PLTW Engineering Manufacturing **Computer Integrated**

Jeide, Matthew 11/18/24 Period 2

W15: CIM [G] 3.1.2G RoboCell [ER-4u] Palletization and Storage

Introduction

A **robot** can work with a variety of storage devices, such as gravity feeders, pneumatic feeders, or racks. In this activity you will work with a parts feeder. You will get the parts from the feeder and palletize them on the table. Palletizing is the placement of parts in a uniform position, performed by pick-and-place robots.

Equipment

Computer with intelitek® RoboCell software

Procedure

1.Open CellSetup and create the graphics in CellSetup using the specifications below.

a. Table into the cell, 1000 x 1000.
b. Robot: **Scorbot ER4**
c. Feeder
   i. Open the Storage Devices folder and select **Feeder**.
   ii. In the FEEDER1 properties list, select **Capacity** and then place 8 parts in the Feeder.

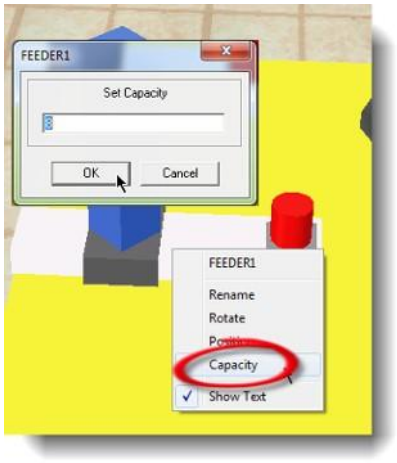


Figure 2. Feeder Popup

   iii. Click **Controller Setup** and then the **Outputs** tab.

Figure 3. Controller Setup

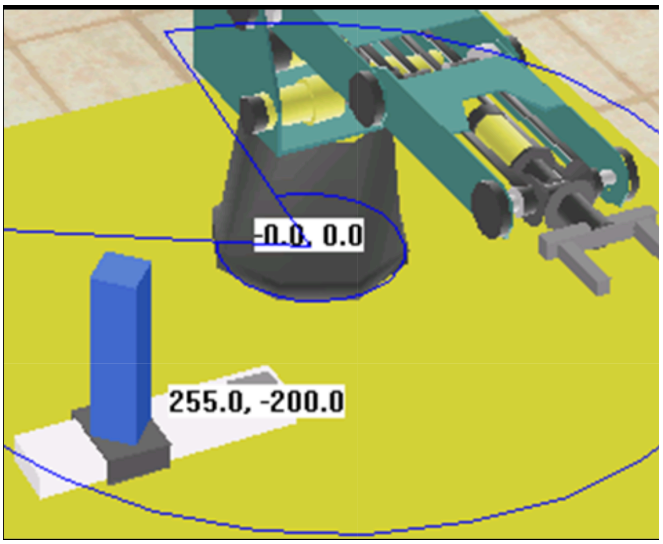
   iv. Left-click and hold, then slide the Feeder information up to line 1 of the Outputs tab.

Properties | Inputs | Outputs

#Output	Object	Name	Output
1	Feeder	FEEDER1	PushPart
2			
3			
4			
5			
6			
7			
8			
	Not connected		

Figure 4. Outputs

v. Place the Feeder onto the Table.
vi. Double-click the **Feeder** and rotate it 90 degrees.
vii. Double-click the **Feeder** and position the feeder at 255,–200.
viii. Place a Cylinder onto the Feeder (40 mm x 40 mm).
ix. Place Cylinder on the light grey square.
x. Once the Cylinder is in place, double-click it and change the position to 255, –200.



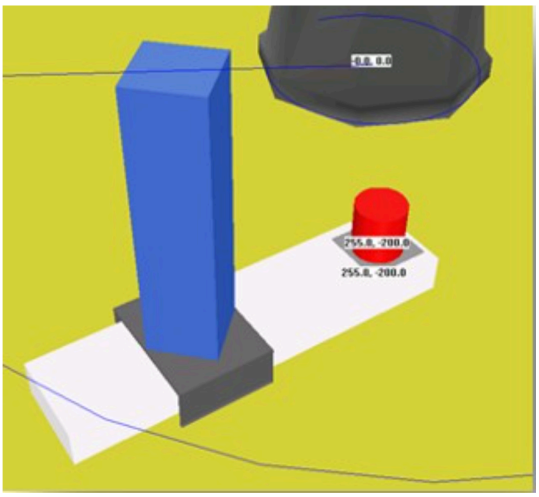


Figure 6. Cylinder

2. Save this graphic file as "LastName_A312g".

3.Exit CellSetup.

