

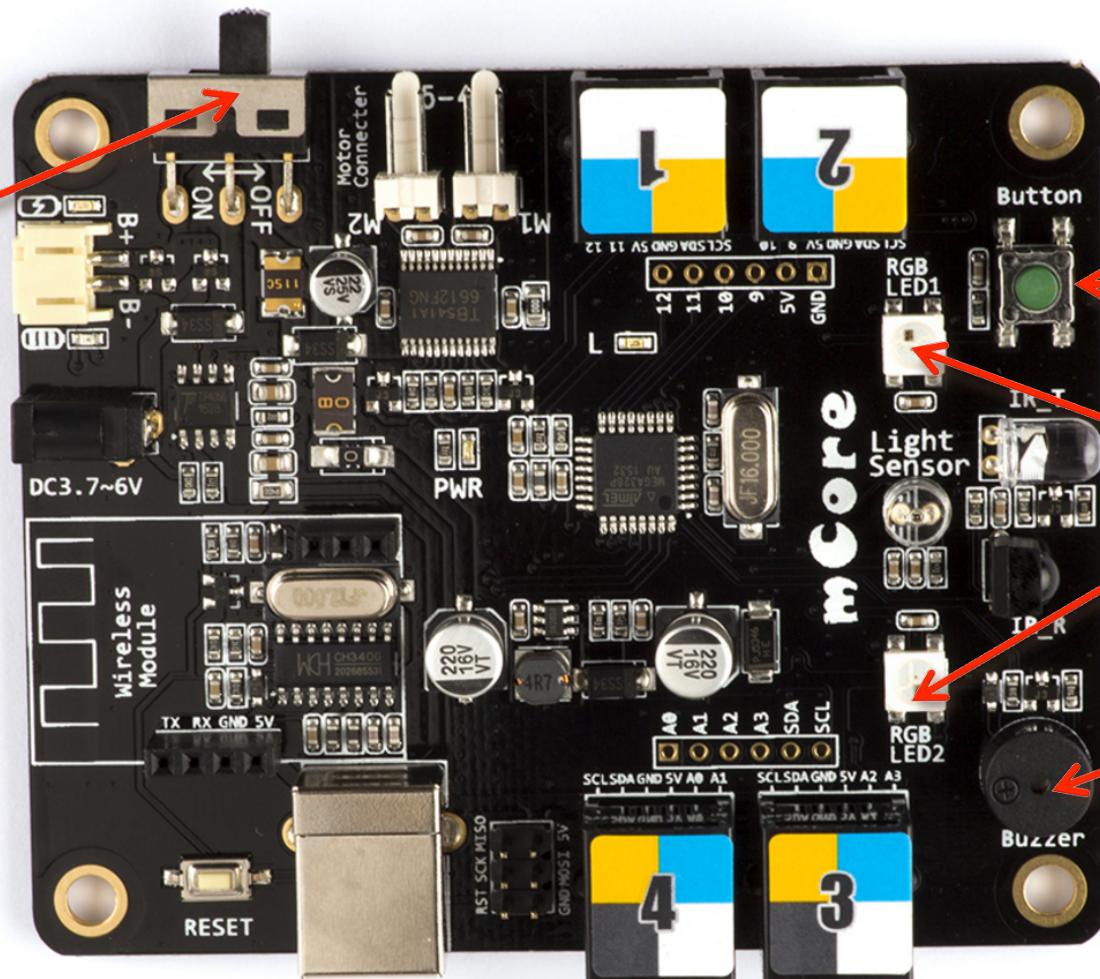
Bot Training

April 2016 – Refugee Coding



Part

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ch



Button

RGB LED

Buzzer - Sou

Demonstrate Programming

Link the LEDs

RGB -> Red, Green, Blue

Set values for each color from 0 [off] to 255 [very bright]

You can mix Red, Green and Blue to make thousands of colors.

k the lights

Bot Program

```
forever
  set led [led on board v all v red 255 v green 0 v blue 0 v]
  wait [0.5 secs]
  set led [led on board v all v red 0 v green 255 v blue 0 v]
  wait [0.5 secs]
  set led [led on board v all v red 0 v green 0 v blue 255 v]
  wait [0.5 secs]
```

There are two leds you can control

LED stands for Light Emitting Diode.

Can you make them different colors?

Can you make them blink with sound?

Demonstrate Programming

Make Sounds with Buzzer

Play individual notes by setting note and duration.

Play a Sound

Scratch Program

```
tone on note [C4 v] beat [Quater v]
tone on note [C4 v] beat [Quater v]
tone on note [G4 v] beat [Quater v]
tone on note [G4 v] beat [Quater v]
tone on note [A4 v] beat [Quater v]
tone on note [A4 v] beat [Quater v]
tone on note [G4 v] beat [Half v]
```

Can you add a few more notes to play your favorite tune?

Notes for a few songs you might know:

C C G G A A G, F F E E D D C Twinkle little star

F F F, F F F, F A D E F Jingle Bells

A A A F C A F C A Star Wars - Imperial March

Hands On Lab

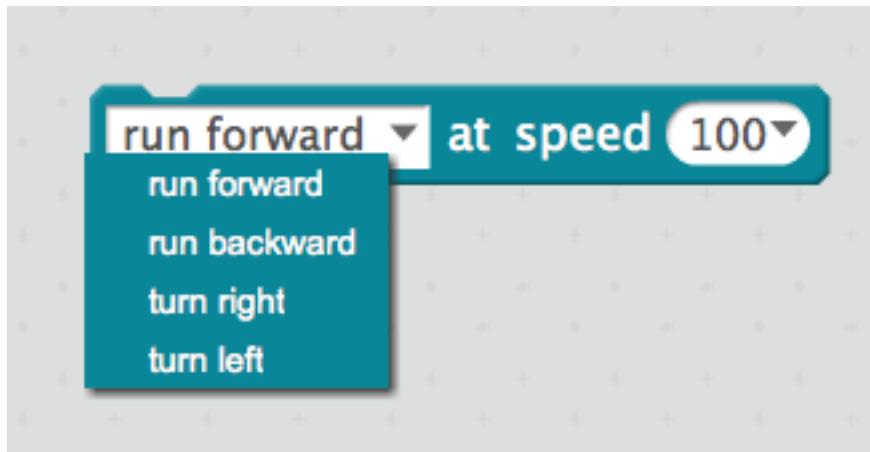
Connect your mBot to the computer

Make it blink the LEDs with different colors and play sounds

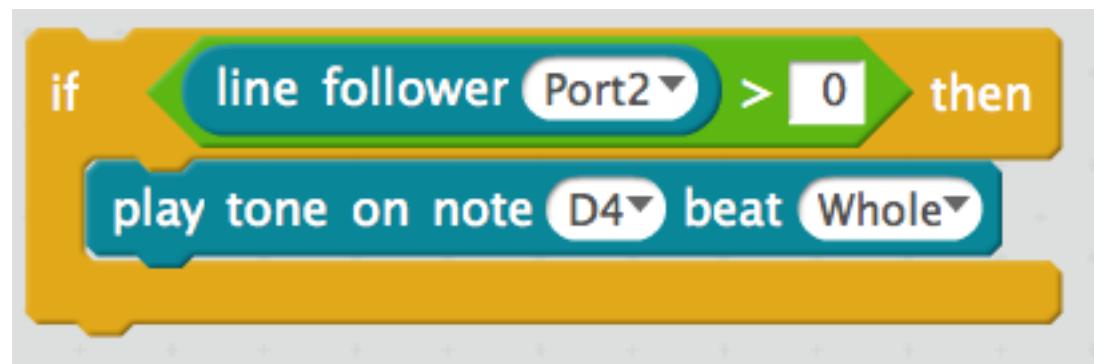
Line Following

What does it take to have a robot follow a line?

Move



See the line



ving



Can you adjust this to move in a square?
Can you move in a circle?
Can you spin?

Valid motor speeds are between -255 and 255.

- 0 stop
- 50 is slow
- 100 is medium
- 200 is fast
- 255 is fastest

What do negative values do?

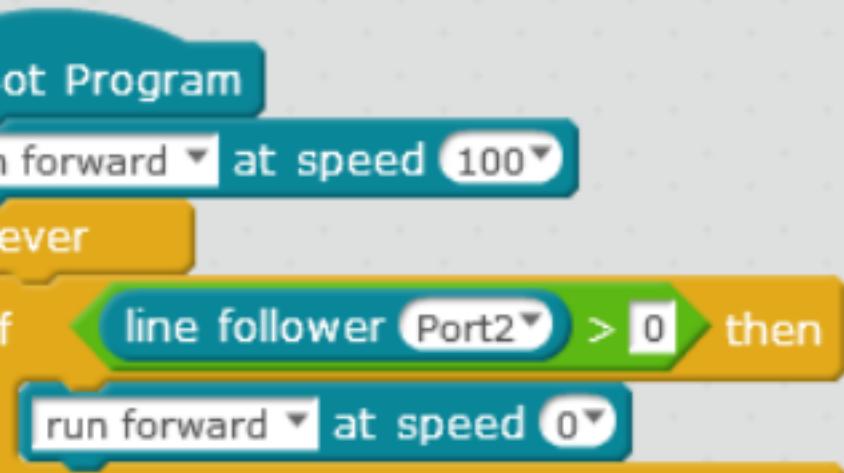
demonstrate uploading code

ack

Upload to Arduino

```
#include <Servo.h>
#include <SoftwareSerial.h>
```

eing



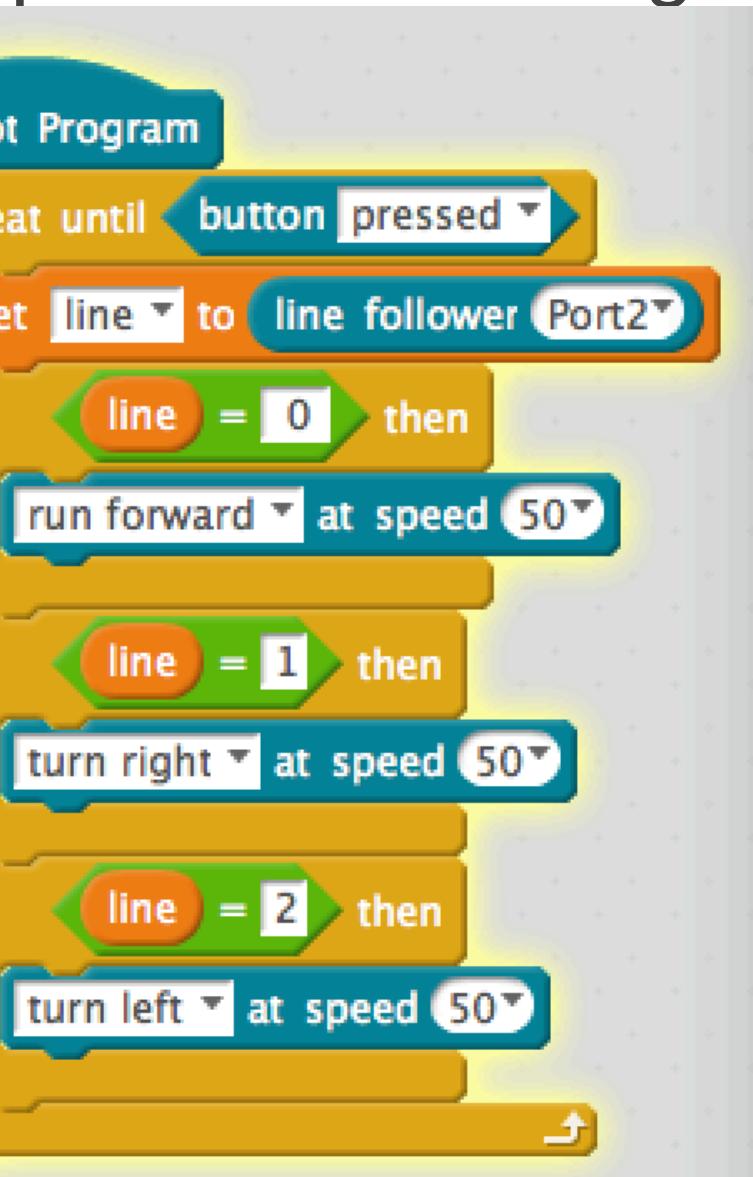
Start on white, stop on black.

