THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

INDUSTRIAL CENTRE
工業中心

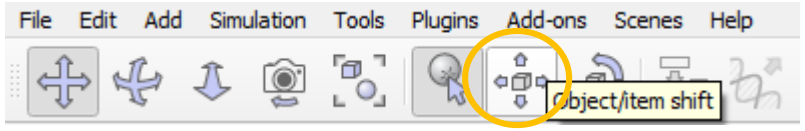
Control and Automation IC2122
Robotics Lab with VREP

Instructor: Louis Wong

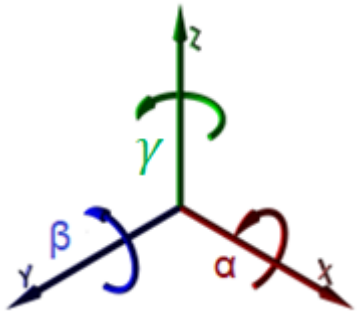
Industrial Centre

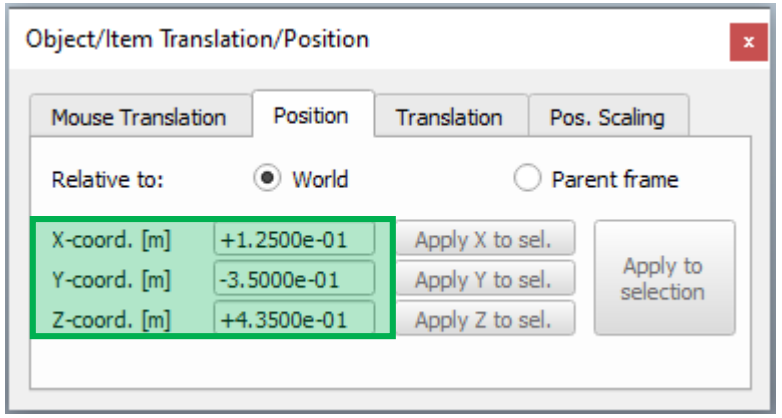
The Hong Kong Polytechnic University

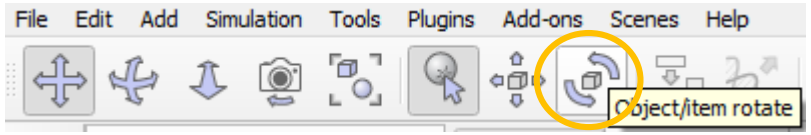
V-REP Tools

- Object Position:
