Documentation of Operation Board Game Demo

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Robot installation

UR3 Installation

Install the robot such that the joints positions are as follows:

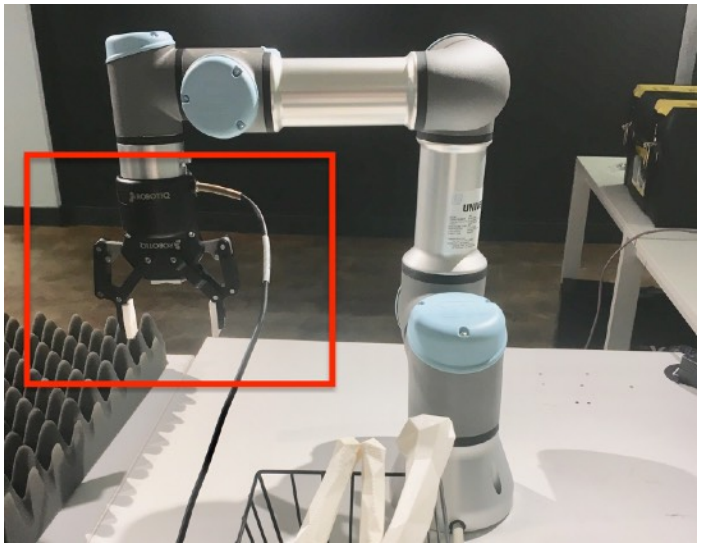
(Numbers are in degrees)

Base: 2.26
Shoulder: -87.6
Elbow: -91.5
Wrist1: -90.38
Wrist2: 93.25
Wrist3: 181.86

Figure above shows the front view (facing the operation board) of the UR3 with the correct installation.

Gripper Installation

1. Attach the gripper to UR3 such that it has the orientation as shown in the picture below.

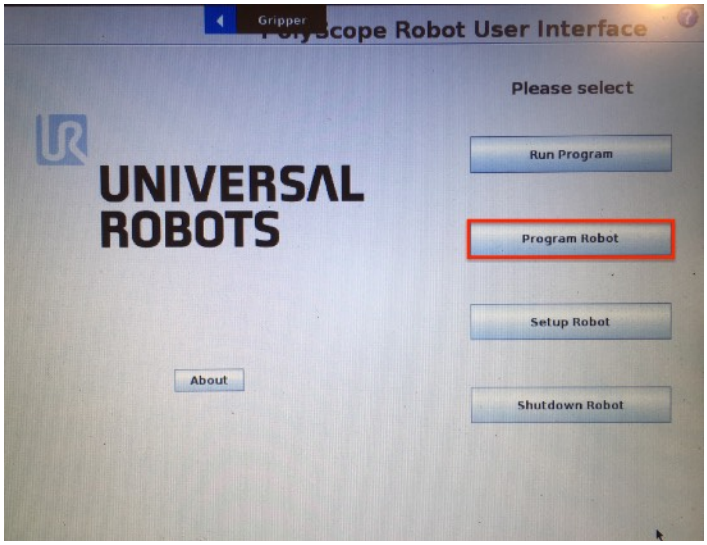


Robot Initialisation

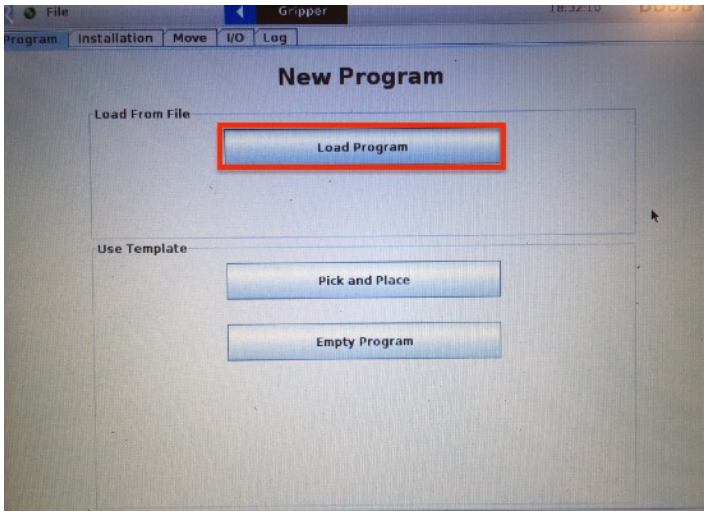
UR3 Initialisation

1. Once UR3 is turned on, if you are prompted with a message saying robot has not been initialised, select “**Go to initialisation**” and jump to step 7. Otherwise skip this step.

