Robotics 101: Workshop

Part III: Buzzers

KCL Robotics Society

Before We Start

- Have you signed up for KCL Robotics Membership via KCLSU? It's FREE!   https://tinyurl.com/y6pa9qyo
- Have you done attendance? Talk to one of our team members!
- Check if your computer has Arduino IDE installed. If not, download from here.
- Have you downloaded this presentation? Get it from the discord server!

Today's Goals

Base Tasks:

- Turn on buzzer with code.

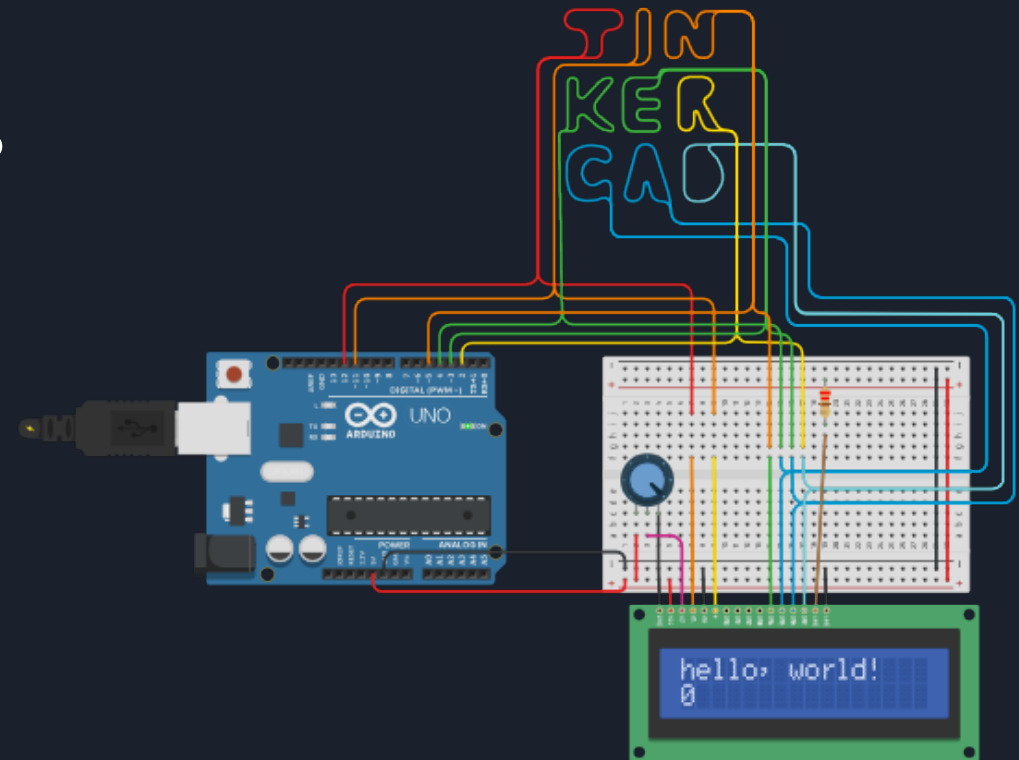- Programming different sounds using different voltages.

Challenge Task:

- Make a song with it or make buttons play different notes like a piano/keyboard.
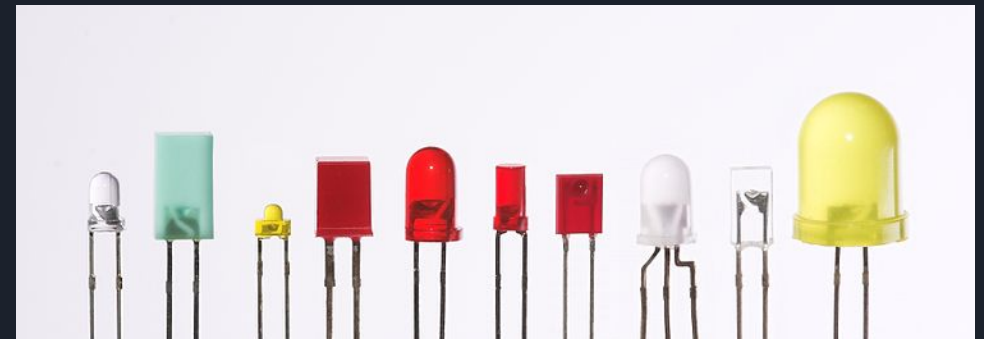
What is Tinkercad?

- Tinkercad is an online software that can be used to simulate electronic circuits.

What is a LED?

- LED stands for Light Emitting Diode.
- It is a component that emits light when a sufficient voltage is applied across it.

What is an Arduino?

- An Arduino is a microcontroller that can be used to control electronic components.
- It does this by using the pins to either output voltage or detect inputted voltage.

