

# Microcontrollers

# What is a microcontroller?

A microcontroller is a compact microcomputer designed to govern the operation of embedded systems in motor vehicles, robots, office machines, complex medical devices, mobile radio transceivers, vending machines, home appliances, and various other devices.

A typical microcontroller includes a processor, memory, and peripherals.

# Example microcontrollers

- Arduino
- ESP8266
- Code Bug
- micro:bit

# Why use an Arduino microcontroller

- Boot up instantly
- Can power off without harm (don't have to shutdown)
- An Arduino can provide 20mA per GPIO (RPi is 16mA, 50mA total)
- Arduino has 5V GPIO (RPi has 3.3V)
- Arduino has analogue and digital GPIO
- Very low power (perhaps 20mA - less if sent to sleep)
- Very cheap

# When might we use a Pi

- If we need a camera
- If we need a database
- If we need a complex display (e.g. HDMI or a 2.8" display with 320x240 16-bit color pixels and a resistive touch overlay)
- If we need a web browser
- If we need to make use of an operating system for some tasks
- If we need to store and/or manipulate/crunch a lot of data
- If we need lots of processing power (e.g. for optical recognition - like OpenCV)
- If we need to multi-thread.

micro:bit exercise

# Arduino Exercise

# Blink (aka “Hello World”)

1. Click Menu > Programming > Arduino IDE
2. Connect your Arduino to the Raspberry Pi using the USB cable
3. In the Arduino IDE, you need to select the arduino and serial port
  - a. Click Tools > Board > Arduino Pro or Pro Mini (5v, 16MHz) ATmega328
  - b. Click Tools > Serial Port > /dev/ttyUSB0
4. Load the Blink program into the IDE
  - a. Click File > Examples > 01.Basics > Blink
5. Upload the code onto the Ardunio
  - a. Click on the “arrow” to the right of the “tick” (under Edit)
6. The Arduino on-board LED should flash once a second