  1. Select the object
  2. Click 

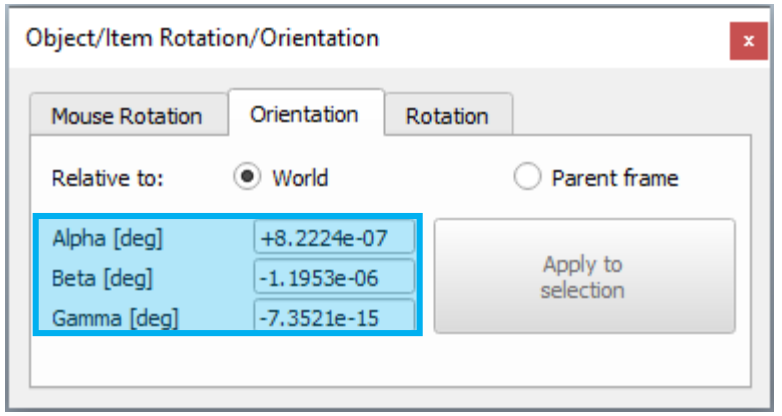
  3. Position: X, Y, Z





- Object Orientation:
  1. Select the object
  2. Click 

  3. Orientation: Alpha (α), Beta (β), Gamma(γ)



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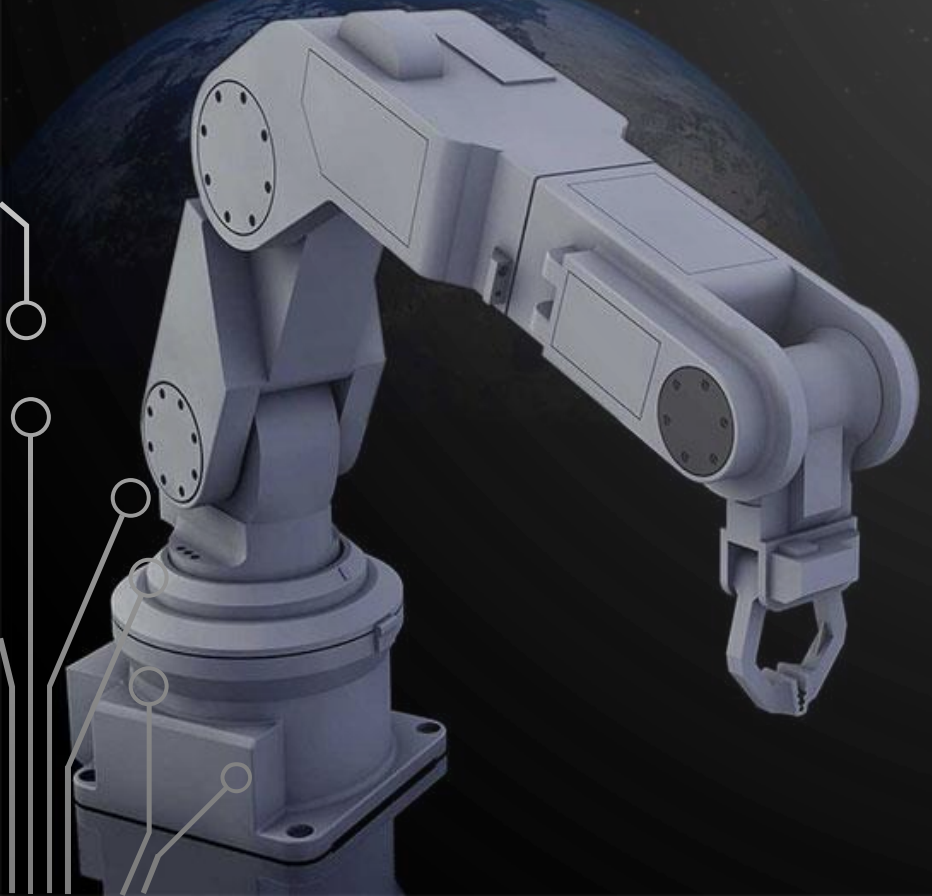
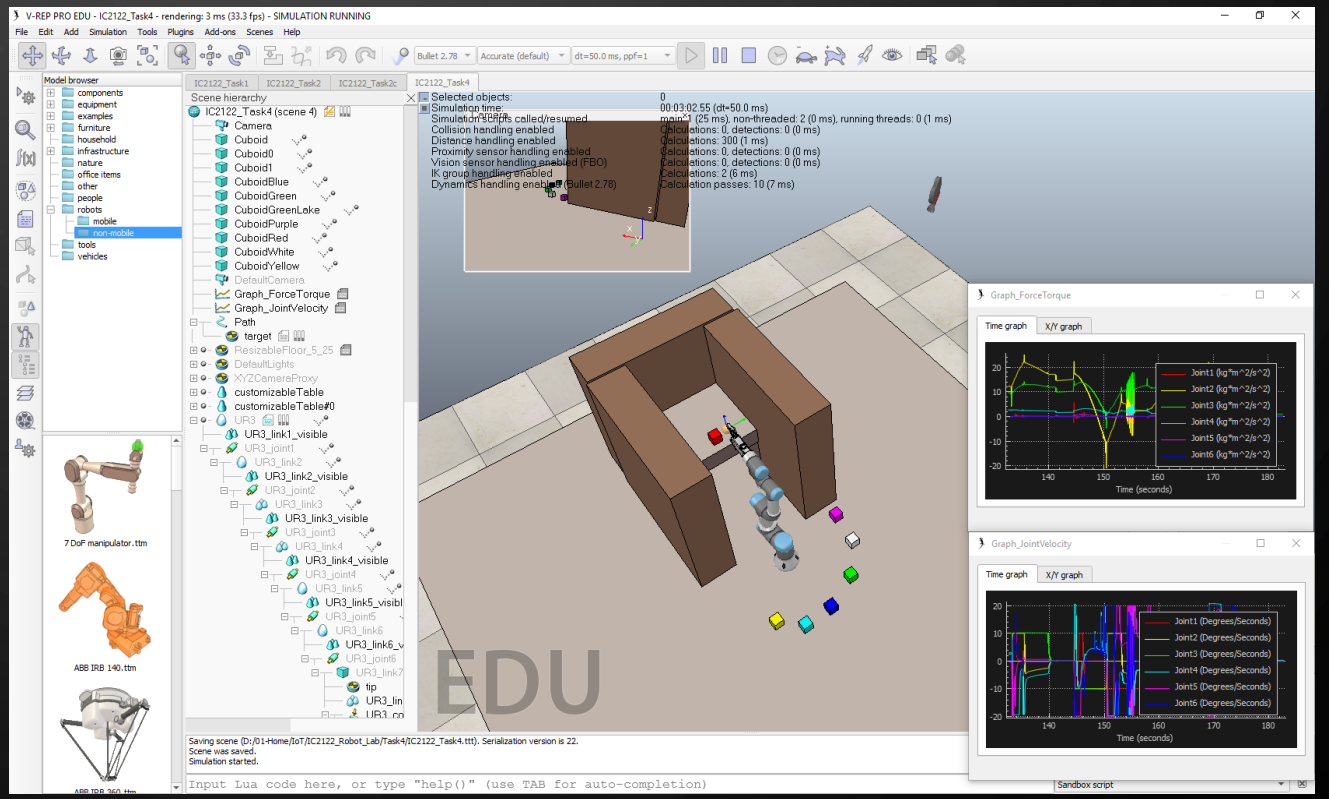
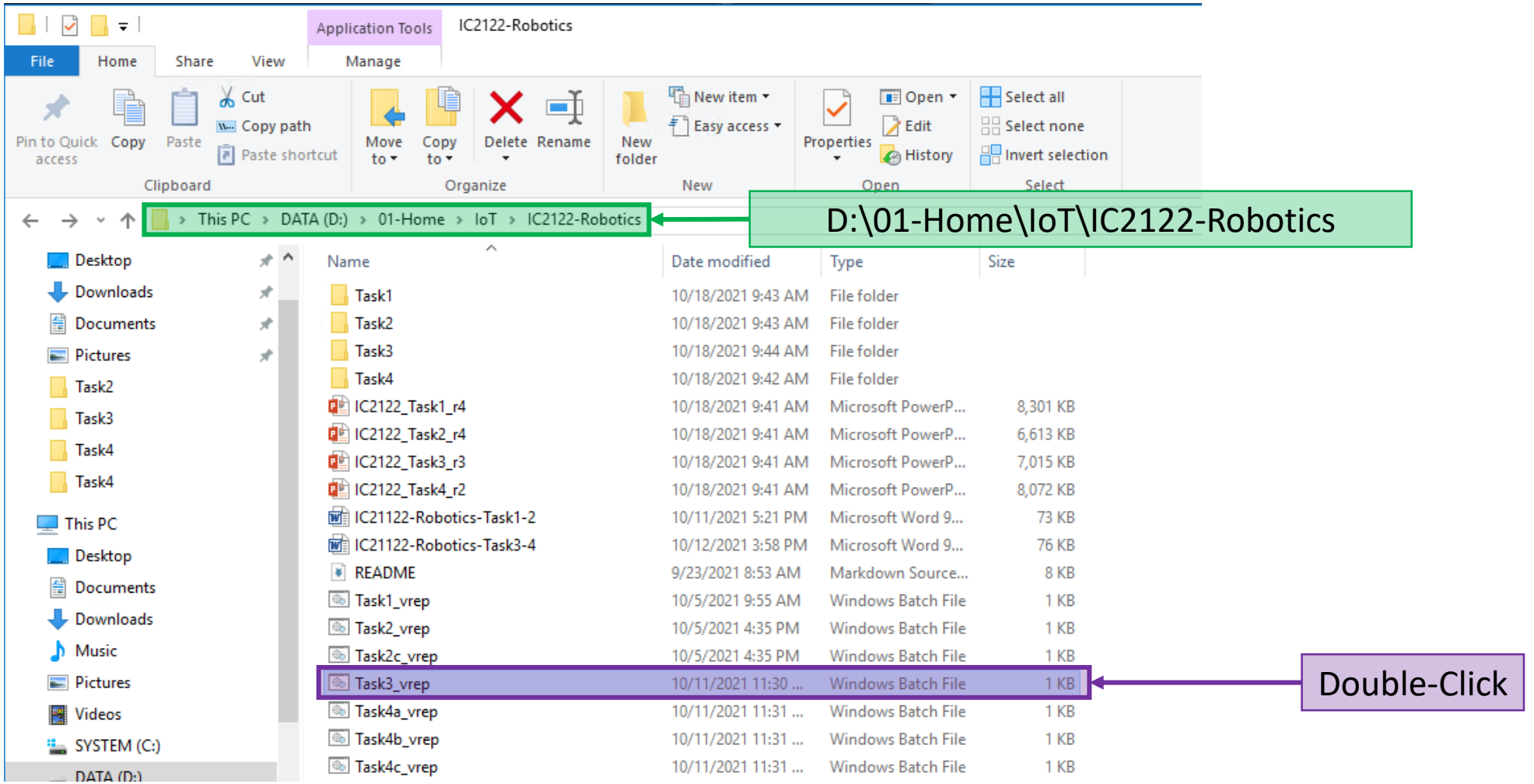
Task 3: Pick and Place





