"Library Noise Detection and Indicator Using Arduino UNO"

A Minor Project Report

SUBMITTED TO

JABALPUR ENGINEERING COLLEGE, JABALPUR

Submitted in partial fulfilment of the requirements for the award of graduate degree of

BACHELOR OF TECHNOLOGY
IN
ELECTRONICS AND TELECOMMUNICATIONS ENGINEERING

SUBMITTED BY

NITIN KUMAR PATEL	**0201IP191051**
SACHI RANA	**0201EC191071**
SAMIKSHA BAGDE	**0201EC191073**
SARTHAK JOSHI	**0201EC191074**
SHIVAM SINGH BHADORIA	**0201EC191080**

UNDER THE GUIDANCE OF
Prof. GARIMA TIWARI
Assistant Professor

6TH SEMESTER

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING
JABALPUR ENGINEERING COLLEGE, JABALPUR
GOKALPUR, JABALPUR– 482011
(Established in 1947 as Government Engineering College, Jabalpur)
(Declared Autonomous by Government of Madhya Pradesh and RGPV, Bhopal)

SESSION: 2021-22

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING
JABALPUR ENGINEERING COLLEGE, JABALPUR
GOKALPUR, JABALPUR 482011

CANDIDATE'S DECLARATION

We hereby declare that the work which is being presented in the minor project entitled "**Library Noise Detection and Indicator Using Arduino UNO**" *in partial fulfilment for the award of* ***Bachelor of Technology*** *degree in* ***Electronics and Telecommunication Engineering****, submitted in the Department of Electronics and Telecommunication Engineering, Jabalpur Engineering College, Jabalpur, is an authentic record of our own work carried out* under the guidance of **Dr. Bhavana Jharia** HOD, E&TC Department and **Prof. Garima Tiwari** Assistant Professor, Jabalpur Engineering College, Jabalpur. We have not submitted the matter embodied in this report for award of any other degree.

SUBMITTED BY

NITIN KUMAR PATEL (0201IP191051)

DATE:

PLACE:

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING
JABALPUR ENGINEERING COLLEGE, JABALPUR
GOKALPUR, JABALPUR 482011

CERTIFICATE OF APPROVAL

This is to certify that the Minor project entitled "**Library Noise Detection and Indicator Using Arduino UNO**" submitted by **NITIN KUMAR PATEL (0201IP191051)** student of Bachelor of Technology(E&TC, 6th semester) is accepted towards partial fulfilment for the award of degree of **BACHELOR OF TECHNOLOGY IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING** from **JABALPUR ENGINEERING COLLEGE, JABALPUR(M.P)**.

INTERNAL EXAMINER

DATE:

EXTERNAL EXAMINER

DATE:

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING
JABALPUR ENGINEERING COLLEGE, JABALPUR
GOKALPUR, JABALPUR 482011

CERTIFICATE

This is to certify that the Minor project entitled "**Library Noise Detection and Indicator Using Arduino UNO**" submitted by **NITIN KUMAR PATEL (0201IP191051)** student of Bachelor of Technology (E&TC, 6th semester) have been carried out under my guidance and supervision. This report is forwarded for submission towards the partial fulfilment for the award of **BACHELOR OF TECHNOLOGY DEGREE** in **ELECTRONICS AND TELECOMMUNICATION ENGINEERING.**

Dr. Bhavana Jharia
Head of Department
Electronics And Telecommunication Department
Jabalpur Engineering College

Date:

Prof. GARIMA TIWARI
Assistant Professor
Electronics And Telecommunication Department
Jabalpur Engineering College

Date:

ACKNOWLEDGEMENT

It is a matter of extreme honour and privilege for us to offer our grateful acknowledgement to our respected guide **Prof. Garima Tiwari** Asst. Professor, Electronics and Telecommunication Engineering, Jabalpur Engineering College, Jabalpur to give us a chance to work under her guidance and supervision. We are also grateful for all kinds of support and inspiration, constant encouragement, sincere criticism and valuable guidance which were given by her throughout the investigation and preparation of this thesis..

