Hands-on Games Design

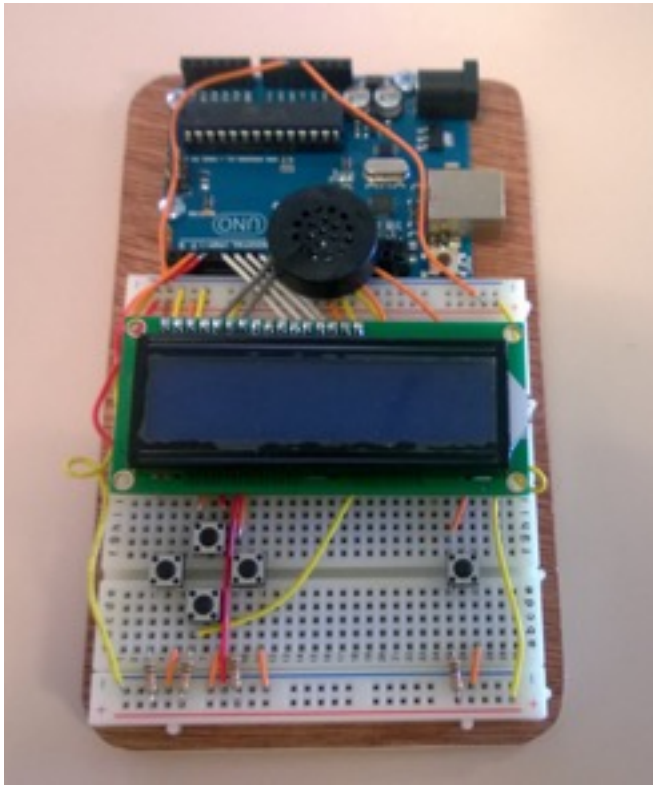
Arduino console game competition

Cameron & Tim

TASK

TASK

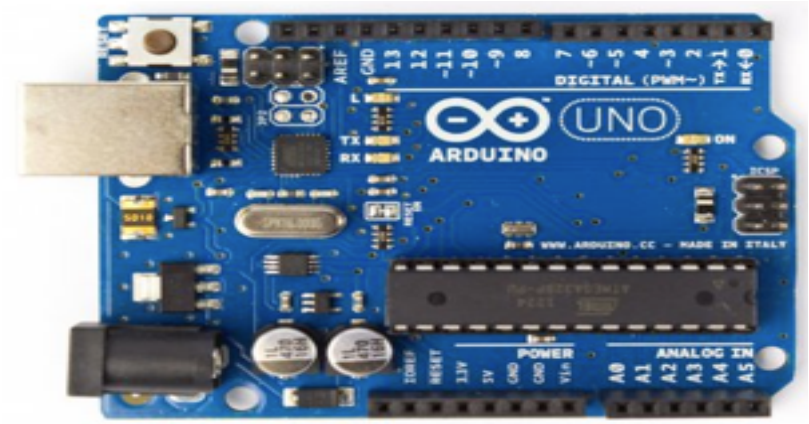
- Groups of 5 to 10
- Extend an Arduino games console prototype
  - Hardware & software



BASICS

Setting up the Arduino

- Arduino is an open-source electronics prototyping platform based on flexibility.



- Plug in USB to power and program

IDE – ‘Arduino’

- Already installed (or on memory stick)

SOFTWARE

Setup and Loop

setup used to initialize variables, pin modes etc. The setup method will run once after you have turned on or reset the Arduino board.

loop loops perpetually, allowing your program to change and respond.

```
const int buttonPin = 3;

// setup initializes serial and the button pin
void setup()
{
  Serial.begin(9600);
  pinMode(buttonPin, INPUT);
}

// loop checks the button pin each time,
// and will send serial if it is pressed
void loop()
{
  if (digitalRead(buttonPin) == HIGH)
    Serial.write('H');
  else
    Serial.write('L');

  delay(1000);
}
```

