

W15: [F] CIM 3.1.2F RoboCell [ER-4u] Variable Programming

Introduction

Creating a program that contains variables provides flexibility and efficiency options. A variable allows data tracking flexibility within the program to control the logical flow. In this activity you will learn how to improve the efficiency of a program through the use of variables.

Equipment

Computer with intelitek® RoboCell software

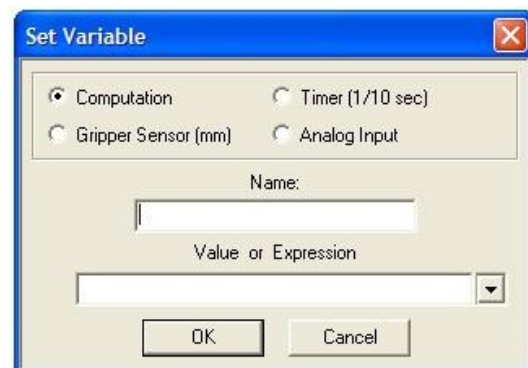
Set Variable

The Set Variable command provides a way to assign a value or expression to a variable. As a program example, a robot must drop off a part at position 3. Position 3 could be defined as a variable called "DROP" instead of instructing the robot to go to position 3.

Variable Defined as an Unchanging Value

The procedure to set a variable to be an unchanging value is shown.

1. Select the **Set Variable** command to open the Set Variable dialog box.
Figure 1. Set Variable Dialog Box
2. Enter "DROP" in the Name box.
3. Enter "3" in the Value or Expression box to represent position 3.
4. Click **OK** to insert the following line into the program:
Set Variable Drop = 3



Variable Defined as an Incremental Value

The first execution of a program must be followed by a variable increment to the index to the next position in the sequence. Use the Set Variable dialog box. In the example, the variable Drop is to be incremented by 1, for an updated value of 4. The variable name would again be DROP.

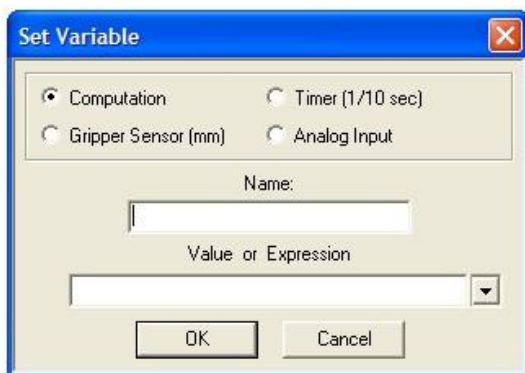


Figure 2. Set Variable Dialog Box

The procedure to set a variable to be an incremental value is shown.

1. In the Set Variable dialog box, select Computation.
2. Change Value or Expression to be $DROP = DROP + 1$.

Procedure

1. Review [Set Variable](#).
2. Open CellSetup and create the graphics in CellSetup using the specifications below.
 - a. Table: 1000 x 1000
 - b. Robot: Scorbot ER4
 - c. Cylinder Size: diameter = 40 mm and height = 40 mm
 - d. Cylinders:
 - i. C1 300, 100
 - ii. C2 300, 0
 - iii. C3 300, -100
 - iv. C4 300, -200
3. Save this graphic file as "LastName_A312f".

4. Exit CellSetup.
5. Read the [Set Variable Information](#) page for an overview of variable use.
6. Start the RoboCell software and import the graphics file you created previously.
7. Program the positions shown using the variables which are also shown.

Remark: 3.1.2 [F] Variable Programming

Remark: Student Name

Remark: Date

ATPICK: The **robot** is in a position to pick up the cylinder.

ABPICK: The robot is in position above the pickup point.

DROP: The robot is in position to drop off the cylinder.