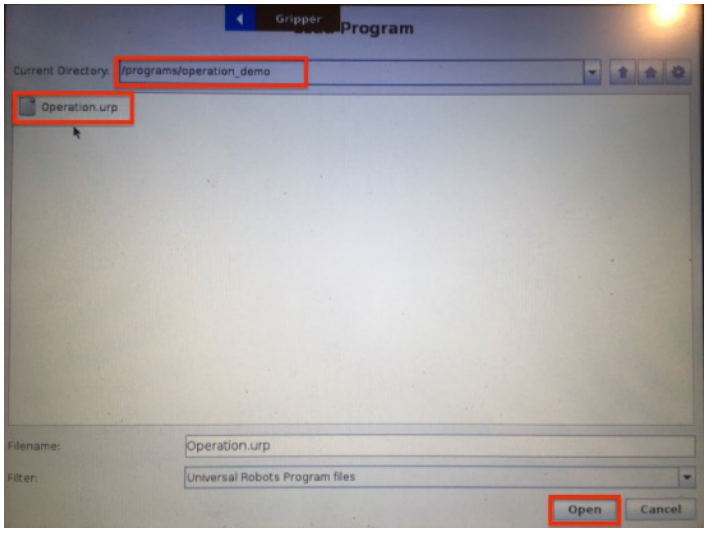
2. On the home page of the **Polyscope Robot User Interface**, select “**Program Robot**”.