We would also like to take this opportunity to present my sincere regards to **Prof. Mahesh Prasad Parsai, Dr. Bhavana Jharia(HOD)**, **Dr. Agya Mishra, Dr. Kanchan Cecil, Prof. Sunil Kumar Singh, Prof. Namrata Sahyam, Prof. Garima Tiwari, Prof. Devendra Kumar Meda,** and all faculty members of the **Department of Electronics and Telecommunication Engineering,** for their valuable advice and assistance during our studies at Jabalpur Engineering College Jabalpur, and their support

We want to express our sincere gratitude to **Prof. P.K. Jhinge** , Principal, Jabalpur Engineering College, Jabalpur, for his valuable support and facilities provided to us to carry out this work at Jabalpur Engineering College, Jabalpur (M.P.).

We have a great pleasure in expressing our deep sense of gratitude to all the respected faculty members of Electronics and Telecommunication department.

Above all my deepest love and gratitude is devoted to my parents. They are always a source of love, support and encouragement.

Last but not least, we also thankful to Almighty God for giving us the patience and the strength for guiding us make choices in life and helping us in such mysterious way that is impossible for us to explain.

Abstract

The Library Noise Detector with Short Information Provider is a portable device that is used in detecting noise in the library. The device is used to control excessive noise inside the library. The system uses a digital sound sensor to detect noise, Arduino to process and led light in displaying the output. The design was developed as an alternative or additional help in controlling the noise and prevent disturbances in a specific area of the library.

Keywords: library, sensor, noise, noise detector, microcontroller (Arduino), led light

Introduction

As our minor project, we are going to present “Library silence manager”. Our project measure sound pressure level. The project is also connected to Led light. So, our project continuously measures sound pressure, and compare with critical noise level set using programming. If sound noise pressure exceeds from set value, led light will light up, giving warning massage. This project can be very useful for the college library and everywhere where noise level matter.

Design Background

a. ***The design setting or context or frame of reference***

Noise is widely known in science and technology. Its general meaning in such fields, as in everyday life, is useless or interfering signal of some form. It is any unwanted sound due to a variety of causes. Often, noise is a nuisance because it interferes with a measurement that it is being made or with some signal that is being transmitted. The amount of signal, divided by the amount of noise that is also present, is often called 'signal – to – noise ratio'. Techniques such as electronic filtering are often used to improve the signal – to – noise ratio. This is useful if the signal that is being looked for is at particular frequency; the filter allows that frequency to pass through, but not the other frequencies which are present in the noise. The study of noise is important, because by understanding the processes that cause it we can try to reduce it. Judgments of whether or not environmental sounds are noises are subjective, but the fact is that unwanted sounds can precipitate severe psychological effects. In addition, above certain levels of intensity, noises can cause physical harm.

Such uses of the term noise have been extended to the fields of electricity and electronics and, in general, to all areas that involve some form of frequency range. Noise is generated within electron tubes and electrical conductors in general, and all circuits possess an inherent level of random noise. External interferences also contribute to electrical and electronic noise.

Broadly speaking, the term noise is used in information theory to refer to any form of disturbance of information-bearing signals, or to any meaningless addition to such signals. This does not, however, include redundant signals added as means of checking the accuracy of the signals.

Noise levels are usually measured in decibel unit. A decibel is one tenth of a bel (B). Devised by engineers of the Bell Telephone Laboratory to quantify the reduction in audio level over a 1.6 km length of standard telephone cable, the bel was originally called the transmission unit or TU, but was renamed in 1923 or 1924 in honour of the laboratory's founder and telecommunications pioneer Alexander Graham Bell. In many situations, however, the bel proved inconveniently large, so the decibel has become more common.

