Robotics Lab - 221 LIA 001
Assignment 4
Due: November 22, 2024, 2.00 pm IST

Instructions

1. All final code files to be pushed to your assignment repo
2. The questions below are to be answered serial order in a text file them pushed to your assignment repo as a **single file named <your first name>_assignment4_answers.txt file**
3. Commit all files to the assignment git. *You have to commit to the assignment folder from terminal. Uploads via graphical interface will get penalised*
4. Screencast videos are to committed **only in** *webm* format

1. **Interfacing temperature sensor with ROS Serial Arduino**
   A robot may feature several sensors as in the figure 1. In this assignment question your task is to interface a commercially available temperature sensor DHT 22 with rosserial Arduino. DHT 22 supplies temperature (in degree Celsius) and relative humidity. A sample output is shown in this video [1]

   (a) Interface DHT22 with Arduino Uno
   (b) Write the C++ code to publish the temperature and relative humidity and deploy it on Arduino Uno
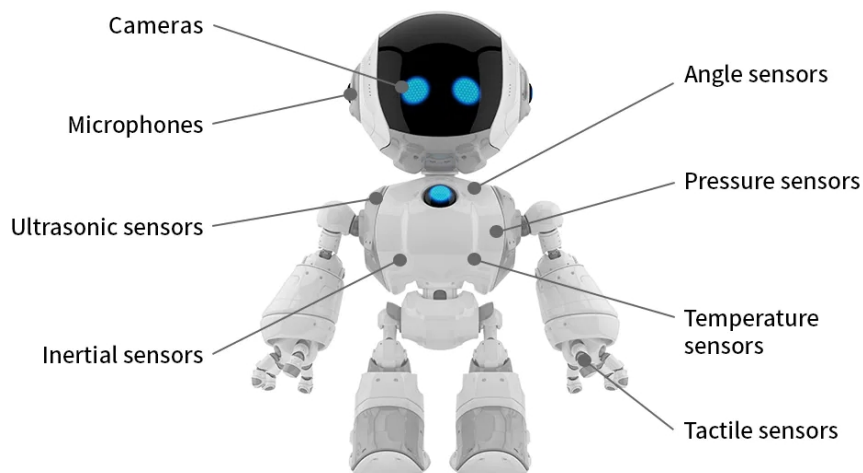   (c) Echo the temperature and relative humidity on the ROS terminal.

Figure 1: A Bot with various sensors

Answer these questions in the Assignment text file

   (a) List the currently running nodes
   (b) List the currently running topics
   (c) Run the rqt_graph tool and save the ros graph as **<dht22_your first name>.png**
   (d) Save a picture of the sensor interfaced with Arduino Uno with your laptop running the code as the background. Save the picture as **<dht22_connect_your first name>.png**

(e) Use the built-in screen recorder, and record a **1 minute** video showing : terminals with the nodes running, rqt_graph. Save the file in *webm* format as **dht22_your first name>.webm** as commit in the assignment submission.

2. **Interfacing ultrasound sensor with ROS Serial Arduino**
   In this assignment question your task is to interface a commercially available ultrasound sensor HC-SR05 with rosserial Arduino. A sample output is shown in this video [2]

   (a) Interface HC-SR05 with Arduino Uno

   (b) Write the C++ code to publish the distance of the object from the sensor and deploy it on Arduino Uno

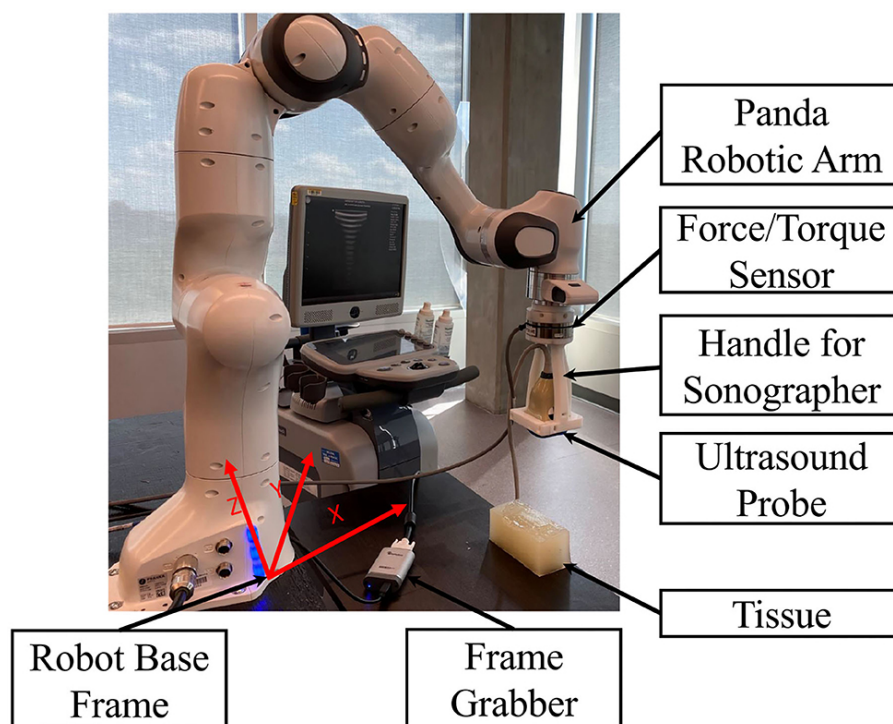   (c) Echo the target distance on the ROS terminal.

Figure 2: Sample application : A Panda robotic arm with ultrasound sensor[3]

Answer these questions in the Assignment text file

   (a) List the currently running nodes

   (b) List the currently running topics

   (c) Run the rqt_graph tool and save the ros graph as **<hcsr05_your first name>.png**

   (d) Save a picture of the sensor interfaced with Arduino Uno with your laptop running the code as the background. Save the picture as **<hcsr05_connect_your first name>.png**

   (e) Use the built-in screen recorder, and record a **1 minute** video showing : terminals with the nodes running, rqt_graph. Save the file in *webm* format as **hcsr05_your first name>.webm** as commit in the assignment submission.

References

[1] *Question 1 sample output video*. https://youtu.be/d7R565Bth7Y.

[2] *Question 2 sample output video*. https://youtu.be/7d2ieKzqU6k.

[3] Kuan-Ju Wang et al. "An improved sensing method of a robotic ultrasound system for real-time force and angle calibration". In: *Sensors* 21.9 (2021), p. 2927.

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