

AiTLE micro:bit Workshop

Level 3 : Connect micro:bit to other devices through PINS (I)

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HKUSPACE

HKU School of Professional and Continuing Education

Level 1

- **micro:bit Basics**
 - micro:bit hardware interface (button, LED, sensor)
 - micro:bit Let's Code Platform and Resources
 - Ways to connect micro:bit to device (Bluetooth, USB)
 - Way to flash from device to micro:bit
 - Simple micro:bit Coding (3-4 activities)

Level 2

- **Built-in micro:bit I/O**
 - micro:bit Coding using micro:bit built-in sensor
 - Light Sensors
 - Accelerometer
 - Compass
 - Temperature sensor

Level 3

- **Connect micro:bit to other devices through PINS (I)**
 - Connect micro:bit to other sensors and servo motors
 - Radio Transmission (Easy communication between micro:bits)
 - Adding Package
 - Small scale project on real life scenarios

Structure of Micro:bit

Micro USB
MSC, UART, CMSIS-DAP
Drag-and-drop programming

5x5 LED Matrix

Digital/analog IO
Muxable to SPI, UART, I2C

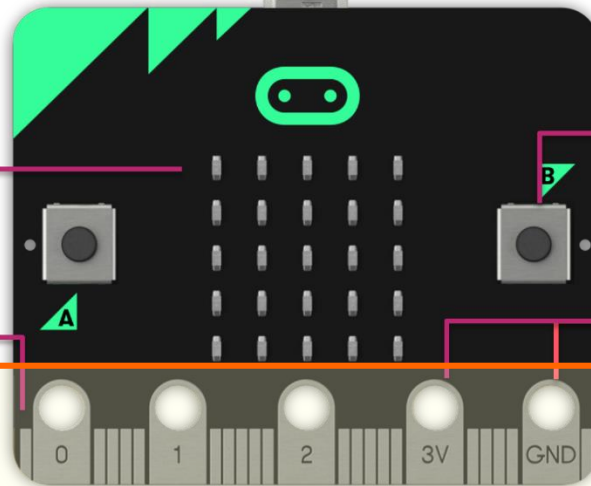
Pads for crocodile clips
Holes for banana plugs

User buttons

External supply

Regulated 3.3V in or battery out

Edge Connector



2.4GHZ Antenna

Bluetooth low energy
Gazell

Nordic nRF51822

Magnetometer

Freescale MMA8652

Accelerometer

Freescale MAG3110

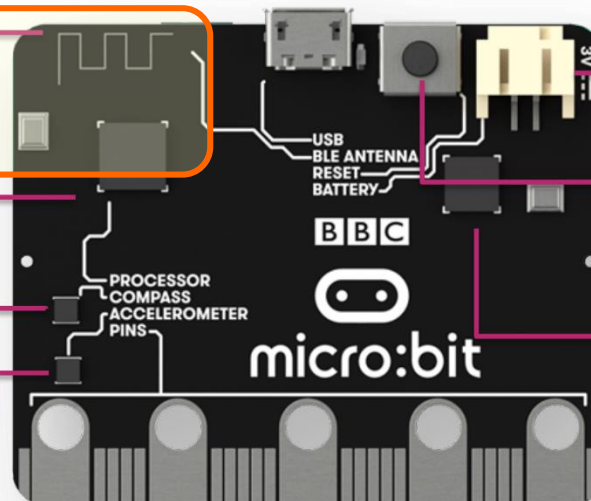
Battery connector

JST connection for 3V

Reset Button

Freescale KL26Z

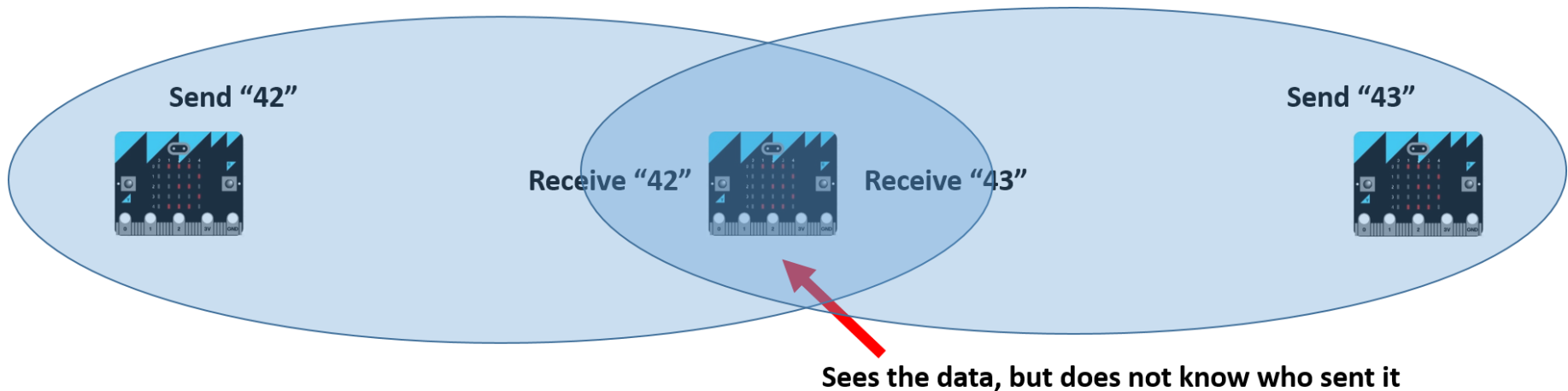
USB Interface chip



<http://tech.microbit.org/hardware/>

Activity 1: Radio

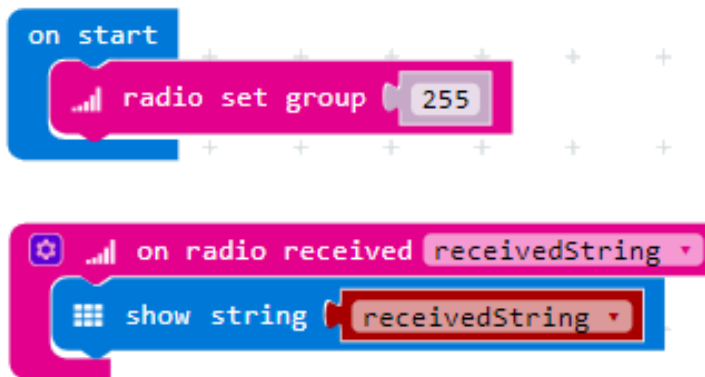
- Using Nordic Gazell protocol
 - 255 group codes
 - Up to 8 devices
 - 2.4GHz frequency band



