**IC2122 Control and Automation**

**Robotics Laboratory - Worksheet**

|  |  |
| --- | --- |
| **Student Name:** | **Student ID:** |
|  | **Date:** |

**Task 3a**

Pick the RED block and place it on the table (machine) using Inverse Kinematics for processing and write down the procedure.

|  |
| --- |
| Step 1: Set Position (-0.2,0,1.1)  Step 2: Set Position (-0.1,0,1.1)  Step 3: Set Target (0.125,-0.35,0.8,0,90,-180)  Step 4: Set Target (0.125,-0.35,0.435,0,90,-180)  Step 5: close RG2  Step 6: Set Target (0,0,1.1,90,0,0)  Step 7: Set Target (-0.575,0,0.9,90,0,0)  Step 8: open RG2  Step 9: Home Position  Step 10: |

**Task 3b**

Pick the RED block from the table (machine) and place it on the original position using Inverse Kinematics and write down the procedure.

|  |
| --- |
| Step 1: Set Target (-0.425,0,0.9,90,0,0)  Step 2: Set Target (-0.575,0,0.9,90,0,0)  Step 3: Set Target (-0.575,0,0.846,90,0,0)  Step 4: Close RG2  Step 5: Home Position  Step 6: Set Position (-0.2,0,1.1)  Step 7: Set Position (-0.1,0,1.1)  Step 8: Set Target (0.125,-0.35,0.8,0,90,-180)  Step 9: Set Position (0.125,-0.35,0.45)  Step 10: Open RG2  Step 11: Set Position (-0.1,0,1.1,90,0,0)  Step 12: Home Position |

**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

|  |
| --- |
| movement.setTargetPosition\_withoutInput(-0.2,0,1.1)  checking.checking(0.07,0.6)  movement.setTargetPosition\_withoutInput(-0.1,0,1.1)  checking.checking(0.07,0.07)  movement.setTarget\_withoutInput(0.125,-0.35,0.8,0,90,-180)  checking.checking(0.07,0.6)  movement.setTarget\_withoutInput(0.125,-0.35,0.435,0,90,-180)  checking.checking(0.07,0.06)  robot.closeRG2()  time.sleep(2)  checking.checking(0.07,0.6)  movement.setTarget\_withoutInput(0,0,1.1,90,0,0)  checking.checking(0.07,0.6)  movement.setTarget\_withoutInput(-0.375,0,0.9,90,0,0)  checking.checking(0.07,0.17)  movement.setTarget\_withoutInput(-0.575,0,0.9,90,0,0)  checking.checking(0.07,0.06)  time.sleep(2)  robot.openRG2()  time.sleep(1)  checking.checking(0.07,0.6)  robot.returnPose()  checking.checking(0.07,0.6)  time.sleep(3)  movement.setTarget\_withoutInput(-0.425,0,0.9,90,0,0)  checking.checking(0.07,0.06)  time.sleep(1)  movement.setTarget\_withoutInput(-0.575,0,0.9,90,0,0)  checking.checking(0.07,0.06)  time.sleep(1)  movement.setTarget\_withoutInput(-0.575,0,0.846,90,0,0)  checking.checking(0.07,0.06)  time.sleep(1)  robot.closeRG2()  time.sleep(3)  robot.returnPose()  checking.checking(0.07,0.06)  time.sleep(1)  movement.setTargetPosition\_withoutInput(-0.2,0,1.1)  checking.checking(0.07,0.6)  time.sleep(1)  movement.setTargetPosition\_withoutInput(-0.1,0,1.1)  checking.checking(0.07,0.06)  time.sleep(1)  movement.setTargetPosition\_withoutInput(0.1,0,1.1)  checking.checking(0.07,0.6)  time.sleep(1)  movement.setTarget\_withoutInput(0.125,-0.35,0.8,0,90,-180)  time.sleep(4)  movement.setTarget\_withoutInput(0.125,-0.35,0.45,0,90,-180)  checking.checking(0.07,0.06)  time.sleep(1)  robot.openRG2()  time.sleep(3)  movement.setTarget\_withoutInput(0.1,0,1.1,90,0,0)  checking.checking(0.07,0.6)  time.sleep(1)  robot.returnPose() |

**Task 4a**

1. Find the translation value and rotation angle of UR3B, and Homogeneous Transformation matrix (PowerPoint slide 8) using Homogeneous Transformation

|  |
| --- |
| Translated 0.78 m along x-axis and rotated 180 degrees along z-axis |

1. Draw the UR3B’s position and coordinate at the graph. (you can copy and adjust the UR3A’s arrows and markers for drawing)

|  |
| --- |
| UR3B  **Y**  **X**  UR3A  **Y**  **X** |

**Task 4b**

Calculate the following results using Homogeneous Transformation

1. Translation value and rotation angle

|  |
| --- |
| Translated 0.7 m along x-axis, 0.6 m along y-axis and rotated 180 degrees along z-axis |

1. Homogeneous Transformation matrix

|  |
| --- |
|  |

1. Draw the UR3B’s position and coordinate at the graph. (you can copy and adjust the UR3A’s arrows and markers for drawing)

|  |
| --- |
| **Y**  **X**  UR3B  WHITE block  **X**  **Y**  UR3A |

1. WHITE Block position (x, y, z) based on translation value and rotation angle for UR3B

|  |
| --- |
| White block position = [0.35, 0.3, 0.435] |

**Task 4c**

Calculate the following results using Homogeneous Transformation

1. Translation value and rotation angle

|  |
| --- |
| Translated 0.4 m along x-axis, -0.4 m along y-axis and rotated 90 degrees along z-axis |

1. Homogeneous Transformation matrix

|  |
| --- |
|  |

1. Draw the UR3B’s position and coordinate at the graph. (you can copy and adjust the UR3A’s arrows and markers for drawing)

|  |
| --- |
| **Y**  **XD**  UR3B  YELLOW block  **XD**  **Y**  UR3A |

1. YELLOW Block position (x, y, z) based on translation value and rotation angle for UR3B

|  |
| --- |
| Yellow block position = [0.2, 0.2, 0.435] |