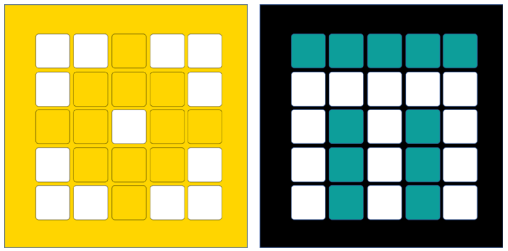
PRIME LESSONS

By the Makers of EV3Lessons

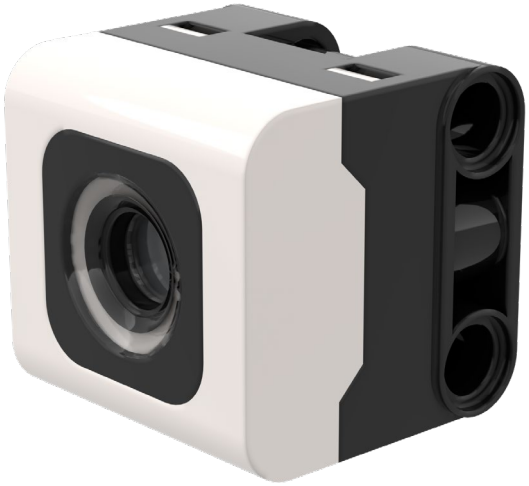


INTRODUCTION TO COLOR SENSOR

BY SANJAY AND ARVIND SESHAN

LESSON OBJECTIVES

- Learn how to use the Color Sensor
- Learn how to use the Wait Until Block
- Note: Although images in this lessons may show a SPIKE Prime, the code blocks are the same for Robot Inventor



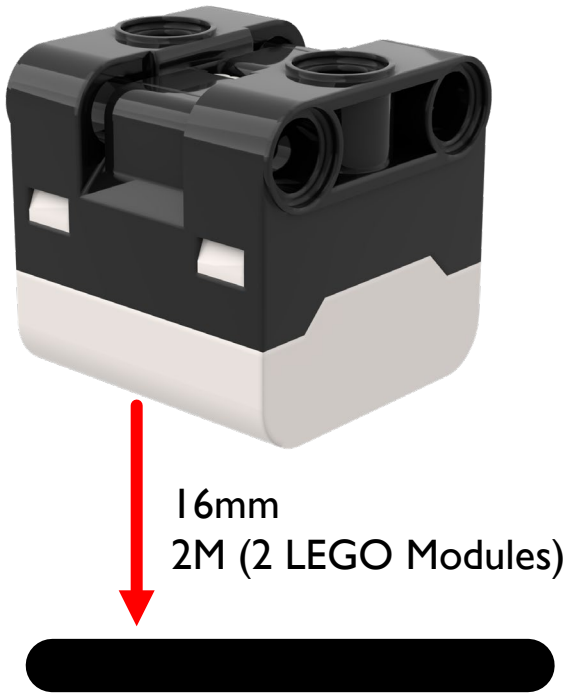
WHAT IS A COLOR SENSOR?

- The sensor API can report either the color or reflectivity measured
- Unlike the EV3, reflectivity is measured while shining a white light, not a red light.
- The sensor can report 8 colors (shown on right) and no color (None)
- Optimal reading distance according to the specs: 16 mm (depending on object size, color, and surface)