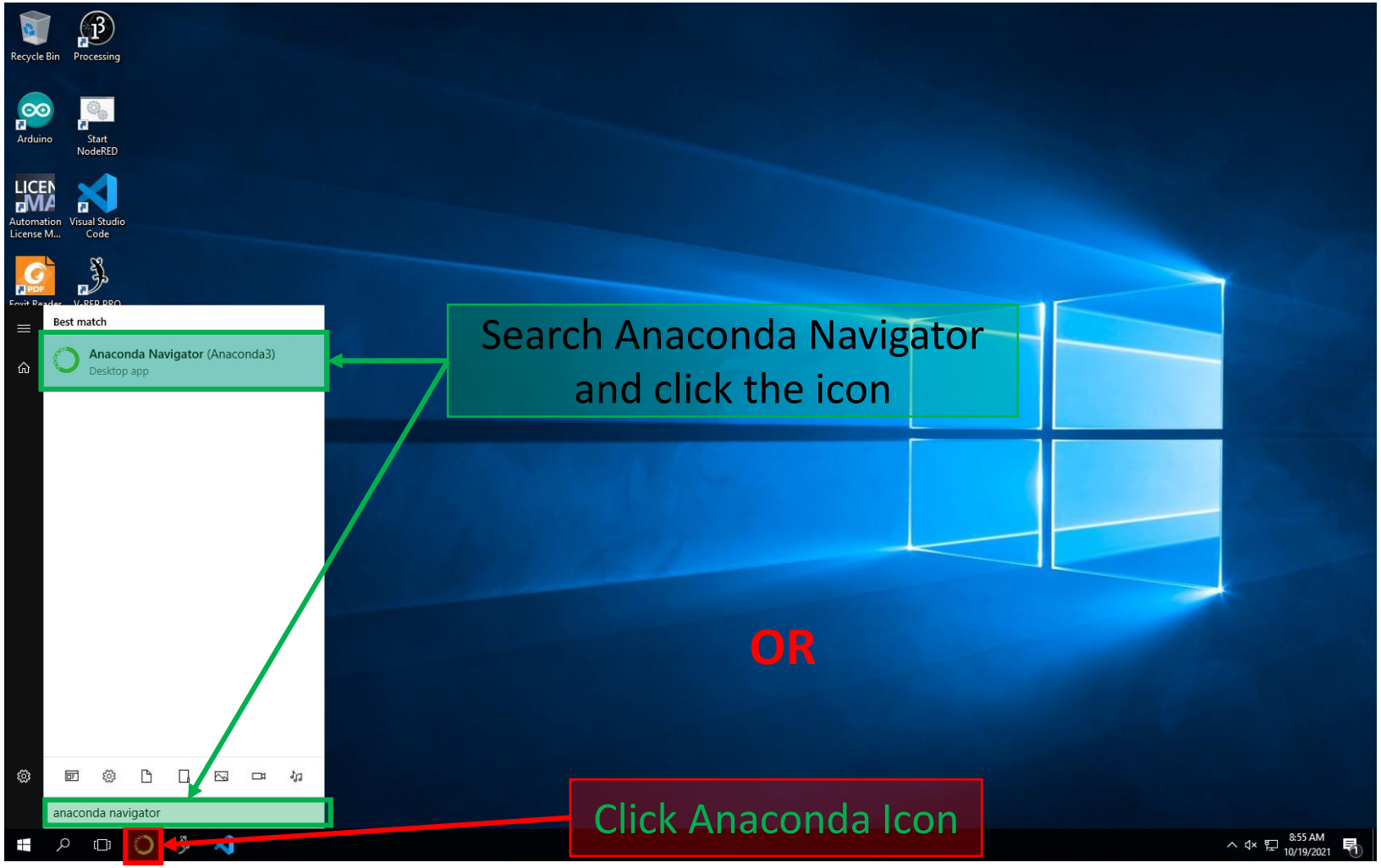
Start-up – V-REP

- Start the V-REP (Task3_vrep.bat)



