



# arm

## Inputs

Lesson 3



**arm** School Program

# Objectives

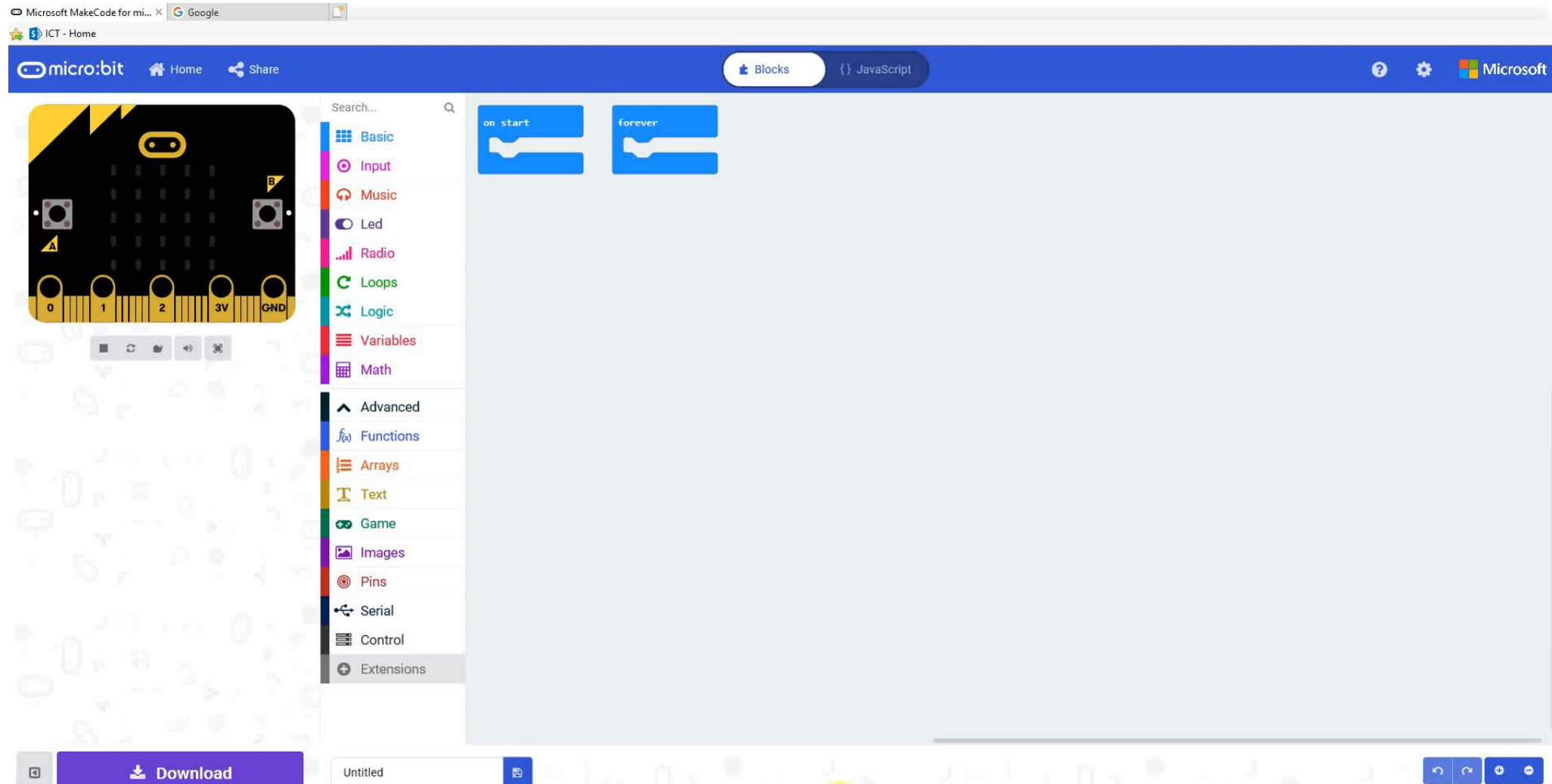
- Identifying the environment using sensors
- To be able to use code to take a reading from an **ultrasonic** sensor to gauge distance
- To be able to use code to take an **analogue** reading from a **light sensor**
- To be able to use code to detect the presence of a line or marker as part of a **line follower**

