PROTOTYPE SIMULATION & HOW TO GUIDE

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CONTENTS

SIMULATION SOFTWARE

IoT simulation software or web sites provides the user to create and simulate IoT systems without having to program or needing the physical device. Most software provides almost every IoT device available in the market and some services have the ability to reprogram the sensors. This report investigates Proteus software and Tinkercad IoT builder web site.

TINKERCAD

Tinkercad is a 3D modelling program on web made by AutoDesk (Autodesk, 2022) that also allows to create and simulate IoT system. However, it does not have a large variety of sensors and devices available.

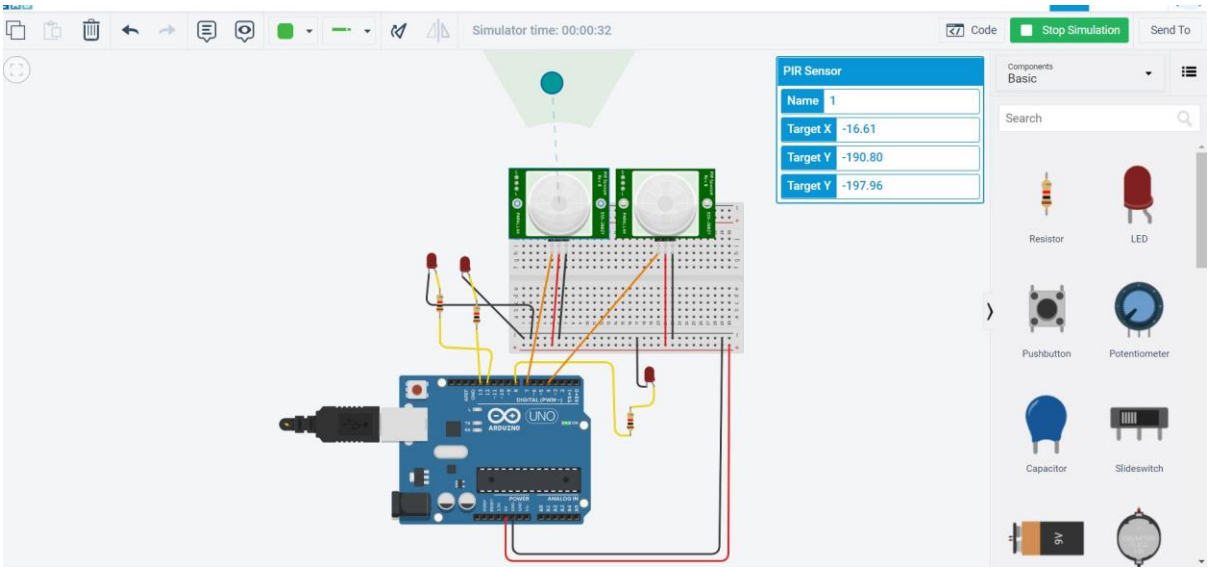

FIGURE 1 TINKERCAD SIMULATION

Because of the popularity for 3D models and the lack of available equipment, Tinkercad is mostly used in school to teach the basics of 3D modeling and circuit building.

PROTEUS SOFTWARE

Proteus (Proteus, 2022) is an IoT builder that can be used to design IoT systems with Arduino and Raspberry pi. Unlike Tinkercad, proteus has almost every sensor and other equipment used in building IoT systems. The range of features include Front Panel Design, Program control, Access control, Simulate, Debug, Deploy, Message logs and Graphing elements.

Front panel design lets the user to create a GUI to control the system once it has been built. This is similar to real life simulation. Program control allows to program the sensors using flow charts without needing the knowledge of creating functions using programming languages. Once the IoT application has been created, using access control, user can add a login control to decide who can access it.

The circuit built with proteus has the complete embedded systems workflow which allos to create schematic to PCBs. By simulating the circuit, user can identify faults and debug the program and change the circuit without having the real-life struggle of removing wires and dismantling the whole circuit. It also provides MQTT (Message Query Telemetry Transport) service to allow control and communication between multiple IoT devices or with an IoT device and a computer. Once the circuit is completed, it can be deployed to a physical hardware such as Arduino or Raspberry pi and function the IoT system.