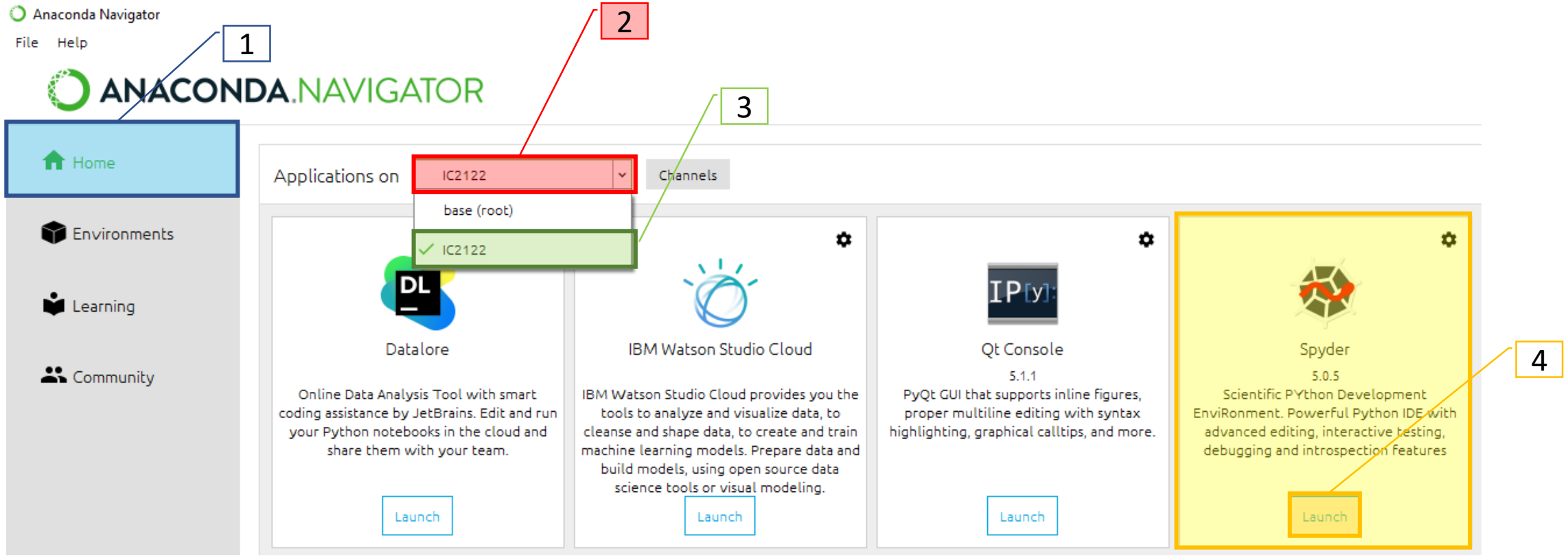
Start-up – Anaconda Navigator

- Start the Anaconda Navigator on Taskbar or search Windows

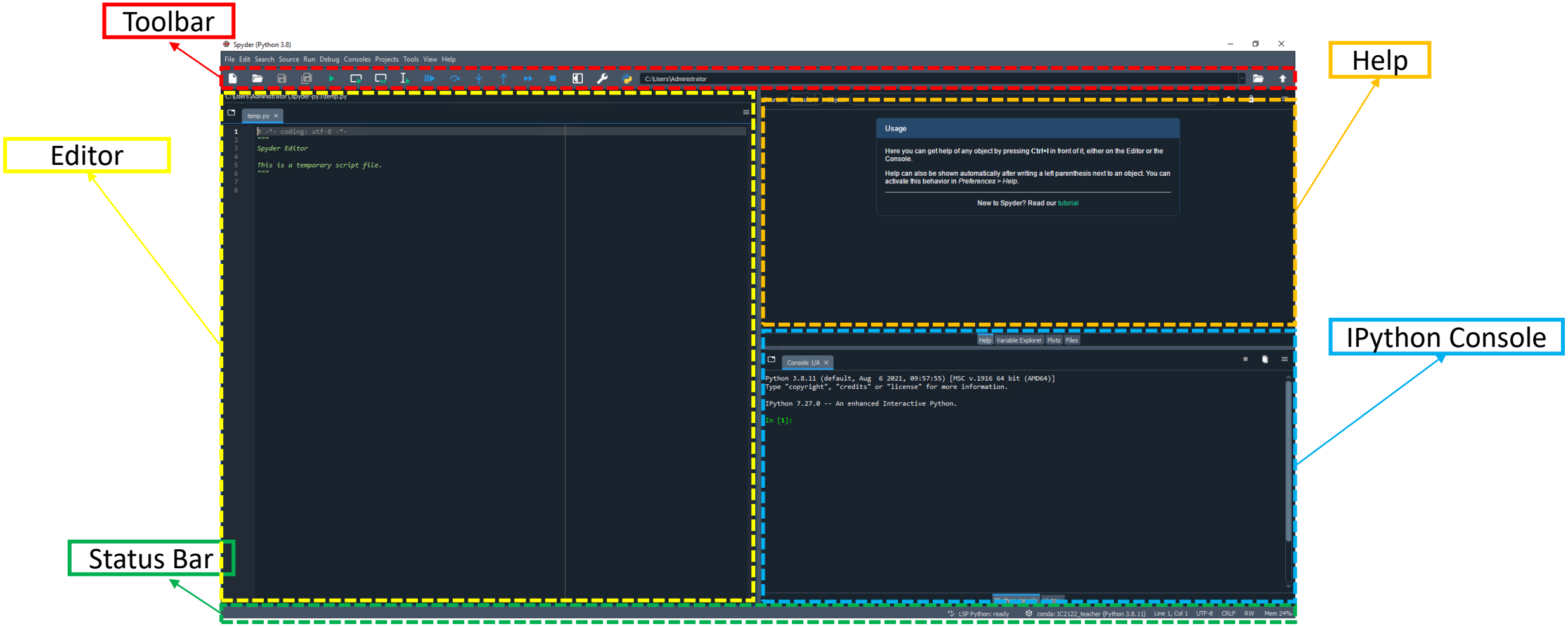


Start-up – Spyder

- Launch Spyder

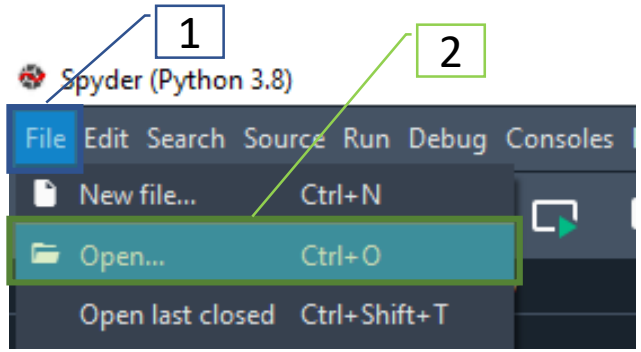


Start-up – Spyder



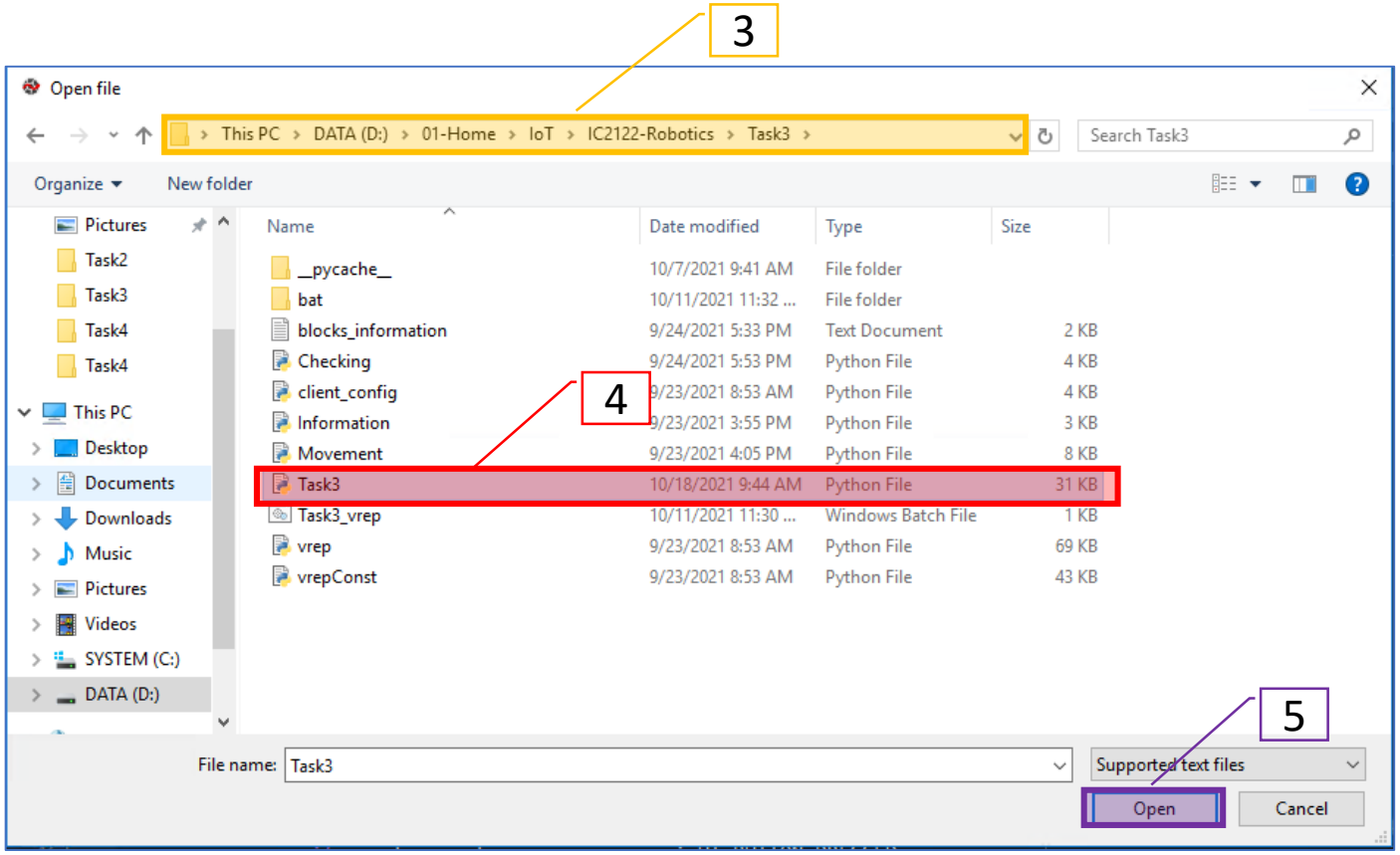
Start-up – Spyder

- Open Python file at editor