# Introduction to the Bit:Bot

- The Bit:Bot from 4tronix is a robot kit with:
  - Motors
  - Sensors
  - LEDs
- You can use it to experiment with various inputs and outputs utilising the micro:bit as the core computer



# Adding the Bit:Bot Extension



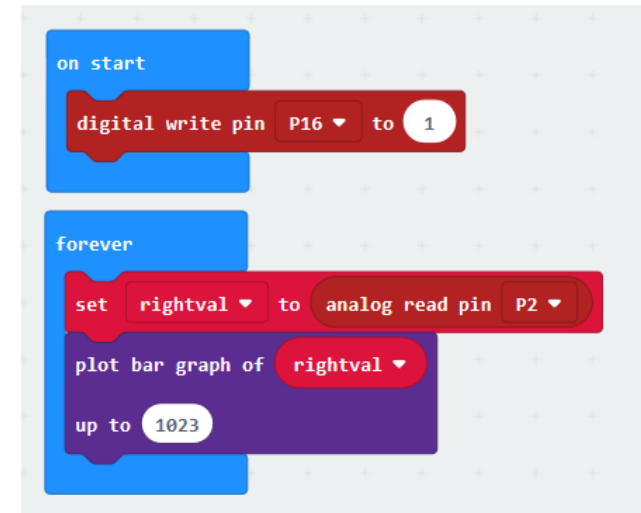
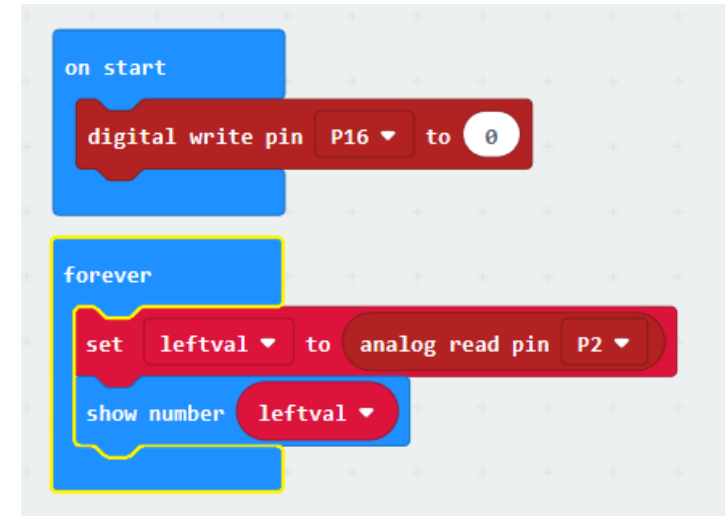
# Light Sensor

- The two analogue light sensors at the front of the Bit:Bot will give a value between 0 and 1023 where
  - 0 is fully dark
  - 1023 is maximum brightness
- We need to use a **digital** output signal on Pin 16 to set whether we are reading from the left sensor or the right sensor
- Setting Pin 16 to:
  - 0 utilises the left sensor
  - 1 utilises the right sensor