4. Display the cylinder in RoboCell. Initially, the cell does not display the Cylinder.

a. To view the active and inactive inputs and outputs, click **View** > **Dialog Bars** > **Digital Outputs** and **Digital Inputs**. The bars pop up at the bottom of the screen.

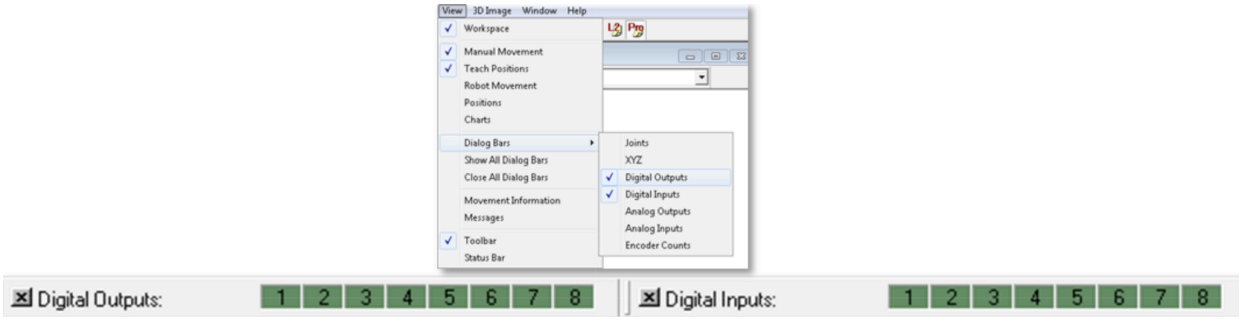


Figure 7. Inputs and Outputs

b. To display the cylinder, you need to turn on the output associated with the cylinder (in this case output 1). Insert the following three lines into the program to display the cylinder.

Program	Explanation
Turn on output 1	Cylinder will appear.
Wait 5 (tenths of a second)	Wait 0.5 second to allow output to be read and block to appear.
Turn off output 1	Feeder will reset and wait for another call for part.

5. Create the program as follows:

Remove the cylinders from the feeder and stack them on the table at the positions shown.
Stack the eight objects two layers high with four objects in a layer.
Use variable programming to stack the objects on the pallet (table).

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Fill in the chart below with the position coordinates.

Position #	Absolute or Relative	x	Y	Z	P ABS/REL	R	Comment
99	Absolute	169	0	504	-90	0	Home-Recorded Position
100	Absolute	255	0	150	-90	0	
1	Absolute	255	-200	42	-90	0	ATPICK-Taught Position
11	Absolute	255	-200	100	-90	0	Above ATPICK
20	Absolute	200	-55	100	-90	0	COLUMN 1
21	Absolute	310	-55	100	-90	0	COLUMN 2
22	Absolute	200	55	100	-90	0	COLUMN 3
23	Absolute	310	55	100	-90	0	COLUMN 4
24	N/A				-90|0	0	
25	N/A				-90|0	0	
26	N/A				-90|0	0	
27	N/A				-90|0	0	
30	Relative	0	0	-50	0	0	Used by ONLY the first layer
31	Relative	0	0	-40	0	0	Used by both layers
32	N/A				-90|0	0	
33	N/A				-90|0	0	

Commands
RE – Remark
SV – Set Variable to Computation
OG – Open Gripper
CG – Close Gripper
GP – Go to Position
GL – Go Linear to Position
LA – Label
JU – Jump To
II – If Input # on Jump to
WT - Wait

Commands
Z for ***Level 1*** (20-23) = Absolute +10mm
Z for ***Level 2*** (24-27) = Relative to (20-23) +40mm
Z for ***Level 3*** (30-33) = Relative to (20-23) +90mm
Z for Position 100 = Absolute 140mm
Z for Position 1 = Absolute 42mm *(Send Robot to Object)*
Z for Position 11 = Relative to 1 +60mm

e. Use the Send Robot to Object command to direct the robot to pick up the Cylinder at Position 1.