Basic Program

- Arduino has its own language which is implemented in C/C++, however it is similar to Java.
- Example
  - **Loops**

```
while(expression){
    statement;
}

for(initialization; condition; increment){
    statement;
}
```

Conditional Statement

```
if(someCondition){
 do some stuff
} else {
do some stuff
}
```

SOFTWARE

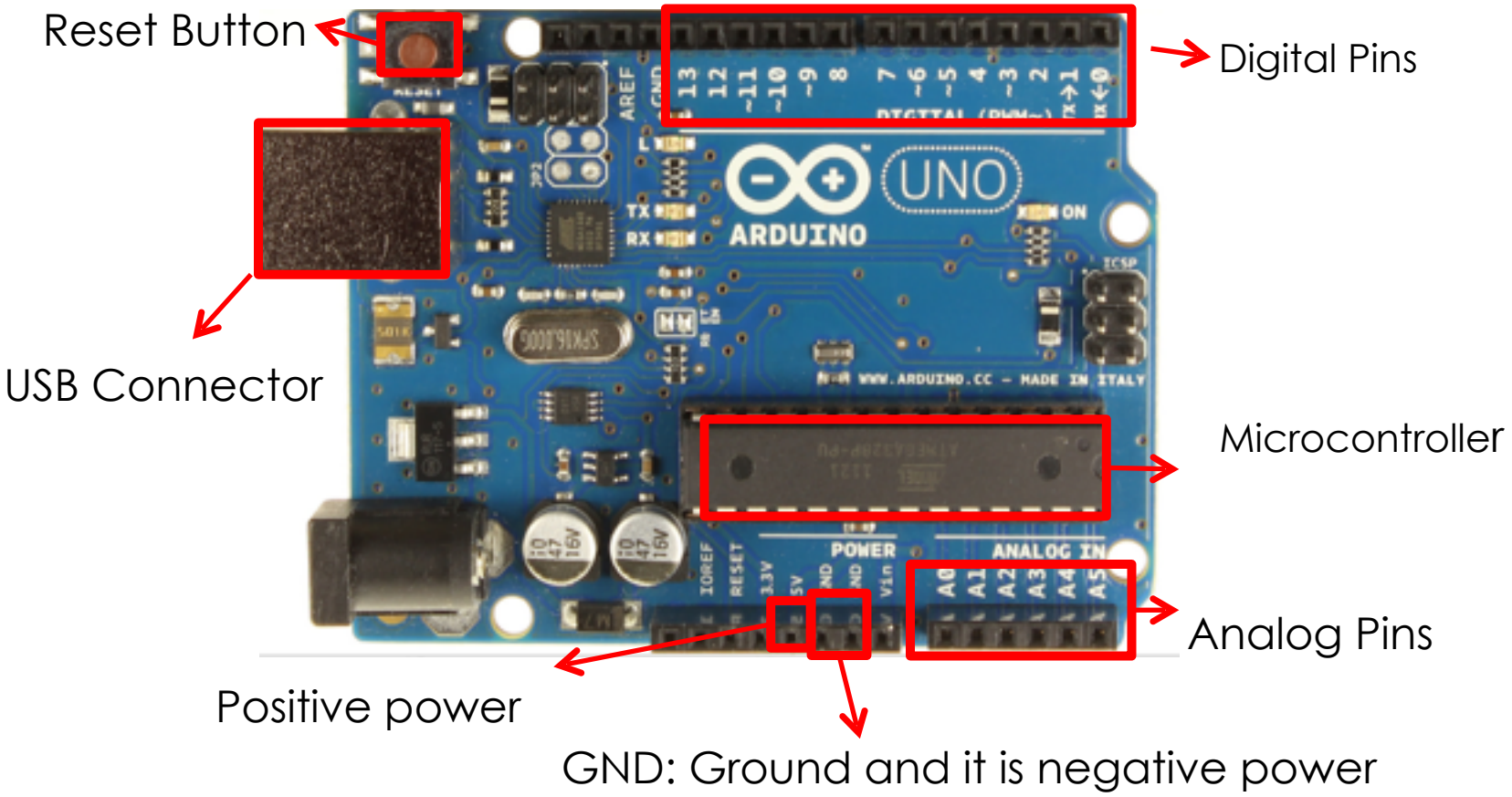
Compile and Upload

It compiles and then uploads the program to the Arduino

HARDWARE

HARDWARE

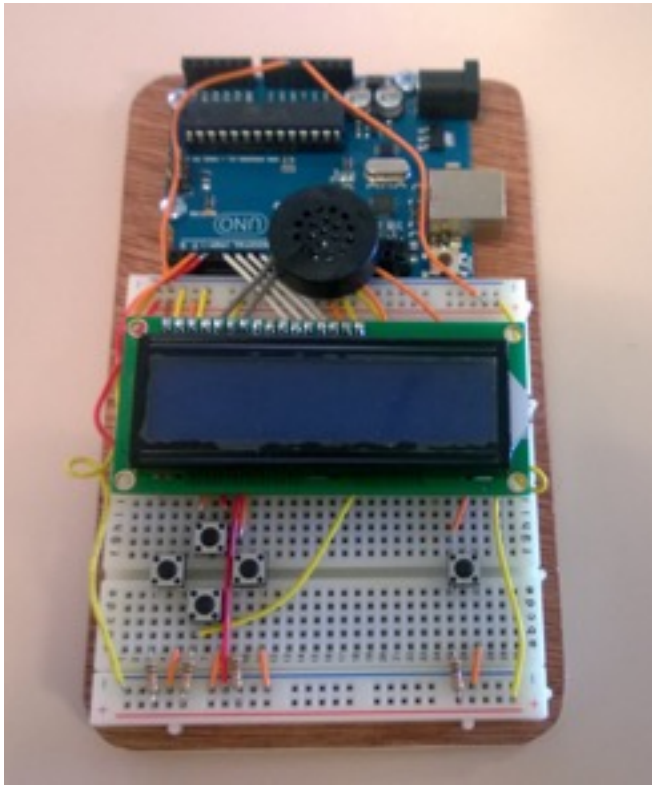
Arduino Board



HARDWARE

Breadboard & Circuits

- Positive and ground
- Wires and components clip in
- Power runs vertically, not horizontally



HARDWARE