# Light Sensor

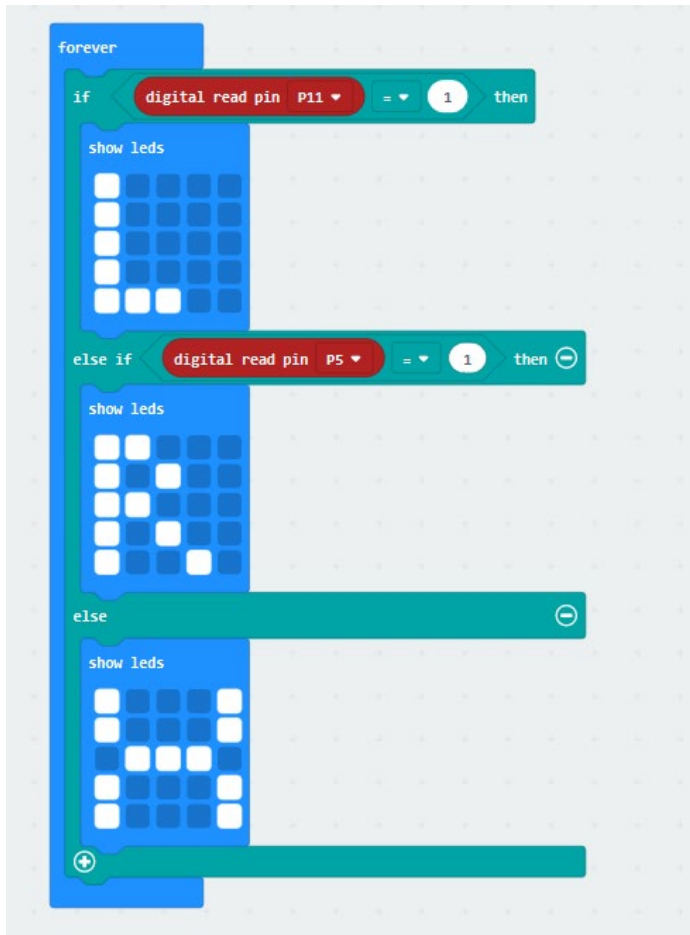
- Try out the example on the right
- What happens to the screen when you cover the sensor
- How high is the reading under ambient lighting conditions
- What happens if you point a torch on the sensor





