W1B: [A] CIM 3.1.2a RoboCell [ER-4u] Pick and Place Routine

INTRODUCTION

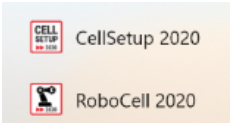
Have you ever tried to go someplace but did not know how to get there? You probably had to ask for directions or look at a map. The importance of directions to a human navigating from one place to another is similar to the importance of a program for a **robot** navigating from one point to another.

EQUIPMENT

Computer with intelitek® RoboCell software

- **YouTube Video Resource:**
- https://www.youtube.com/watch?v=p3_Wc-bvWEs&list=PLJuwb3xnlvclFigEg127kl_0baNgBkWjG&ab_channel=Chris%26JimCIM

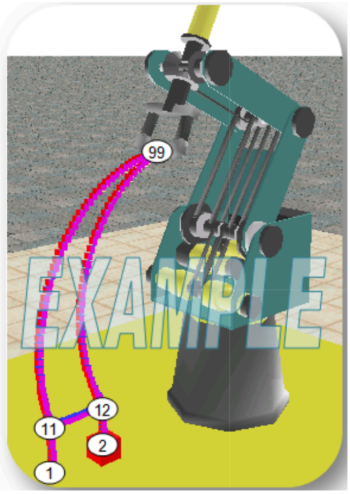
Procedure



1. Create a folder named [Last name RoboCell 2020]. Inside that folder create Folders
   A Last Name Pick and Place Routine
   B Last Name Teach Positions
   C Last Name Stacking Objects
   D Last Name Relative Position
   E Last Name Go Circular
   F Last Name Variable Programming
   G Last Name Paletization
   H Last Name Handshaking

2. Open CellSetup and create the following graphics using the specifications given.
   a. Add a robot (no slide base).
   b. Add a table (1000x1000). Choose the table color from this list.

c. Add a cube (40x40x40), position (400,0). The block color should be one of the colors on this list.



3. Save the graphics file. [Ex: Guzman CellSetup 2020]
Exit CellSetup.

4. Start the RoboCell software and create a RoboCell program for a robot to complete the operation using the positions shown below. Refer to the program setup for additional requirements.

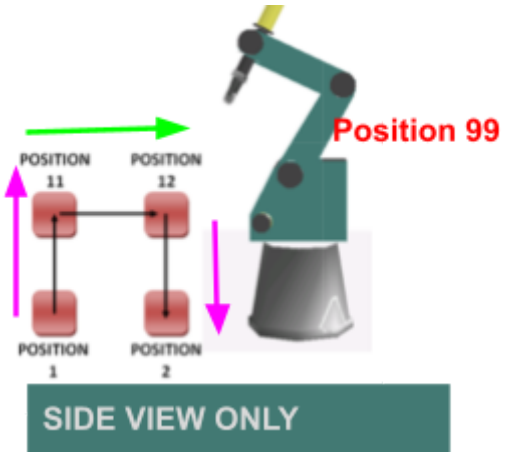
Tutorials for assistance are provided below:
Tutorial 1: https://www.youtube.com/watch?v=wm4YzrNthYY&list=PLJuwb3xnlvclFigEg127kl_0baNgBkWjG&index=3 Tutorial 2: https://youtu.be/uvRepIp7EDo?si=c0saYPKzj5ccaQMh Tutorial 3: https://youtu.be/uvRepIp7EDo?si=dVkKDfeNVfloXQlu

a. Operation:
   i. Pick up a cube.
   ii. Lift it straight up in the air a short distance.
   iii. Move the arm straight back toward the base a short distance.
   iv. Place the cube back on the table.
   v. Release the cube and return to your previous position.
   vi. Move to a home position.