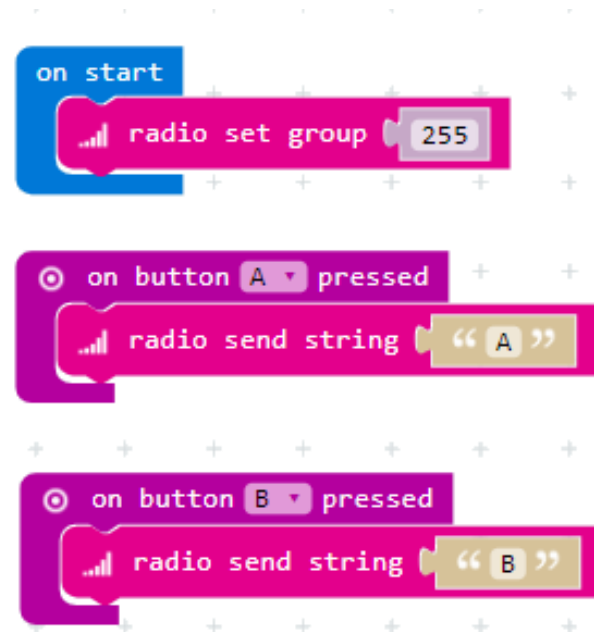
Activity 1: Radio

- Work in pairs

Host



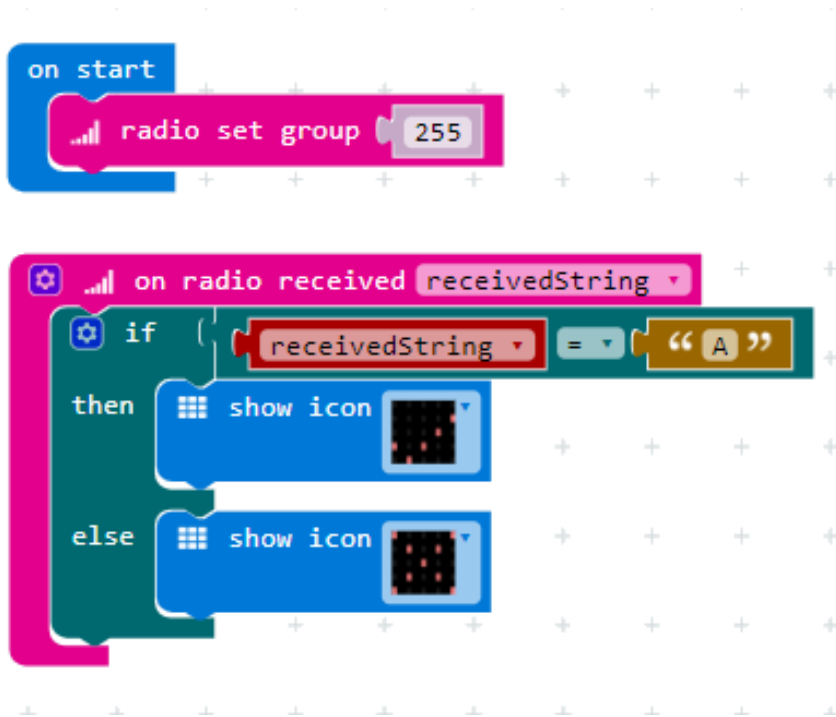
Device



Activity 1: Radio

- Modified Version
(What is the difference?)

Host

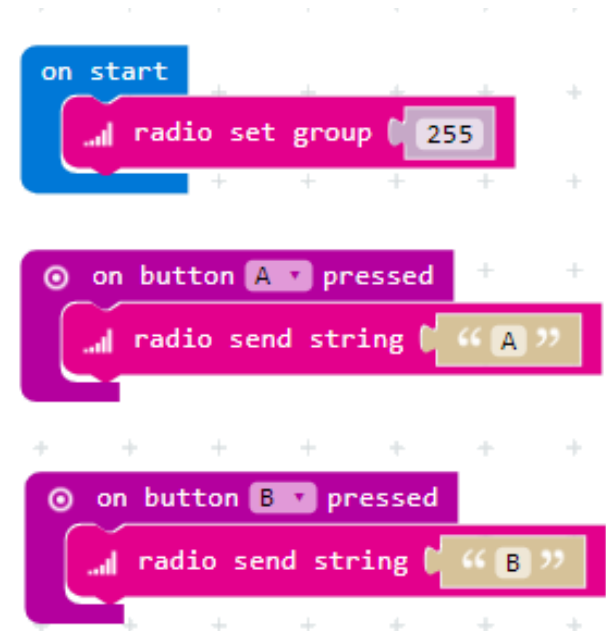


```
on start
  radio set group 255

on radio received receivedString
  if (receivedString = "A")
  then
    show icon [radio icon]
  else
    show icon [radio icon]
```

The Host code starts with an 'on start' block containing a 'radio set group' block with the value '255'. Below this is an 'on radio received' block with a dropdown menu set to 'receivedString'. Inside this block is an 'if' statement. The condition is 'receivedString = "A"'. If true, it executes 'show icon' with a radio icon. If false, it also executes 'show icon' with a radio icon.

Device



```
on start
  radio set group 255

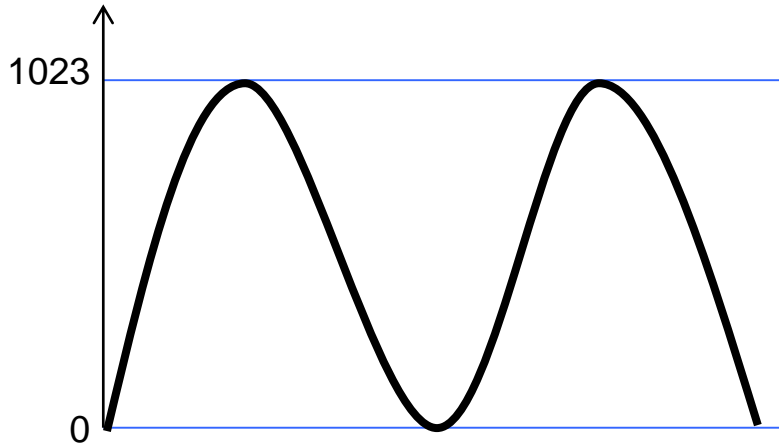
on button A pressed
  radio send string "A"

on button B pressed
  radio send string "B"
```

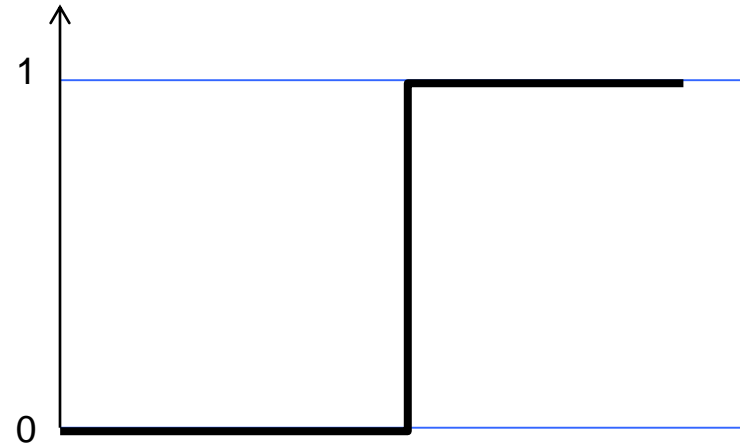
The Device code starts with an 'on start' block containing a 'radio set group' block with the value '255'. Below this are two 'on button pressed' blocks. The first is 'on button A pressed' with a 'radio send string' block containing the value 'A'. The second is 'on button B pressed' with a 'radio send string' block containing the value 'B'.