	1	2	3	11	12	13	4	41	42	43	100	99
X	300	300	300	300	300	300	300	300	300	300	300	130
Y	100	0	-100	100	0	-100	-200	-200	-200	-200	-200	0
Z	10	10	10	200	200	200	10	50	90	130	200	330
Pitch	-90	-90	-90	-90	-90	-90	-90	-90	-90	-90	-90	-90
Roll	0	0	0	0	0	0	0	0	0	0	0	0

Draft of RoboCell Work Envelope

#	Coor.	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 7	Axis 8	Type
		X (mm)	Y (mm)	Z (mm)	Pitch (deg)	Roll (deg)	mm/deg	mm/deg	
1	Joint	18.43	-3.16	72.06	21.10	0.00			Abs. (XYZ)
	XYZ	300.00	100.00	10.00	-90.00	0.00			
2	Joint	0.00	-4.57	77.82	16.75	0.00			Abs. (XYZ)
	XYZ	300.00	0.00	10.00	-90.00	0.00			
3	Joint	-18.43	-3.16	72.06	21.10	0.00			Abs. (XYZ)
	XYZ	300.00	-100.00	10.00	-90.00	0.00			
4	Joint	-33.69	2.84	53.08	34.08	0.00			Abs. (XYZ)
	XYZ	300.00	-200.00	10.00	-90.00	0.00			
11	Joint	18.43	-46.45	94.42	42.03	0.00			Abs. (XYZ)
	XYZ	300.00	100.00	200.00	-90.00	0.00			
12	Joint	0.00	-49.21	100.03	39.18	0.00			Abs. (XYZ)
	XYZ	300.00	0.00	200.00	-90.00	0.00			
13	Joint	-18.43	-46.45	94.42	42.03	0.00			Abs. (XYZ)
	XYZ	300.00	-100.00	200.00	-90.00	0.00			
41	Joint	-33.69	-7.28	62.73	34.55	0.00			Abs. (XYZ)
	XYZ	300.00	-200.00	50.00	-90.00	0.00			
42	Joint	-33.69	-16.50	69.61	36.89	0.00			Abs. (XYZ)
	XYZ	300.00	-200.00	90.00	-90.00	0.00			
43	Joint	-33.69	-25.00	74.25	40.75	0.00			Abs. (XYZ)
	XYZ	300.00	-200.00	130.00	-90.00	0.00			
99	Joint	0.00	-115.25	134.78	70.47	0.00			Abs. (XYZ)
	XYZ	130.00	0.00	330.00	-90.00	0.00			
100	Joint	-33.69	-38.11	77.55	50.56	0.00			Abs. (XYZ)
	XYZ	300.00	-200.00	200.00	-90.00	0.00			