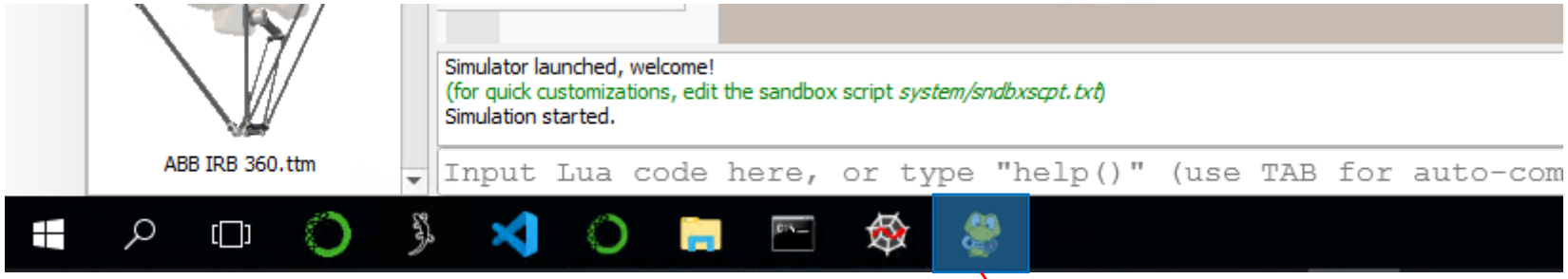
- Run the program at Spyder

D:\01-Home\IoT\IC2122-Robotics\Task3



Start-up – Control panel window

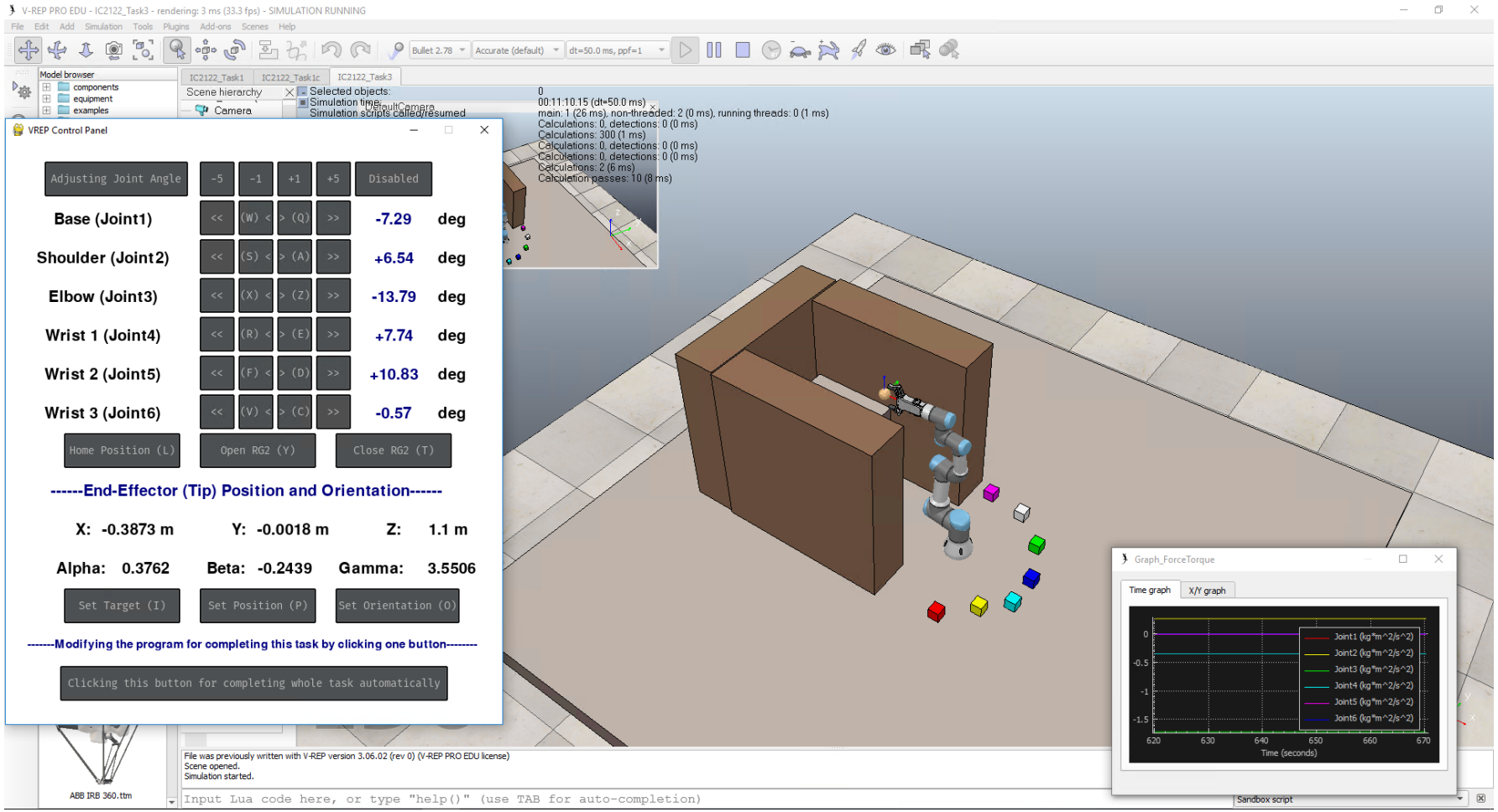
- Control panel window will be appeared after running the program
- After switching to the V-REP, the control panel window will be hidden
- Click the Control panel window icon to open it.