This is called a Pick and Place routine.

b. Positions:
   i. Position 1: This position will have the **gripper** in place to pick up the cube at its initial location in the work cell.

ii. Position 11: This position is directly above Position 1. The vertical distance should be approximately three times the height of the cube.
iii. Position 2: This will be the final position of the cube.
iv. Position 12: This position is directly above Position 2. The vertical distance should be approximately three times the height of the cube.
v. Position 99: Home position. After homing the robot, record this position.
vi. For positions 1, 11, 2, and 12, the gripper orientation should be as close to 90° to the table as possible.



c. Program setup:
   i. Open RoboCell.
   ii. Under the Options menu, select **PRO**.
   iii. Import the 3D graphics file.
   iv. Add the four Remark statements to your program:
      i. Remark: Activity 3.1.2a Pick and Place
      ii. Remark: Your Name
      iii. Remark: Period X
      iv. Remark: Date: MM/DD/YY
   v. In the Manual Movement Section, switch from Joints to **XYZ** mode.
   vi. Record the five required positions.
   vii. Write the program as described in step 4a.
   viii. Run the program to see the results and correct if necessary.
   ix. Save this file as "LastName_A Pick and Place".

5. Submit your program file.

Insert Code to program RoboCell.

Open Gripper
Go to Position 99 Fast
Go to Position 1 Fast
Close Gripper
Go to Position 11 Fast
Go to Position 13 Fast
Open Gripper
Go to Position 12 Fast
Go to Position 2 Fast
Close Gripper
Go to Position 12 Fast
Go to Position 13 Fast
Open Gripper

#	Coor.	Axis 1 X (mm)	Axis 2 Y (mm)	Axis 3 Z (mm)	Axis 4 Pitch (deg)	Axis 5 Roll (deg)	Axis 7 mm/deg	Axis 8 mm/deg	Type
1	Joint	0.00	10.88	30.05	49.07	0.00			
	XYZ	400.00	0.00	17.50	-90.00	0.00			Abs. (XYZ)
2	Joint	0.00	-6.47	79.53	16.94	0.00			
	XYZ	300.00	0.00	17.50	-90.00	0.00			Abs. (XYZ)
11	Joint	0.00	-10.68	51.66	49.01	0.00			
	XYZ	400.00	0.00	100.00	-90.00	0.00			Abs. (XYZ)
12	Joint	0.00	-26.71	93.64	23.06	0.00			
	XYZ	300.00	0.00	100.00	-90.00	0.00			Abs. (XYZ)
99	Joint	0.00	-120.28	95.02	88.81	0.00			Abs. (Joint)
	XYZ	169.03	0.00	504.33	-63.55	0.00			

E-Porfolio Published link with video file. Use the Snipping Tool to record. Then upload the file to your Google Drive to upload on your Portfolio.

https://m-jeide.github.io/eng-portfolio/CIM/Robocell
Please refer to Activity B Demonstration for the video.

Conclusion

Answer in complete sentences each of the questions below.

1. Describe three industrial operations that a robot similar to the one used in this activity could be used.

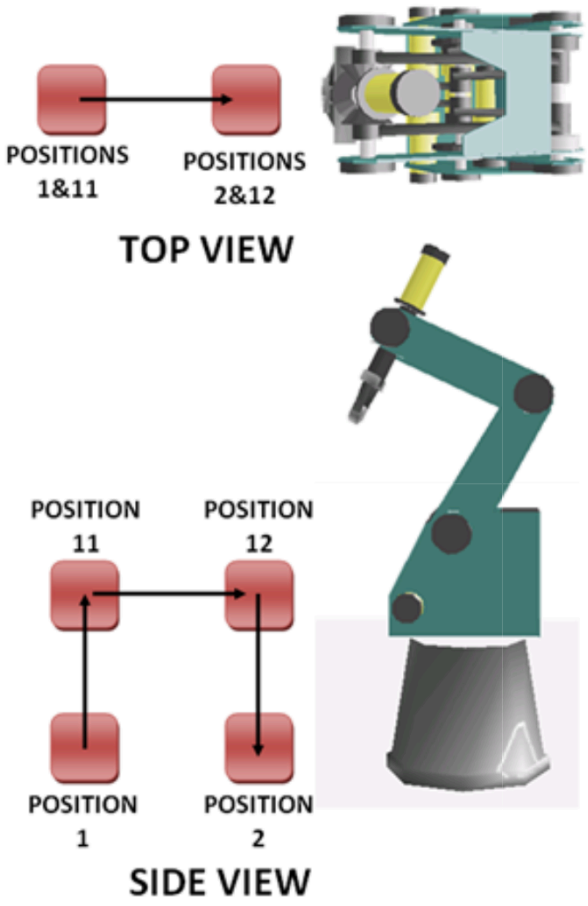
1. Assembly Line Parts Placement - In electronics or automotive manufacturing, the robot could pick components from a conveyor belt and precisely place them onto circuit boards or into assembly fixtures.
2. Quality Inspection and Sorting - The robot could pick up manufactured parts, position them in front of cameras or sensors for inspection, then sort them into "pass" or "fail" bins based on quality criteria.
3. Machine Tending - The robot could load raw materials or workpieces into CNC machines, injection molding machines, or other manufacturing equipment, then remove the finished parts.