Figure 9. Send Robot to Object

Robot Work Cell Illustration

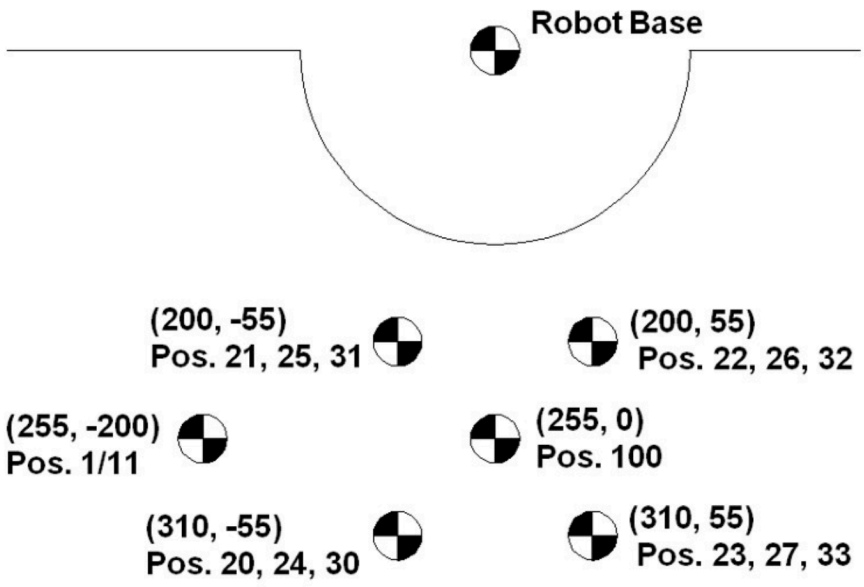

Figure 10. Robot Positions Top View

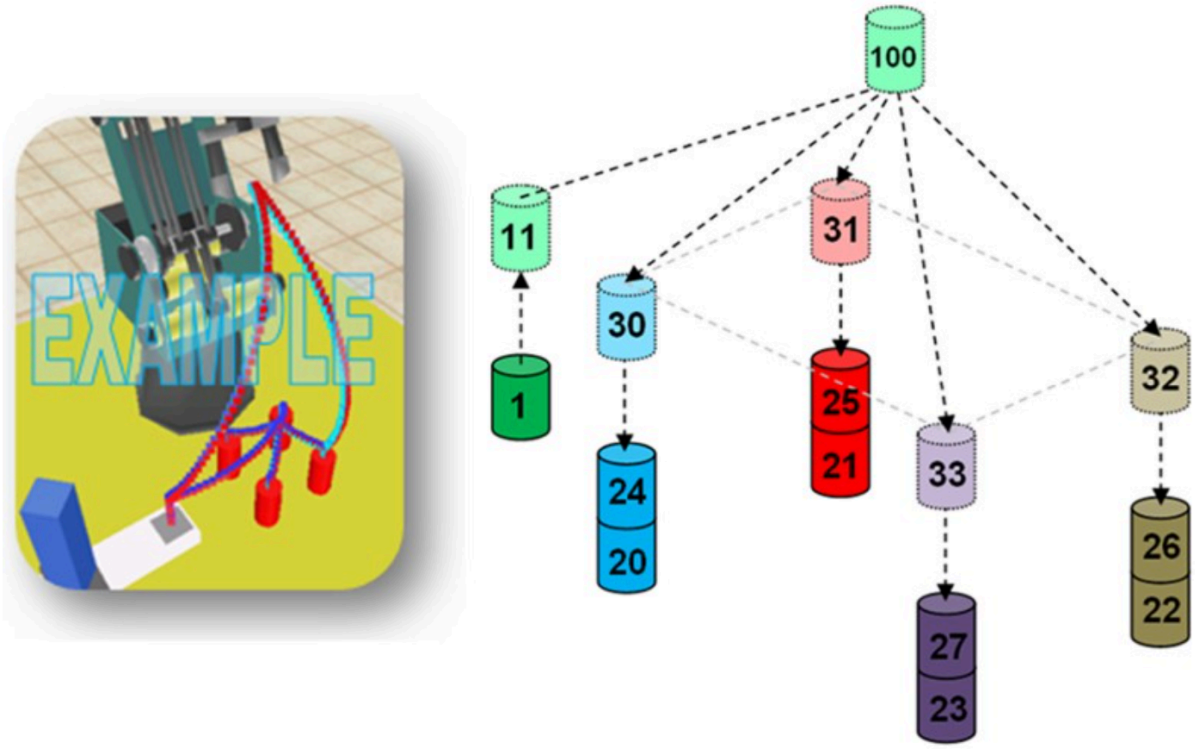

Figure 11. Robot Positions Isometric View