Click this icon

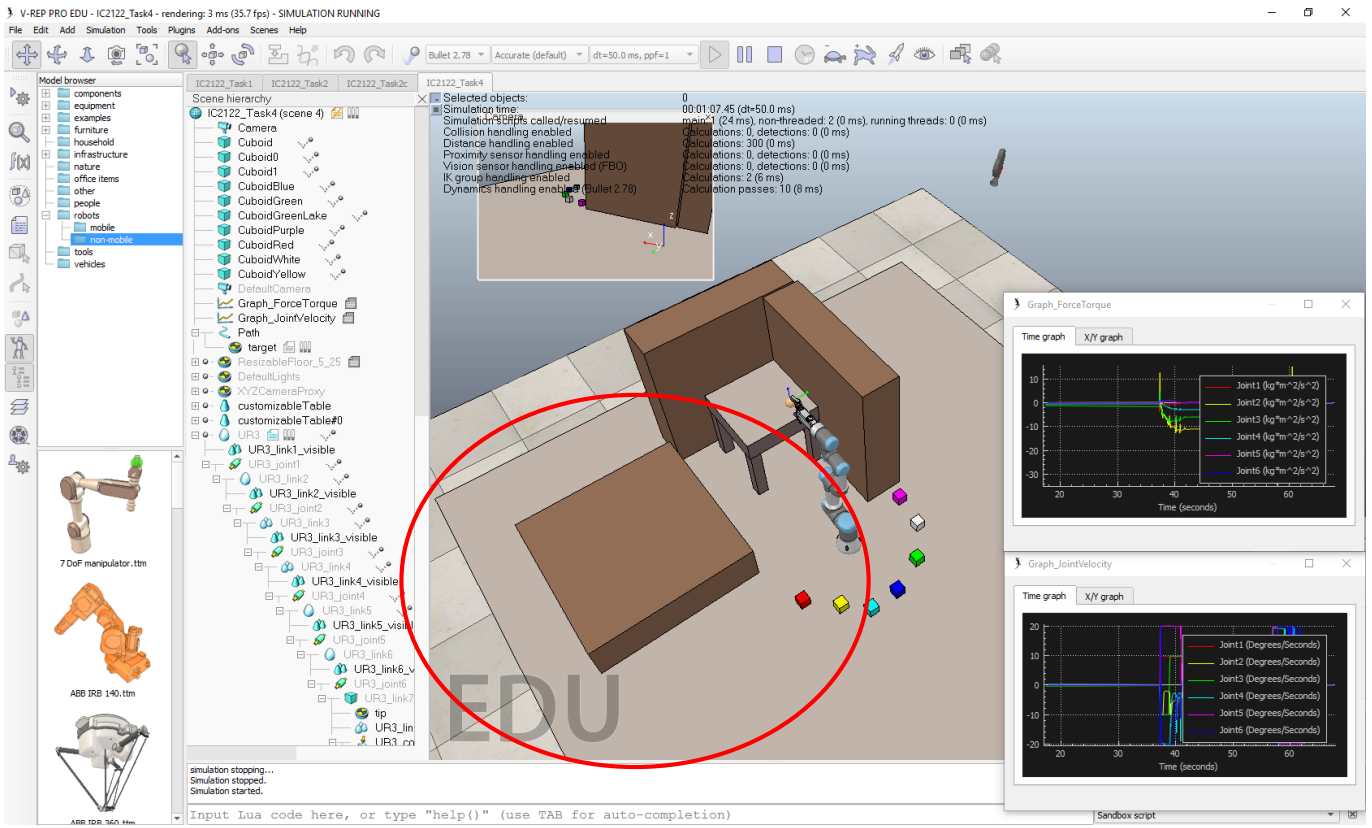
V-REP interface

- V-REP interface :

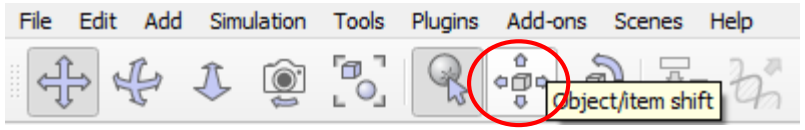


IC2122 – Task 3

- Remarks:
  - No collisions on the blocks and walls



  - Not allow to move the blocks via V-REP tools



IC2122 – Task 3a

DEMO

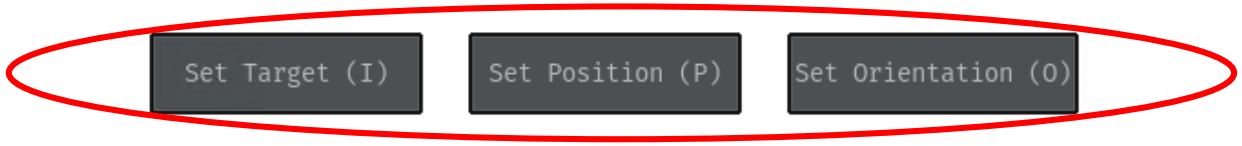
- Task 3a: Assume there has a collaborative robot working in the factory. The color blocks are the raw materials which are placed in the machine for process.

