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Sound Level Monitoring system

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Abstract: This paper proposes a system that is used for sound level monitoring. The system is totally based on Internet of Things (IoT) highly desirable in the sound pollution control field. In this system, one can detect the level of pollution (Sound) time by time. Also, the realization of the "Smart City" concept is done via this project. The overall design, objectives, performance, and characteristics of the sensing system for continuous measuring sound are discussed.

Keywords: Sound level, Sound level monitoring, Pollution, IoT

I. INTRODUCTION

Noise pollution is a common problem in modern cities which tends to affect people's cognitive abilities and health. Its effect is much more complex than we interpret. By definition, noise is an unwanted sound i.e. every sound phenomenon like for instance buzzing, gulls, noise, loudspeakers, speech, etc., or overall that hinders work or rest can be noise. Long-term exposure to sound levels over 85 dB can lead to permanent hearing loss. The human ear can sense the sound of a frequency range between 16 Hz to 20 kHz, approximately.

Many times, the sound caused by vehicles, fire-crackers, or loud music could be extremely dangerous especially in the silent zone areas. This type of noise can cause a major hindrance for people in educational institutes, hostels, hospitals, courts, residential areas, etc. It is necessary to monitor and control sound levels in such areas so that no disturbance is caused. So, we have designed a system where the level of sound when reaches a predefined level a message is sent to the central server informing about the sound increase so that appropriate measures could be taken to control it.

II. LITERATURE SURVEY

With an aim to reduce the unnecessary sound pollution and work towards it, [1] helps present the IOT concept of Smart sensor unit for environmental sound level measurement. Arduino UNO microcontroller, Microphone, Lo-Ra click module and antenna are used for connection and cloud storage to the global TTN platform is used for implementation. The system has good performance in terms of sustainability, acquisition and representation of measured value of Sound level.
[2] The implementation of sound-level monitoring IOT based on MQTT protocol is presented where Raspberry Pi 3, Arduino MEGA, ESP8266 Wi-Fi module, SPL meter and desktop is used for implementation. On subscriber side, the measured data is shown on SPL meter and collected in Arduino MEGA.
[3] The System constantly keeps measuring the sound level in different areas using the sound sensors and these sensors interact with raspberry pi and constantly transmit data which in turn is then used by the authorities to take an imposing action wherever necessary.
[4] The sensors are deployed in different areas and then they transmit the exact values (sound level) to the Arduino. After the processing of these values is done the Arduino transmits these values to the LCD screen through GSM.

III. PROPOSED SYSTEM

With the help of this system, it is possible for us to not only monitor but also regulate noise pollution. It requires the minimum cost of conventional monitoring and with much more accuracy. This proposed device is used for monitoring noise level in particular areas to make the environment intelligent or interactive with objects. This model is adaptive and distributive in nature to monitor the environment parameters. It allows us to monitor and check live sound pollution in an area through IOT. Smart sensors are used to sense the level of sound and measure it. It interacts with the Arduino which processes this data and transmits it to the applications. Authorized person can keep a watch on the areas where noise pollution is restricted such as near schools, hospitals and no honking areas.

A. Block Diagram:

The diagram given in Fig. 1 is the block diagram of the system. The Sound sensors (Nodes) are placed at different silent zones/ no honking zones in the city. The sound sensor continuously monitors the sound level in the surrounding area. The Arduino appears to be the brain of the entire system. If the sound level rises above 50 decibels in the morning

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or 40 decibels in the night then a message would be sent to the central server through the Arduino and the sound level would be displayed on a screen. This information then can be used by the higher authorities to take necessary action.

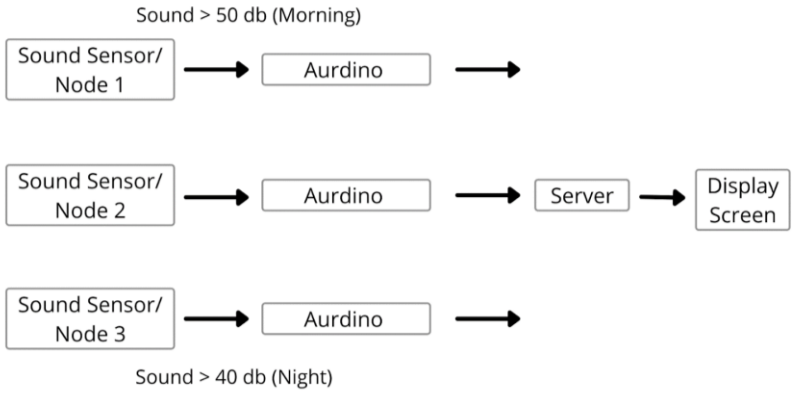

Fig. 1 Block Diagram

B. Flow Chart:

The flowchart of sound level monitoring is illustrated in Fig. 2. When the system is turned on the sound sensor starts measuring the sound level and this data is transmitted to Arduino. Arduino keeps monitoring the sound level which is also connected to the display screen. This sound level would be visible on the display screen. If the sound level raises above the predefined limit, then a message would be sent to the central server as “Sound Level Exceeded”. This information can be used by the authorities to take necessary action.