Resistors

- **Resistors** are electronic components which control the amount of current in a circuit.

I (current) = V (voltage)/R(resistor)

- **Resistors** values are marked using colored band.

560Ω 1KΩ **10KΩ** 1KΩ

- **Resistors** are important because they deliver the right amount of energy to the electronic components.

E.g LED requires 23mA current what resistor should I use?

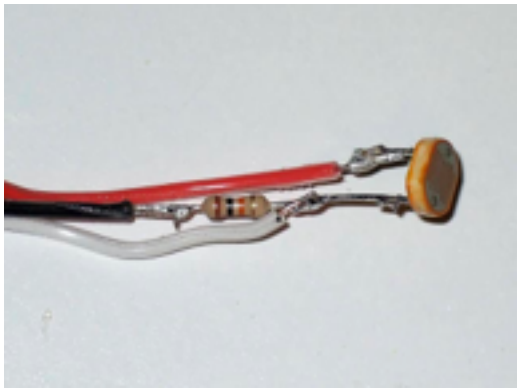
R = 5v /(23/1000)A = 220 ohm

HARDWARE

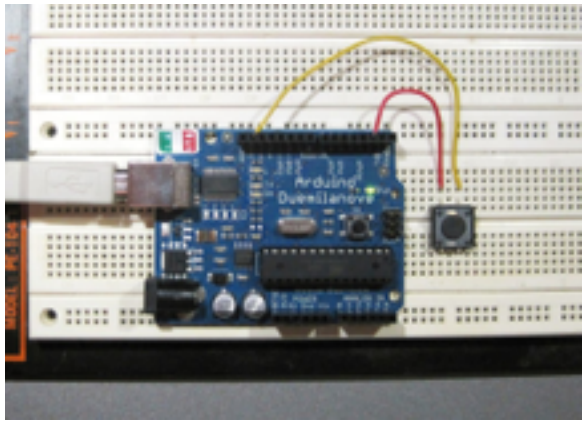
Digital vs Analog

- The main difference between analog and digital signal is that an analog signal is continuous and digital signal is discrete.
- Example