Can you make sound when you stop?

Make the lights green when moving.

Make the lights red when you stop.

Simple Line Following



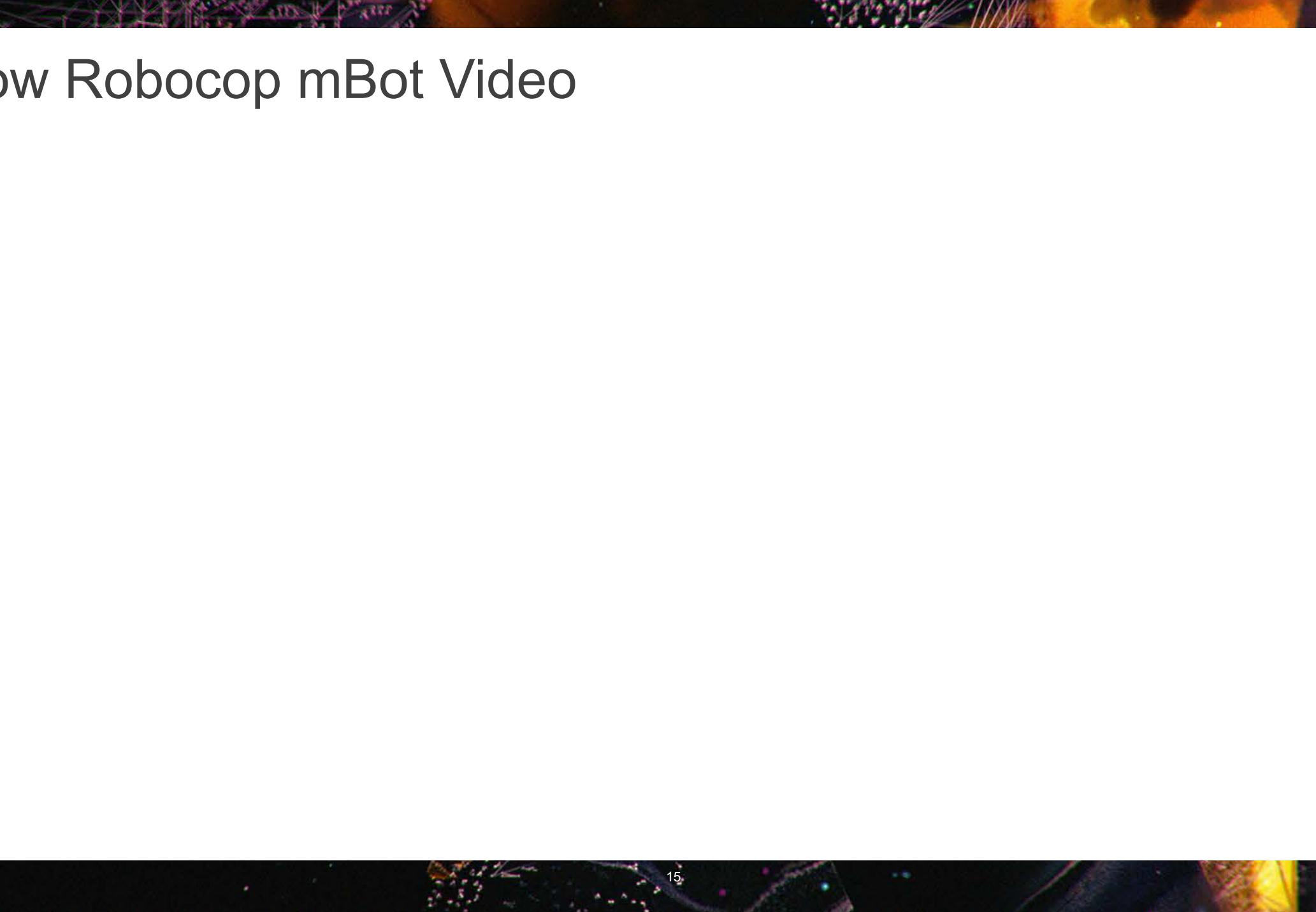
The line follower has two detectors and 4 possible values:

- 0 means both detectors see black.
- 1 means one detector sees black, one white.
- 2 means one detector sees white, one black.
- 3 means both detectors see white.

Try to follow the figure 8 found in your box.

Can you fix the code shown so it works properly on your robot?

Can you make your mBot go faster?