➢ Pick the RED block and place it on the table (machine) using Inverse Kinematics for processing and write down the procedure. (Return to the home position at the final step)

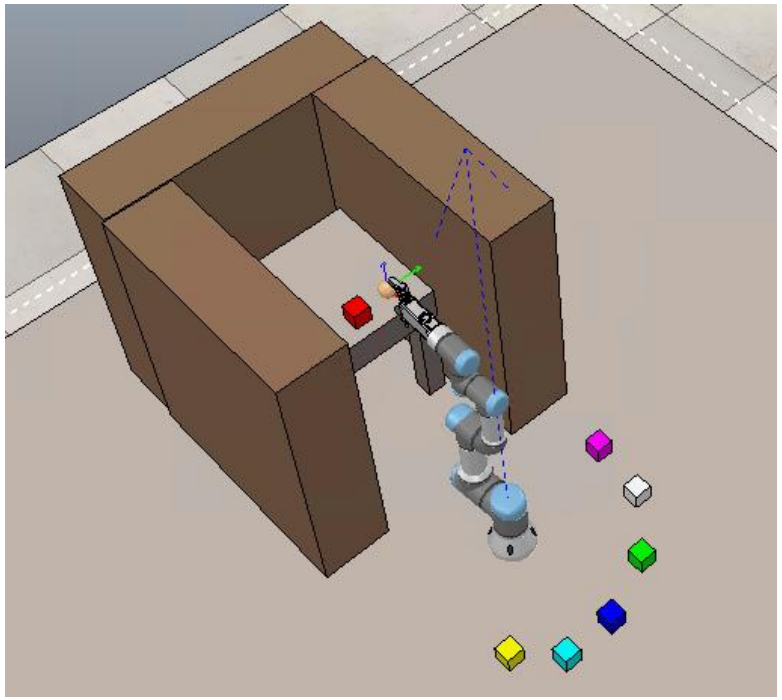
➢ (Remark: No collisions)

RED Block original Position:	Position X	Position Y	Position Z
	0.125 m	-0.35 m	0.435 m

RED Block final Position:	Position X	Position Y	Position Z
	≈ -0.667 m	≈ 0 m	0.846 m



Final Goal



IC2122 – Task 3b

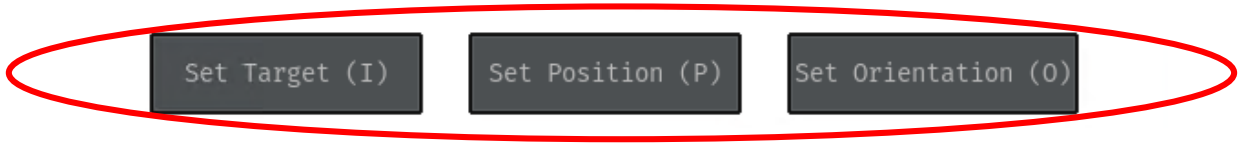
DEMO

- Task 3b: Continuing in part a, the process of material (RED block) is completed. Put it back to the original position.

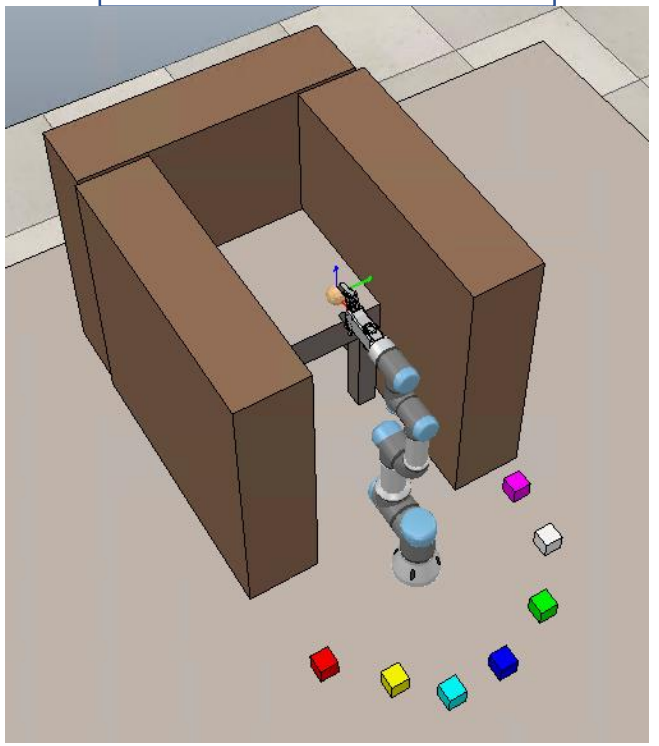
➢ Pick the RED block from the table (machine) and place it on the original position using Inverse Kinematics and write down the procedure. (Return to the home position at the final step)

RED Block original Position:	Position X	Position Y	Position Z
	≈ -0.667 m	≈ 0 m	0.846 m

RED Block final Position:	Position X	Position Y	Position Z
	0.125 m	-0.35 m	0.435 m



Final Goal

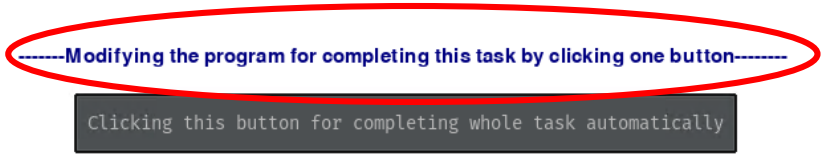


IC2122 – Task 3c

DEMO

- Task 3c: Create a python program to automate the process of raw material by clicking the "Clicking this button for completing whole task automatically" button.

  Write down the procedure and explain your program.