6. Attach the screenshot below of the RoboCell Work Envelope

Screenshot of RoboCell Work Envelope

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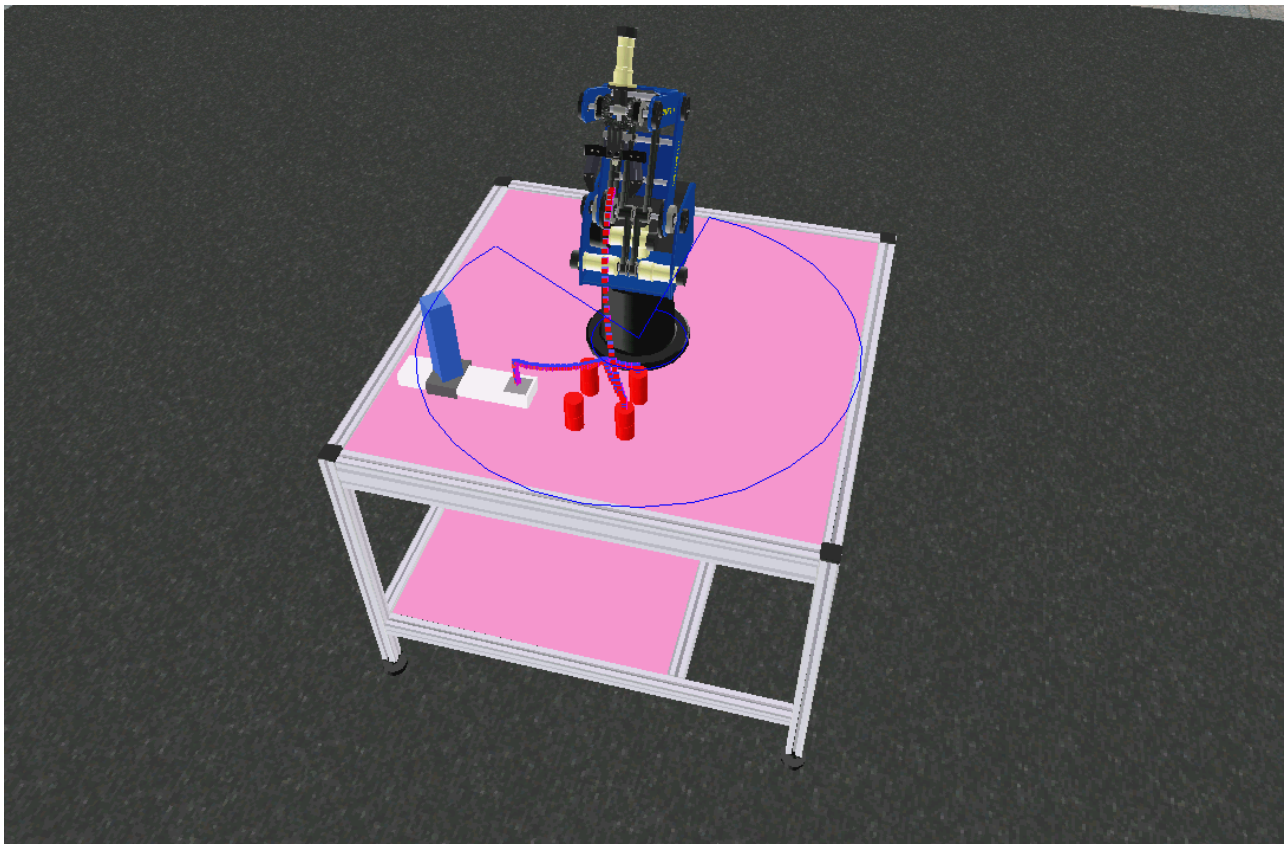