Arduino
Photoresistor



Arduino
Button



Digital - Inputs & Outputs

- Digital pins have two values, either High (positive voltage) or Low (ground). Digital pins on the Arduino can be configured as digital input or digital output.
  - Example

```
int ledPin = 13; // LED connected to digital pin 13
int inPin = 7;   // pushbutton connected to digital pin 7
int val = 0;     // variable to store the read value

void setup()
{
  pinMode(ledPin, OUTPUT);      // sets the digital pin 13 as output
  pinMode(inPin, INPUT);      // sets the digital pin 7 as input
}

void loop()
{
  val = digitalRead(inPin);   // read the input pin
  digitalWrite(ledPin, val);    // sets the LED to the button's value
}
```

Analog - Inputs & Outputs

- Analog pins will map input values between 0 and 5V into integers value between 0 and 1023.
  - Example

```
int ledPin = 9;       // LED connected to digital pin 9
int analogPin = 3;    // potentiometer connected to analog pin 3
int val = 0;          // variable to store the read value

void setup()
{
  pinMode(ledPin, OUTPUT);   // sets the pin as output
}

void loop()
{
  val = analogRead(analogPin);   // read the input pin
  analogWrite(ledPin, val / 4);  // analogRead values go from 0 to 1023, analogWrite values from 0 to 255
}
```

TASK

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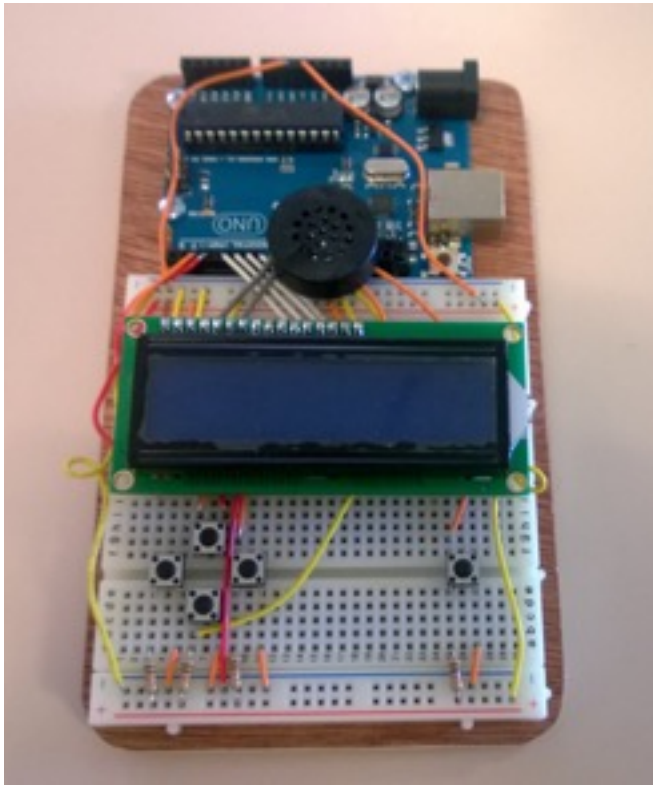
- Groups of 5 to 10
- Extend an Arduino games console prototype
  - Hardware
    - Digital
    - Analog
    - Design
  - Software

    Choice of 3 games



TASK

Live Demonstration

- Showcase your creation
- Judge's favorite

Prizes

- ???