

BANGABANDHU SHEIKH MUJIBUR RAHMAN DIGITAL UNIVERSITY,

BANGLADESH

# Department of Internet of Things and Robotics Engineering.

**Faculty of Cyber Physical System**

**Project Report**

## Title: Smart Sound Activated Switch with Sound Intensity Sensitivity

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**Authors:**

**MEHRIN FARZANA**

**Dept of IRE, BDU**

**Gazipur, Bangladesh**

**[mehrin0001@std.bdu.ac.bd](mailto:mehrin0001@std.bdu.ac.bd)**

**MARIA JAHAN MIM**

**Dept of IRE, BDU**

**Tangail, Bangladesh**

**[mim0003@std.bdu.ac.bd](mailto:mehrin0001@std.bdu.ac.bd)**

**ISMOT ARA**

**Dept of IRE, BDU**

**Dhaka, Bangladesh**

**[ismotara0001@std.bdu.ac.bd](mailto:mehrin0001@std.bdu.ac.bd)**

**SADIA ISLAM MOU**

**Dept of IRE, BDU**

**Gazipur, Bangladesh**

**[mou0001@std.bdu.ac.bd](mailto:mehrin0001@std.bdu.ac.bd)**

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# Introduction

# Overview

# Sound plays a vital role in humans everyday life. Sound is a way to interact with the environment. Sound can be utilized for convenient lifestyle. Then again, the safe range for hearing is typically between 0 dB (threshold of hearing) and approximately 120-130 dB. Sounds above this level can cause damage to the ear. [1]

# Motivation

# Very often, the sound produced by us are of over the safe range of hearing, causing health issues to human and damage to the nature. Also, in home automation system, turning devices on and off is not convenient enough. Rather, regulating the power is admirable and demanding even.

# Problem Definition

# Often people don’t comprehend the level of sound that they produce. If only it could be visualized. Also, in home automation system, zero touch switches have limited capacity in controlling the power of devices.

# Objectives

# Our goal is to,

# Design and construct a sound activated switch

# Give output based on the sound intensity

# Visually represent the output

# Control the output intensity based on the input sound intensity

# Application

# Our project is applicable on various fields such as.

# Traffic sound monitor

# Industrial sound monitor

# Sound regulation center

# Home automation system

# Entertainment system

1. **Literature Review:**

# The “Smart Sound Activated Switch with Sound Intensity Sensitivity” is a device that allows users to control electrical appliances using sound (specifically, clapping). In recent years, research and development in this area have led to several interesting findings:

# 1. Sound-Based Control Systems:

# - Researchers have explored various sound-based control mechanisms, including voice recognition, hand claps, and finger snaps. These systems aim to enhance convenience and accessibility.

# - Studies have investigated the effectiveness of different sound patterns (e.g., single clap, double clap) for triggering switches.

# 2. Microcontroller-Based Approaches:

# - Many smart clap switches utilize microcontrollers (such as Arduino or Raspberry Pi) to process sound input and activate relays.

# - The choice of microcontroller affects factors like response time, power consumption, and scalability.

# 3. Energy Efficiency and Sensitivity:

# - Energy-efficient designs are crucial for battery-powered smart clap switches.

# - Researchers have explored ways to improve sensitivity while minimizing false triggers (e.g., due to ambient noise).

# 4. Applications and User Experience:

# - Smart clap switches find applications in home automation, lighting control, and entertainment systems.

# - User experience studies have examined user preferences, reliability, and ease of setup.

# 5. Challenges and Future Directions:

# - Challenges include robustness in noisy environments, adaptability to different sound patterns, and avoiding false positives.

# - Future research could focus on integrating machine learning for better sound recognition and exploring novel interaction methods.

