**Controlled White LED System**

**🔧 Project Title:**

**Sound-Based White LED Control with Clap Detection and LCD Feedback**

**📝 Objective:**

Build a system using an **Arduino Uno**, **LM393 sound sensor**, **I2C 16x2 LCD**, **White LED**, and a **Buzzer** that:

* Turns **ON** the white LED when **1 clap** is detected.
* Turns **OFF** the white LED when **2 claps** are detected.
* Ignores more than 2 claps.
* Displays the current state on the LCD.
* Buzzer beeps **twice** every time the LED state changes.

**📦 Components Required:**

| **Component Name** | **Pin No (Arduino)** | **Destination Component** | **Pin No** | **Special Remark** |
| --- | --- | --- | --- | --- |
| LM393 Sound Sensor | D2 | Arduino Uno | D2 | Connect D0 pin of sound sensor |
| LM393 GND | GND | Arduino Uno | GND | Power ground |
| LM393 VCC | 5V | Arduino Uno | 5V | 5V power supply |
| White LED (anode) | D3 | Arduino Uno | D3 | Use a 220Ω resistor to GND from cathode |
| Buzzer (positive) | D6 | Arduino Uno | D6 | Connect negative to GND |
| I2C LCD SDA | A4 | Arduino Uno | A4 | I2C data |
| I2C LCD SCL | A5 | Arduino Uno | A5 | I2C clock |
| I2C LCD VCC | 5V | Arduino Uno | 5V | Power supply |
| I2C LCD GND | GND | Arduino Uno | GND | Ground |

**🔌 Circuit Diagram Overview:**

**(URL:-** [**https://app.cirkitdesigner.com/project/ff1c99b6-6fa4-4340-b2f6-2a97359e996f**](https://app.cirkitdesigner.com/project/ff1c99b6-6fa4-4340-b2f6-2a97359e996f)**)**

* **Sound Sensor D0** → **Arduino D2**
* **White LED** → 220Ω Resistor → **Arduino D3**
* **Buzzer** (+) → **D6**, (–) → GND
* **I2C LCD**: SDA → A4, SCL → A5, VCC → 5V, GND → GND

**🧾 Libraries You Need**

* LiquidCrystal\_I2C

***Install them via the Arduino Library Manager (Sketch → Include Library → Manage Libraries).***

**📜 Arduino Code:**

#include <Wire.h>

#include <LiquidCrystal\_I2C.h>

LiquidCrystal\_I2C lcd(0x27, 16, 2); // LCD address 0x27, 16 columns, 2 rows

const int SOUND\_PIN = 2; // LM393 D0

const int WHITE\_LED = 3; // White LED pin

const int BUZZER\_PIN = 6; // Buzzer pin

const unsigned long CLAP\_WINDOW = 800; // Max gap between claps (ms)

const unsigned long DEBOUNCE\_TIME = 50; // Sensor debounce time (ms)

unsigned long lastClapTime = 0;

int clapCount = 0;

bool prevSoundState = LOW;

void setup()

{

pinMode(SOUND\_PIN, INPUT);

pinMode(WHITE\_LED, OUTPUT);

pinMode(BUZZER\_PIN, OUTPUT);

Serial.begin(9600);

lcd.init();

lcd.backlight();

lcd.setCursor(0, 0);

lcd.print("Sound system");

lcd.setCursor(0, 1);

lcd.print("ready...");

prevSoundState = digitalRead(SOUND\_PIN); // Avoid initial false clap

}

void loop()

{

bool soundNow = digitalRead(SOUND\_PIN);

if (soundNow == HIGH && prevSoundState == LOW) {

unsigned long now = millis();

if (now - lastClapTime > DEBOUNCE\_TIME) {

clapCount++;

lastClapTime = now;

Serial.print("Clap detected → count = ");

Serial.println(clapCount);

}

}

prevSoundState = soundNow;

if (clapCount > 0 && millis() - lastClapTime > CLAP\_WINDOW) {

if (clapCount == 1) {

setWhiteLED(true); // ON

} else if (clapCount == 2) {

setWhiteLED(false); // OFF

} else {

Serial.println("Ignored: 3 or more claps");

}

clapCount = 0;

}

}

void setWhiteLED(bool turnOn)

{

beepTwice();

digitalWrite(WHITE\_LED, turnOn ? HIGH : LOW);

lcd.clear();

lcd.setCursor(0, 0); lcd.print("White LED");

lcd.setCursor(0, 1); lcd.print(turnOn ? "is ON " : "is OFF");

Serial.println(turnOn ? "★ White LED ON" : "★ White LED OFF");

}

void beepTwice()

{

for (byte i = 0; i < 2; i++) {

tone(BUZZER\_PIN, 1000, 200); // 1kHz tone for 200ms

delay(300);

}

}

**📺 LCD Output at Different Stages:**

| **Event** | **LCD Line 1** | **LCD Line 2** |
| --- | --- | --- |
| System start | Sound system | ready... |
| 1 clap | White LED | is ON |
| 2 claps | White LED | is OFF |
| 3+ claps | *no change* | *no change* |

**📊 How It Works:**

1. The LM393 detects sharp sounds like claps via its **D0 pin**.
2. The system waits **800ms** to group claps.
3. Based on the number of claps:
   * **1 clap** → Turn ON White LED
   * **2 claps** → Turn OFF White LED
4. **2 beeps** are played before each state change.
5. LCD shows the current LED status clearly.