Analog vs Digital Signal

- micro:bit uses different voltage level to represent different signal

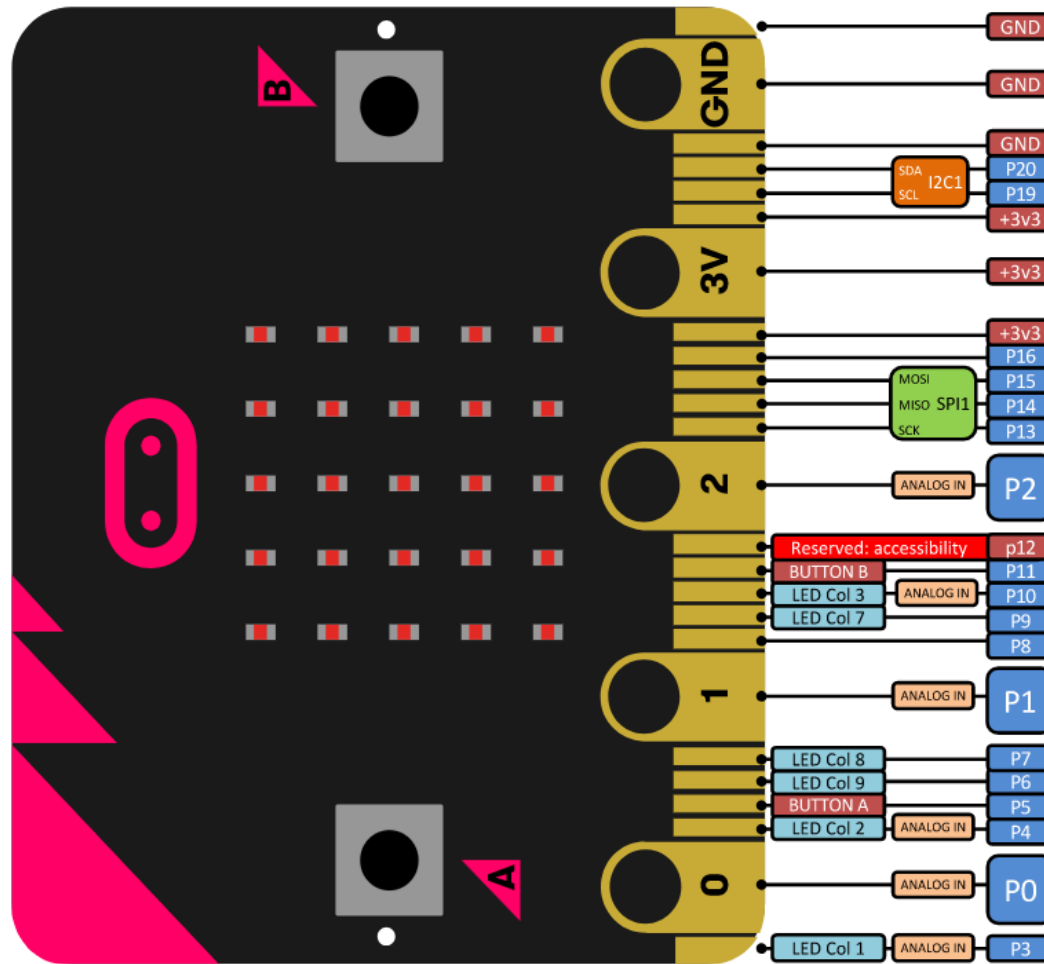


Analog Signal



Digital Signal

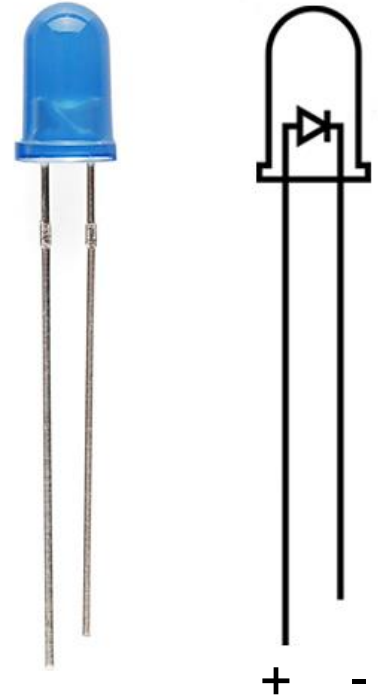
Micro:bit Edge Connector



<http://tech.microbit.org/hardware/edgeconnector/>

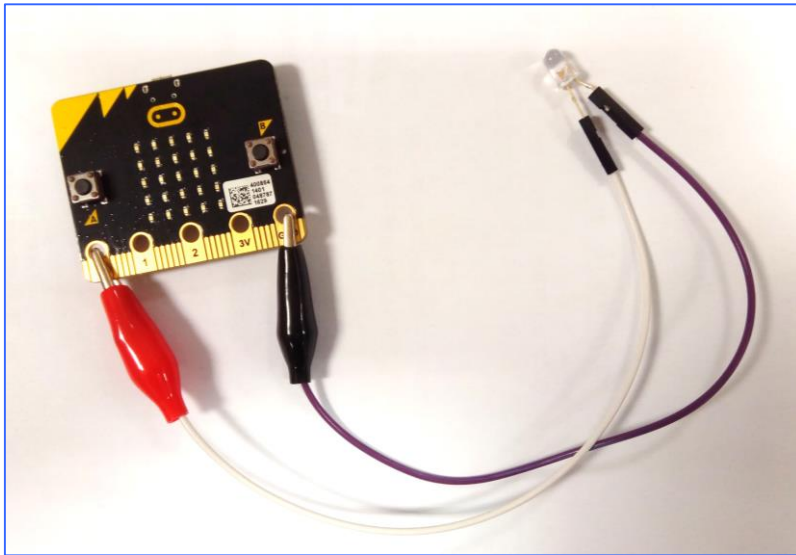
Activity 2: LED

- LED = Light Emitting Diode
- It is an energy-saving light emitting device, which allow current **only in single direction**.