How Robocop mBot Video

Bot Training - Session 2

il 2016 – Refugee Coding



view Last week

link the LEDs

ake Sounds

ove

llow lines

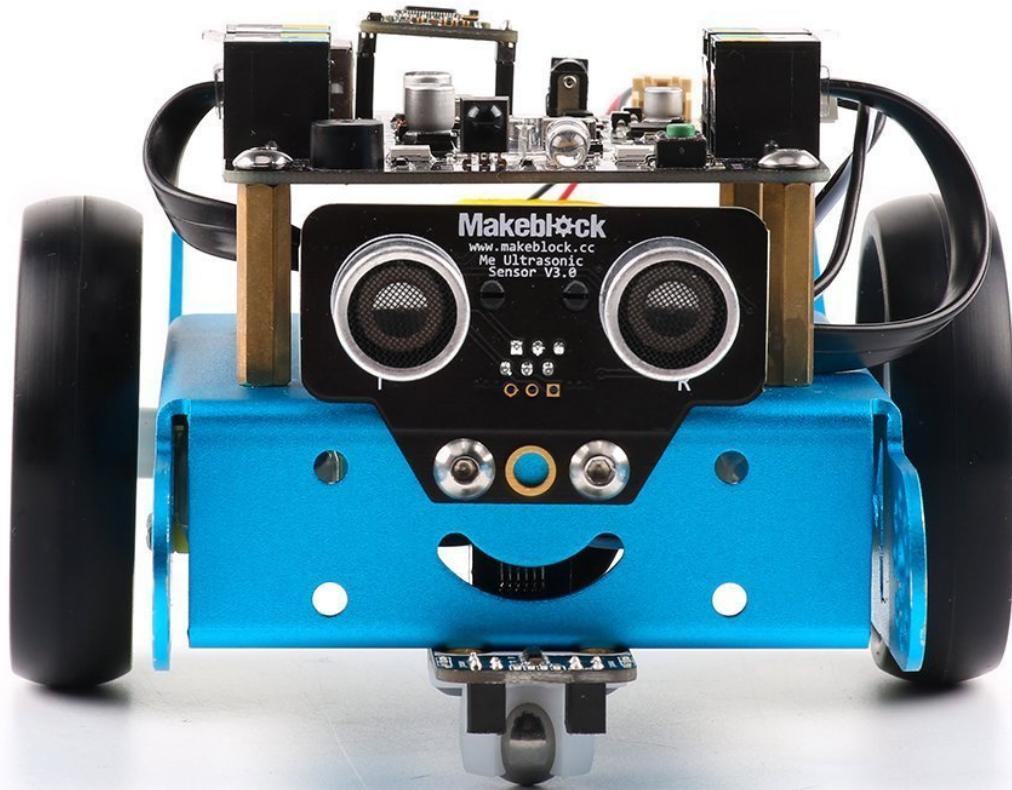


Robot Vision

last time we learned about the line following module.
Today we'll add the distance sensor.

looks like Eyes on the front
senses ultrasonic waves
(sound you can not hear)

just like a bat

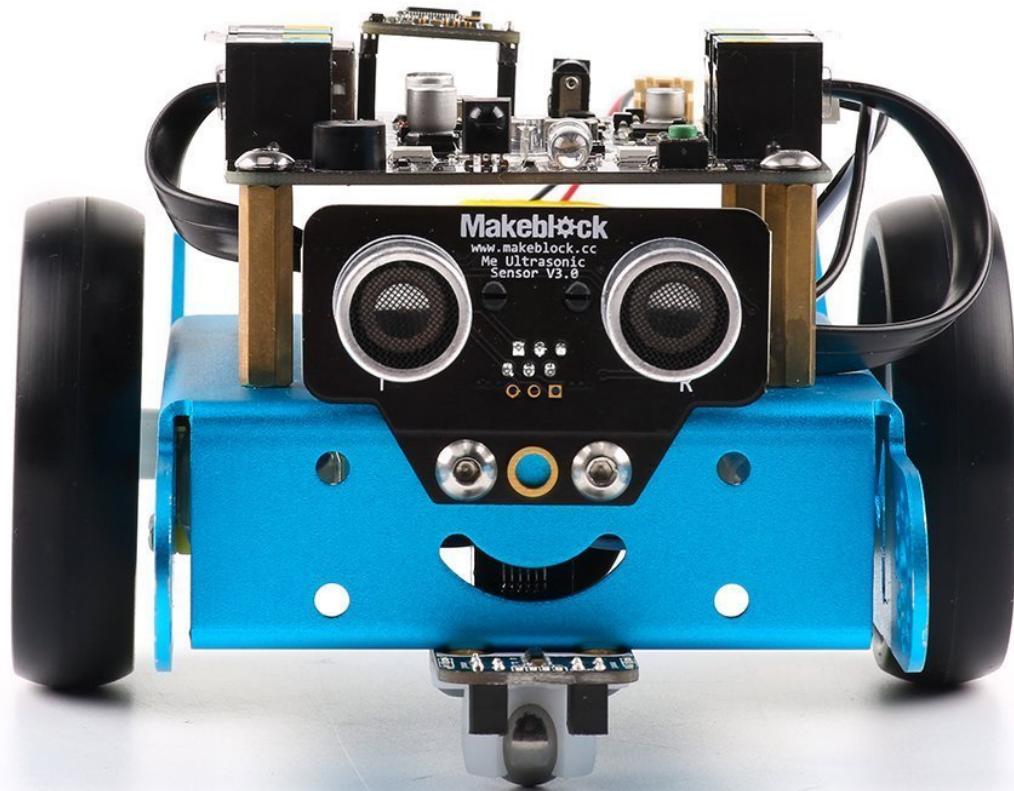
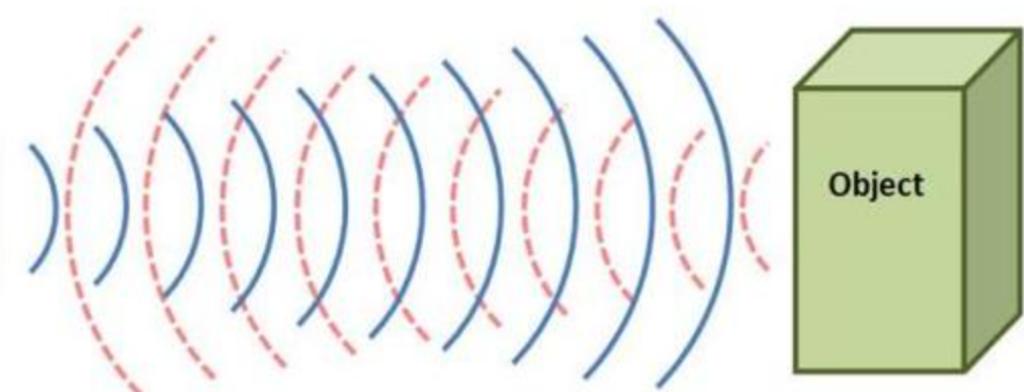


Robot Vision

One “eye” sends a ultrasonic ping

One “eye” hears it come back

Distance is calculated by time between
sending and receiving.

