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

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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)

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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
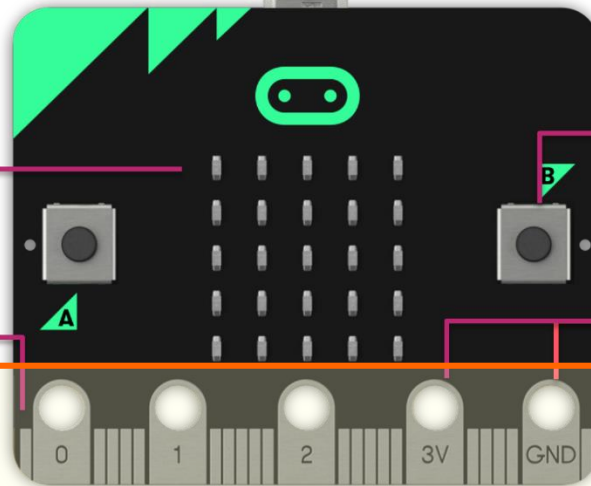
2.4GHZ Antenna
Bluetooth low energy
Gazell

Nordic nRF51822

Magnetometer
Freescale MMA8652

Acceleromater
Freescale MAG3110

Battery connector
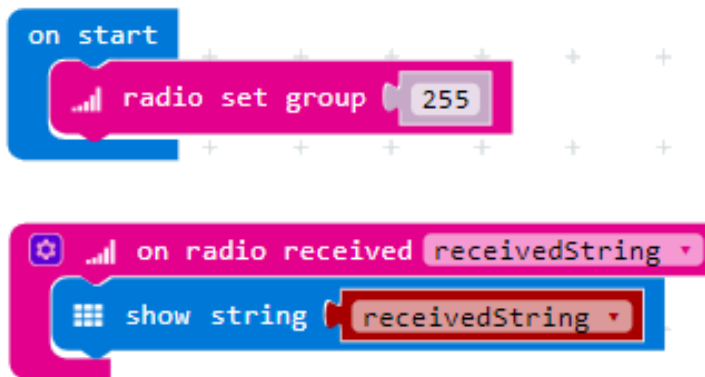JST connection for 3V

Reset Button

Freescale KL26Z
USB Interface chip

http://tech.microbit.org/hardware/
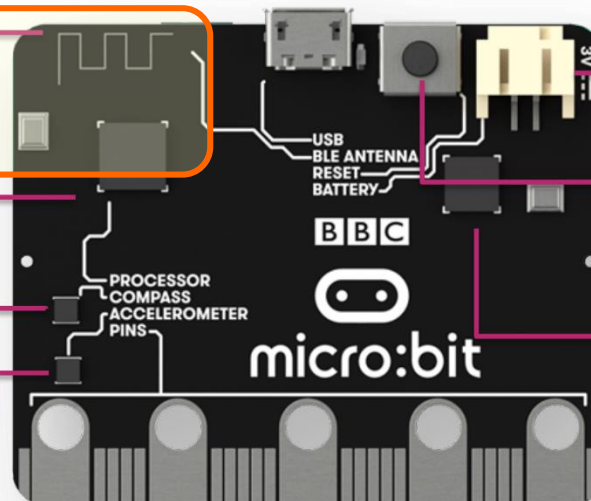
Activity 1: Radio

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

Send "42"

Receive "42"   Receive "43"

Send "43"

Sees the data, but does not know who sent it

https://lancaster-university.github.io/microbit-docs/ubit/radio/
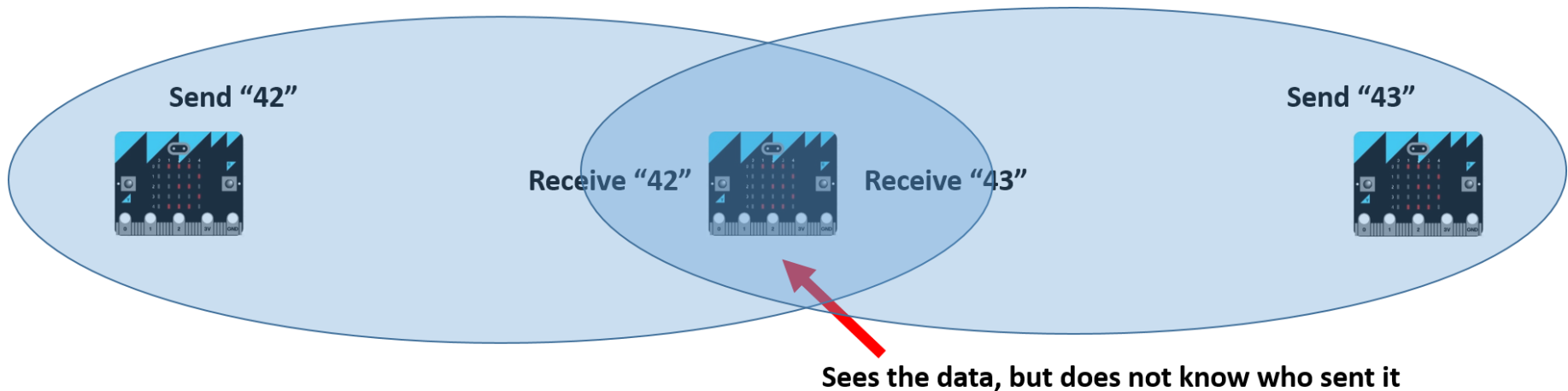
Activity 1: Radio

