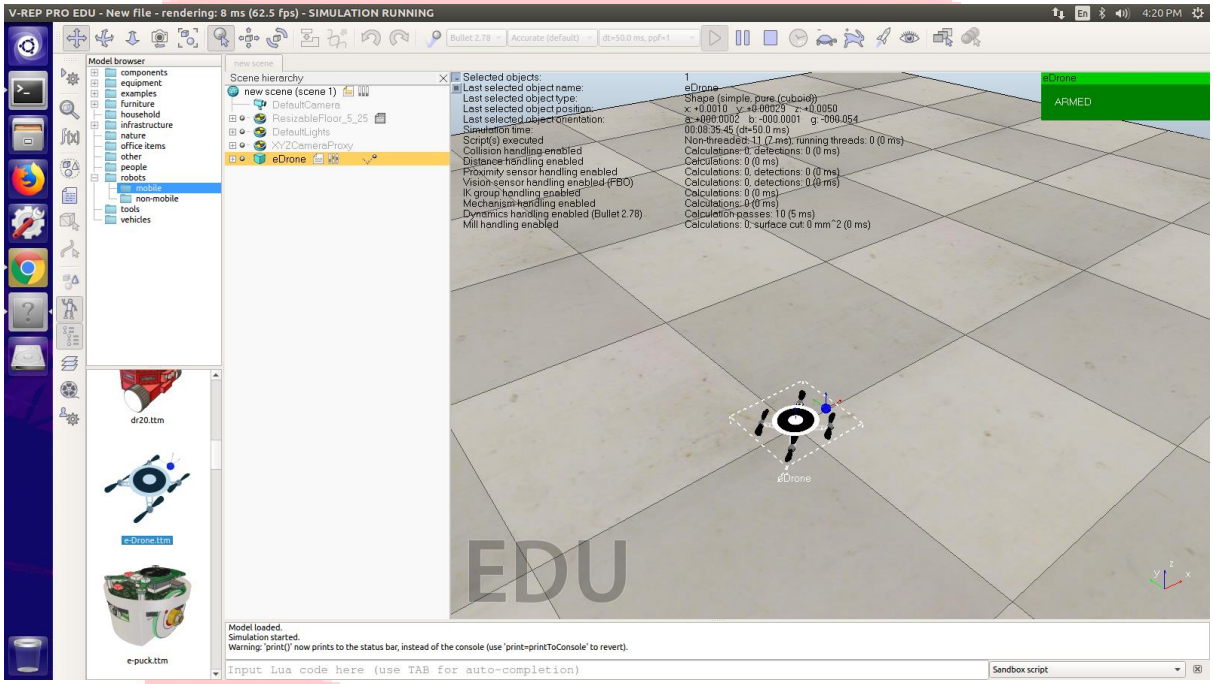

Figure 6: Arm

Flight (Take-Off):

The condition for the drone to take-off is rcThrottle ≥ 1500, after arming. To test the drone's take-off, publish the following message to increase the throttle:

≫ rostopic pub /drone_command plutodrone/PlutoMsg "{rcRoll: 1500, rcPitch: 1500, rcYaw: 1500, rcThrottle: 1500, rcAUX1: 0, rcAUX2: 0, rcAUX3: 0, rcAUX4: 1500}"

The drone should now steadily rise until a new command is given.

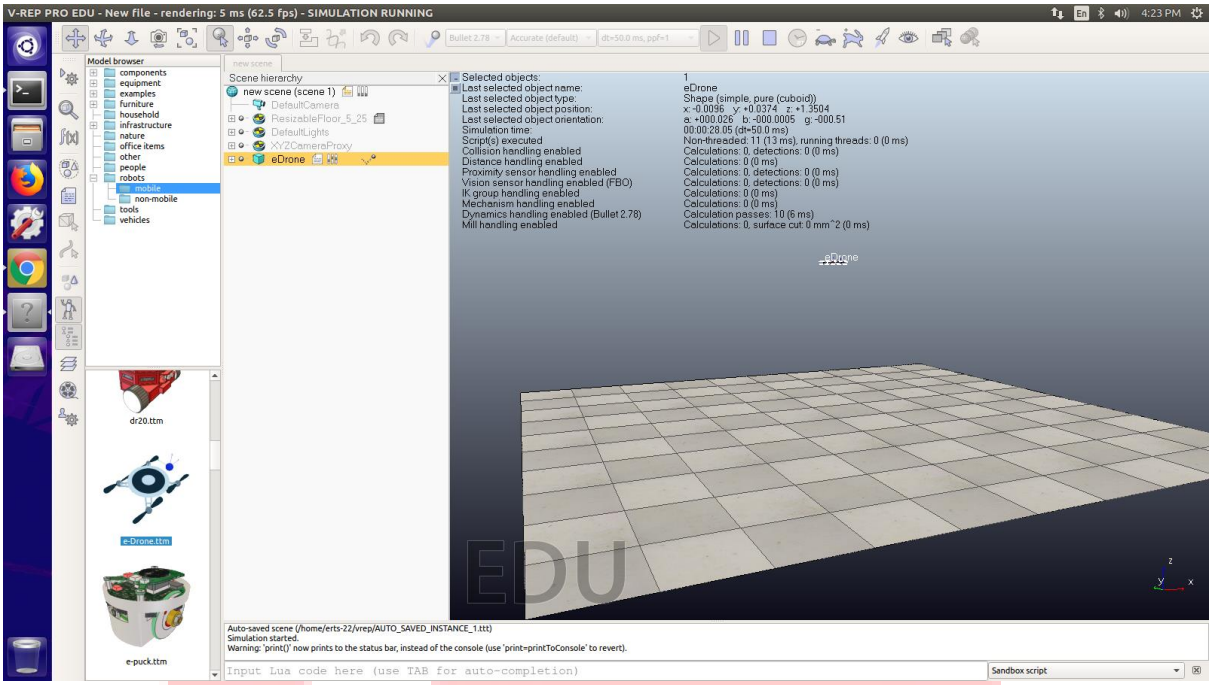

Figure 7: Flight

Disarming the Drone:

A disarmed drone means the drone is in a mode that will not take any commands from a user or software to fly.