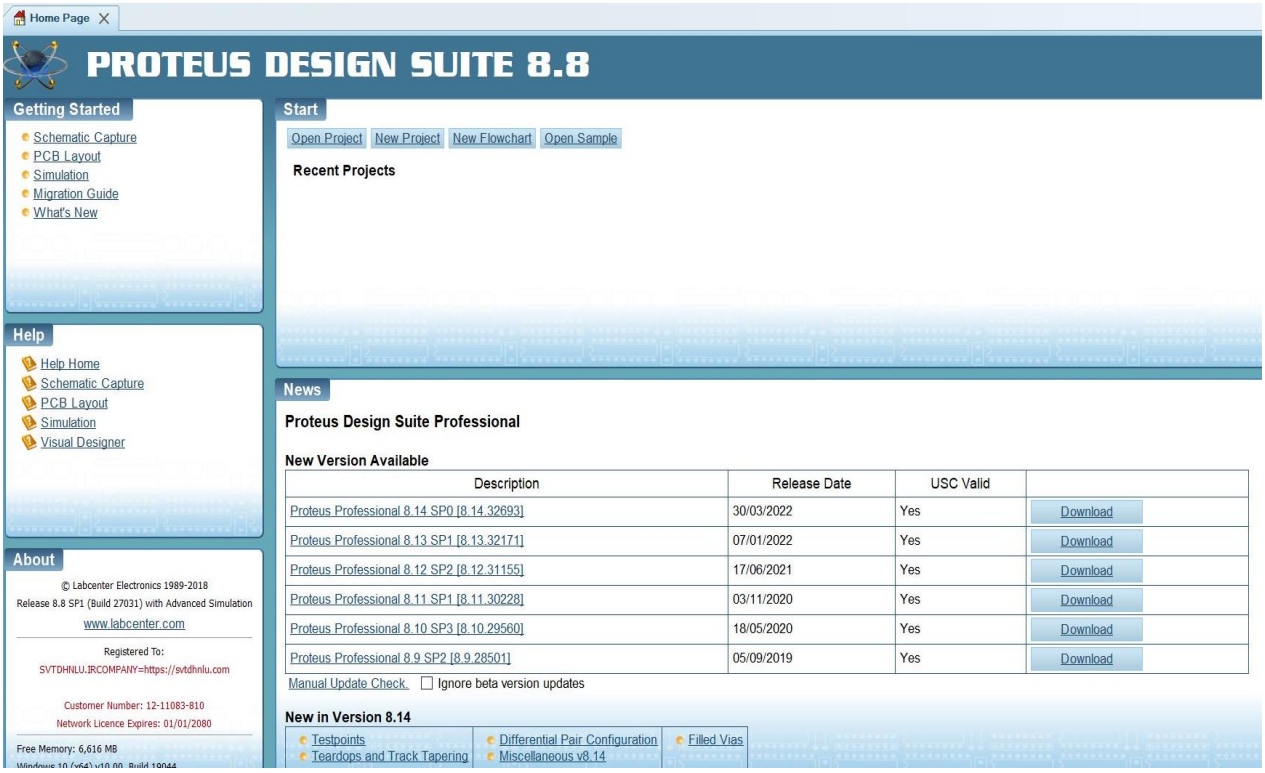

FIGURE 2 PROTEUS SOFTWARE

CONNECTING SENSORS

This project will be using Arduino as the microcontroller to create a functional IoT system. The following pages will include instructions on how to connect the list of chosen sensors to Arduino and Particle devices.

ESP8266

FIGURE 3 EPS8266 PINS

1. ESP8266 Wi-Fi module **Tx** Pin with **D2** of Arduino
2. ESP8266 Wi-Fi module **CH-EN** Pin with **3V** of Arduino
3. ESP8266 Wi-Fi module **Vcc** Pin with **3V** of Arduino
4. ESP8266 Wi-Fi module **GND** Pin with **GND** of Arduino

5. ESP8266 Wi-Fi module **Rx** Pin with **middle point (Junction point of series 1k and 2k resistor) of Voltage divide**r.
6. **Second end of 1k resistor** with **D3** of Arduino.
7. **Second end of 2k resistor** with **GND** of Arduino.

