

Smart Clap Switch Using Arduino UNO & Relay

A

REPORT ON

MINI SKILLED BASED PROJECT (CONTROL SYSTEM LAB)

Submitted in partial fulfillment of the requirement for the award of the degree of

BACHELOR OF TECHNOLOGY

In

ELECTRICAL ENGINEERING

By

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Under the guidance of

Dr. Himmat Singh

Department of Electrical Engineering



DEPARTMENT OF ELECTRICAL ENGINEERING

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE,

GWALIOR (M.P.) – 474005

2024

CERTIFICATE

This is to certify that **SHASHANK CHANDRAVANSHI (0901EE21Q1104)** studying in **MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, BATCH-2021-2025** have completed their Mini Skilled Based Project entitled “**Smart Clap Switch Using Arduino UNO & Relay**” at **MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE** under my supervision.

It is further certified that they had attended required number of practical classes at **MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR** for the completion of their Mini Skilled Based Project during 6th semester.

Dr. Himmat Singh

Project Supervisor

DECLARATION OF STUDENT

We hereby declare that the work presented in this SKILLED BASED PROJECT entitled “**Smart Clap Switch Using Arduino UNO & Relay**” which is being submitted in the partial fulfillment of the requirement for the award of degree of Bachelor of Engineering in Electrical Engineering is an authentic record of our own work carried out under the guidance of **Dr. Himmat Singh**, Electrical Engineering Department.

The matter presented in this project has not been submitted elsewhere by us for the award of any other degree/diploma.

SHASHANK CHANDRAVANSHI

(0901EE211104)

Date: 23/04/2024

Place: Gwalior

This is to certify that the above statement made by the candidates is correct to the best of my knowledge and belief.

Guided by

Dr. Himmat Singh
Department of Electrical Engineering
MITS, Gwalior

ACKNOWLEDGEMENT

Engineers in all disciplines must acquire knowledge of project making. Student, in particular, will find ‘project making’ as an integral part of their studies that will infuse the spirit of doing practical work in them.

The satisfaction that accompanies the successful completion of any task would be incomplete without the mention of the people who made it possible whose constant guidance crowned our efforts with success.

We sincerely express our deep gratitude to the management of our college for giving us liberty to choose and to work on the most relevant project i.e. **“Smart Clap Switch Using Arduino UNO & Relay”**. We are thankful to **Dr. Himmat Singh** for ensuring that we have a smooth environment at the college and lab. At the very outset we would like to offer our never ending thanks to our project supervisor **Dr. Himmat Singh** who helped us with our project from the beginning till the end. His continuous surveillance over our work allowed us to work more efficiently.

SHASHANK CHANDRAVANSHI

(0901EE211104)

ABSTRACT

The "Simple Arduino Clap Switch with LED and Relay" project presents a straightforward yet effective circuit and code implementation for controlling a relay and an LED with an Arduino board based on sound input. Utilizing an electret microphone module to detect claps, the Arduino reads the analog input and triggers the relay and LED when the sound level surpasses a predefined threshold. This compact setup offers a convenient means to control appliances or devices with a simple clap, demonstrating the integration of basic electronics components and programming logic for practical applications.

Introduction

Imagine turning on or off your lights with just a clap! Imagine turning on or off your lights with just a clap! This Arduino clap switch project enables this possibility. Home automation has never been this simple and exciting. Let's dive into the details of creating your very own clap-activated switch.

Components Required for Arduino Clap Switch

Arduino Uno	× 1
LM393 Sound Sensor Module	× 1
5V Relay Module	× 1
LED and resistor kit	× 1
Breadboard	× 1
Jumper wires kit	× 1
USB cable type A/B	× 1

These components are affordable and widely available, making this project accessible to everyone.

Software

Arduino IDE

LM393 Sound Sensor Module

The **LM393 Sound Sensor** is the heart of our clap switch. It **detects sound intensity and sends signals** to the Arduino. For protection, switching, and monitoring applications, this module can be used. Adjusting its precision for ease of use is easy. **It uses a microphone that provides an amplifier, high detector, and buffers for the signal.**

The sensor **generates an output signal voltage** when it detects sound., which is then sent to a microcontroller, which performs the required processing. The sound detector sensor module for Arduino determines whether or not sound has crossed a predefined threshold value. A microphone detects sound, which is then fed into an LM393 op-amp. **An onboard potentiometer is used to change the sound level set point. As the sound frequency reaches the threshold, an LED on the module illuminates and the output is reduced.**

LM393 Sound Sensor Module Specifications

Operating voltage	3.3 V – 5 V
Sensitivity	48-66 dB
Outputs	one analog + one digital
Impedance	2.2 k Ω
Operating temperature	-40 °C to +85 °C
Frequency response	50 Hz – 20 kHz
Indicator LED	1 power indicator + 1 comparator output indicator
Dimensions	44 x 15 x 10 mm

5V Relay Module

A relay has three pins: NO (Normally Open) terminal, NC (Normally Closed) terminal, common pin, and coil. When the magnetic field energizes the coil, it creates connected contacts. The COM (Common) terminal, which is the moving part of a relay, connects to the NC (Normally Closed) terminal when the relay is turned off. Only when the relay is turned on, the NO (Normally Open) terminal of the relay becomes connected. The transition from NC to NO occurs when turning on the relay.