Library is a study place for people especially for students. It is a place where books, journals, compact discs, microforms, other media. This information may be found in the local library or at other sites in an expanding global network of bibliographic databases. Public libraries provide access to materials of general interest and are open to everyone. School libraries support student research and enrich curriculum by integrating cultural and educational resources into classroom instruction. Indian libraries currently are expanding and enriching their services in an economy dominated by converging, computing, and communication technologies while facing severe cutbacks in public funding and government support. A quiet ambiance is essential in the library; it should have a peaceful and noiseless environment all the time to avoid distractions to library users. But most of the time, as the people in the library increase; noise is always present and cannot be easily managed by the library staffs. With this implication, the groups decided to design a system that can help detect noise in the library with an alert message provider to let the people become aware whenever they are making loud noises. The device will monitor the library without further intervention of the library staffs

b. ***Statement of the Problem***

Generally, the library is a learning place for everyone. In places like this where people are always present the tendency of having noise cannot be avoided. When library becomes a noisy environment the main library rule to observe silence is violated. As the people in library increase, there is a bigger probability to have uncontrollable noise inside the library. In this case, the library staffs have a hard time controlling and informing the people that they are creating intolerable noise that can disturb others

c. ***Objective of the Design***

The design aims to create a device that will detect excessive noise inside the library as well as inform the library users of the rules and regulations that are strictly implemented.

The following points were considered in order to implement the design project:

1.To be able to lessen the library staff's task in maintaining a quiet ambience;

2.To interface noise detector circuit with a led based message display; and

3.To design an effective and efficient device for the use of school libraries.

d. ***The Significance of the Design***

The design provides the library staff with a means of immediately controlling the noise level inside the library with any arrangement of the people. It further provides a means of instructing students to accept responsibility for maintaining a level of noise in to the library conducive to studying. The message provider presents a good alternative in posting or displaying the library rules and regulations.

For the designers being also student is and having the right to use the library,

it is important for them to implement the design to help the library staff in managing and making the library a better learning place. All the people using the library will benefit from the design especially when they are annoyed of the noise and distractions created by unconcerned people.

e. *Conceptual Framework*

In order to build the design, Ideas and principles related to the design were studied and discussed. Below Figure shows the conceptualized design of the system. This conceptual framework illustrates how the system of the design works starting from its inputs then how it will be processed until it produces an