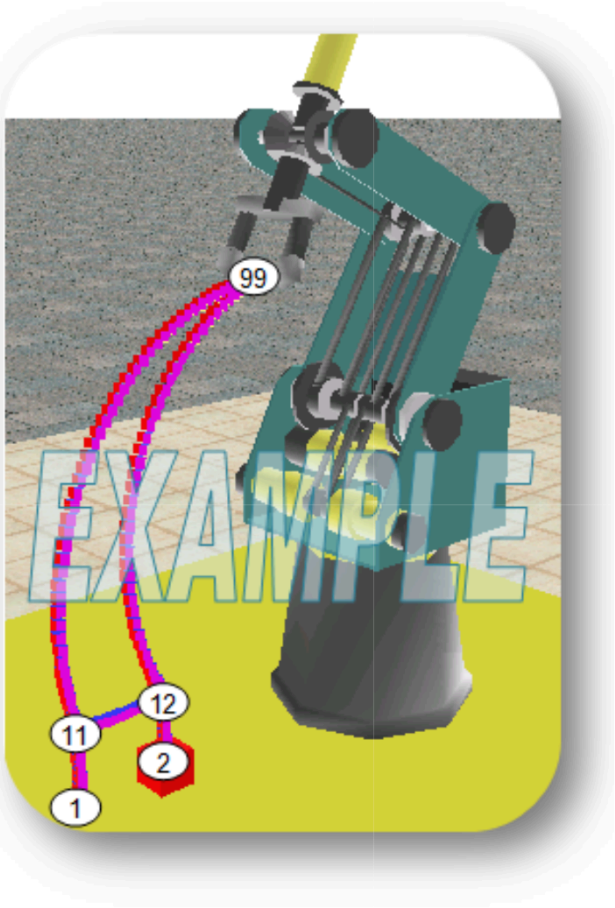
2. Describe how a robot end-effector could impact the capabilities of a robot similar to the one used in this activity.

The end-effector determines the Scorbot ER-4U's capabilities by defining what objects it can manipulate and what tasks it can perform. Different end-effectors enable the robot to handle various materials and shapes. A parallel gripper works for solid objects like cubes, while a vacuum gripper handles flat materials like glass or sheet metal, and soft grippers protect delicate items.

PLTW Engineering **Computer Integrated Manufacturing**

Jeide, Matthew 11/07/25 Period 2





Conclusion

In a few sentences answer the questions below.

1. 1. What did you learn about the Cartesian Coordinates on a Robotic Arm?
   I learned that the robot's base acts as the 0,0,0 origin, and it's critical to not rotate the robot, or it will "mess up" the X, Y, and Z axes. Additionally, in this specific software, the X and Y axes are "flipped" compared to a standard coordinate system.
2. Why is it important to understand the order of operations on the RoboCell ER-4u?
   It's important because it is the required workflow to create a functional simulation. You must follow the steps in order—build the cell, import the model, teach the points, and then write the program—as each step builds upon the previous one.