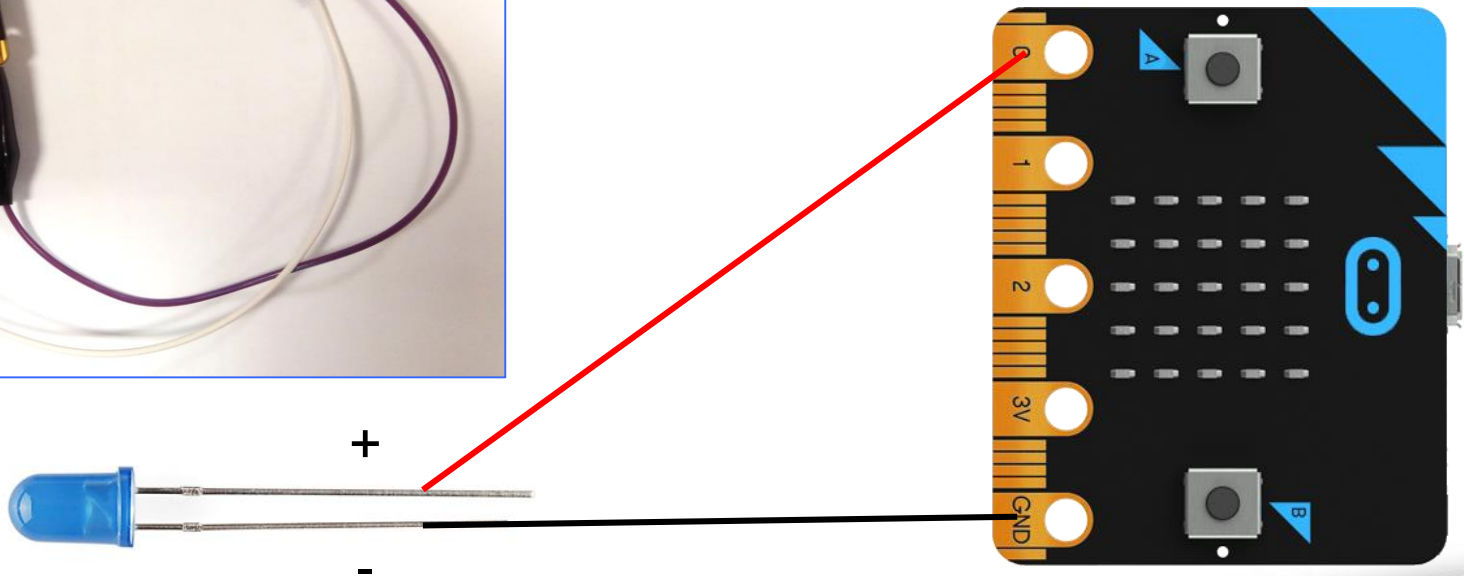
Activity 2: LED

- Make sure the **code** is consistent with the **wiring connections**



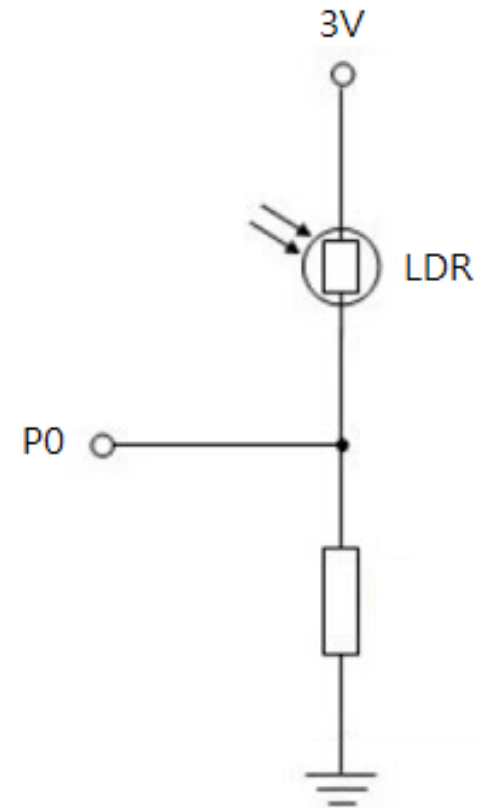
```
on button A pressed
  digital write pin P0 to 1
```

```
on button B pressed
  digital write pin P0 to 0
```

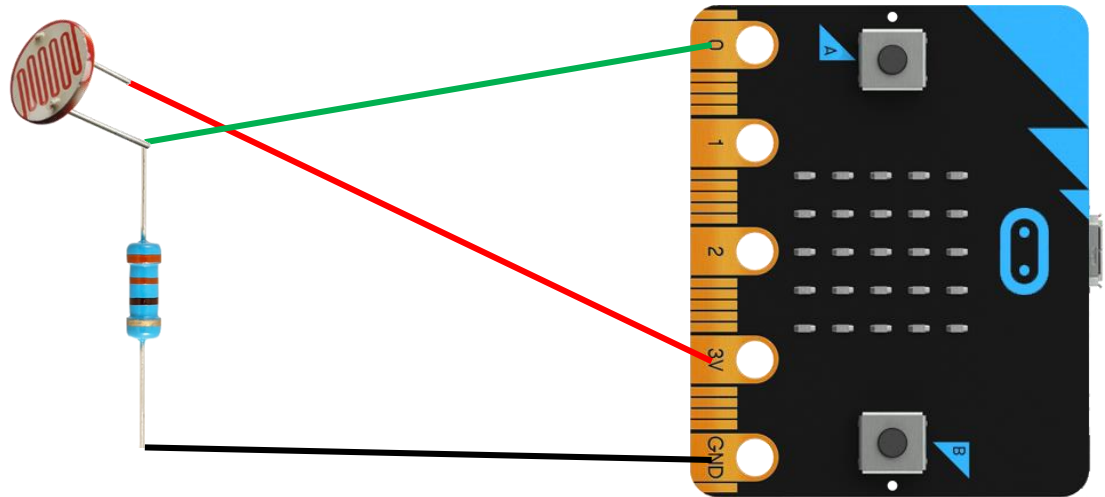
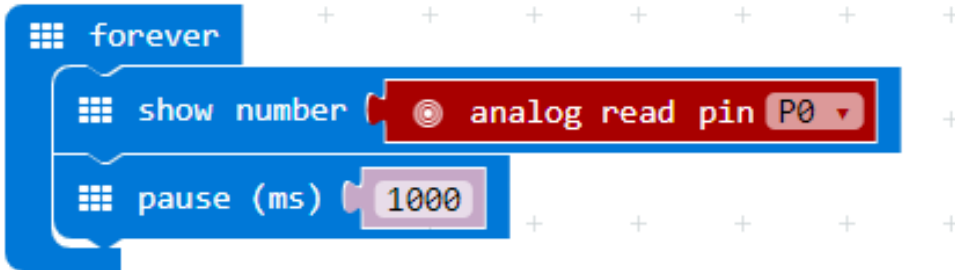


Activity 3: LDR

- LDR = Light Dependent Resistor
- Higher light intensity
→ Lower resistance
- Cannot measure the resistance directly using micro:bit