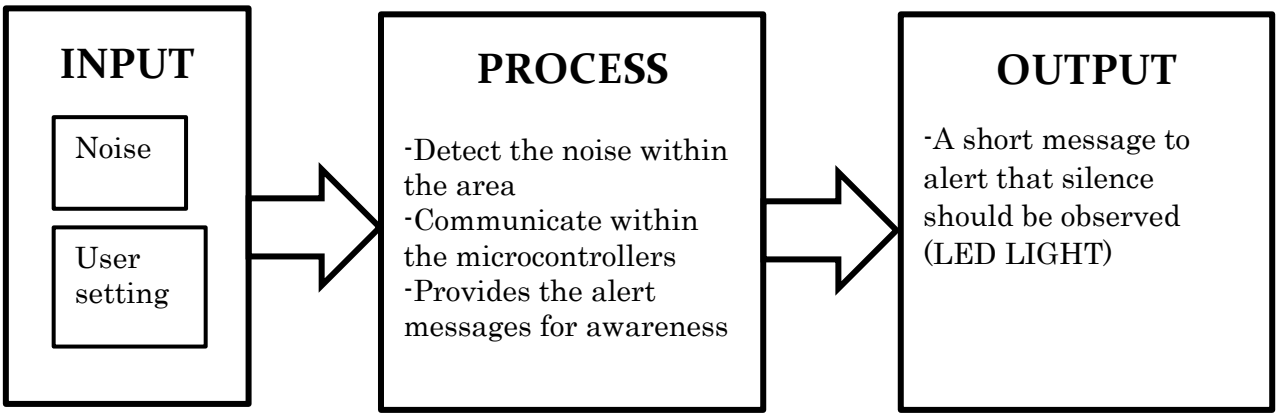


Figure: Conceptual Frame work

The inputs are the noise and the user settings which are independent variables that come from the user and the surroundings. The noise is the main input for the design that needs to be detected. The noise level that the detector should identify can be varied through a potentiometer. After the noise is detected, the microcontrollers will act as the communication medium for the detector and the output devices. The Arduino will process the signal that the detector sends and then pass the alert made by the user for it to output in the LED Light. The LED will light up after the detected noise is processed. This concept describes how the device was designed for its environment and its users.

System

A System is a way of working, organizing or doing one or many tasks according to a fixed plan, program or set of rules. A system is also an arrangement in which all its units assemble and work together according to the plan or program.

Example: **WATCH** - It is a time display SYSTEM

Part: Hardware, Needles, Battery, Dial, Chassis and strap

Rules: All needles move clockwise only.

A thin needle rotates every second.

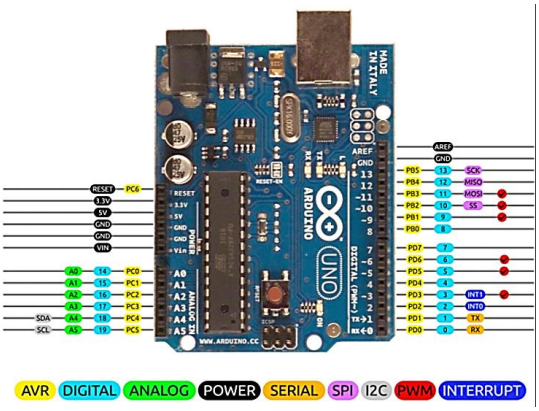
A long needle rotates every minute.

A short needle rotates every hour.

All needles return to the original position after 12 hours.

Embedded System

An Embedded System is one that has computer hardware with software embedded in it as one of its important components. Its software embeds in ROM (Read Only Memory). It does not need secondary memories as in a computer HARDWARE



- ***History of Embedded Systems***

When computers came into the market in the 1940's, they were all Embedded Systems. However, they were never regarded as Embedded Systems because, firstly, they were regarded as computers; and secondly, because they were too large and improper to be formally termed as Embedded Systems.

The Apollo Guidance Computer changed history. It became the world's first modern Embedded System. The Apollo Guidance Computer was developed by Charles Stark Draper. The size of the device was reduced considerably from its monolithic ancestor. However, this increased other risk factors.

Mass production of Embedded Systems began in the year 1961.Ever since; there has been no stopping the production and increase in the use of Embedded Systems.

- ***Why do we need embedded systems?***

The first reason why we need embedded systems is because general-purpose computers, like PCs, would be far too costly. Another reason is because general-purpose solution might also fail to meet a number of functional or performance requirements such as constraints in power-consumption, size-limitations, reliability or real-time performance etc. The digital revolution has reached a stage that we cannot conduct our normal modern daily lives without this technology.

All sectors of the economy have been influenced by the digital revolution and the industry has experienced tremendous developments in all aspects of engineering disciplines.

- ***Basic components of Embedded System***

It has Hardware, Processor, Timers, Interrupt controller, I/O Devices, Memories, Ports, etc.

It has main Application Software

It has Real Time Operating System (RTOS)

RTOS defines the way the system work. Which supervise the application software? It sets the rules during the execution of the application program. A small-scale embedded system may not need an RTOS.

- ***Hardware classification of Embedded System***

1. Small scale Embedded System

   As the name implies, It is the smallest type of Embedded System which has less complexities in their hardware and software. It requires a board level design. Usually, they are designed with 8 or 16-bit microcontroller. 'C' language is mostly used while installing this software. It can be battery operated.
2. Medium scale Embedded System

   It is designed using 16- or 32-bit microcontroller or DSPs. The software includes RTOS, Source Code Engineering Tool, Simulator, Debugger, and Integrated Development

Environment. These things make the software complicated. Software tools also used as solution to the hardware complexities.