• Work in pairs

Host
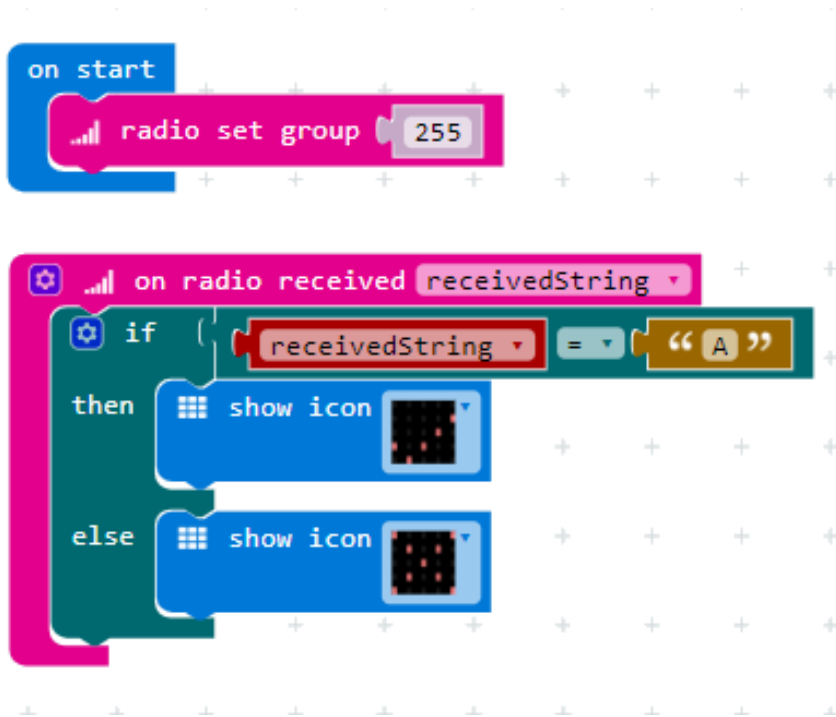
Device
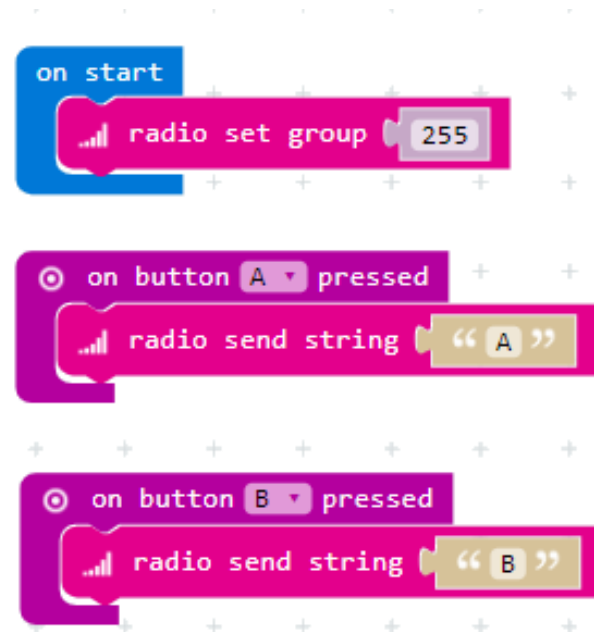
Activity 1: Radio

- ## Modified Version
  ### (What is the difference?)