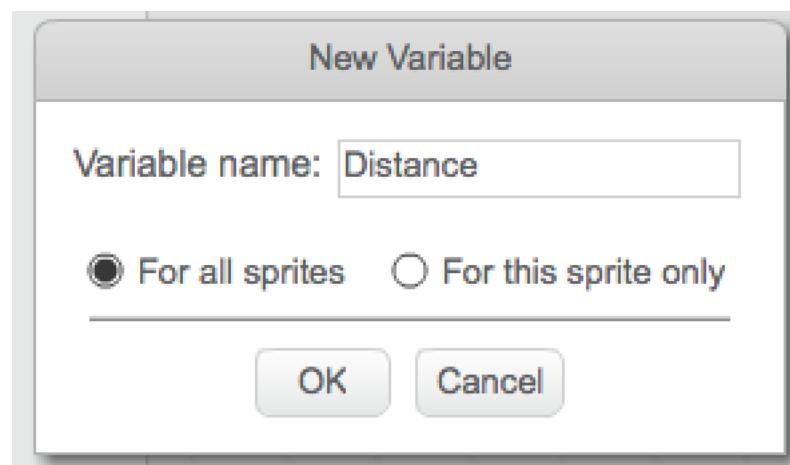
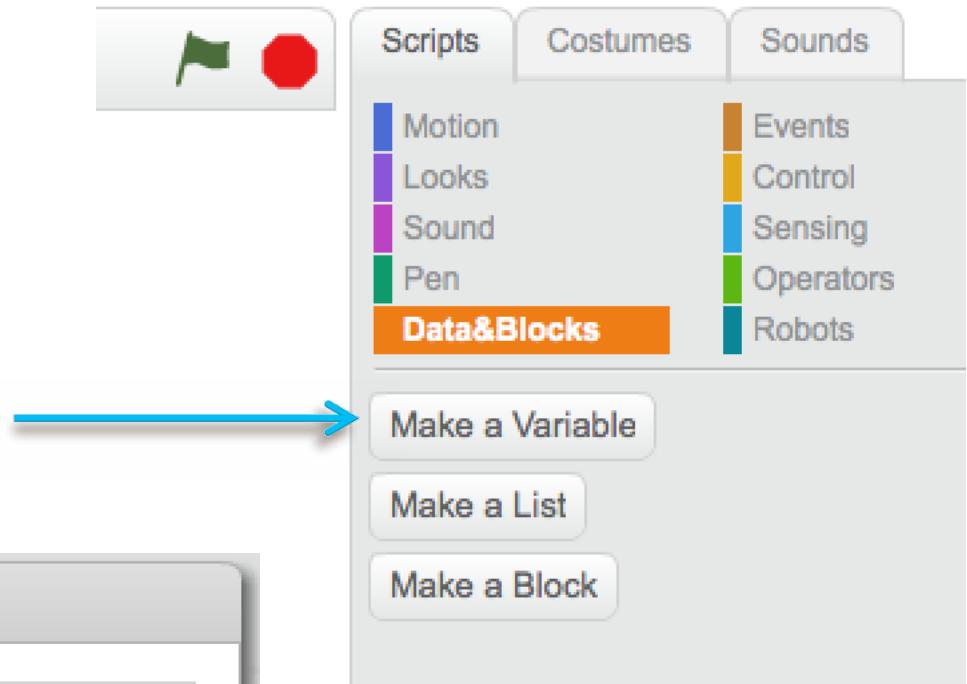


Program the mBot to move around avoiding obstacles

under Data&Blocks – Make a Variable

Set the Variable name to “distance”

We will use this variable in our code



Program the mBot to move around avoiding obstacles

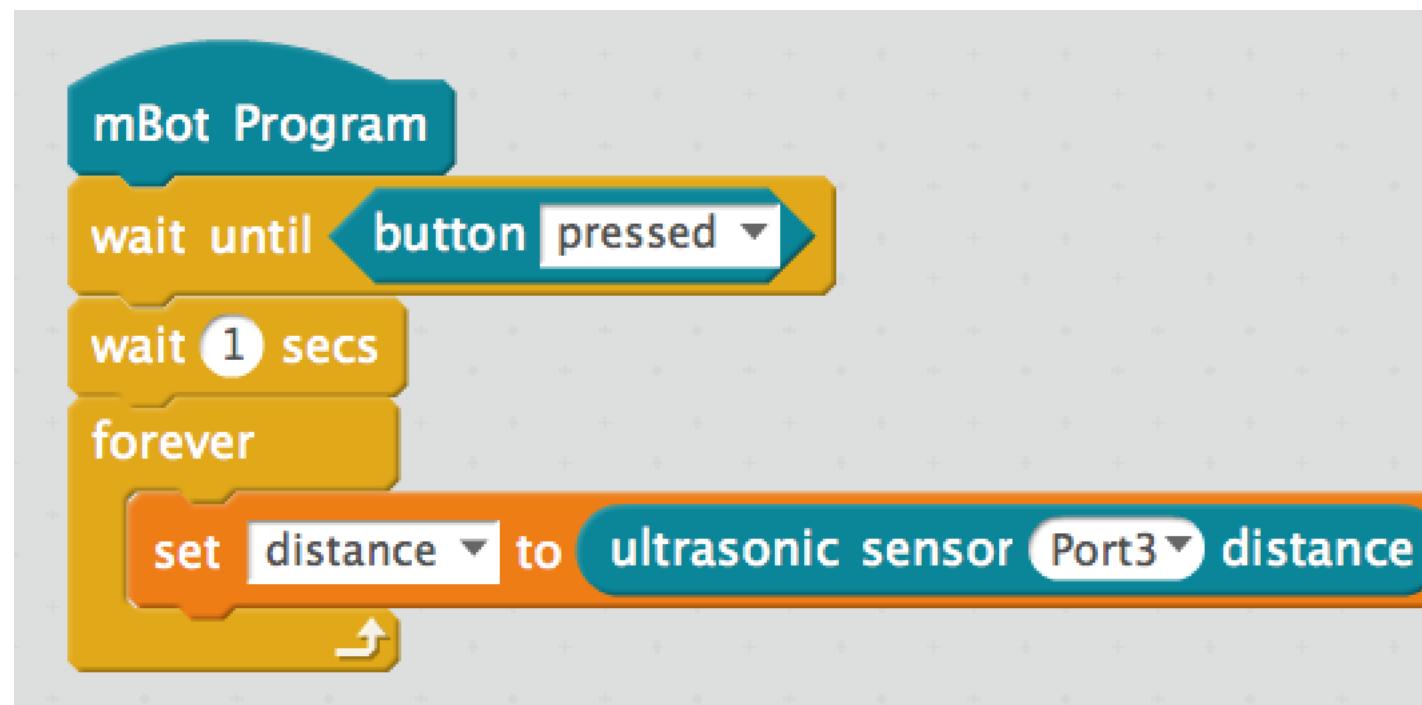
In our forever loop we will set the variable “distance” to the reading from the ultrasonic sensor.