# Line Follower Sensor

- These connect to Pin 11 for the left and Pin 5 for the right

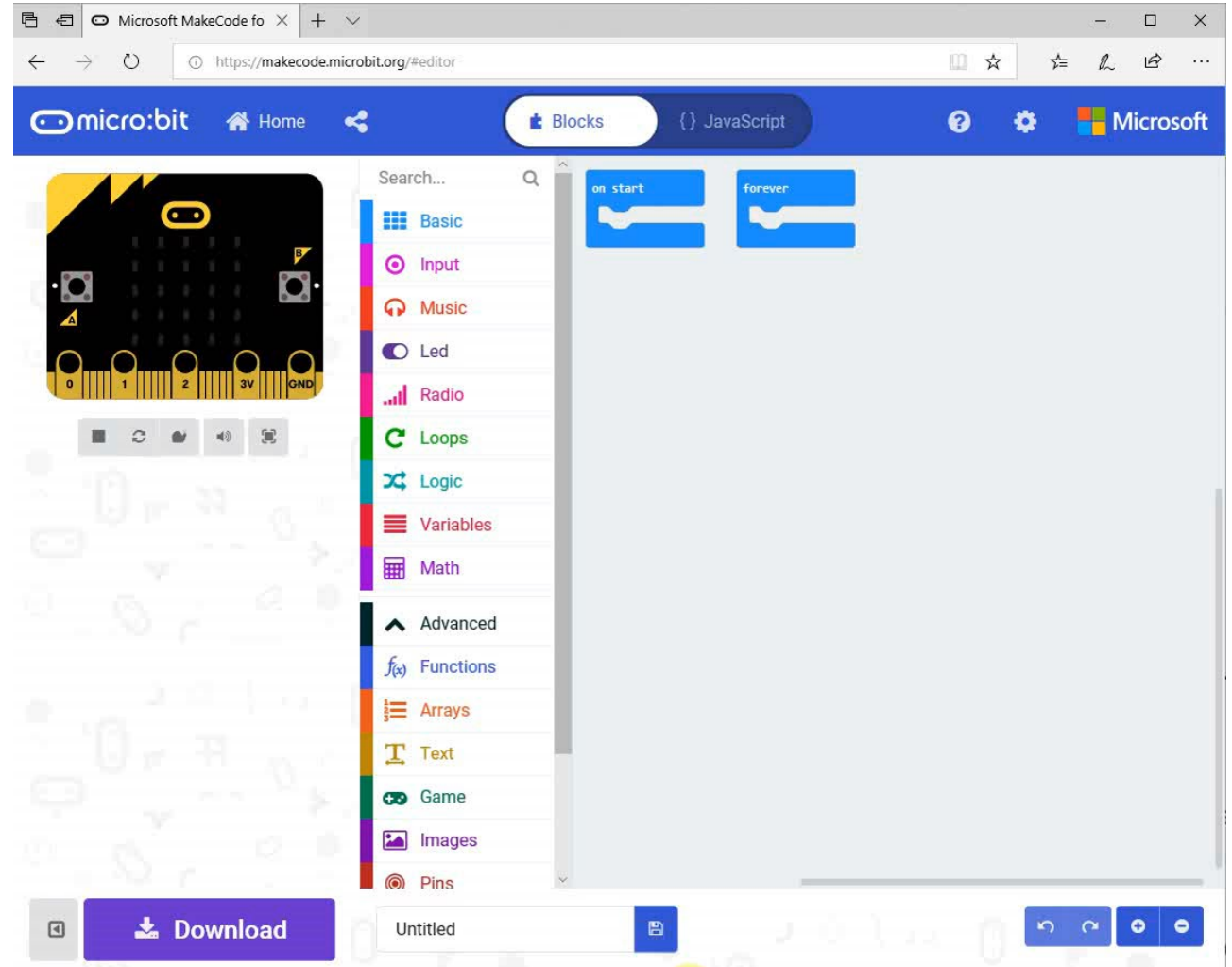


- Try out the example on the left
- What happens when you cover each sensor
- What happens when no sensors are covered
- Try experimenting with different thickness of lines, different colours and on different materials
- Identify the best size, colour and material for a line to be detected reliably
- Create a table of your results



# Ultrasonic Distance Sensor

- The Bit:Bot comes with an optional HC-SR04 ultrasonic distance sensor
- To use this sensor you will need to add the Sonar package
- Follow the video to add this extension