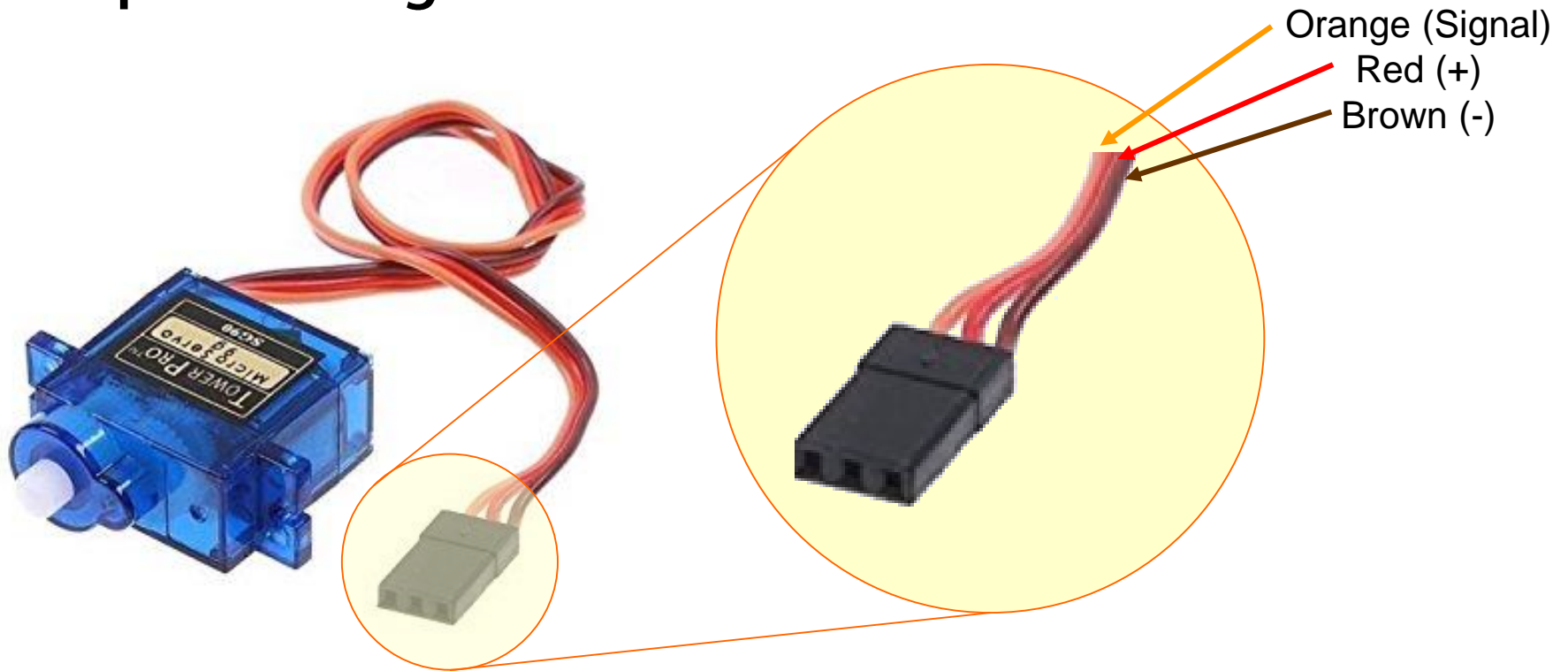
Activity 3: LDR



<https://upload.wikimedia.org/wikipedia/commons/d/d3/LDR-gs-2012.jpg>
https://cdn.techterms.com/img/lg/resistor_1312.jpg

Servo Motor

- Servo motor is a motor which can turn in a specific angle



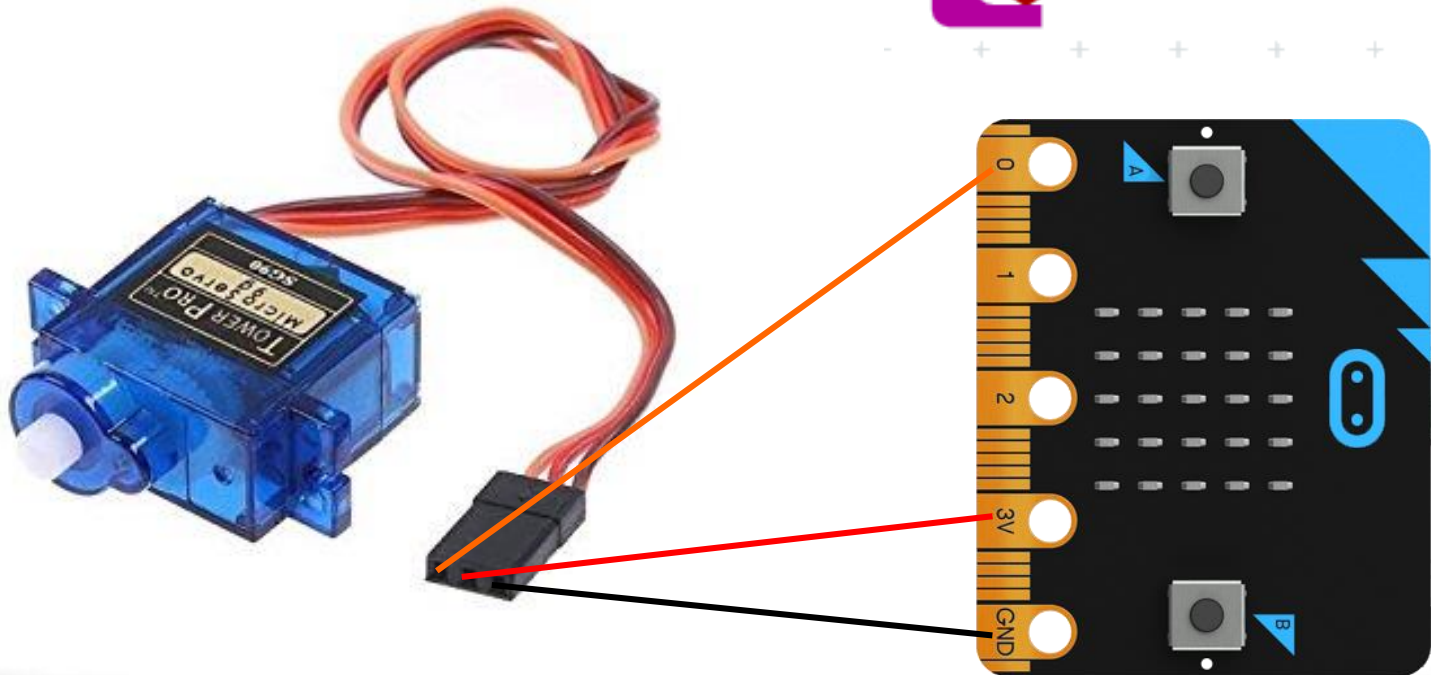
https://images-na.ssl-images-amazon.com/images/I/41Y5VWjAeQL._SX342_.jpg

Servo Motor

- May not work perfectly
(Why?)

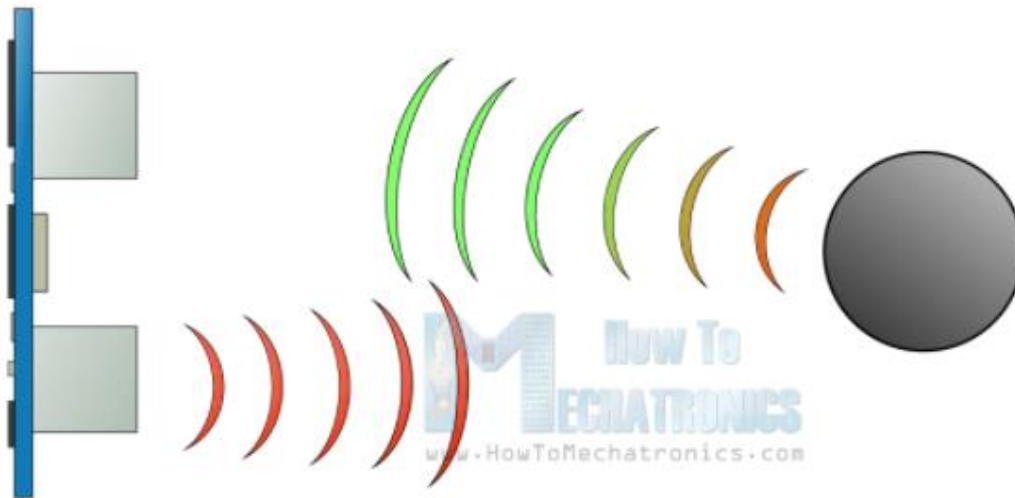
```
on button A pressed  
  servo write pin P0 to 0
```

```
on button B pressed  
  servo write pin P0 to 90
```