3. Select “**Load Program**”.

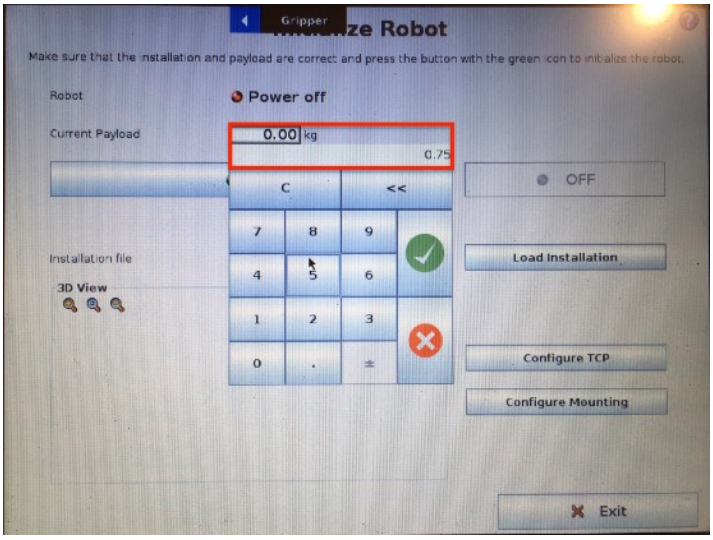


4. Go to the path “**programs/operation_demo**”. Select file “**Operation.urp**” and click “**Open**”.

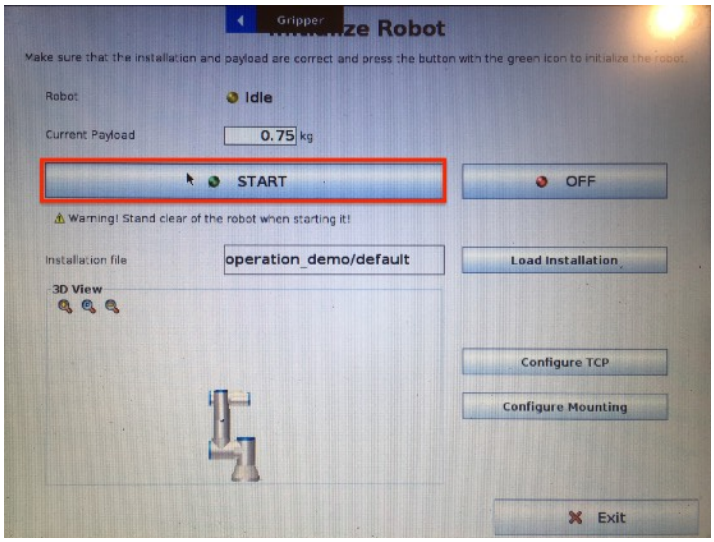


5. You will then be asked to initialise the robot, select “**Go to initialisation**”.

6. Set “**Current Payload**” to **0.75**.

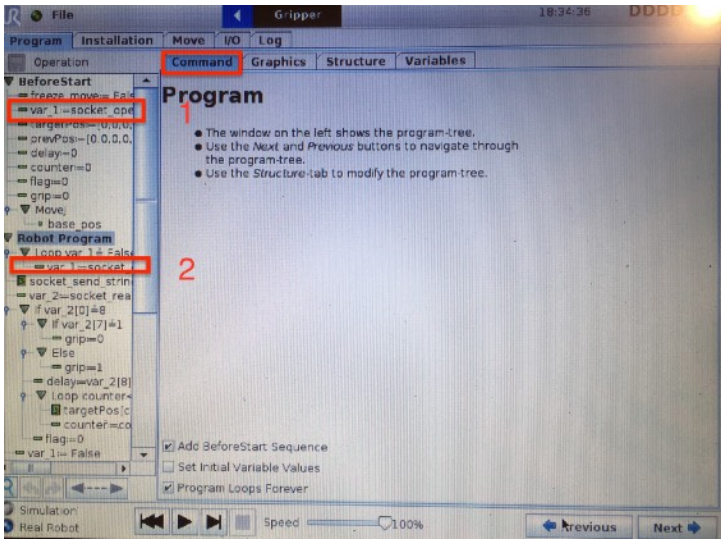


7. Select “**On**”, then “**Start**”.



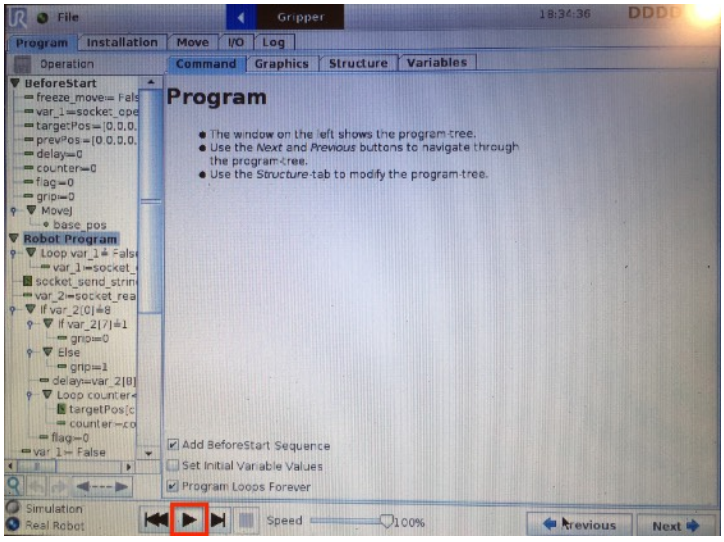
8. Exit by selecting “**Ok**” at the bottom right.

9. You should now have returned to the **Program page**, before starting the program make sure the **IP addresses** used in the program are correct. There are 2 places that need to be checked. Look for this line: “***var_1=socket_open(“192.168.0.13”,30000)***” in the program, there should be **2** places with the same line written. Select the tab “**Command**”. For each lines, change only the **IP address** to that of the laptop. Port number should remain 30000.

