

Voyager Modules

Student Worksheet: Control LocoXtreme Lights (Variables In Python)

Step 0: Watch the “Variables” video at the top of your student guide.

Step 1: Create a Python program

Create a Python program on the LocoRobo Academy. Inside the main definition, the program begins by setting up the LocoRobo API (also known as Application Programming Interface; the LocoRobo API contains many helpful commands for interacting with the robot). Next, we scan for 2000 milliseconds using the Bluetooth dongle to find robots in the room. Then, we use the `get_robot` command (defined in an earlier section of your Python code - this will be covered in detail in a future lesson).

Make sure that you change the name from “lr 00:07” to the name of your robot in the command `robot = get_robot(robots, “lr 00:07”)`. You do not have to change the robot name anywhere else in the code.

After connecting to the robot, we activate its motors and enable the ultrasonic sensor. Activating the robot’s motors also enables us to set a custom LED pattern.

```
26 - def main():
27     # Tell LocoRobo what serial port to use
28     LocoRobo.setup("/dev/tty.usbmodem1")
29
30     # Scan for robots
31     robots = LocoRobo.scan(2000)
32
33     # Use get_robots to find robot with name lr 00:07 in the scan result
34     robot = get_robot(robots, "lr 00:07")
35
36     robot.connect()
37     robot.activate_motors()
38     robot.enable_sensor(Data.ULTRASONIC, True)
39
40     robot.set_light(0, 255, 0, 0)
41     robot.sync_lights()
42
43     LocoRobo.wait(1)
44
```

As demonstrated in the code screenshot, the robot lights are controlled by adding a `robot.set_light()` command and a `robot.sync_lights()` command to your Python code.

The `robot.set_light()` command takes in 4 inputs: the LED number, followed by R, G, and B values. Refer to the Student Guide for more information on RGB LEDs. (docs.locorobo.co)

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The `set_light()` command queues a change in the lights, and the `sync_lights()` command updates the physical LEDs on the robot.

Lastly, add a 1 second wait using the `LocoRobo.wait()` command. Without this, the program would immediately deactivate the motors and disconnect from the robot after syncing the lights.

1. Form a hypothesis about what will happen when the program runs:

Test and Verify!

2. Was your hypothesis accepted? Why or why not?:

Save your program and demonstrate it to your teacher.

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Step 2: Setting the entire LED Ring

Next, we will see how to use the `set_light` command multiple times to modify the entire LED ring.

```
40 robot.set_light(0, 255, 0, 0)
41 robot.sync_lights()
42
43 LocoRobo.wait(1)
44
45 robot.set_light(0, 255, 0, 0)
46 robot.set_light(1, 255, 0, 0)
47 robot.set_light(2, 255, 0, 0)
48 robot.set_light(3, 255, 0, 0)
49 robot.set_light(4, 255, 0, 0)
50 robot.set_light(5, 255, 0, 0)
51 robot.set_light(6, 255, 0, 0)
52 robot.set_light(7, 255, 0, 0)
53 robot.sync_lights()
54
55 LocoRobo.wait(1)
56
57 robot.set_light(0, 255, 255, 0)
58 robot.set_light(1, 255, 255, 0)
59 robot.set_light(2, 255, 255, 0)
60 robot.set_light(3, 255, 255, 0)
61 robot.set_light(4, 255, 255, 0)
62 robot.set_light(5, 255, 255, 0)
63 robot.set_light(6, 255, 255, 0)
64 robot.set_light(7, 255, 255, 0)
65 robot.sync_lights()
66
67 LocoRobo.wait(1)
68
```

After the initial `sync_lights()` command, there is a 1 second wait. Directly after that, we use the `set_light()` command 8 times, followed by another `sync_lights()` command. This is followed by another 8 `set_light()` commands and a `sync_lights()` command. Similar to the earlier procedure, we end with a 1 second wait so that the program does not immediately disconnect.

3. Form a hypothesis about what will happen when the above code is run:

Test and Verify!

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4. Was your hypothesis accepted? Why or why not?:

Save your program and demonstrate it to your teacher.

Step 3: Use variables!