Host

Device

Analog vs Digital Signal

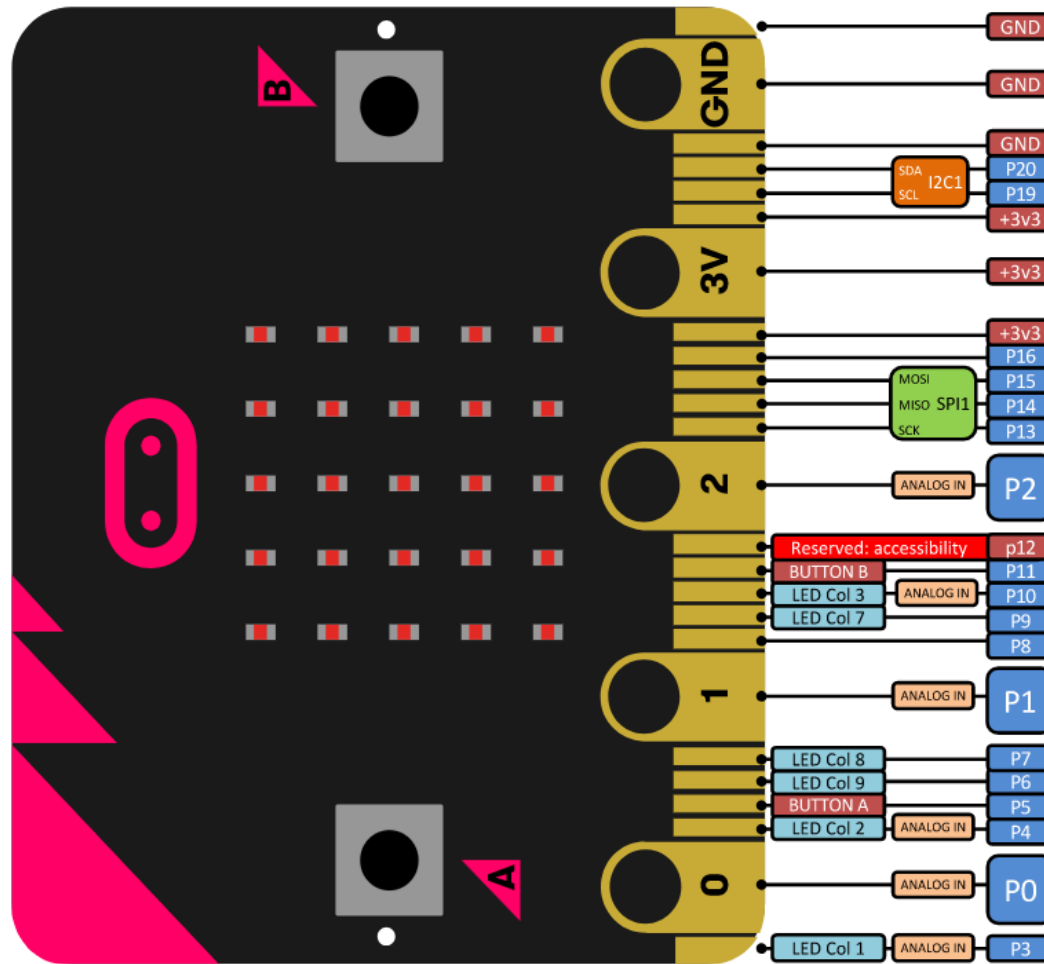- micro:bit uses different voltage level to represent different signal
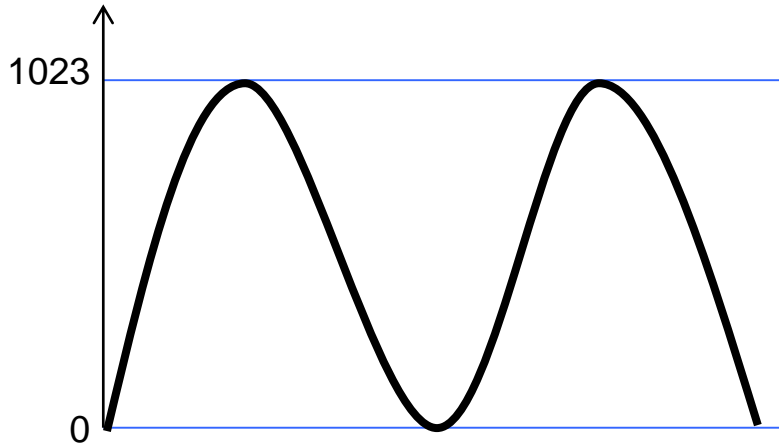
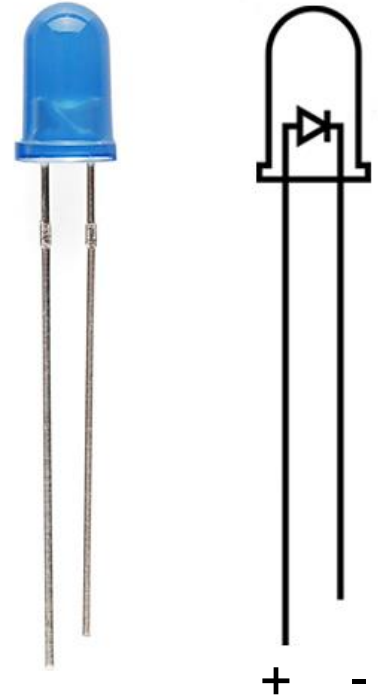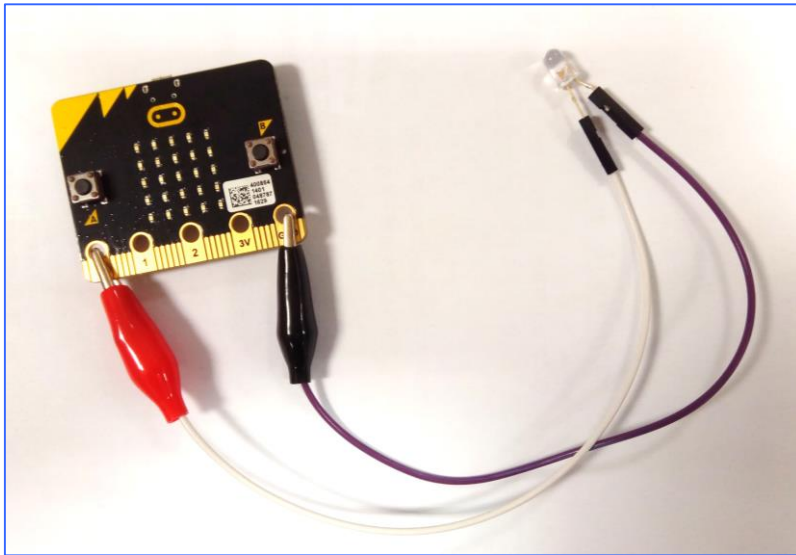Analog Signal