7. Attach the Code below with the

Remark: 3.1.2G Palletization & Storage

Remark: Name

Remark: Date

RoboCell **Code** with the Work Envelope

Remark: home

Open Gripper

```
Go to Position 99 Fast

Remark: setup variables

Set Variable LAYER  = 1

Set Variable POSITION  = 0

LOOP:

Turn On Output 1

Wait 5 (10ths of seconds)

Turn Off Output 1

PROCESS:

Remark: get the cylinder

Go to Position 100 Fast
```

Go to Position 11 Fast

Go to Position 1 Fast

Close Gripper

Go to Position 11 Fast

Go to Position 100 Fast

Remark: determine node

Set Variable NODE = 20 + POSITION

Go to Position NODE Fast

If LAYER>1 Jump to SECOND LAYER

FIRST LAYER:

Go to Position 30 Fast

SECOND LAYER:

Go to Position 31 Fast

Open Gripper

Go to Position NODE Fast

Set Variable ITERATION = LAYER*4+POSITION-4

Remark: increment

Set Variable POSITION = POSITION+1

If POSITION>3 Jump to INCREMENT LAYER

If ITERATION<7 Jump to LOOP

HOME:

Go to Position 99 Fast

```
End

INCREMENT LAYER:

Set Variable LAYER  = LAYER + 1

If LAYER>2 Jump to HOME

Set Variable POSITION  = 0

Jump to LOOP
```

#	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	-38.11	-10.31	76.09	24.21	0.00			
	XYZ	255.00	-200.00	42.00	-90.00	0.00			Abs. (XYZ)
11	Joint	-38.11	-23.98	85.28	28.71	0.00			
	XYZ	255.00	-200.00	100.00	-90.00	0.00			Abs. (XYZ)
20	Joint	-10.06	-25.09	88.57	26.53	0.00			
	XYZ	310.00	-55.00	100.00	-90.00	0.00			Abs. (XYZ)
21	Joint	-15.38	-31.95	120.94	1.01	0.00			
	XYZ	200.00	-55.00	100.00	-90.00	0.00			Abs. (XYZ)
22	Joint	15.38	-31.95	120.94	1.01	0.00			
	XYZ	200.00	55.00	100.00	-90.00	0.00			Abs. (XYZ)
23	Joint	10.06	-25.09	88.57	26.53	0.00			
	XYZ	310.00	55.00	100.00	-90.00	0.00			Abs. (XYZ)
30	Joint								
	XYZ	0.00	0.00	-40.00	0.00	0.00			Rel. Cur. (XYZ)
31	Joint								
	XYZ	0.00	0.00	-50.00	0.00	0.00			Rel. Cur. (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			
100	Joint	0.00	-43.60	112.67	20.93	0.00			
	XYZ	255.00	0.00	150.00	-90.00	0.00			Abs. (XYZ)

8. Updated portfolio with video.

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. YouTube Videos are preferred.
https://m-jeide.github.io/eng-portfolio/CIM/Robocell

Conclusion

Answer in complete sentences each of the questions below.

1. Describe how the program could be modified to be more efficient.

Depending on the desired efficiency type (runtime or size), the runtime could be updated to directly go to each position of the drop point. This

would require each position to be saved manually by the programmer, rather than being able to use relative positions or variables. Size-wise, the program could be programmed to utilize more calculations and dynamically teach itself positions. Perhaps a complex circular path could be used.

2. Describe how this operation could be applied in a manufacturing environment.

As components come down the production line, a robot could grab and put objects in boxes in an arrangement.