Program the mBot to move around avoiding obstacles

Start by waiting for the button to be pressed

Then set distance to the reading from the ultrasonic sensor



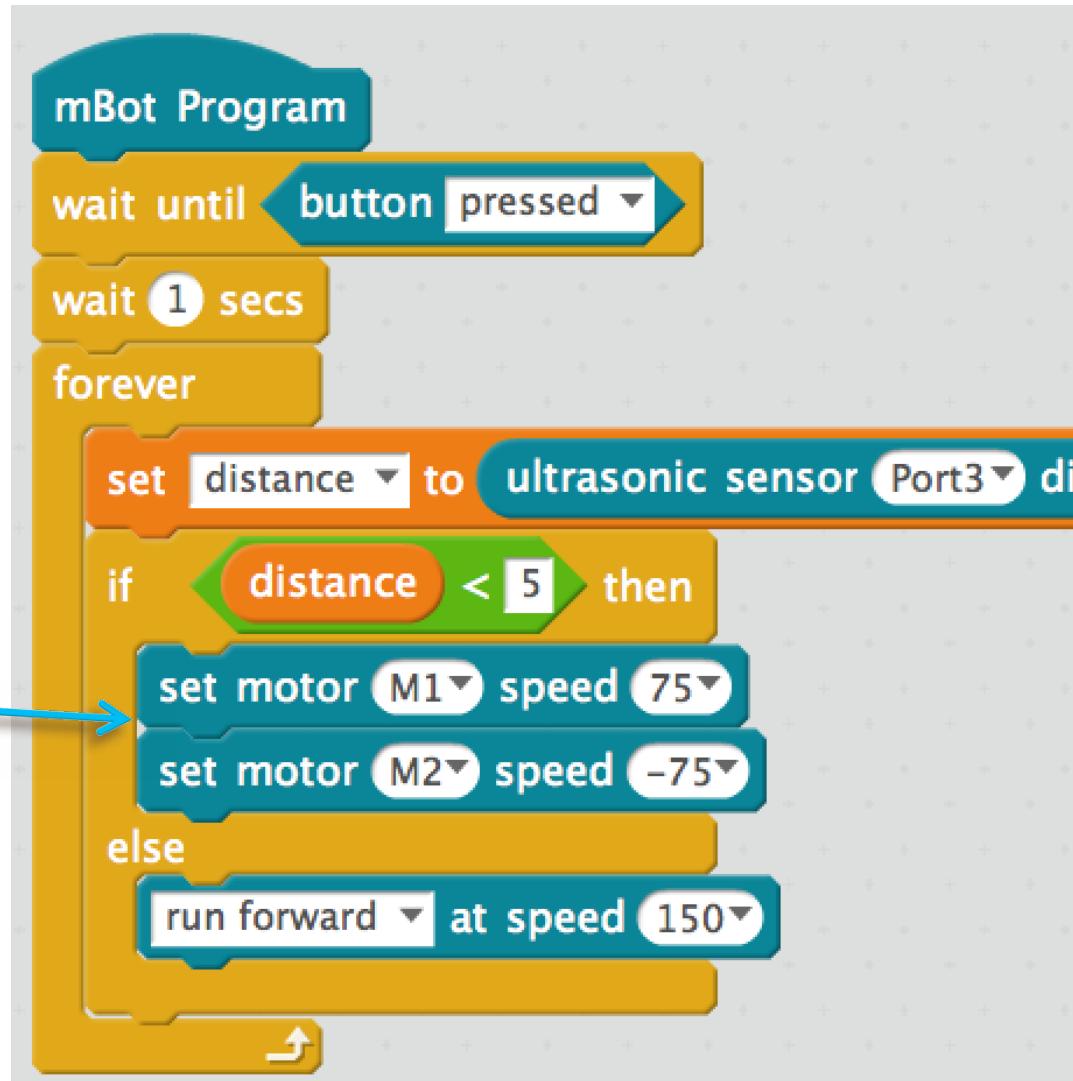
Program the mBot to move around avoiding obstacles

The distance variable is in centimeters.

If there is something in front, spin.

If not, go forward

Spin Around



Program the mBot to move around avoiding obstacles

Improving the code

Add a wait to spin longer before checking the sensor again.

Spin longer

```
mBot Program
wait until button pressed
wait 1 secs
forever
  set [distance v] to [ultrasonic sensor (Port3) distance]
  if [distance < 5] then
    set motor [M1 v] speed [75 v]
    set motor [M2 v] speed [-75 v]
    wait [.5] secs
  else
    run forward [150 v] at speed [150 v]
```

Program the mBot to move around avoiding obstacles

Improving the code

Use the LED in different colors to help you know where the robot is in your code.

Add lights

The Scratch script titled "mBot Program" starts with setting the board's LED to red. It then waits for a button press, followed by a forever loop. Inside the loop, it sets the distance to the ultrasonic sensor. An if-then block checks if the distance is less than 5. If true, it turns the LED to red and 150 green, sets motor speeds M1 to 75 and M2 to -75, waits 0.5 seconds, and then turns the LED back to red and 0 green. If false, it runs forward at speed 150.

```
mBot Program
set led [led on board v] [all v] [red v] [0 v] [green v] [0 v] [blue v] [60 v]
wait until [button pressed v]
repeat
    set [distance v] to [ultrasonic sensor v] [Port3 v] [distance v]
    if [distance < 5] then
        set led [led on board v] [all v] [red v] [150 v] [green v] [0 v]
        set motor [M1 v] [speed v] [75 v]
        set motor [M2 v] [speed v] [-75 v]
        wait [0.5] secs
    else
        set led [led on board v] [all v] [red v] [0 v] [green v] [150 v]
        run forward [at speed v] [150 v]
end
```