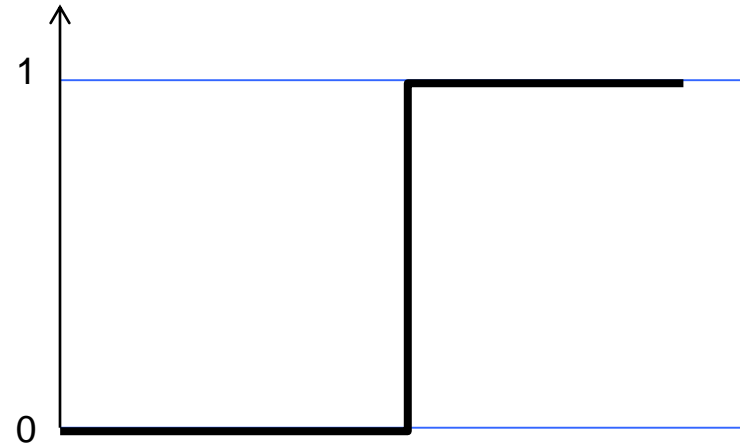
Digital Signal

Micro:bit Edge Connector

Activity 2: LED

- LED = Light Emitting Diode

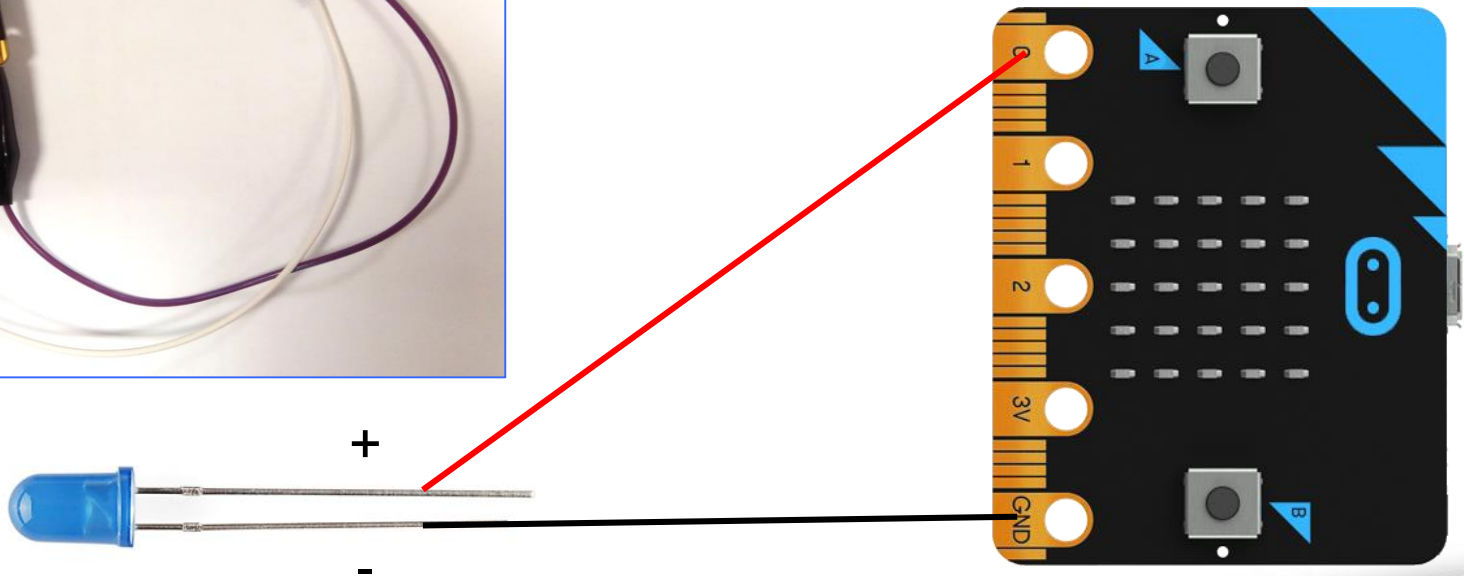- It is an energy-saving light emitting device, which allow current only in single direction.