FLEX SENSOR

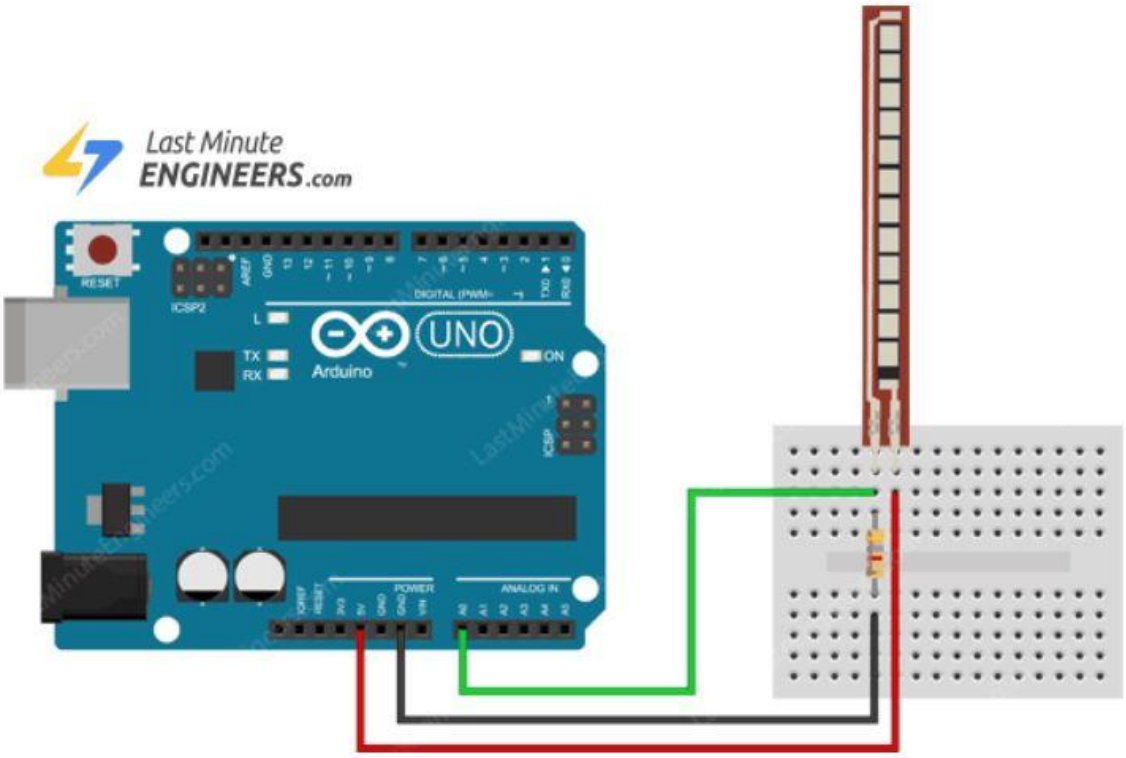

FIGURE 4 FLEX SENSOR

1. Connect a **47kΩ resistor** to **one of the pins** on the flex sensor
2. Connect **A0** to **the resistor** and the **end of the flex sensor** the **resistor is connected** to
3. Connect the **other end** of the resistor to **GND** pin on Arduino Uno
4. Connect the **other pin** of **the flex sensor to 5V pin** on Arduino Uno

