

Robotics Lab - 221 LIA 001

Assignment 3

Due: November 08, 2023, 2.00 pm IST

Instructions

1. Submission via Github classroom
2. Type down the questions and answers in the assignment submission template and commit the **pdf** to the assignment folder.
3. Commit all package files to the assignment git

1. Question 1: ROS Service

Multiple ultrasound sensors are mounted on an mobile robot for distance measurement. Create a ROS service that accepts the distance measured by the sensor (client) in Centimeters and responds with distance converted to Millimeters to the client.

Run the service server node script and answer the questions below:

- (a) List the currently running nodes
- (b) List the currently running topics
- (c) List the currently running services
- (d) Screenshot the running terminals, save the screenshot as 'assign3_1.webm' and commit to git
- (e) Call the service you created using the command `rosservice call <service name> <args>`. Paste the screenshot of terminal

Run the service client node & service server node scripts and answer the questions below:

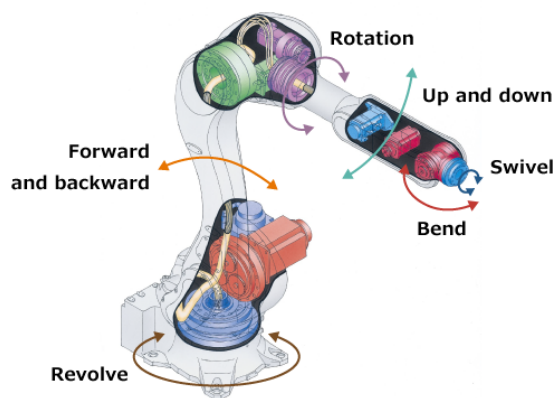
- (a) List the currently running nodes
- (b) List the currently running topics
- (c) List the currently running services
- (d) Screenshot the running terminals, save the screenshot as 'assign3_2.webm' and commit to git

2. Question 2: ROS Service

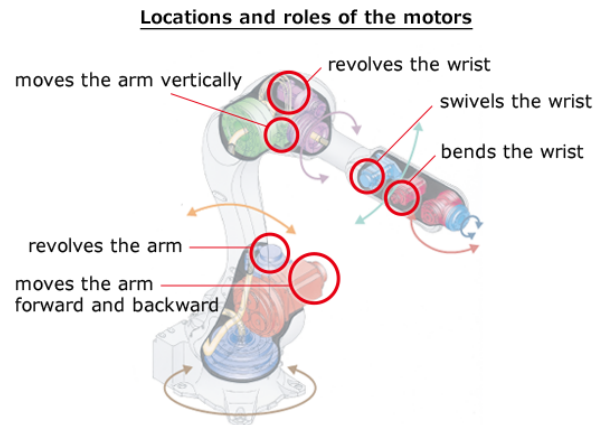
An industrial robotic arm similar to the one shown in figures 1a & 1b have a diagnostic code that checks on power up / restart whether all the components of the system are working properly.

In this assignment question we simulate the diagnostic code as a client node named *diagnostics* that request status from the robot joint motors.

- The three motor nodes (server nodes *motor1*, *motor2*, *motor3*) provide the response 'True' or 'False' to the *diagnostics* corresponding to whether the diagnostic test is passed by the motor or not. A string message for informational purpose is also passed to the *diagnostics*.



(a) Industrial robotic arm [1]



(b) Industrial robotic arm location of motors [1]

- *diagnostics* prints (on the terminal) response and the string message passed by the motor nodes. (see code execution video below)
 - If all three motors pass the test, then the *diagnostics* node prints the message 'Joint motors check : PASS' else the message 'Joint motors check : FAIL'
- (a) Realize the server nodes and client node. Run `rqt_graph` and paste the screenshot here
 - (b) List the running nodes
 - (c) List the running services
 - (d) Screencast the running terminals, save the screencast as 'assign3_3.webm' and commit to git
 - (e) Use `rospy.logerr` to generate an error message if any of the nodes fail. Screencast the error message displayed on terminal(s), save the screencast as 'assign3_4.webm' and commit to git

References

- [1] @online How Are Industrial Robots Built? A Guide on the Components and the Movement of Robot Arms, <https://robotics.kawasaki.com/ja1/xyz/en/1804-03/> Online; accessed 30-October-2023

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