+   -

https://cdn.sparkfun.com/assets/1/6/5/a/4/51f1d3a2ce395fd720000008.jpg

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Activity 2: LED
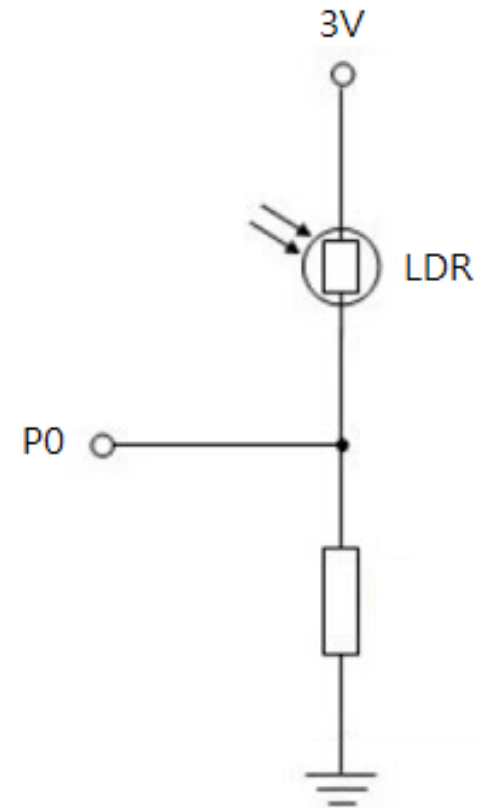
- Make sure the code is consistent with the wiring connections


```
on button A pressed
    digital write pin P0 to 1
```
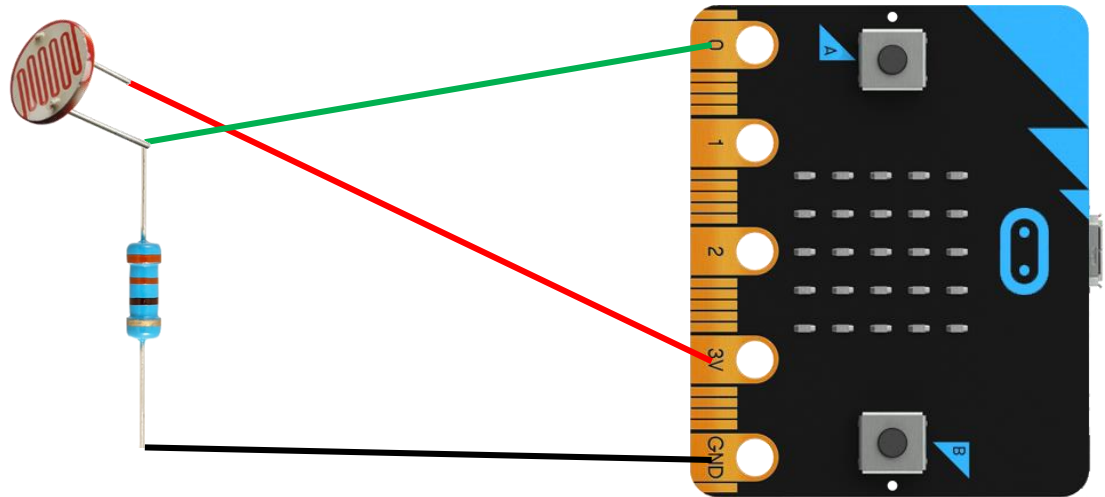
```
on button B pressed
    digital write pin P0 to 0
```
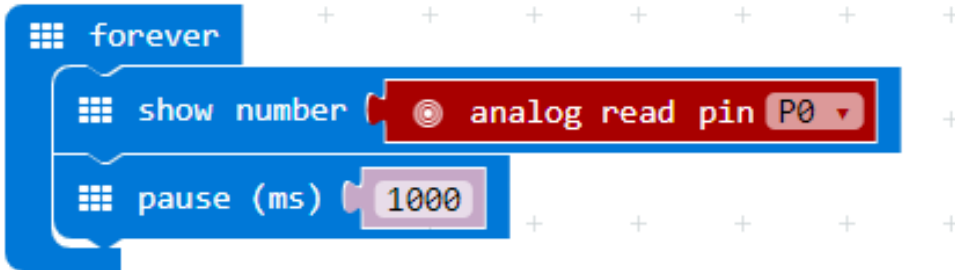