MPU6050

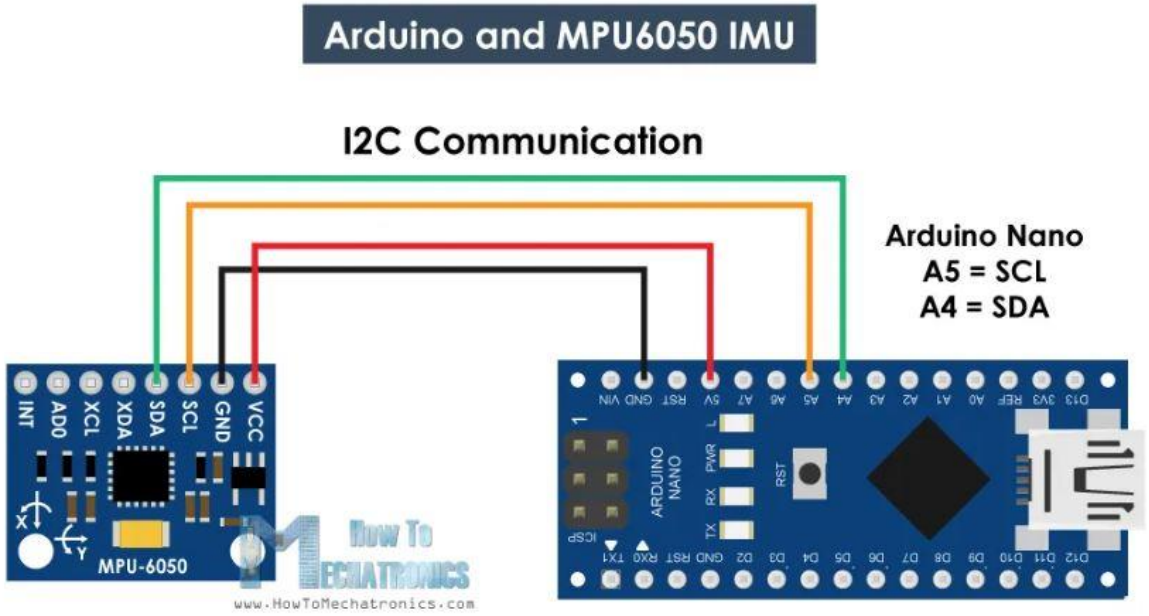

FIGURE 5 MPU6050 WITH ARDUINO

1. Connect **SCL** pin to **A5** on Arduino
2. Connect **SDA** pin to **A4** on Arduino
3. Connect **GND** pin to **GND** on Arduino
4. Connect **VCC** pin to **3.3V** on Arduino

HC-SR04 ULTRASONIC SENSOR

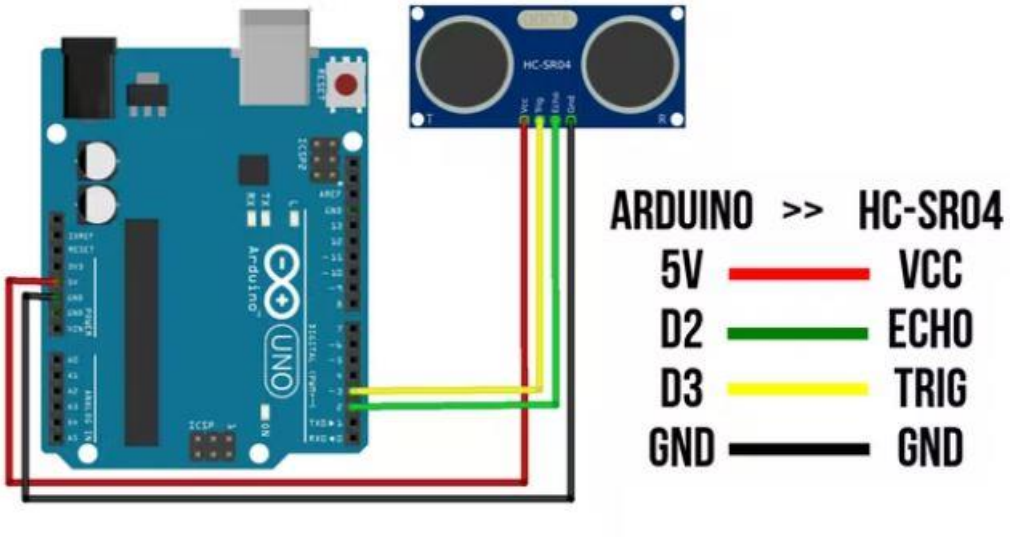

FIGURE 6 ULTRASONIC SENSOR

1. Connect **VCC** pin to **5V** on Arduino
2. Connect **Echo** pin to **D2** on Arduino
3. Connect **Trig** pin to **D3** on Arduino
4. Connect **GND** pin to **GND** pin on Arduino