1. Pick the RED block and place it on the table (machine)
2. Return to the Home Position
3. Pick the RED block from table (machine) and place it on the original position
4. Return to the Home Position

RED Block (table) Position:	Position X	Position Y	Position Z
	≈ -0.667 m	≈ 0 m	0.846 m

RED Block original Position:	Position X	Position Y	Position Z
	0.125 m	-0.35 m	0.435 m

(Remark: No collisions)

IC2122 – Task 3c

- Modify the Task3.py (Path: D:\01-Home\IoT\IC2122-Robotics\Task3\Task3.py)
- Useful command:

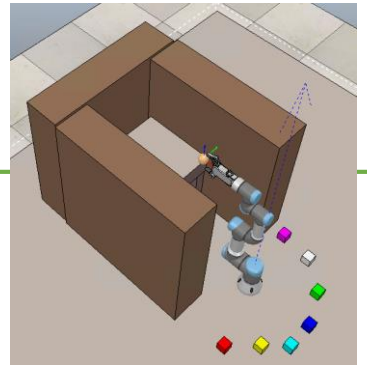
1. Move the end-effector to position (X, Y, Z)
   - movement.setTargetPosition_withoutInput(PosX, PosY, PosZ)
2. Configure the end-effector's orientation (Alpha,Beta,Gamma)
   - movement.setTargetOrientation_withoutInput(Alpha, Beta, Gamma)

Input the corresponding value at ()

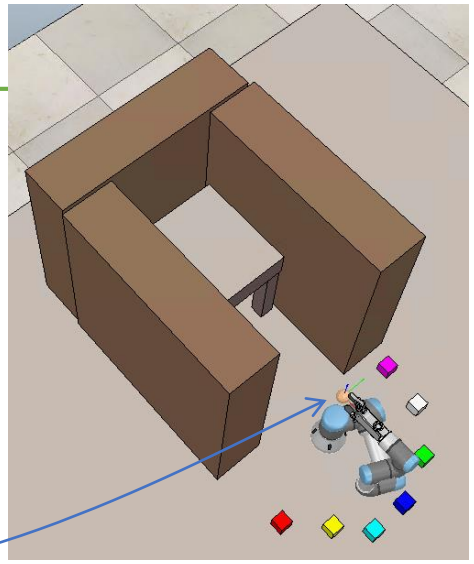
```
# Please input the necessary command for completing this task by clicking one button
# You can review the comments for seeking the useful functions which are located at other files
# (Movement.py, Information.py, Checking.py)
if event.user_type == pygame_gui.UI_BUTTON_PRESSED:
    if event.ui_element == complete_button:
        # -----Example start-----
        movement.setTargetPosition_withoutInput(0.2,-0.2,0.6)   # Move the end-effector to the position X, Y, Z
        time.sleep(5)                                           # Delay 5 seconds for waiting the previous movement
        movement.setTargetOrientation_withoutInput(0,90,-90)    # Configure the end-
effector's orientation Alpha, Beta, Gamma
        # -----Example End-----
        # Please input your command (functions can be found at Task3.py, Movement.py, Information.py, Checking.py )
        print("Working.......")
```

IC2122 – Example

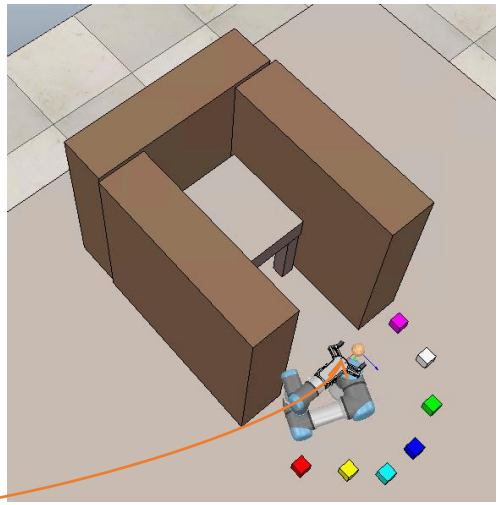
- According to previous program:
  - Step 1: Move the end-effector to the position X, Y, Z
    - movement.setTargetPosition_withoutInput(0,0,0.8)
  - Step 2: Delay 10 seconds for waiting the previous movement
    - time.sleep(10)
  - Step 3: Configure the end-effector's orientation Alpha, Beta, Gamma
    - movement.setTargetOrientation_withoutInput(0,90,-90)



Original Pose



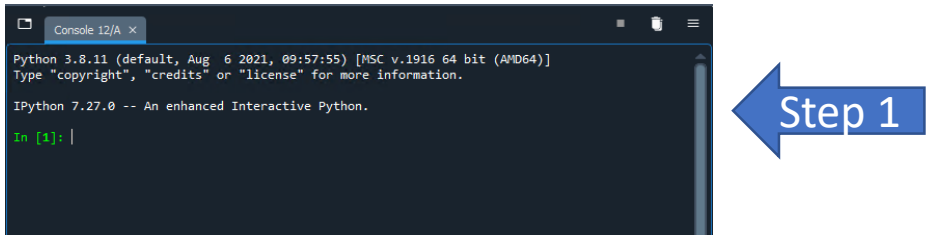
Step 1



Step 3

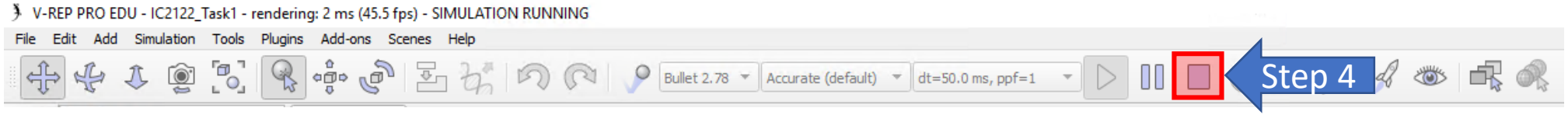
Task3 – Troubleshoot

- Step 1: Switch to the Spyder IPython Console

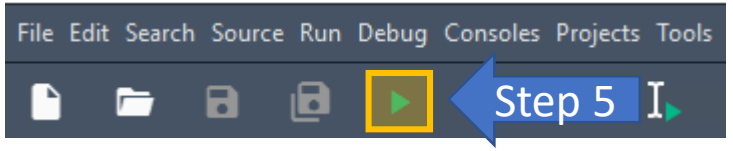


- Step 2: Stop the program by pressing “Ctrl + C”
- Step 3: Open a new console by pressing “Ctrl + D”

- Step 4: Stop the V-REP simulation



- Step 5: Run the program at Spyder



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Q&A