

W5B CIM [D. Sorting with Pneumatics] Dobot Magician

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COMPUTER INTEGRATED MANUFACTURING



Portfolio link

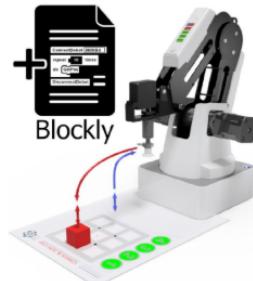
<https://m-jeide.github.io/eng-portfolio/CIM/Dobot%20Magician>**WARNING:**

Caution: NEVER wire anything to the Dobot Magician while it has power on. ALWAYS shutdown the Dobot before making connections or damage to the robot could occur.

INTRODUCTION

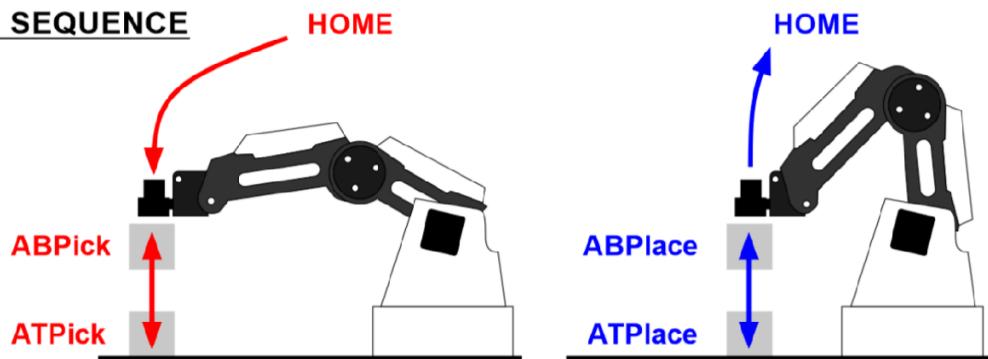
In this assignment, you will create a sorting machine using the following items:

- Two Dobot
 - One for placing objects on the conveyor
 - Second to sort the colors
- A conveyor belt
- Two sensors
- Pneumatics- Refer to the notes for connections and programming. Must connect to the VEX Brain.
- Must sort a minimum of two colors.
 - Example Red means defective & green means the product is viable.



PICK & PLACE SEQUENCE

1. HOME
2. ABPick
3. ATPick
4. Vacuum On
5. ABPick
6. ABPlace
7. ATPlace
8. Vacuum Off
9. ABPlace
10. HOME



Complete the table below with all of the XYZ coordinates needed for all four blocks placed on the four corners.

	X	Y	Z	R
Complete the table below with all of the XYZ coordinates needed for all four blocks placed on the four corners.				
1.Home (Drop off)	1.7	-181.4	24.2	-89.5
2.Above Object (block)	188.9	-229.0	27.1	-50.5
3.Above Color Sensor (VEX optical sensor)	302.5	-11.3	44.7	-2.1
4.Relative movement - plunge (to pick up block)	0	0	-23	0
5.Relative movement - going up!	0	0	40	0
6.Relative movement - rotating block	0	0	0	45
7.Relative movement - plunge - placing block in front of optical sensor	0	0	-43	0
8.Relative movement - going up!	0	0	60	0

9.Relative movement - plunge - pick up block	0	0	-60	0
10.Relative movement - going up, once again!	0	0	60	0

Video of the sorting routine with pneumatics

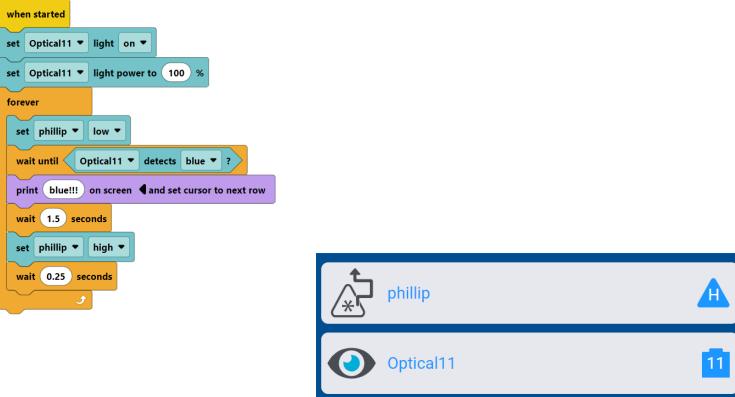
https://www.youtube.com/watch?v=vnqfpO_3W5k

Attach the code



The Scratch script for the robotic arm includes:

- when green flag clicked:**
 - Set color sensor status: ON, version: V2, port: GP1
 - Set infrared sensor status: ON, version: V1, port: GP1
 - Set end effector: Suction Cup
 - Suction Cup: Off
 - Set Conveyor Motor: STEPPER1, Speed: 80 mm/s
- repeat forever:**
 - Above Object:**
 - wait until [Get GP1 infrared sensor reading = 1]
 - Suction Cup: On
 - Relative Movement ΔX: 0 mm ΔY: 0 mm ΔZ: -23 mm ΔR: 0°
 - Relative Movement ΔX: 0 mm ΔY: 0 mm ΔZ: 40 mm ΔR: 0°
 - Above Color Sensor:**
 - Relative Movement ΔX: 0 mm ΔY: 0 mm ΔZ: 45 mm ΔR: 45°
 - Relative Movement ΔX: 0 mm ΔY: 0 mm ΔZ: -43 mm ΔR: 0°
 - Suction Cup: Off
 - Relative Movement ΔX: 0 mm ΔY: 0 mm ΔZ: 60 mm ΔR: 0°
 - wait [1.5 seconds]
 - Suction Cup: On
 - Relative Movement ΔX: 0 mm ΔY: 0 mm ΔZ: -60 mm ΔR: 0°
 - Relative Movement ΔX: 0 mm ΔY: 0 mm ΔZ: 60 mm ΔR: 0°
- Drop off:**
 - Suction Cup: Off