HC-SR501 PIR SENSOR

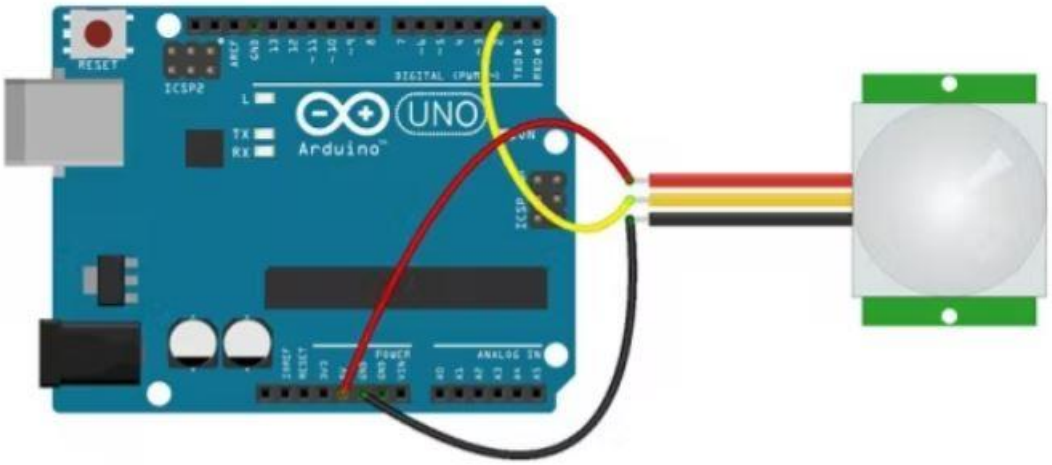

FIGURE 7 PIR SENSOR

1. Connect **Out** pin (yellow) to **D2** on Arduino
2. Connect **GND** pin to **GND** on Arduino
3. Connect **Power** (Red) pin to **3V** on Arduino

IR SENSOR

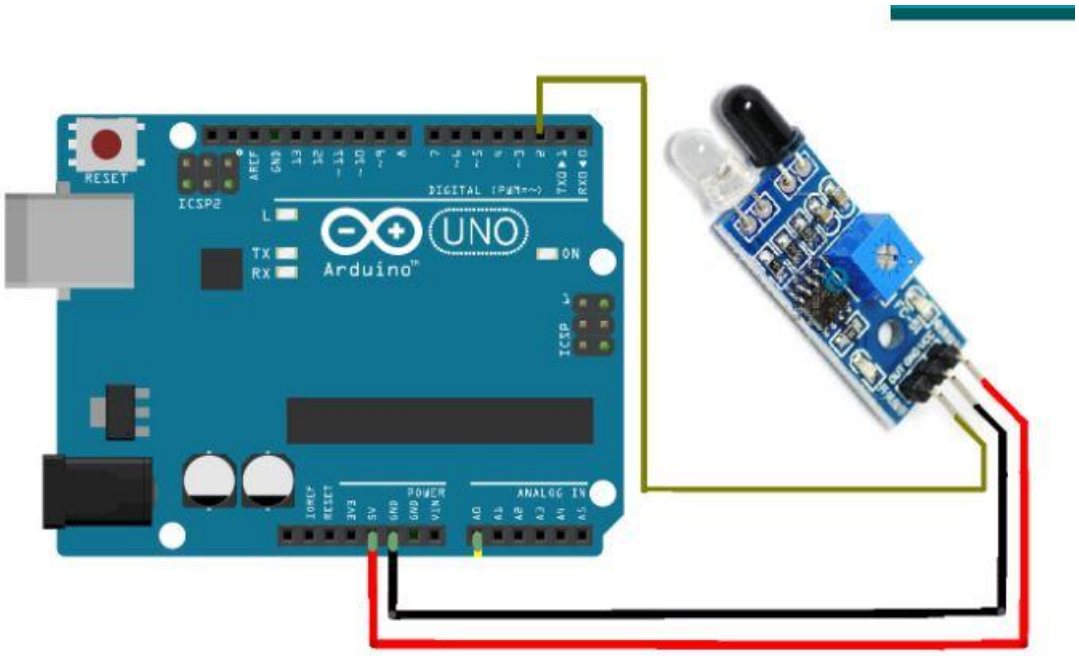

FIGURE 8 IR SENSOR

1. Connect **GND** pin to **GND** on Arduino
2. Connect **Power** pin to **5V** on Arduino
3. Connect the **Output** pin to **D2** on Arduino