+

-

Activity 3: LDR

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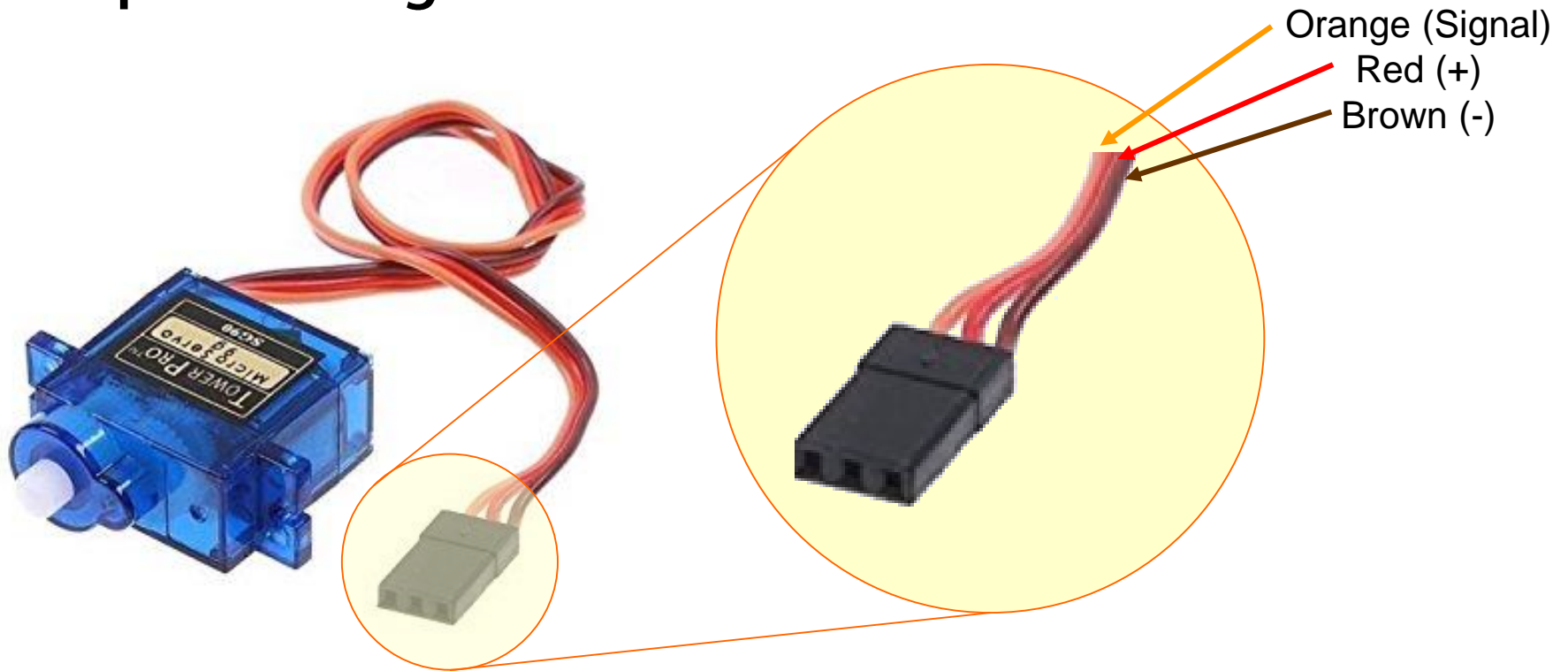- Cannot measure the resistance directly using micro:bit

3V

LDR

P0

Activity 3: LDR

Servo Motor

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

Orange (Signal)
Red (+)
Brown (-)

Servo Motor

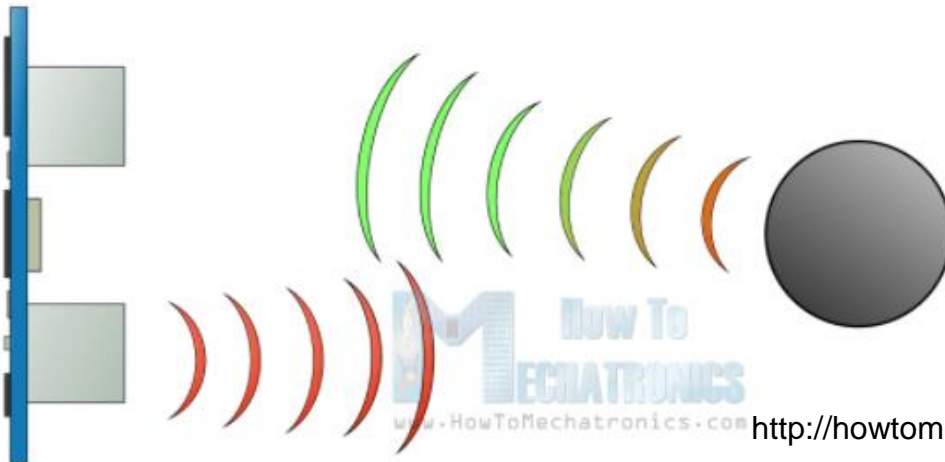- **May not work perfectly (Why?)**
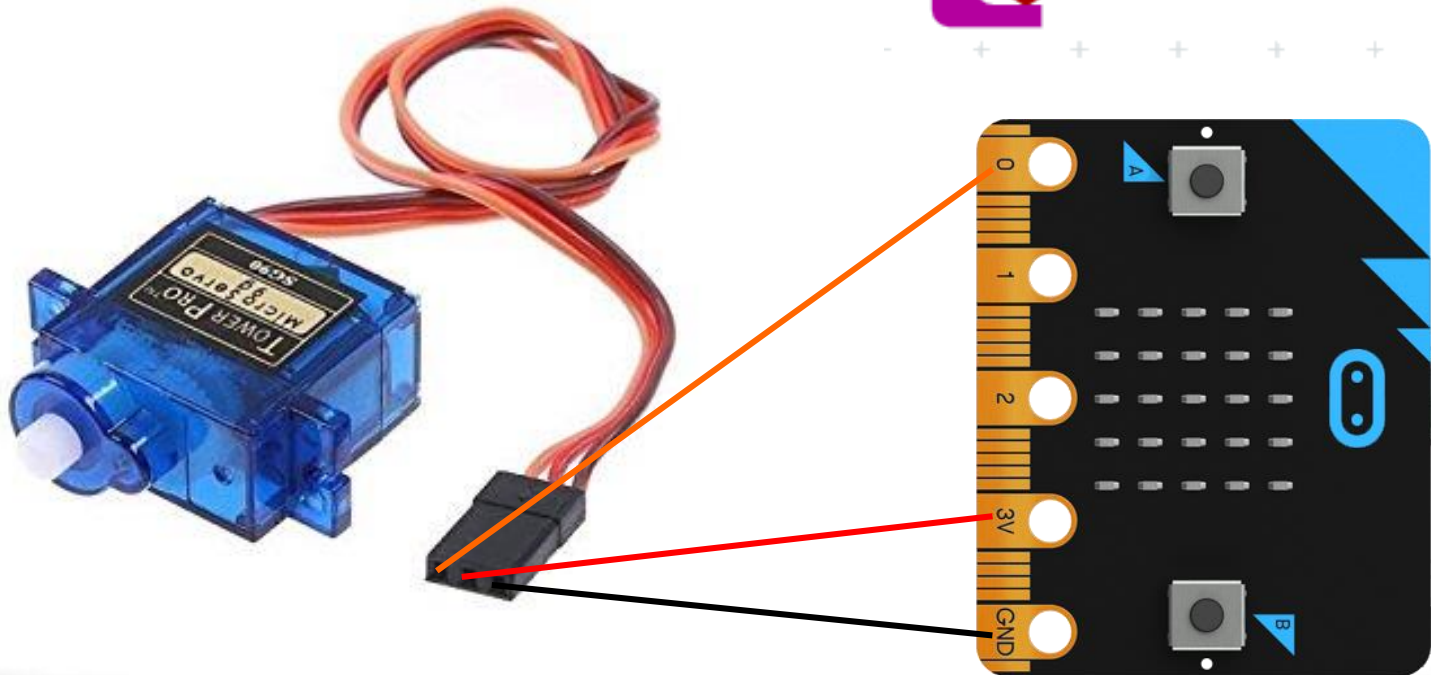
Ultrasonic Sensor