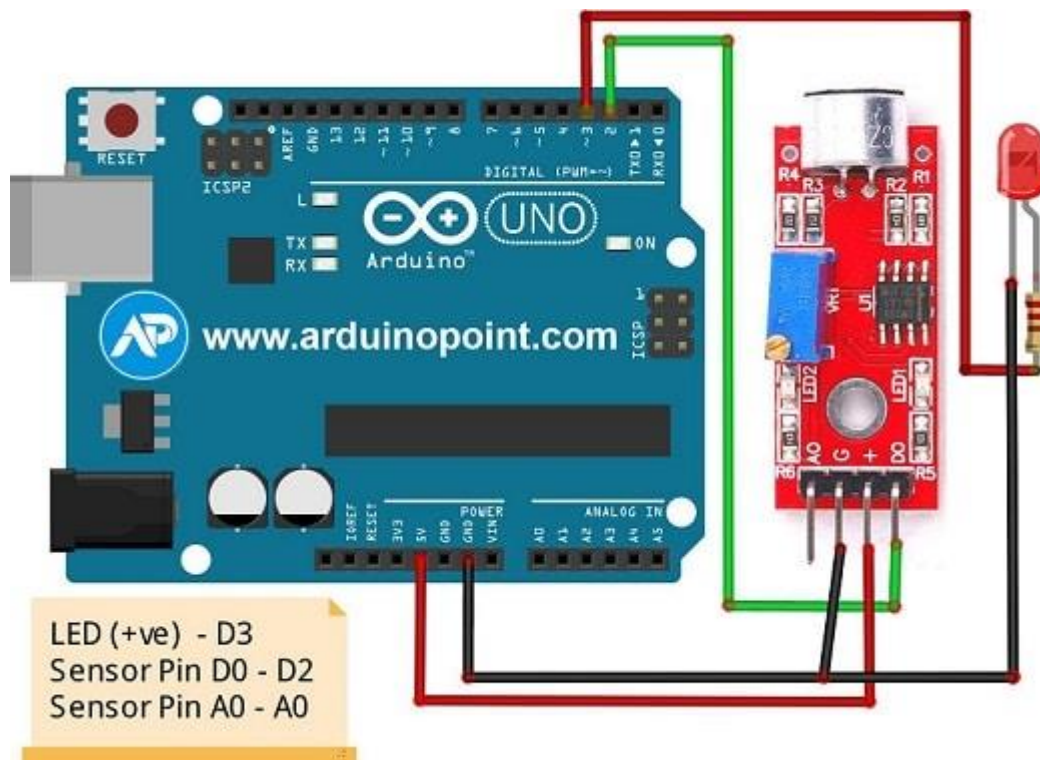
The Arduino's instructions control the connected devices, such as the LED, via the 5V Relay Module. The 5V Relay Module controls the connected devices, such as the LED, based on the Arduino's instructions. Properly connect the relay module to both the Arduino and the components you want to control.

5V Relay Module Specifications

Operating voltage	3.75V – 6V
Quiescent current	2mA
Current when the relay is active	~70mA
Relay maximum contact voltage	250VAC or 30VDC
Relay maximum current	10A

Arduino Clap Switch with LED Circuit Schematics

Refer to the image below for the circuit connection. Follow the steps to ensure a correct and functional setup.