ESP32

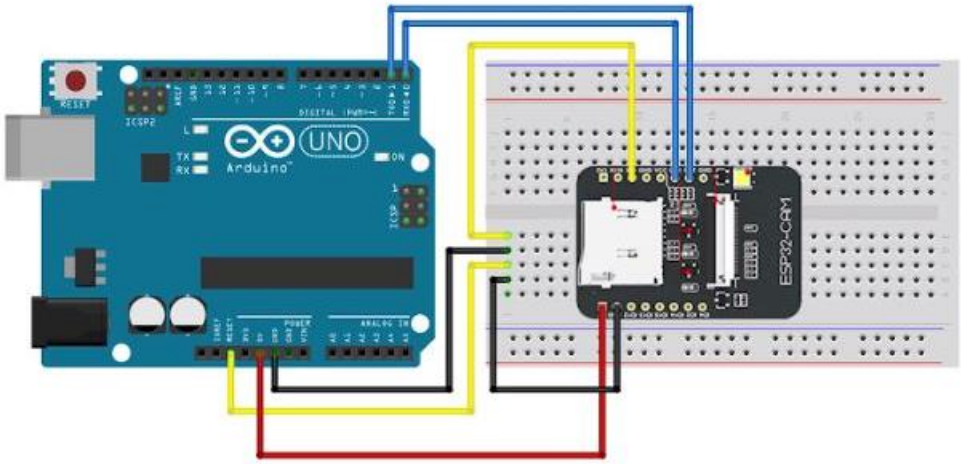

FIGURE 10 ESP32

FIGURE 9 ESP32 PINS

1. Connect **UOT** pin to **TX** on Arduino
2. Connect **UOR** pin to **RX** on Arduino
3. Connect **5V** pin to **5V** on Arduino
4. Connect **GND** pin to **GND** on Arduino
5. Connect **GPIO 0** on Esp32 to **GND** on Esp32
6. Connect **Reset** pin on Arduino to **GND** on Arduino

REFERENCES

Arduino, 2022. *How to use IR Sensor with Arduino.* [Online]
Available at: https://create.arduino.cc/projecthub/energen/how-to-use-ir-sensor-with-arduino-43d61c
[Accessed 1 May 2022].

Arduino, 2022. *MPU6050 Configuration with Arduino.* [Online]
Available at: https://create.arduino.cc/projecthub/Raushancpr/mpu6050-configuration-with-arduino-1a3dcf
[Accessed 1 May 2022].

Arduino, 2022. *PIR Motion Sensor: How to Use PIRs w/ Arduino & Raspberry Pi.* [Online]
Available at: https://create.arduino.cc/projecthub/electropeak/pir-motion-sensor-how-to-use-pirs-w-arduino-raspberry-pi-18d7fa
[Accessed 1 May 2022].

Arduino, 2022. *Setting up ESP-CAM with Arduino "No more usb TTL".* [Online]
Available at: https://create.arduino.cc/projecthub/CiferTech/setting-up-esp-cam-with-arduino-no-more-usb-ttl-35467a
[Accessed 1 May 2022].

Arduino, 2022. *Ultrasonic Sensor HC-SR04 with Arduino Tutorial.* [Online]
Available at: https://create.arduino.cc/projecthub/abdularbi17/ultrasonic-sensor-hc-sr04-with-arduino-tutorial-327ff6
[Accessed 1 May 2022].

Autodesk, 2022. *Tinkercad.* [Online]
Available at: https://www.tinkercad.com/dashboard
[Accessed 1 May 2022].

howtomechatronics, 2022. *Arduino and MPU6050.* [Online]
Available at: https://howtomechatronics.com/tutorials/arduino/arduino-and-mpu6050-accelerometer-and-gyroscope-tutorial/
[Accessed 1 May 2022].

Microcontrollerslab, 2022. *Data receiving on Webpage from Arduino using esp8266.* [Online]
Available at: https://microcontrollerslab.com/data-receiving-webpage-arduino-esp8266/
[Accessed 1 May 2022].

Proteus, 2022. *Proteus.* [Online]
Available at: https://www.labcenter.com/iotbuilder/
[Accessed 1 May 2022].

Sparkfun, 2022. *Flex Sensor Hookup Guide.* [Online]
Available at: https://learn.sparkfun.com/tutorials/flex-sensor-hookup-guide/all
[Accessed 1 May 2022].