'black'
'violet'
'blue'
'cyan'
'green'
'yellow'
'red'
'white'
None

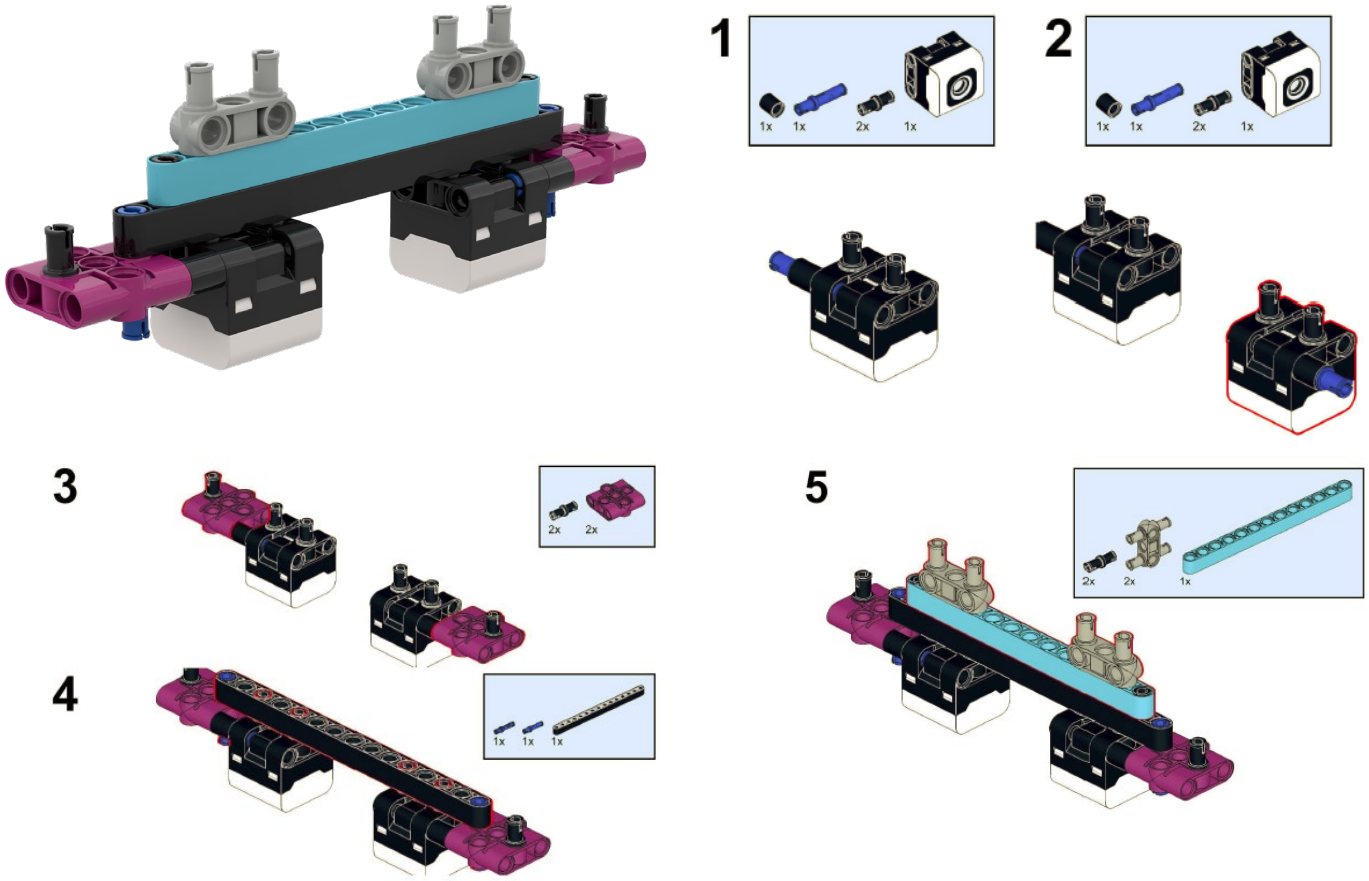
NOTE: ADB AND SENSING COLOR

- *The color sensor on ADB is mounted at about 8mm off the ground, but the optimal distance for mounting the sensor according to the specs is 16mm.*
- When using this robot design, Black does not read correctly in Color Mode using electrical tape lines or a FIRST LEGO League challenge mat.
- See the next slide for modifications. The build instructions are also provided as a separate file on our site.



MODIFICATIONS TO ADB

- Build instructions for modifying the front bumper of ADB so that the color sensors are raised one LEGO module up are included on this website



HOW DO YOU PROGRAM WITH A COLOR SENSOR?

- Before using the sensor, it must be initialized as an object

```
color = ColorSensor('B')
```

Name for the sensor

Port

- The two modes you can program the color sensor in: Color Mode and Reflected light mode
- We will use color mode in this lesson
- The ColorSensor class provides a method to wait until the *color* is detected:

```
color.wait_until_color(color)
```

COLOR SENSOR METHODS

- **get_color()**
  - Reads current color
- **get_ambient_light**()
  - Reads ambient light intensity
- **get_blue**()
  - Reads just the blue component of the RGB color
- **get_green**()
  - Reads just the green component of the RGB color
- **get_red**()
  - Reads just the red component of the RGB color
- **get_reflected_light**()
  - Reads reflected light intensity
- **get_rgb_intensity**()
  - Reads overall RGB intensity
- **light_up**(light_1=100, light_2=100, light_3=100)
  - Adjusts color sensor light brightness
- **light_up_all**(brightness=100)
- **wait_for_new_color**()
- **wait_until_color**(color)

CHALLENGE 1

- Program your robot to move straight until the color sensor sees black
- You will need to use the Wait Until color or while loops

```
color.wait_until_color('black’)
```

Or

```
while (color. get_color() != "black"): pass
```

- **Basic steps:**
  - Set the **movement motors** for your robot (A and E for Droid Bot IV and ADB robot)
  - Set the **stop action** to brake
  - Set the **% speed** for your robot
  - **Initialize** the color sensor
  - Start **moving straight**
  - Use the **wait_until_color() method** to detect when the color sensor sees black
  - **Stop moving**

CHALLENGE 1: SOLUTION

In previous lessons, you learnt how to configure your robot. (See Configuring Your Robot Lesson)

```
motor_pair = MotorPair('A', 'E')
motor_pair.set_stop_action('brake')
motor_pair.set_default_speed(30)
color = ColorSensor('B')
motor_pair.start()
color.wait_until_color('black')
motor_pair.stop()
```

Configure robot

Start moving

Wait until the color sensor sees black

Stop moving

CREDITS

- This lesson was created by Sanjay and Arvind Seshan for Prime Lessons
- More lessons are available at www.primelessons.org