Imagine you wanted to change all 8 LEDs. You would need to modify 8 lines of code. Instead, we can use variables. A variable is defined as follows:

```
57 robot.set_light(0, 255, 255, 0)
58 robot.set_light(1, 255, 255, 0)
59 robot.set_light(2, 255, 255, 0)
60 robot.set_light(3, 255, 255, 0)
61 robot.set_light(4, 255, 255, 0)
62 robot.set_light(5, 255, 255, 0)
63 robot.set_light(6, 255, 255, 0)
64 robot.set_light(7, 255, 255, 0)
65 robot.sync_lights()
66
67 LocoRobo.wait(1)
68
69 #####
70
71 red1 = 255
72 green1 = 0
73 blue1 = 0
74
75 robot.set_light(0, red1, green1, blue1)
76 robot.set_light(1, red1, green1, blue1)
77 robot.set_light(2, red1, green1, blue1)
78 robot.set_light(3, red1, green1, blue1)
79 robot.set_light(4, red1, green1, blue1)
80 robot.set_light(5, red1, green1, blue1)
81 robot.set_light(6, red1, green1, blue1)
82 robot.set_light(7, red1, green1, blue1)
83 robot.sync_lights()
84
85 LocoRobo.wait(1)
86
```

Here, the variables red1, green1, and blue1 are created. When used in the set_light() command, the values of these variables are substituted.

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5. Aside from reducing the amount of code we must modify, what is an advantage of using the red1, green1, and blue1 variables?

Test and Verify!

6. Did the code perform as you expected? Why or why not?

Save your program and demonstrate it to your teacher.

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Step 4: Modify the variables!

Now, change the values of green1 and blue1 to be 255. By modifying the variable once, the change is replicated throughout the program.

```
69     red1 = 255
70     green1 = 0
71     blue1 = 0
72
73     robot.set_light(0, red1, green1, blue1)
74     robot.set_light(1, red1, green1, blue1)
75     robot.set_light(2, red1, green1, blue1)
76     robot.set_light(3, red1, green1, blue1)
77     robot.set_light(4, red1, green1, blue1)
78     robot.set_light(5, red1, green1, blue1)
79     robot.set_light(6, red1, green1, blue1)
80     robot.set_light(7, red1, green1, blue1)
81     robot.sync_lights()
82
83     LocoRobo.wait(1)
84
85     red1 = 255
86     green1 = 255
87     blue1 = 255
88
89     robot.set_light(0, red1, green1, blue1)
90     robot.set_light(1, red1, green1, blue1)
91     robot.set_light(2, red1, green1, blue1)
92     robot.set_light(3, red1, green1, blue1)
93     robot.set_light(4, red1, green1, blue1)
94     robot.set_light(5, red1, green1, blue1)
95     robot.set_light(6, red1, green1, blue1)
96     robot.set_light(7, red1, green1, blue1)
97     robot.sync_lights()
98
99     LocoRobo.wait(1)
100
```

7. What color do you expect this combination of red, green, and blue to produce?

Test and Verify!

8. Was your hypothesis accepted? Why or why not?

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Save your program and demonstrate it to your teacher.

Step 5: More variables

Create another set of variables called red2, green2, and blue2 as shown below:

```
71     red1 = 255
72     green1 = 255
73     blue1 = 255
74
75     robot.set_light(0, red1, green1, blue1)
76     robot.set_light(1, red1, green1, blue1)
77     robot.set_light(2, red1, green1, blue1)
78     robot.set_light(3, red1, green1, blue1)
79     robot.set_light(4, red1, green1, blue1)
80     robot.set_light(5, red1, green1, blue1)
81     robot.set_light(6, red1, green1, blue1)
82     robot.set_light(7, red1, green1, blue1)
83     robot.sync_lights()
84
85     LocoRobo.wait(1)
86
87     red2 = 0
88     green2 = 255
89     blue2 = 0
90
91     robot.set_light(0, red2, green2, blue2)
92     robot.set_light(1, red2, green2, blue2)
93     robot.set_light(2, red2, green2, blue2)
94     robot.set_light(3, red2, green2, blue2)
95     robot.set_light(4, red2, green2, blue2)
96     robot.set_light(5, red2, green2, blue2)
97     robot.set_light(6, red2, green2, blue2)
98     robot.set_light(7, red2, green2, blue2)
99     robot.sync_lights()
100
101     LocoRobo.wait(1)
102
103     robot.deactivate_motors()
104     robot.disconnect()
```

Add another round of setting the LED ring, including a wait. This time, use the variables red2, green2, and blue2.

9. How could a single set of variables be used in the above code to control the LED R, G, and B values?

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10. Now that we have two sets of variables, both you and your partner can tweak the values to create your own colors. Below, include notes or discoveries that you make about how RGB color combinations work. (Try [0, 0, 0], [255, 255, 255], and [127, 127, 127] for [R, G, B] values)

Save your program and demonstrate it to your teacher.

Bonus Question: Exactly how many color combinations are possible with 8-bit RGB LEDs?