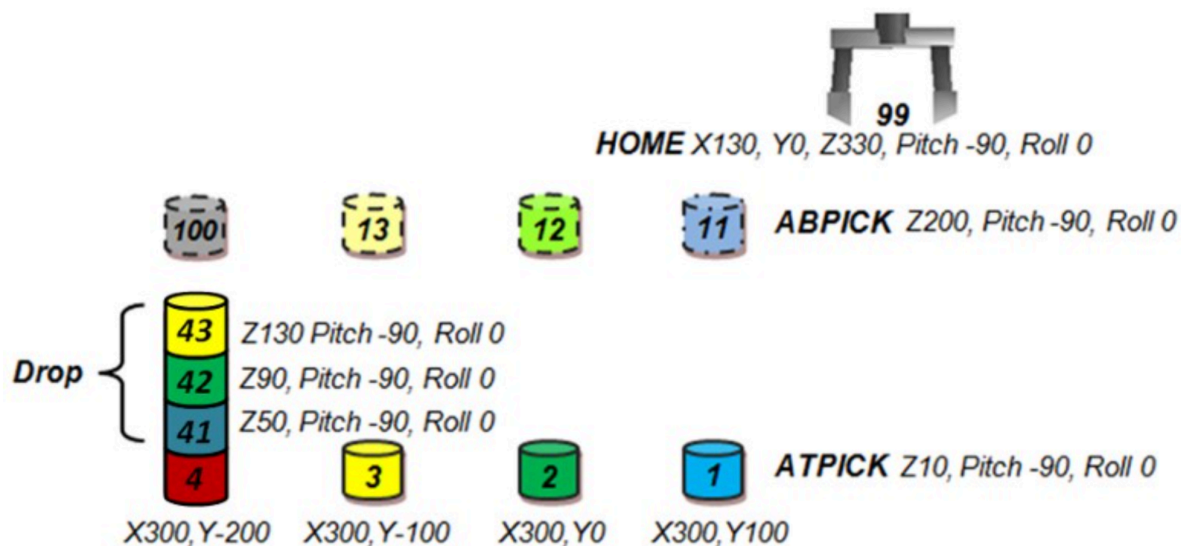


Figure 2. Robot Positions Shown Looking Toward The Robot

Program Operation

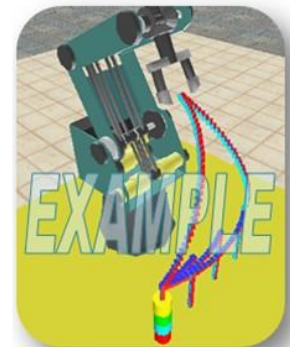
The program below will perform a stacking operation with variables.

Figure 3. Robot Commands

- a. Remark: Your Name
- b. Remark: Class Period
- c. Remark: Variable Stack
- d. Remark: Set Variables
- e. Set Variable ABPICK = 11
- f. Set Variable ATPICK = 1
- g. Set Variable DROP = 41
- h. Remark: Home
- i. Open **Gripper**
- j. Go to Position 99 Fast
- k. Remark: Stack
- l. LOOP:
- m. Open Gripper
- n. Go to Position ABPICK Fast
- o. Go Linear to Position ATPICK Speed 90%
- p. Close Gripper
- q. Go Linear to Position ABPICK Speed 90%
- r. Go to Position 100 Fast
- s. Go Linear to Position DROP Speed 90%
- t. Open Gripper
- u. Go Linear to Position 100 Speed 90%
- v. Remark: Update Variables
- w. Set Variable ATPICK = ATPICK+1
- x. Set Variable ABPICK = ABPICK +1
- y. Set Variable DROP = DROP +1
- z. Remark: Looping
- aa. IF ATPICK>3, jump to END
- bb. Jump to LOOP
- cc. END:
- dd. Remark: Home
- ee. Go to Position 99 Fast

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
IF – If Condition Jump



8. Verify that the program performs the operation accurately. Revise the program until it meets the objective.

9. Save this file as "LastName_A312f".

Remark: Matthew Jeide

Remark: CIM period 2

Remark: Variable Stack

Remark: Set variables

Set Variable ATPICK = 1

Remark: The following variables can be defined relative to ATPICK

Set Variable ABPICK = ATPICK + 10

Set Variable DROP = ATPICK + 40

Remark: HOME

Open Gripper

Go to Position 99 Fast

Remark: STACK

LOOP:

Open Gripper

Go to Position ABPICK Fast

Go to Position ATPICK Fast

Close Gripper

Go to Position ABPICK Fast

Go to Position DROP Fast

Open Gripper

Go to Position 100 Fast

Remark: update variables

Set Variable ATPICK = ATPICK + 1

Set Variable ABPICK = ATPICK + 10

Set Variable DROP = ATPICK + 40

If ATPICK <= 3 Jump to LOOP

Remark: HOME

Go to Position 99 Fast

#	Coor.	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 7	Axis 8	Type
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	XYZ	300.00	-200.00	200.00	-90.00	0.00			

10. E-Portfolio video with updated code.

E-Portfolio 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 preferred

<https://m-jeide.github.io/eng-portfolio/CIM/Robocell>

Conclusion

Answer in complete sentences each of the questions below.

1. Describe how this program can be applied in the manufacturing setting. Variables allow for dynamic/reactive programming; the robot can remember positions, objects, counters, and evaluate the variables to

perform specific actions, such as adaptively switching which cylinders to pick up and stack.