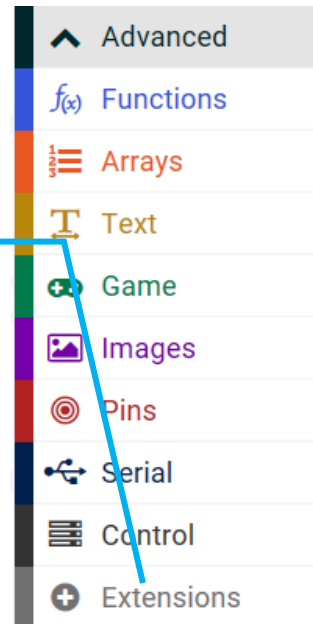




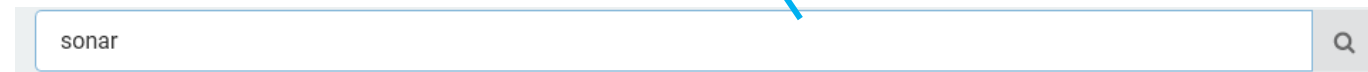
# Ultrasonic Distance Sensor

## Step By Step

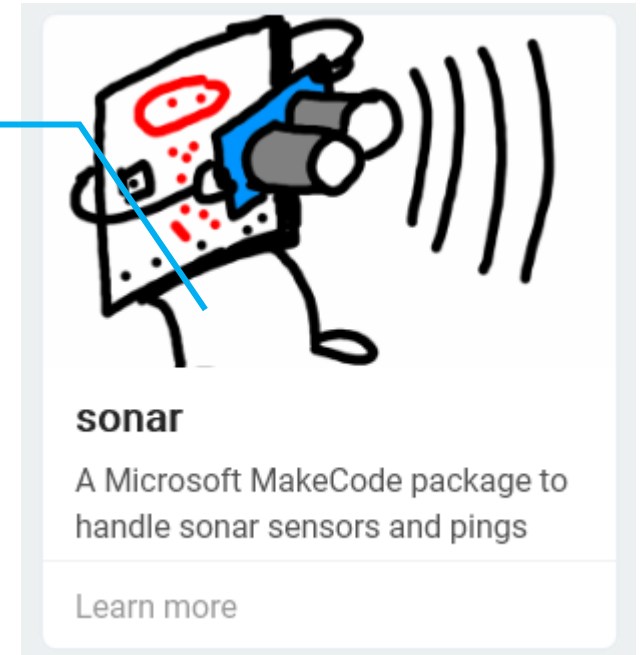
1. From advanced select Extensions



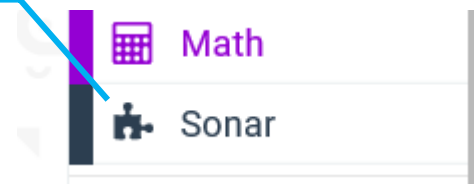
2. Search for **Sonar**



3. Select the sonar extension

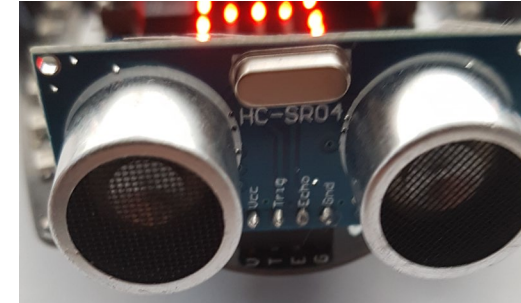


4. Sonar will now appear in your blocks

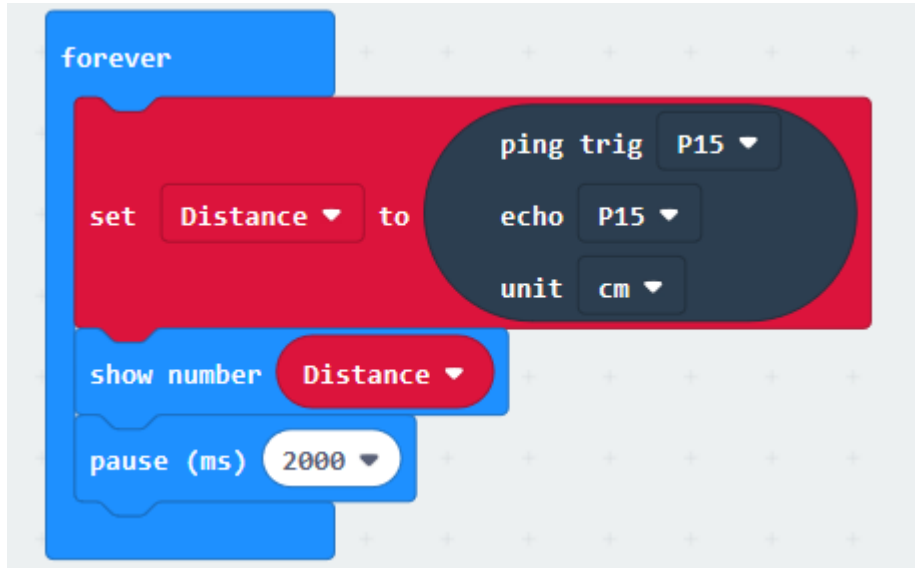


# Ultrasonic Distance Sensor

- An ultrasonic sensor works by:
  - Sending out an ultrasonic sound wave out as ping
  - It measures how long it takes for the sound wave to reflect off a solid object and be echoed back
  - This time can then be converted into distance



# Ultrasonic Distance Sensor



- Try out the example on the left
- It simply sends a ping out every 2 seconds and displays the distance on the screen
- How accurate is the sensor?
- What materials reflect the sound best? (brick, plaster, wood etc)
- Is the sensor affected by outside noise sources?
- Document your results

Thank You

Danke

Merci

谢谢

ありがとう

Gracias

Kiitos

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