# Material and Methodology

# Introduction

# As of the objective states, to implement our project, we require,

# A sound sensor to input the sound in

# Analogue output devices to not only switch on or off but also controlling the the output power

# A circuit to convert the sound into electrical signal, provide output voltage based on the sound intensity

# A algorithm to integrate the input system with the output system

# Project Details

# Used utilities,

# A analogue sound sensor module[2]

# A micro-controller, Arduino UNO[3]

# Five LEDs

# 100 Ohm resistors

# Jumper wires

# Breadboard

# Powering device

# The sound sensor is built on the following circuit design,

# OIP

# Fig. 1: Sound sensor module circuit diagram

# R

# Fig. 2: Sound sensor module

# The Arduino UNO micro-controller is built on the following circuit design,

# R

# Fig. 3: Arduino UNO micro-controller circuit diagram

# test_3-1-768x688

# Fig. 4: Arduino UNO micro-controller

# 

# Fig. 4: Simulation in Proteus 8

# Implementation

# 

# Fig. 4: Smart Clap Switch with Sound Intensity Sensitivity, hardware integrated

# Algorithms

# The project runs on the following algorithm,

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Input voltage | LED1 status | LED2 status | LED3 status | LED4 status | LED5 status |
| >555 & <558 | ON | OFF | OFF | OFF | OFF |
| >558 & <560 | ON | ON | OFF | OFF | OFF |
| >560 & <562 | ON | ON | ON | OFF | OFF |
| >562 & <564 | ON | ON | ON | ON | OFF |
| >564 | ON | ON | ON | ON | ON |

# 

# Arduino code:

/\* Arduino pins where the LED is attached \*/

#define LED\_1 13

#define LED\_2 12

#define LED\_3 11

#define LED\_4 10

#define LED\_5 9

#define sensorPin A0 // Analog input pin that the Sensor is attached to

/\* boolean variables to hold the status of the pins\*/

boolean ledPin1Status;

boolean ledPin2Status;

boolean ledPin3Status;

boolean ledPin4Status;

boolean ledPin5Status;

void setup () {

// TODO: put your setup code here, to run once:

pinMode(LED\_1, OUTPUT);

  pinMode(LED\_2, OUTPUT);

  pinMode(LED\_3, OUTPUT);

  pinMode(LED\_4, OUTPUT);

  pinMode(LED\_5, OUTPUT);

  pinMode(sensorPin, INPUT);

  pinMode(Sensor, INPUT);

  //digitalWrite(LED\_5 HIGH);

  Serial.begin(9600);// initialize serial communications at 9600 bps:

}

void loop() {

// TODO: put your main code here, to run repeatedly:

  int sensorValue = analogRead(sensorPin);

  Serial.println(sensorValue);

  if (sensorValue > 555  )

    ledPin1Status = 1;

  if (sensorValue > 558  )

    ledPin2Status = 1;

  if (sensorValue > 560  )

    ledPin3Status = 1;

  if (sensorValue > 562  )

    ledPin4Status = 1;

if (sensorValue > 564  )

    ledPin5Status = 1;

    if (ledPin1Status == 1 || ledPin2Status == 1 || ledPin3Status == 1 || ledPin4Status == 1 || ledPin5Status == 1){

    if (sensorValue > 555 || sensorValue < 537  )

      digitalWrite(LED\_1, HIGH);

    if (sensorValue > 558 || sensorValue < 534  )

      digitalWrite(LED\_2, HIGH);

    if (sensorValue > 560 || sensorValue < 534  )

      digitalWrite(LED\_3, HIGH);

    if (sensorValue > 562 || sensorValue < 531 )

      digitalWrite(LED\_4, HIGH);

    if (sensorValue > 564 || sensorValue < 528)

      digitalWrite(LED\_5, HIGH);

    delay(200);

    ledPin5Status = 0;

    ledPin4Status = 0;

    ledPin3Status = 0;

    ledPin2Status = 0;

    ledPin1Status = 0;

  }

  digitalWrite (LED\_1, LOW);

  digitalWrite (LED\_2, LOW);

  digitalWrite (LED\_3, LOW);

  digitalWrite (LED\_4, LOW);

  digitalWrite (LED\_5, LOW);

}

# Results

# Achievements:

# The project can detect sound

# The project gives output based on sound intensity level

# The project follows the algorithm

# Bugs:

# Cannot eradicate noise

# Discussion

# Our project fulfilled its objectives with a few bugs. The results are in favour with a few issues.

# 

# Conclusion

# The project “Smart Sound Activated Switch with Sound Intensity Sensitivity” promises to make human lifestyle even more convenient.

# References

# [1] [Hearing range - Wikipedia](https://en.wikipedia.org/wiki/Hearing_range)

# [2] [Sound Sensor : Working, Types, Interfacing & Its Applications (watelectronics.com)](https://www.watelectronics.com/sound-sensor/)

# [3] [A000066-datasheet.pdf (arduino.cc)](https://docs.arduino.cc/resources/datasheets/A000066-datasheet.pdf)

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