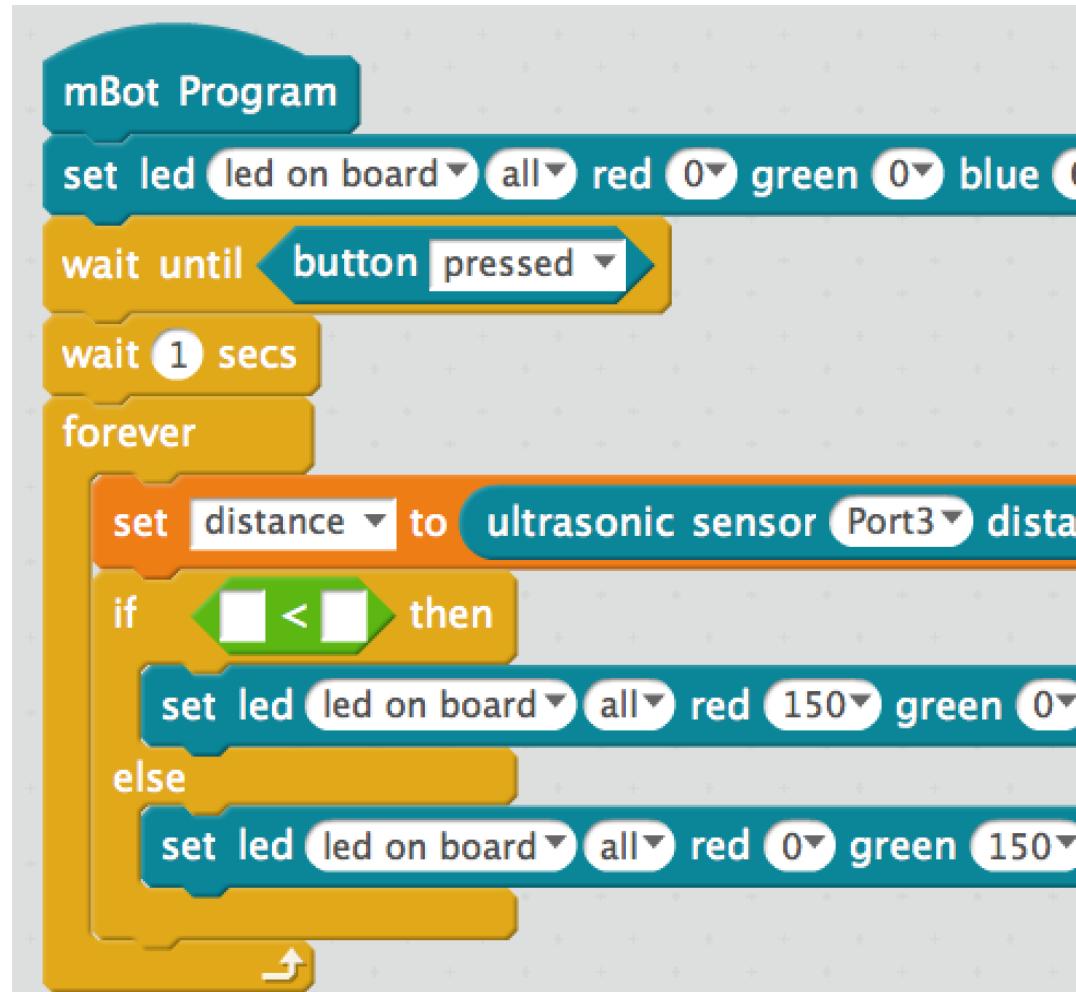
Program the mBot to move around avoiding obstacles

AB

Use this template and program your mBot to avoid obstacles while moving around the room.

Start by stopping before it hits the wall.

Then turn and go in another direction.

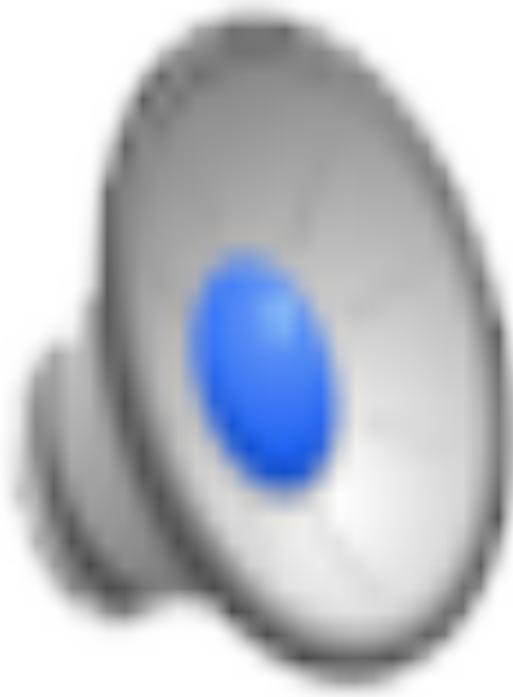


gram the mBot to move around avoiding obstacles

REVIEW

What problems did you have?

How did you fix them?



Program the mBot to move around a Sumo Ring

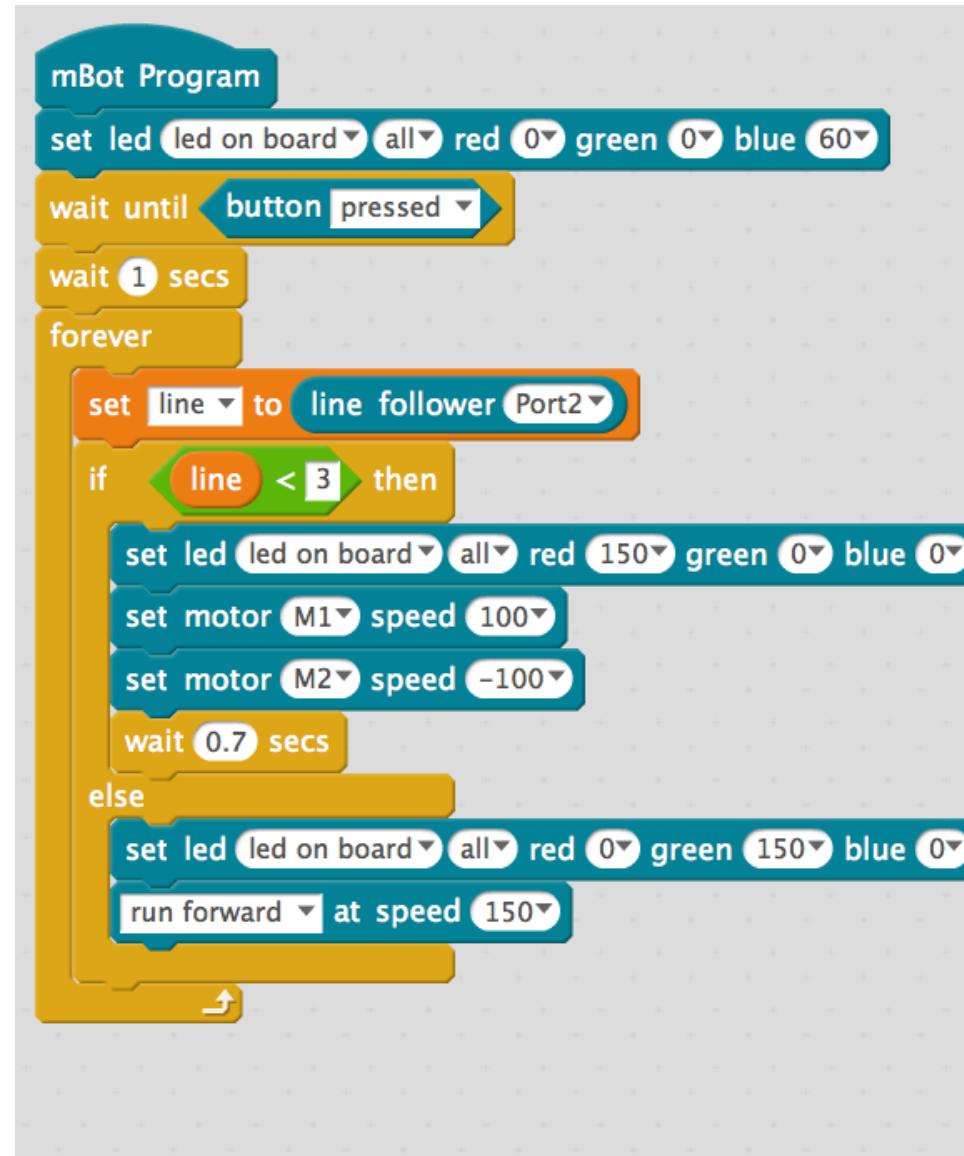
Move the line follower to stay in the ring