The condition to disarm the drone is rcAUX4 ≤ 1200. To test disarming the drone model, publish the following message to the topic ***"/drone_command"*** by typing the command:

≫ rostopic pub /drone_command plutodrone/PlutoMsg "{rcRoll: 1500, rcPitch: 1500, rcYaw: 1500, rcThrottle: 1000, rcAUX1: 0, rcAUX2: 0, rcAUX3: 0, rcAUX4: 1200}"

The drone should now be disarmed. A message should pop on the V-REP window which says **"DISARMED"** and the propellers should stop rotating.

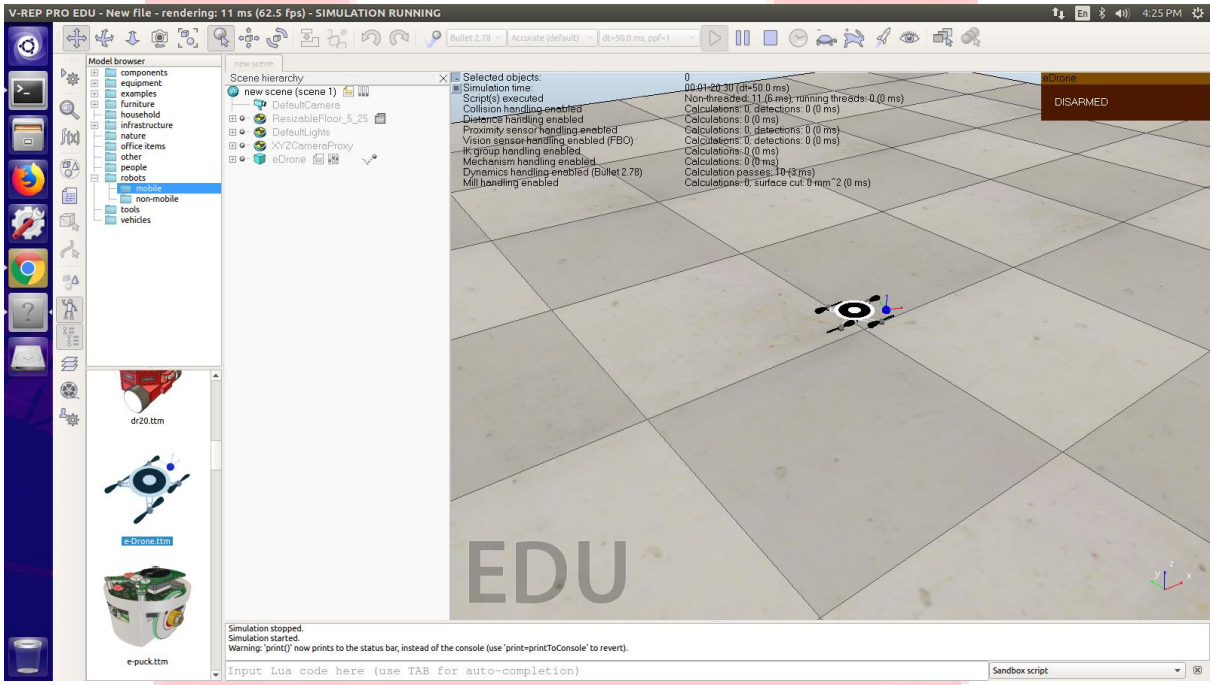

Figure 8: Disarm

Heading if the Drone:

It is important to understand the heading direction of the drone. Refer to Figure 9 to check the heading of drone.

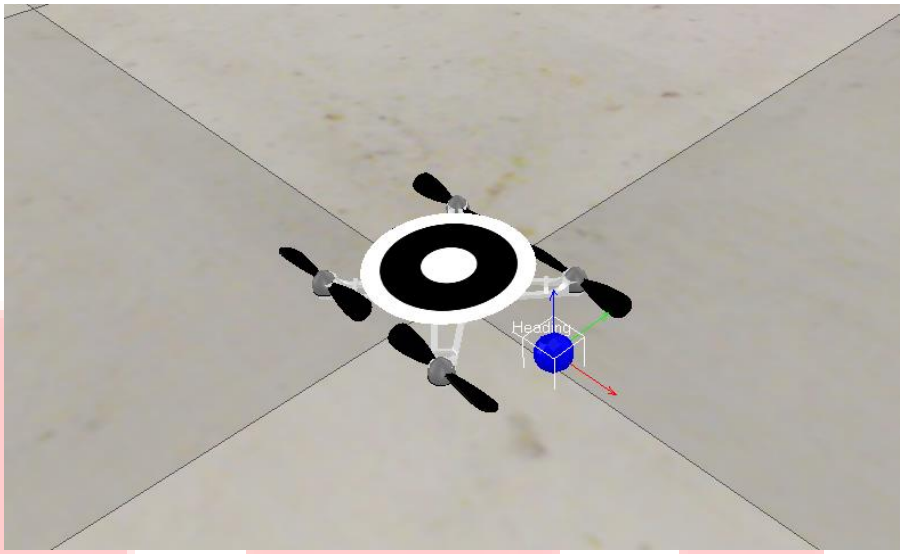

Figure 9: Heading of the Drone

- Red Arrow: Positive X-Axis (Pitch)
- Green Arrow: Positive Y-axis (Roll)
- Blue Arrow: Positive Z-axis (Throttle)