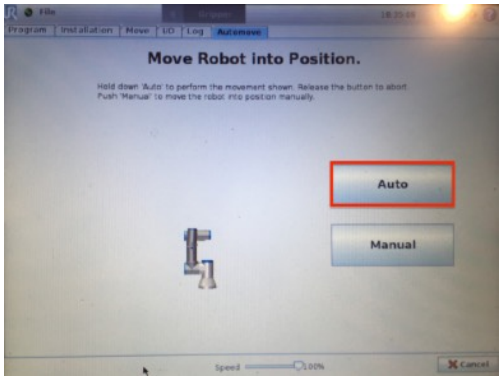


10. Save the changes by selecting **File** > **Save** on the top left corner of the screen.

11. Press the “**play**” button at the bottom of the screen.



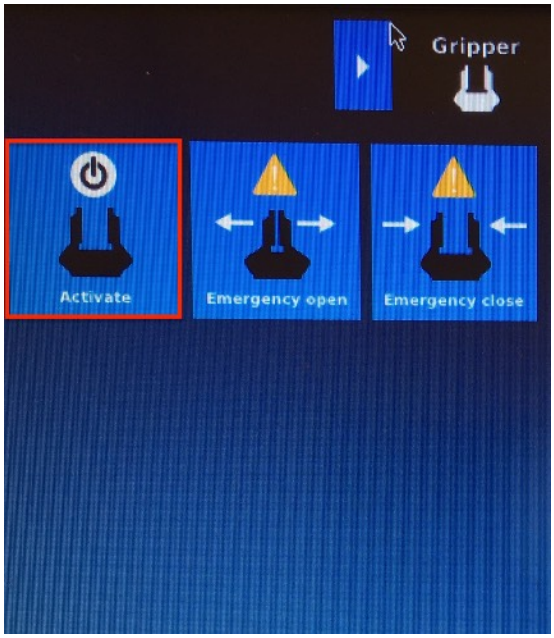
12. You might be prompted to move the robot into position, do so by holding onto the “**Auto**” button until it returns all gray.



Gripper Initialisation

1. On the **Polyscope Robot User Interface**, select “**Gripper**” on the top.

2. Select “**Activate**”.

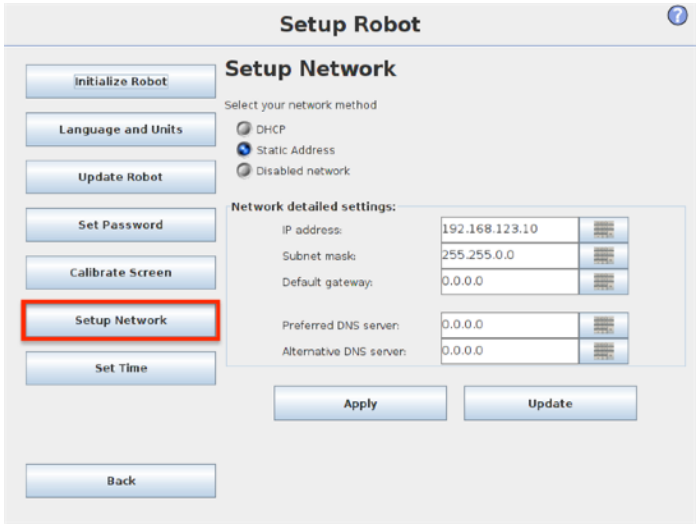


Network Setup

UR3 Network Setup

1. On the **Polyscope Robot User Interface**, go to home page and select “**Setup Robot**”.

2. Select "**Setup Network**”.



3. Put in the correct **Subnet mask** and **Default gateway** (if any) that match with those of the server laptop. There is no specification for the IP address, it can be any valid IP address under the same network of the Laptop.

4. Select “**Apply**”

Laptop Network Setup

1. On the laptop, browse to ***Desktop/RoomOne/OperationDemo/SensorCode***

2. Open the file “**SendingCoordinates.py**” in any text editor and change the **IP address of the HOST** in the code to the current IP address of this laptop. It can be found via the command “***ipconfig***" in the cmd.

Laptop + Leap Motion Setup

1. Connect leap motion to one of the USB ports of the laptop.
2. On the laptop, browse to ***Desktop/RoomOne/OperationDemo/SensorCode***
3. Double click on the file "**SensorCode.vcxproj"** to open the project in VisualStudio.
4. Start the program by pressing the "**Local Windows Debugger**".
5. Open up Windows Command Line in the **same directory** and run the the server program via the command "**python SendingCoordinates.py**".

Trouble shooting

UR3 Protective Stop

- Try holding onto "**Free Drive**" button under the "**Move**" tab and manually move the robot to a safe position, such as base/initial position (2.26, -87.6, -91.5, -90.38, 93.25, 181.86).
- If Free Drive is disabled due to an external force experienced by the robot, remove the force and try again.

UR3 Not Moving after programs have started on both robot and sensor side

- Check if IP addresses are set correctly (refer to Network Setup section).
- Check if Leap Motion is working correctly. You can test it with the software LeapMotion. If there exists any fault in the sensor, replace it with another sensor machine.
- Check if the server program (SendingCoordinates.py) is running. Try to re-start it if needed.