If the line follower returns 3 you are on the outside.

Move forward

If the line follower returns less than 3, you are touching the line

Turn around



Program the mBot to move around a Sumo Ring

B -- Fix the code to the right

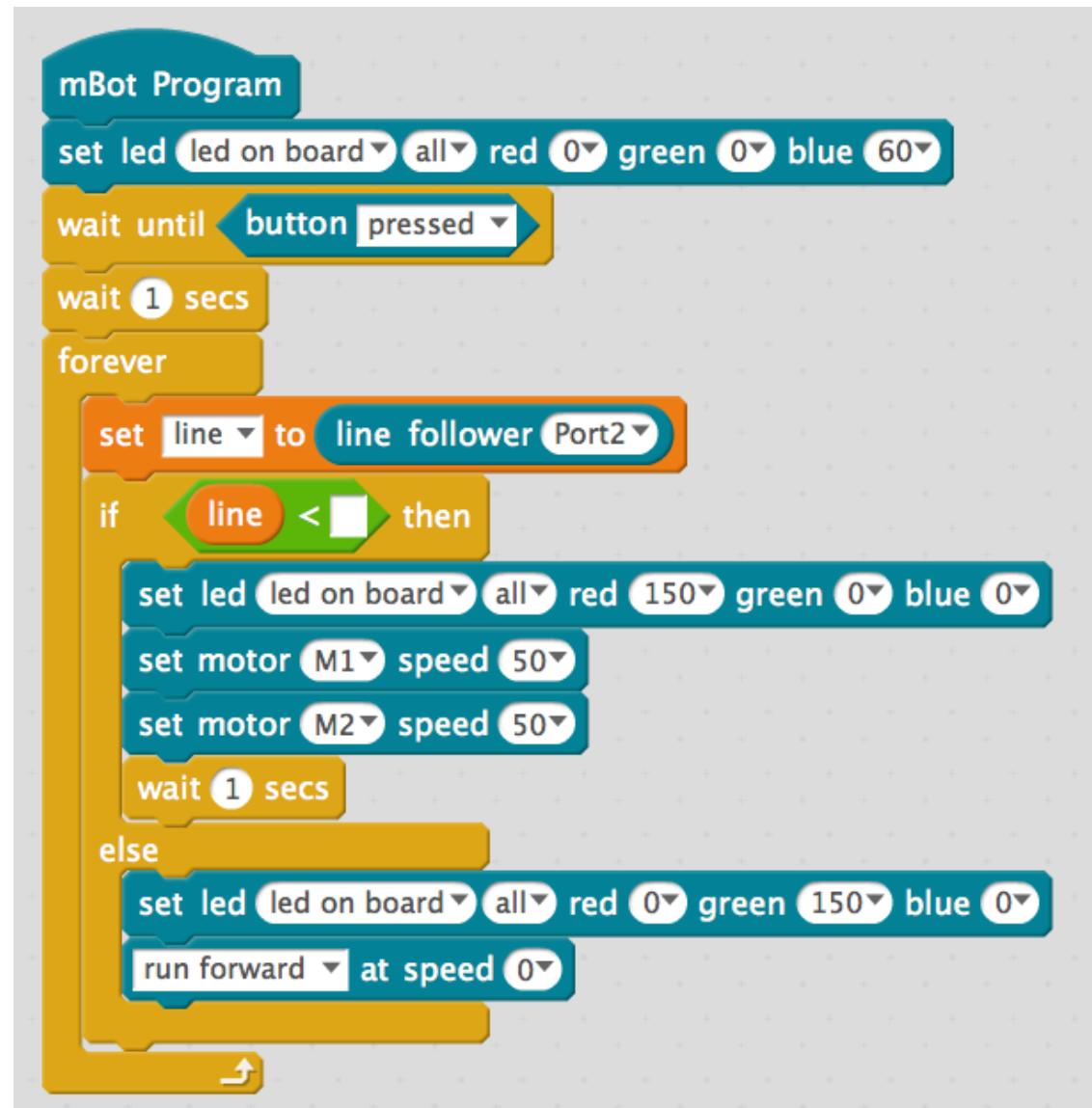
ay in the ring

similar to the line following we did last
e.

ay on white.

You see the line, turn around.

Keep moving





gram the mBot to move around a Sumo Ring

REVIEW

What problems did you have?

How did you fix them?

gram the mBot to find and push a block out of the ring

Use the line follower to stay in the ring

Use the ultrasonic sensor to find the block

Spin until you see it

Move forward and push it out