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

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Ultrasonic Sensor

- It is given that the speed of sound wave in air = 340 m/s

- Distance (cm) = Time (μs) * 340 (m/s) / 2

  $\quad\quad\quad\quad\quad$ = Time (μs) * 0.034 (cm/μs) / 2

  $\quad\quad\quad\quad\quad$ = Time / 58.82

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

Ultrasonic Sensor

10 µs of "1" to trigger an ultrasonic pulse

https://makecode.microbit.org/22449-66025-47572-42128
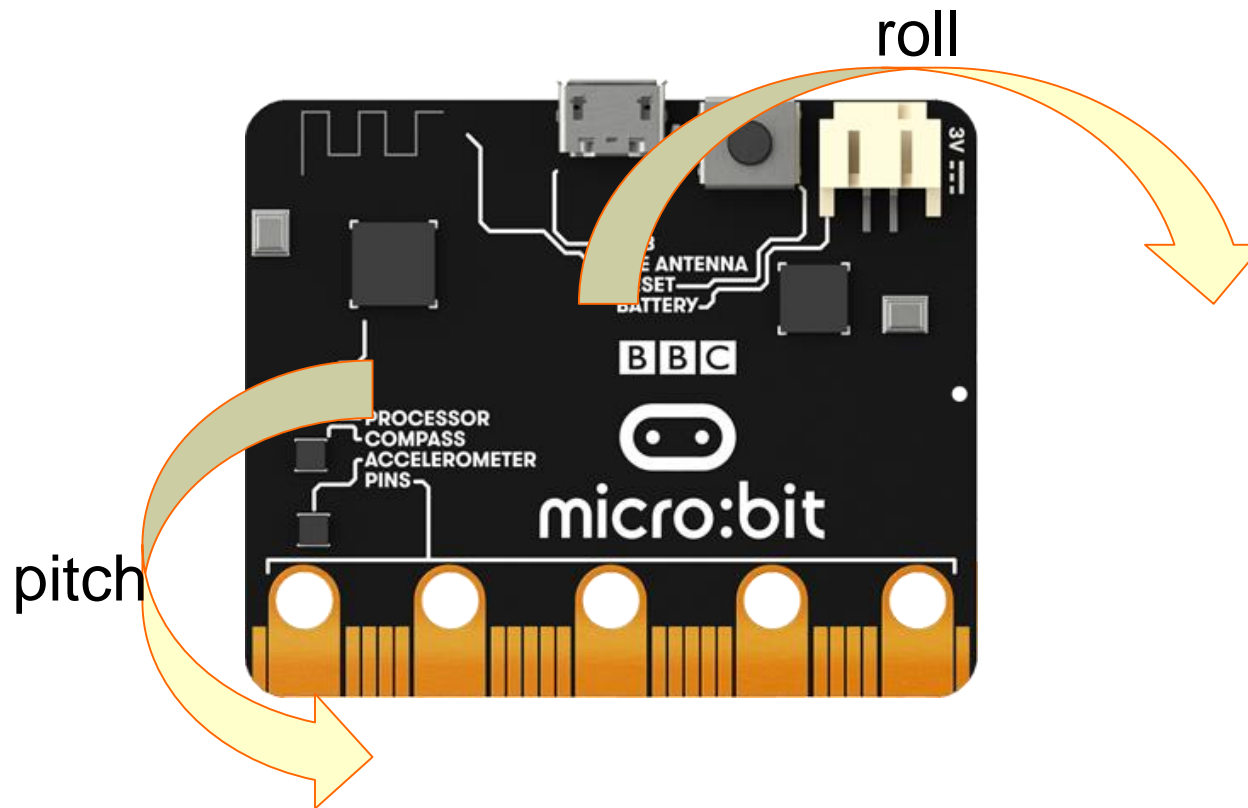
Ultrasonic Sensor
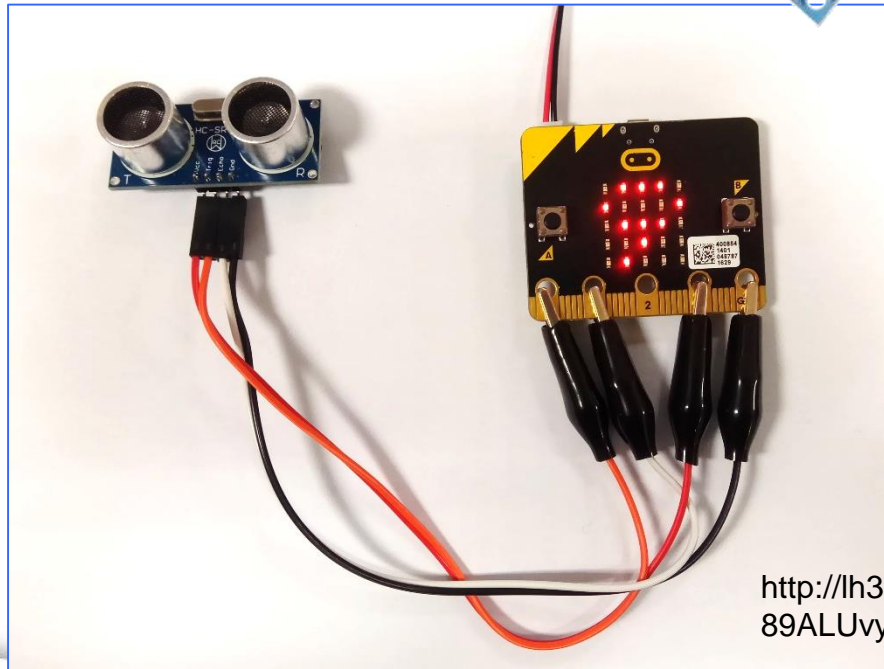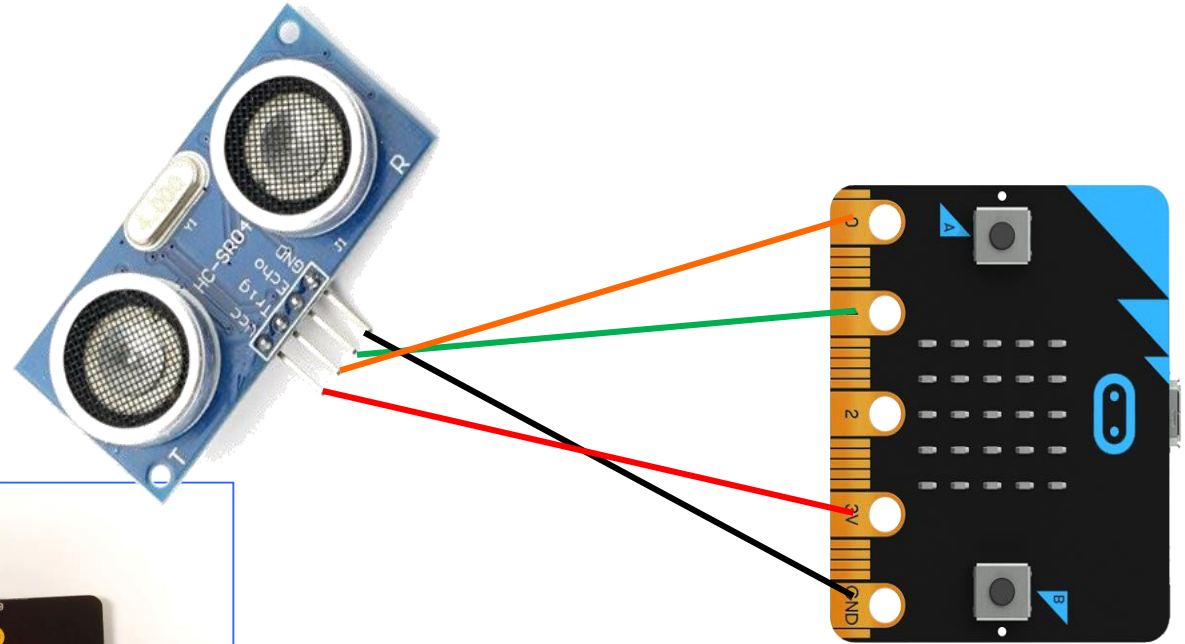
http://lh3.ggpht.com/-ydtR-QvsUv0/UFYSOlOyiWl/AAAAAAAAIa8/-89ALUvyc9Y/51tbSvuOcAL._SL500_SS500__thumb%25255B7%25255D.jpg