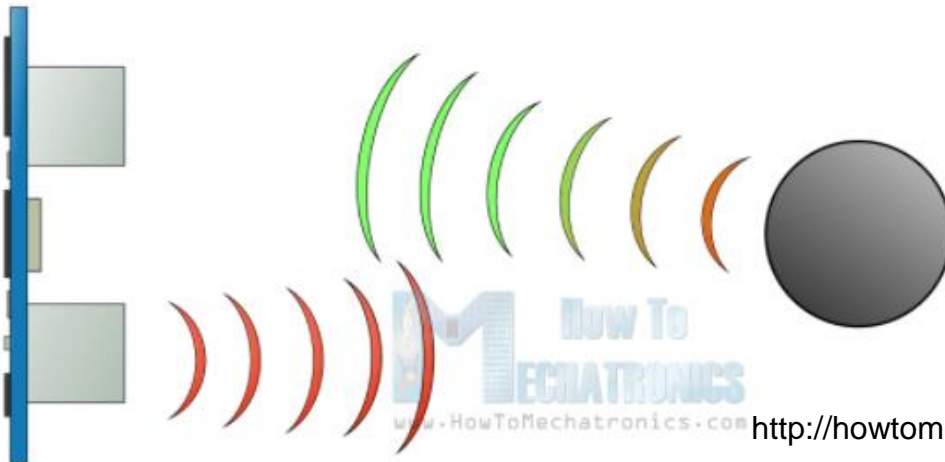
Ultrasonic Sensor

- By reading the time delay (in μs) of receiving the bounced pulse, we can calculate the distance



Ultrasonic Sensor

- It is given that the speed of sound wave in air = 340 m/s
- Distance (cm) = Time (μs) * 340 (m/s) / 2
= Time (μs) * 0.034 (cm/ μs) / 2
= Time / 58.82



www.HowToMechatronics.com

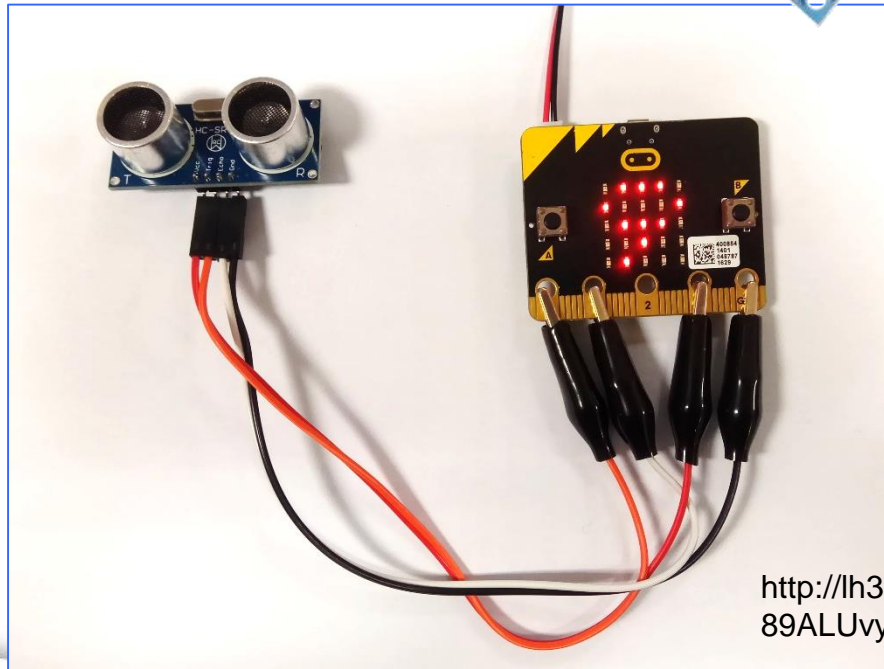
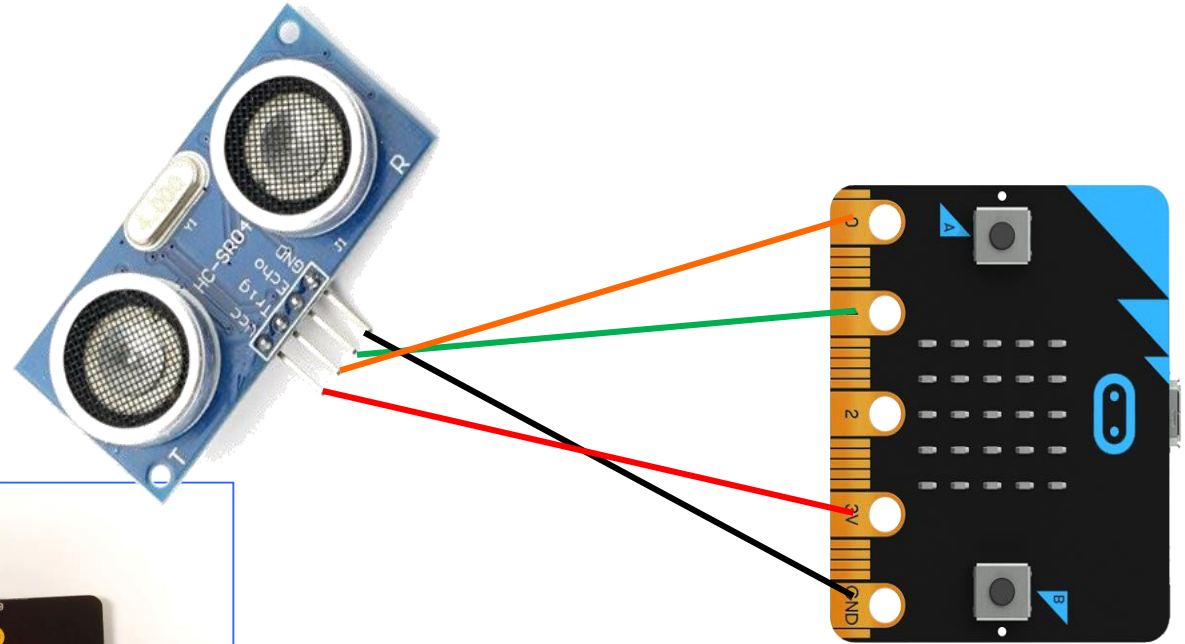
<http://howtomechatronics.com/tutorials/arduino/ultrasonic-sensor-hc-sr04/>

Ultrasonic Sensor

```
forever
  digital write pin P0 to 0
  wait (µs) 2
  digital write pin P0 to 1
  wait (µs) 10
  digital write pin P0 to 0
  set distance to (pulse in (µs) pin P1 pulsed high ÷ 58)
  show number distance
  pause (ms) 1000
```