Voltage and Binary

- In binary, there are two digits, 0 and 1. 0 represents off and 1 represents on.
- We can map this to two different voltages, 0V and 5V. Therefore a binary value of 0 would be considered 0V, and a binary value of 1 would be 5V.
- When programming the arduino, they refer to 5V as HIGH and 0V as LOW instead of binary values.
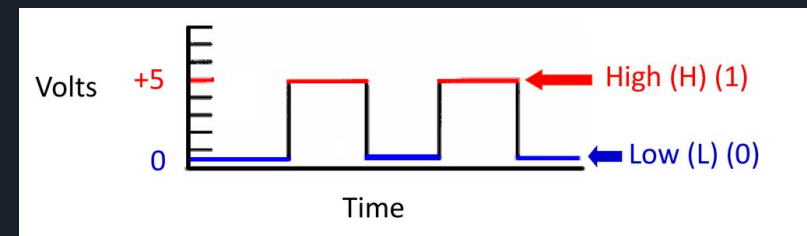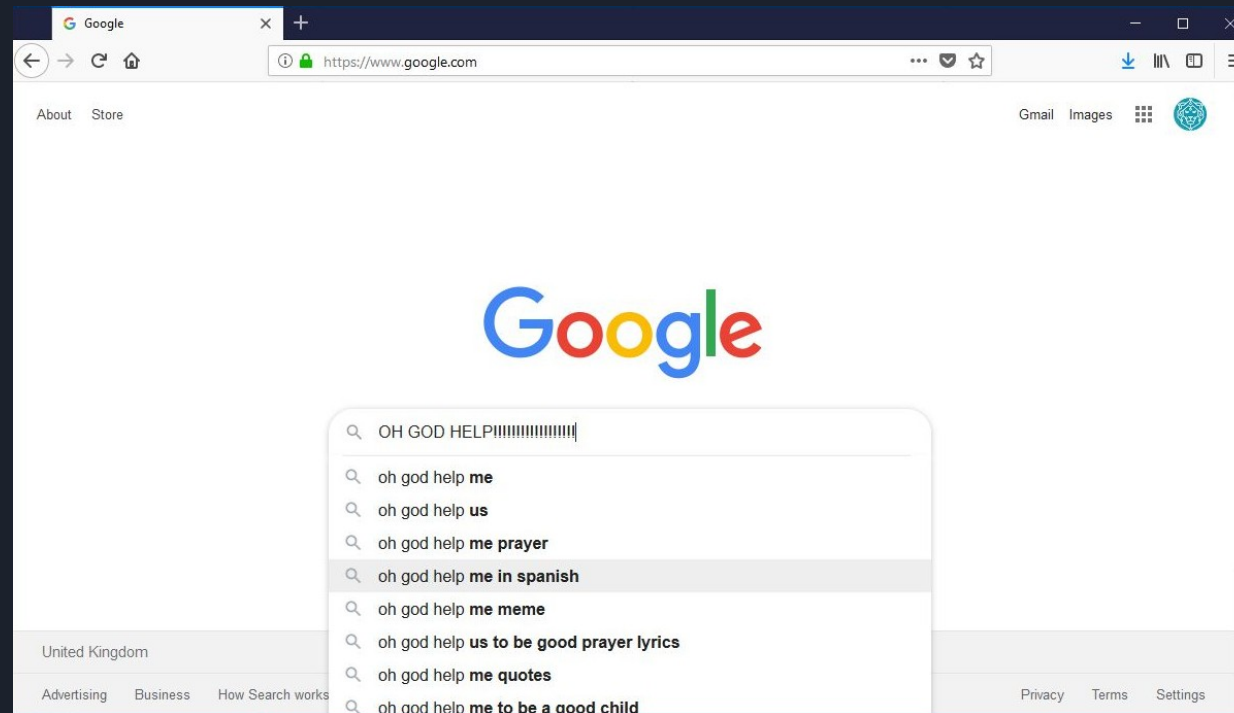
Ohm's Law

- Ohm's Law states that voltage is equal to current times resistance.
- This means we can limit the amount of current in a circuit by using resistance
- This is great because we can avoid killing components!

$$I = \frac{V}{R} \quad \text{or} \quad V = IR \quad \text{or} \quad R = \frac{V}{I}$$

Confused? Just Google It!

Buzzers

"An audio signaling device"

Three types of Buzzers

- Electromechanical.
- Mechanical.
- Piezoelectric.

In Tinkercad, this refers to a component called Piezo.

Applications of buzzers

- Alarm devices.
- Judging panels.
- Annunciator panels.
- Microwave ovens and other household appliances.
- Sporting events such as basketball games.

Let's Get Our Hands Dirty!

Resources to help yourself finish today's tasks:

- Arduino coding basics: https://tinyurl.com/y5u8wreh
- Circuits and breadboard basics: https://tinyurl.com/y5u8wreh
- Anything else:Google!

Base task (1):
Turn on buzzer with code.

- Use Arduino Breadboard.
- Don't forget to include a resistor in your circuit.
- Choose a digital pin for the buzzer.
- Connect the buzzer to your circuit in the right pin.
- Make sure to add a delay in your code and connect the Breadboard to the ground (GND).

Two main functions

Arduino programs have two basic functions that are automatically created for you.

```
//runs only once, at the very beginning of the program
void setup( ) { }

//runs in a loop continuously every 30ms
void loop() { }
```

Actual Implementation

```
void setup()
{
  pinMode(7, OUTPUT);
}

void loop()
{
  tone(7, 200, 100);
    delay(1000);
}
```

tone(pin number, pitch, sound length)

Base task (2):
Programming different sounds using different voltages.

- You can use the previous circuit and modify the resistance value.
- Or change the second parameter value within the tone() method.

Challenge task:
Make a song or make buttons play different notes like a piano/keyboard.

You can make whatever you wish here.
An example here will be making an Arduino Piano, here are some tips:

- Firstly use the largest Breadboard.
- As piano has seven notes you need seven buttons (or eight if you want to step into the first note of the next cycle).
- In your code, make sure to initialise the buttons/buzzer pin values and declare those pins as INPUT and OUTPUT before doing the actual implementations.
- Add a delay for the sake of sound quality.

Thanks for listening!!!
Any Questions?