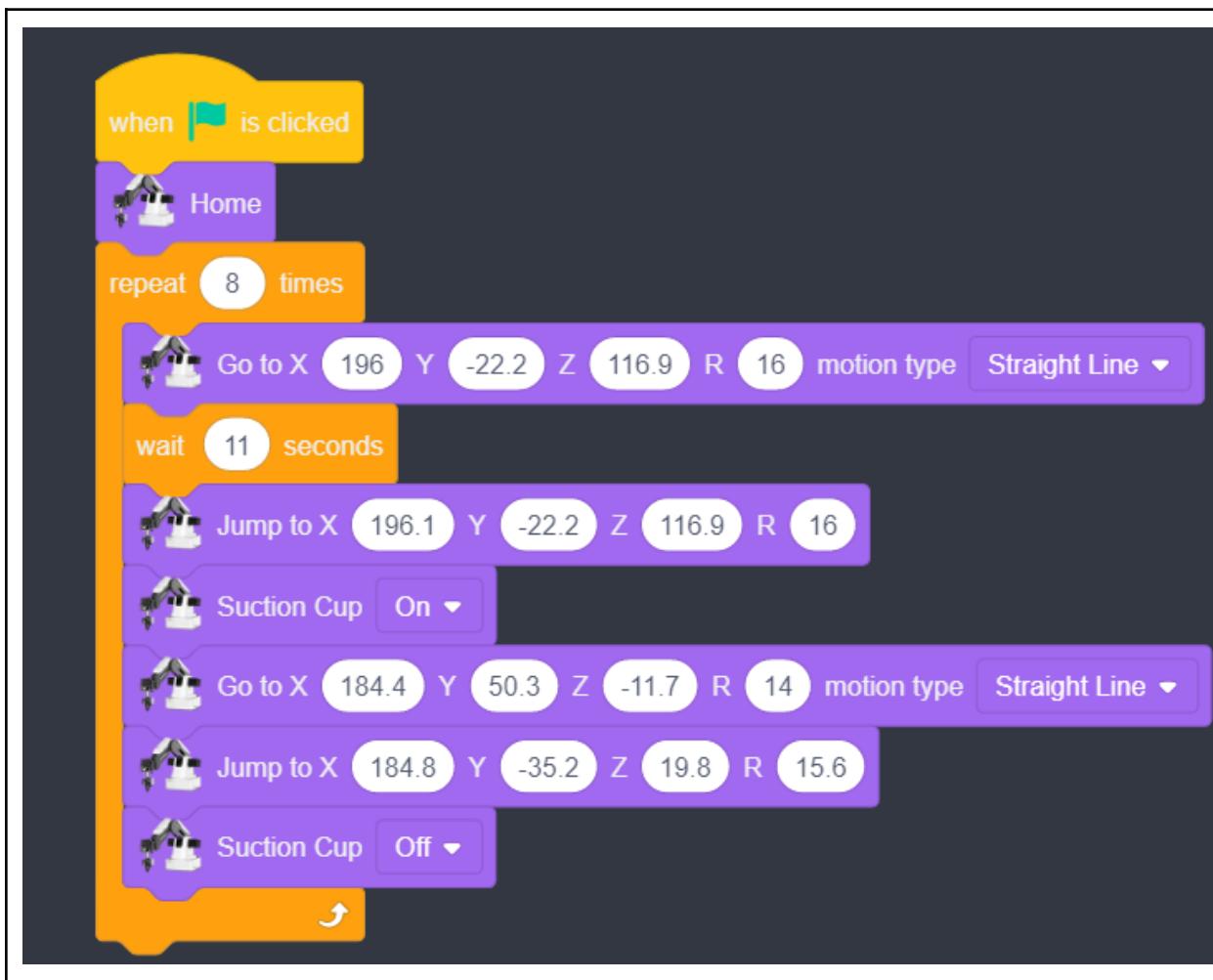


The Scratch script for the robot to detect blue light includes:

- when started:**
 - set Optical11 light on
 - set Optical11 light power to 100%
- forever:**
 - set phillip low
 - wait until [Optical11 detects blue?]
 - print "blue!!! on screen and set cursor to next row
 - wait [1.5 seconds]
 - set phillip high
 - wait [0.25 seconds]

Scratch stage showing variables:

- phillip (Blue flag icon)
- Optical11 (Eye icon)



If your set-up did not work correctly the first time, what did you have to do to make it work?

Due to the positioning of the pneumatics and infrared sensor of the Dobot, the pneumatics occasionally pushed a cube in front of the sensor and the sensor incorrectly sensed the cube as in position, this was fixed by adding a barrier to catch the cubes before they would be sensed.

Conclusion

1. What are the five needed positions for a pick and place operations?

ABOVE PICK
AT PICK
ABOVE DROP

AT DROP
HOME

2. Explain in your own words why it was necessary to add delay times into the program in the space below.

Without delays, the Dobot occasionally moved too fast relative to the Dobot letting go of the cube with its suction module, causing the Dobot to briefly take the cube with it to its new position before dropping it fully--causing the cube to be misplaced.

3. What is the purpose of the safe positions that are programmed above the object before it is picked up.

The purpose of the safe positions that are programmed above the object before it picks it up is to make sure the Dobot doesn't collide into any walls/obstacles before it picks up the block, and going up after collecting the block accomplishes a similar purpose.