10 µs of "1" to trigger an ultrasonic pulse

Ultrasonic Sensor



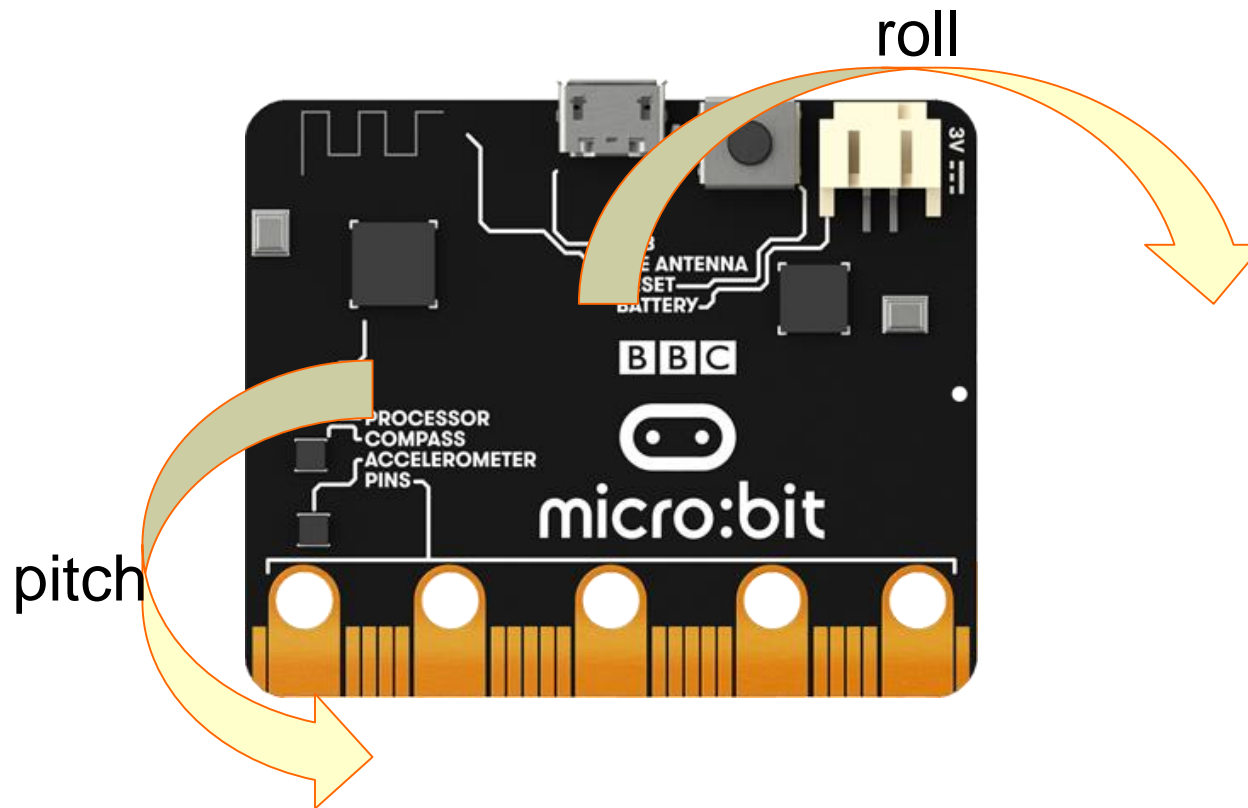
http://lh3.ggpht.com/-ydtR-QvsUv0/UFYSOIOyiWI/AAAAAAAAIa8/-89ALUvyc9Y/51tbSvuOcAL._SL500_SS500__thumb%25255B7%25255D.jpg

Mini-Project

- Connect 2 LEDs to your micro:bit
- Use another micro:bit to control which LED to turn on
 - a) by pressing A or B Button
 - b) by using accelerometer

Tips

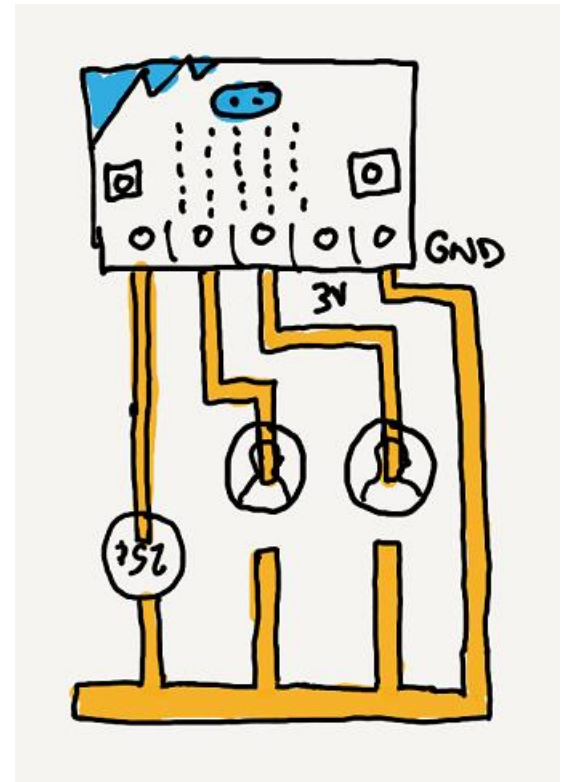
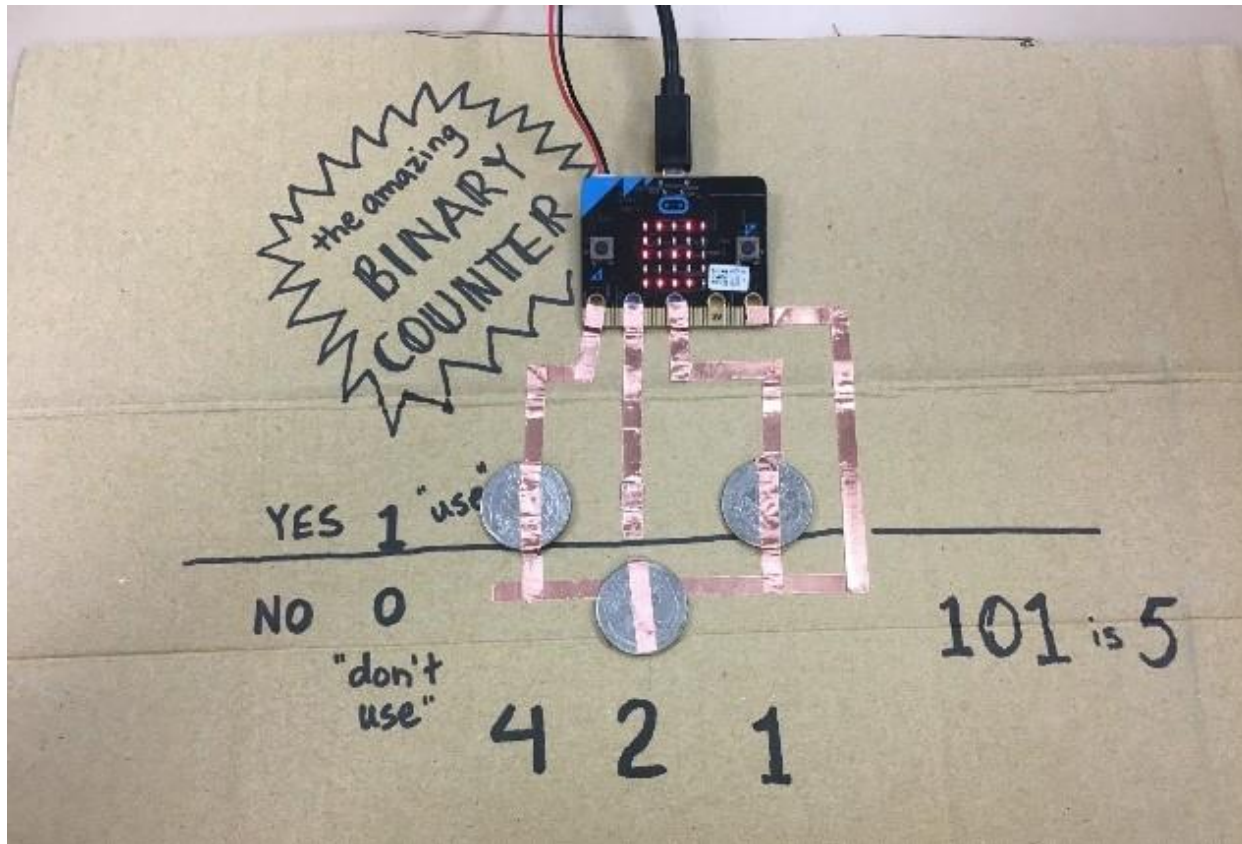
- By using Rotation in Accelerometer