Mini-Project

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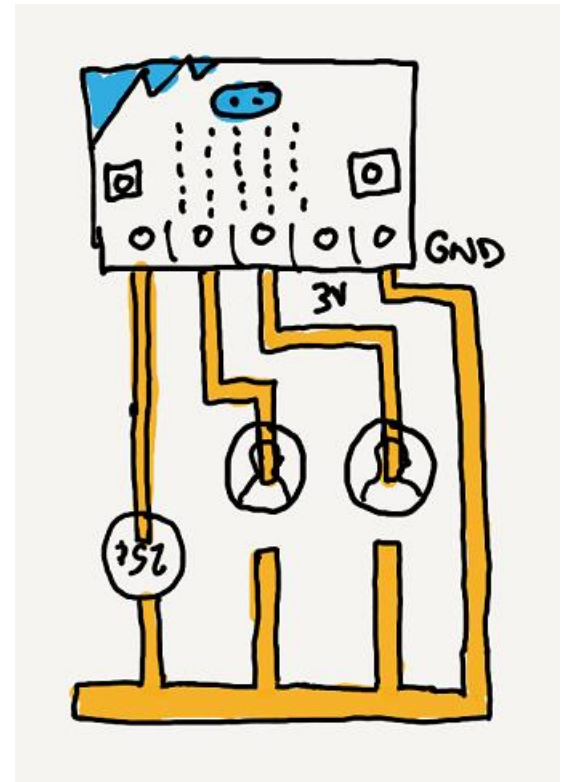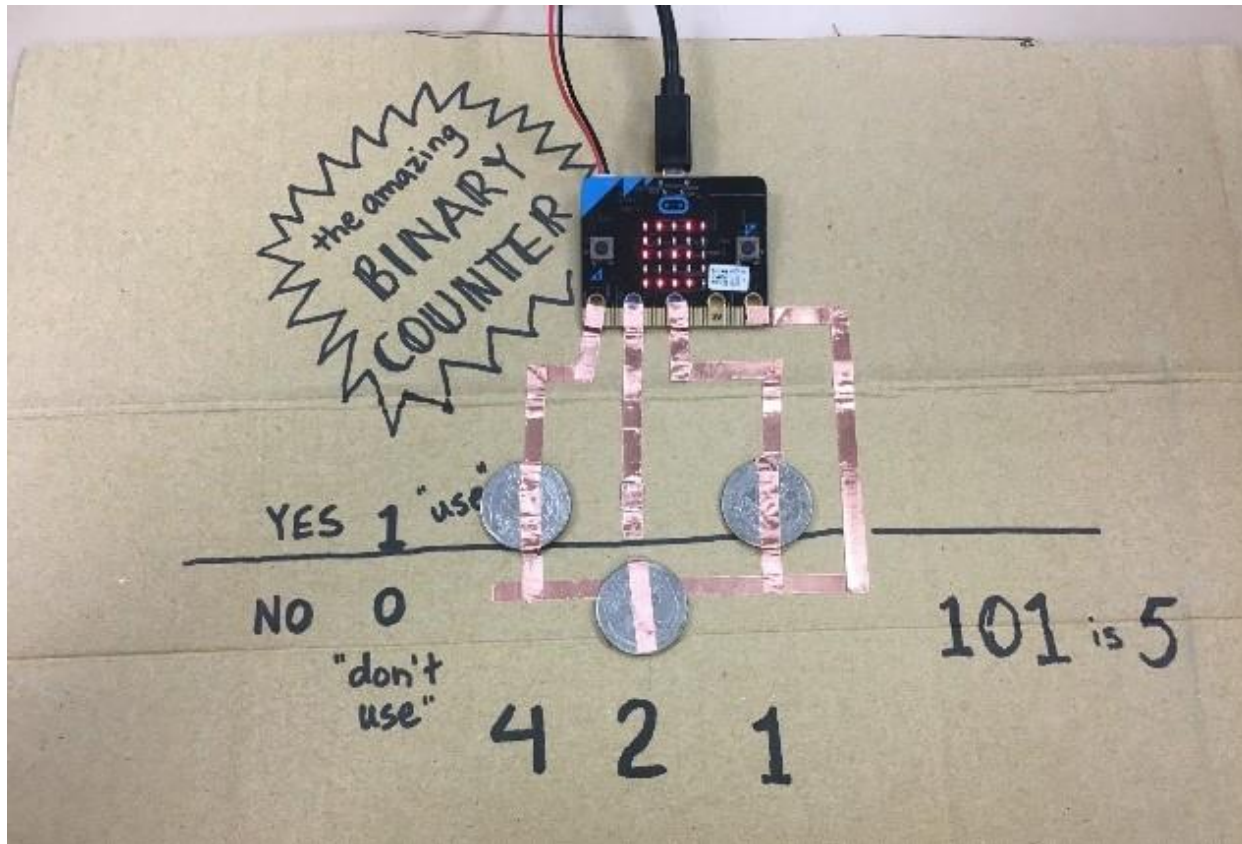   a) by pressing A or B Button
    b) by using accelerometer
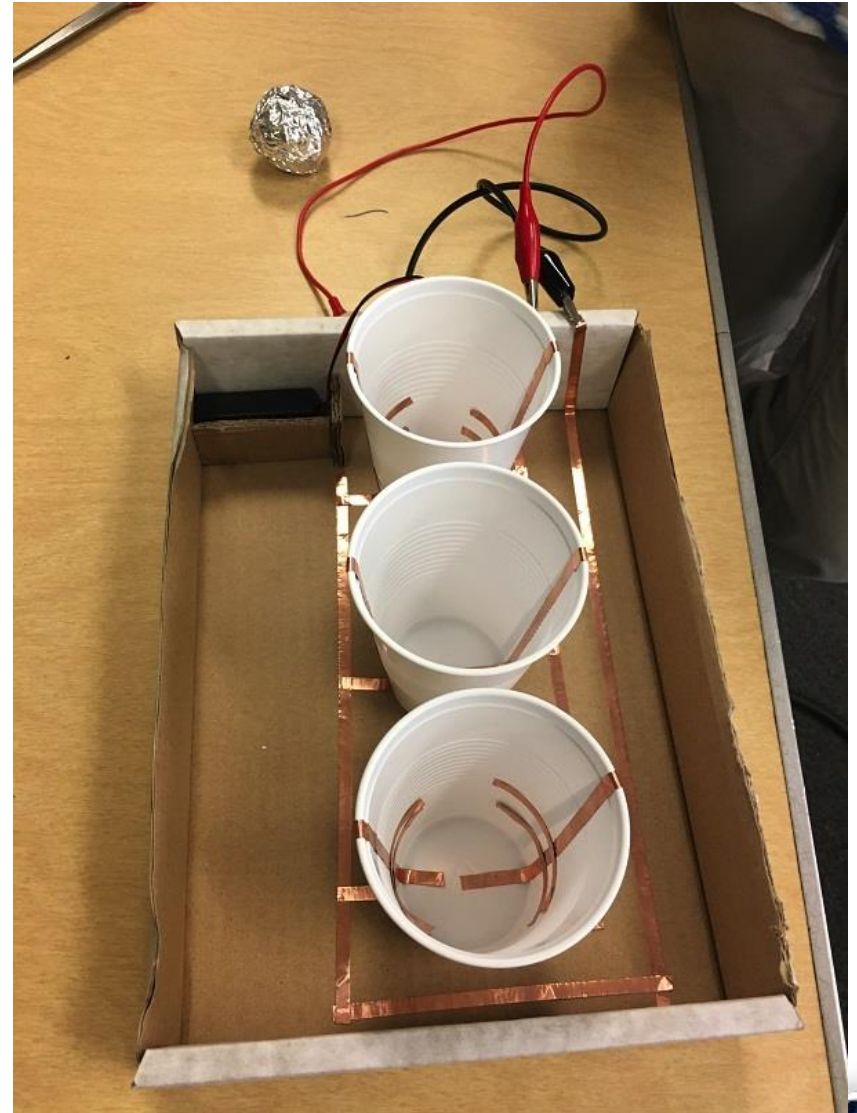
Tips

- **By using Rotation in Accelerometer**

roll

pitch

Other Examples

- 3-bit Binary Converter

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

Other Examples

- Toss a Ball

fppt.com

References

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

fppt.com

Training Score Redeem Code

Guide