Arduino Clap Switch with LED Circuit Schematics

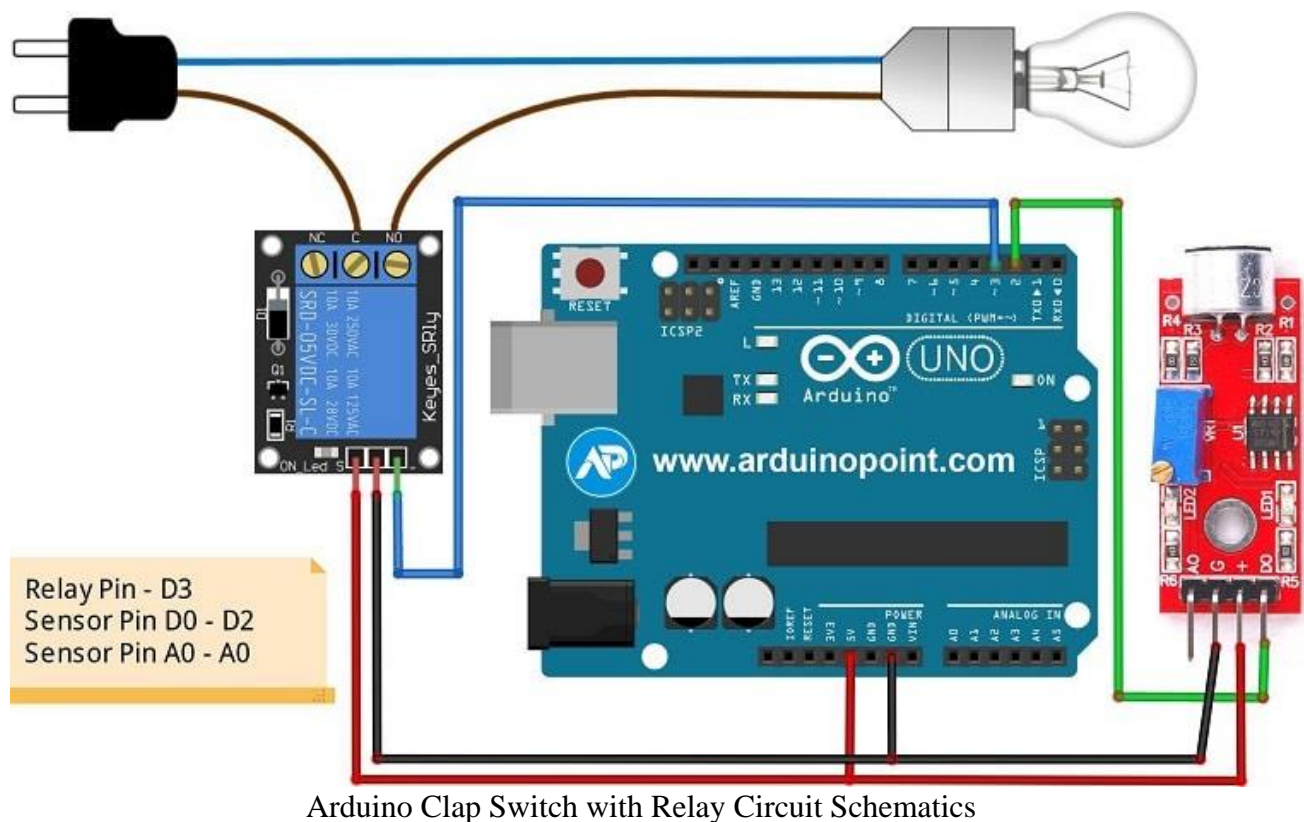
The following connections are also shown in the table:

LM393 Sound Sensor Module Connections

LM393 Sound Sensor Module	Arduino
VCC	5 V
GND	GND
A0	A0
D0	Digital pin 2

Resistor's one terminal goes to LED and another terminal goes to digital pin 3.

Arduino Clap Switch with Relay Circuit Schematics:



Connections are also shown in the table:

Relay Module Connections

5V Relay Module	Arduino
VCC	5 V
GND	GND
IN	Digital pin 2

A bulb connects with a 5V relay module's NO pin and NC pin.



Warning

This board interfaces with a high-voltage AC supply. Improper or incorrect use may result in serious injury or death. As a result, it is intended for people who are familiar with and knowledgeable about HIGH AC voltage.

Arduino Clap Switch Code

Now, let's understand the code. The Arduino code provided controls the relay based on the sound intensity detected by the LM393 Sound Sensor. Adjust the threshold value by rotating the potentiometer to set the desired sound level for triggering the switch.

By clicking the button in the top right corner of the code field, you can copy the code. Copy and paste it into Arduino IDE.

```
/****** Arduino Clap Switch *****/
```

```
int SoundSensor=2; // LM393 Sound Sensor Digital Pin D0 connected to pin 2
```

```
int LED=3; // LED connected to pin 3
```

```
boolean LEDStatus=false;
```

```
void setup() {
```

```
  pinMode(SoundSensor,INPUT);
```

```
  pinMode(LED,OUTPUT);
```

```
  Serial.begin(9600); //initialize serial
```

```
}
```

```
void loop() {
```

```
  int SensorData=digitalRead(SoundSensor);
```

```
  Serial.println(SensorData); //print the value
```

```
  if(SensorData==1){
```

```
    if(LEDStatus==false){
```

```
      LEDStatus=true;
```

```
      digitalWrite(LED,HIGH);
```

```
    }
```

```
  else if(LEDStatus==true){
```

```
    LEDStatus=false;
```

```
    digitalWrite(LED,LOW);
```

```
  }}}
```

Caution Section

A crucial step in this project is **adjusting the threshold value**. Rotate the potentiometer to increase or decrease the threshold. A higher threshold means the clap switch responds to louder sounds. Find the right balance for your environment.

Result Section

After successful implementation, enjoy the convenience of controlling devices with a simple clap. Achieving the desired sound threshold ensures accurate and responsive operation.

Benefits of a Clap Switch

Clap switches offer convenience and energy-saving benefits. Imagine entering a dark room and illuminating it with just a clap. Additionally, they are great for individuals with mobility issues.

Customization Options

Feel free to experiment with different components and customize the project to suit your preferences. Personalizing your clap switch adds a unique touch to your home automation setup.