<https://www.microbit.co.uk/functions/rotation>

Other Examples

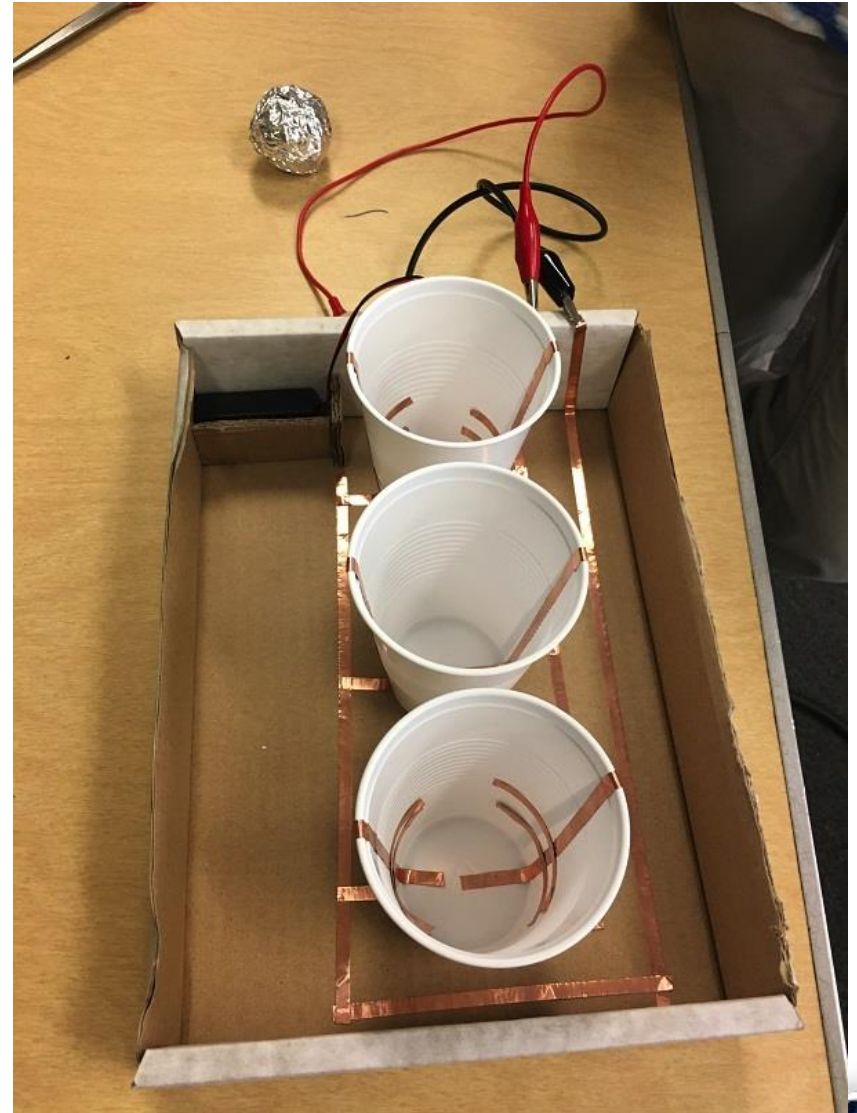
- 3-bit Binary Converter



<https://makecode.microbit.org/courses/csintro>

Other Examples

- Toss a Ball



References

- <http://tech.microbit.org>
- <https://makecode.microbit.org/courses/csintro>
- <https://makecode.microbit.org/22449-66025-47572-42128>
- <http://howtomechatronics.com>

Training Score Redeem Code

The screenshot shows the Microsoft Education website interface. At the top, there is a navigation bar with 'Microsoft', 'Store', 'Products', and 'Support' links, along with a search bar and a shopping cart icon. Below this is a secondary navigation bar with 'Education', 'School leaders', 'Educators', 'Students', 'Products', 'Training', 'News', and 'How to buy' options. A user profile for 'Eric Leung' is visible, including his name, location (TWGHs Lui Yun Choy Memorial College, Hong Kong), and subjects (Technology / Science / Math & Economics / Computer Science). A red box highlights the 'Promotion Code: EL7WU18018' at the top of the page. Below this, a 'Training Details' section is shown, with a red box highlighting the 'Promotion Code' field containing 'EL7WU18018'. The training details include: Topic: Other - Duration is from 1.51 to 3 hours; Training Start Date: 7/1/2017; Training End Date: 6/30/2018. An 'Events' table is also present, showing a single event with a start date of 12/1/2017, an end date of 12/1/2017, and 30 attendees.

Microsoft Education Community home

Hi, how can I assist you today?

Promotion Code: EL7WU18018

Eric Leung
TWGHs Lui Yun Choy Memorial College > Hong Kong > Hong Kong > Hong Kong
Subjects: Technology / Science / Math & Economics / Computer Science

Badges, points, and certificates

Courses and resources

Skype in the Classroom

Find, create, and share a lesson

Connect and share with educators

School Leaders Toolkit

Higher Education

SESSIONS I AM POSTING ATTENDEE LIST

Training Details

Promotion Code: **EL7WU18018**

Topic: Other - Duration is from 1.51 to 3 hours

Training Start Date: 7/1/2017

Training End Date: 6/30/2018

Events

Start Date	End Date	Event Name	Number of Attendees	
12/1/2017	12/1/2017	IT in Education Subject-related Series: Use of Office 365 for Education to conduct e-Learning in Mathematics classes (Secondary School)	30	View



Guide