3. Sophisticated Embedded System

Sophisticated Embedded System has an enormous level of software and hardware complexities. Because there is tremendous co-excision between software and hardware and integration in the final system, they are also used for cutting edge applications. Certain functions such as encryption TCP/IP protocol stacking various algorithms and network driver functions are implemented in hardware to obtain great speeds.

- ***Programming Language for Embedded System***

Language basically used for embedded system: -

1) Assembly Language.
2) Embedded C

Software used for Compiling this language: -

1) Keil π vision
2) Top view
3) Bascom

For designing a circuit, we need compiler like: -

1) Proteus ISIS Professional
2) EXPRESS PCB

The required kits are:

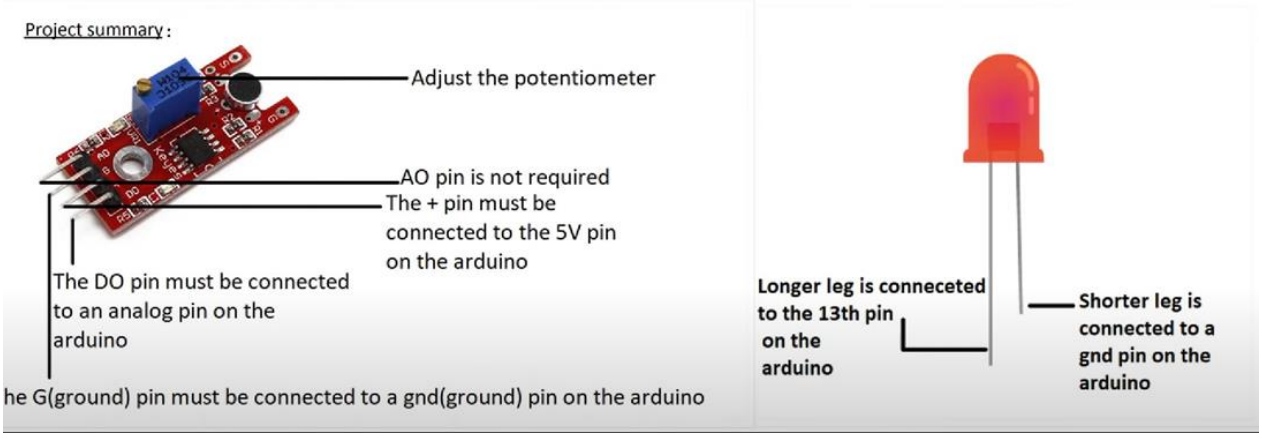
1. An Arduino and its adapter
2. Few jumpers Wires
3. A digital Sound sensor
4. A led and lcd

2X16 LCD Display

There are 4 pins on the digital sound sensor. They are:

1. AO-Analog pin
2. G-Ground pin
3. +-positive power pin
4. DO-digital output pin

There are two legs on a LED. The longer leg is positive and the shorter leg is negative.

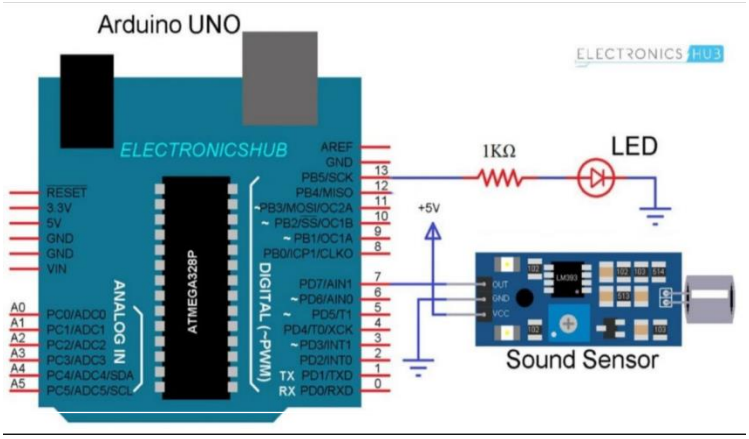


Setup:

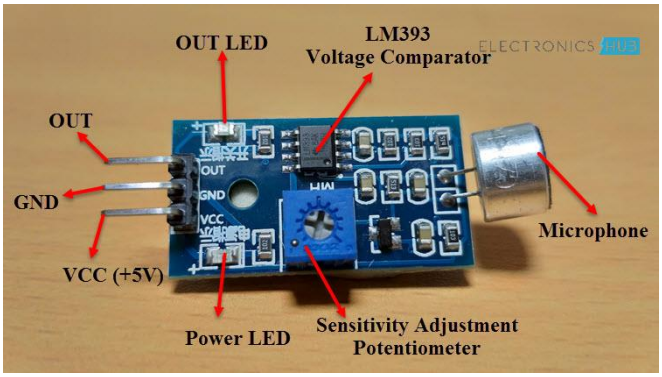
The steps to setup hardware are listed below:

- Connect "+" **pin** to 5V pin on the Arduino.
- Connect "**G**" **ground pin** to GND pin on the Arduino.
- Connect "**DO**" **digital output pin** to any analog or digital pins on the Arduino. We connected it with A2
- Connect **longer LED leg** to pin 13 on the Arduino. If you want to use another pin on the Arduino, you need to use a 220-ohm resistor.
- Connect **shorter LED leg** to GND pin on the Arduino.

The setup is Completed.



Circuit Diagram of Interfacing Sound Sensor with Arduino



LM393 IC based Sound Sensor Module

Code:

```
#include <LiquidCrystal.h>
// initialize the library by associating any needed LCD interface pin
// with the arduino pin number it is connected to
int ledPin=13;
int sensorPin=7;
int val =0;
const int rs = 12, en = 11, d4 = 5, d5 = 4, d6 = 3, d7 = 2;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);

void setup() {
  pinMode(ledPin, OUTPUT);
  pinMode(6, OUTPUT);
  pinMode(sensorPin, INPUT);
  digitalWrite(sensorPin, LOW);
  digitalWrite(ledPin, LOW);
  Serial.begin (9600);
  // set up the LCD's number of columns and rows:
  lcd.begin(16, 2);
  // Print a message to the LCD.
}

void loop() {
    val =digitalRead(sensorPin);
  Serial.println (val);

  // when the sensor detects a signal above the threshold value, LED flashes
  if (val==HIGH) {
    digitalWrite(ledPin, HIGH);
    digitalWrite(6, HIGH);
    lcd.print("Keep Silence!");

    delay(500);
    lcd.clear();
    val = LOW;

  }
  else {
    digitalWrite(ledPin, LOW);
    digitalWrite(6, LOW);
  }
}
```

Conclusion and Future Scope

A sound level meter is simply a device with audio-frequency sensing capabilities that is controlled essentially by a microcontroller in turn measuring, comparing and regulating audio signals all in a bid to reduce noise level in a library as well as maintain a stable audio frequency throughout the library environment. This project focuses on measuring the various sound levels present in a library all in a bid to limit unnecessary noise in the library through audio announcement once the critical sound level has been exceeded. This sound level meter consists of a Condenser microphone (used as an input device to convert the sound into electrical signal), Pre-Amplifier (amplifies the electrical signal), Microcontroller (with internal ADC programmed to compare the input signals with a critical value to detect when there is noise), LED (light up to alert users of the library to increasing sound level).The Sound Level Meter measures sound level in decibels and can be used for activities such as environmental noise studies, sound level comparisons, investigating room acoustics, sound isolation modelling, sound propagation modelling etc. It can be applied in libraries, hospitals, laboratories, lecture rooms, meditation rooms amongst many others.