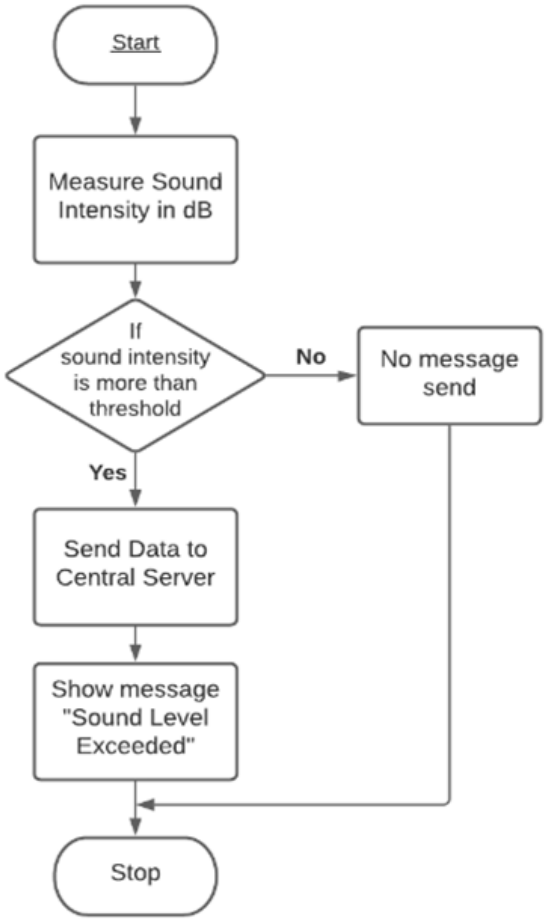

Fig. 2 Flowchart

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C. Components Required:

1. *Arduino UNO:* Arduino is an easy-to-use hardware and software microcontroller. This board is able to interpret inputs and turn them into output. We can control it by giving input and setting a predefined limit through which we get the expected output.

Features:
Microcontroller: ATmega328
Operating Voltage: 5V
Input Voltage (recommended): 7-12V
Input Voltage (limits): 6-20V
Digital I/O Pins: 14 (6 giving PWM output)
DC Current per I/O Pin: 40 mA
DC Current for 3.3V Pin: 50 mA
Analog Input Pins: 6

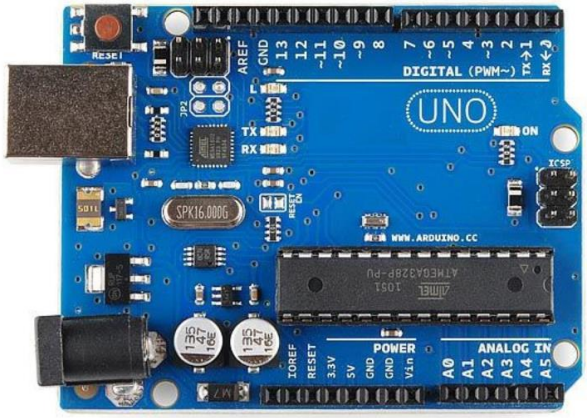

Fig. 3 Arduino UNO

2. *Microphone sound sensor module:* This sensor emits a signal when the front microphone of the sensor detects a noise. The sensitivity of this sensor can be adjusted by means of a controller.
Operating voltage: 3.3V-5V
Output form: Digital outputs
Sensitivity: between 48 dB and 66 dB
LM393 potentiometer is present in the KY- 038 which can be used to increase the sensitivity of the sound sensor.

Fig. 4 Sound Sensor Module

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IV. RESULTS

The results display the simulation of the system. As we can see in Fig. 1 that the alert message is sent to the central server if the sound level rises above the set limit. Similarly, the simulation results represent 2 silent zones (School & Court) where the sensors are placed. Fig. 4 and Fig. 5 displays that the sound level has increased above the set limit in the 2 silent zones.

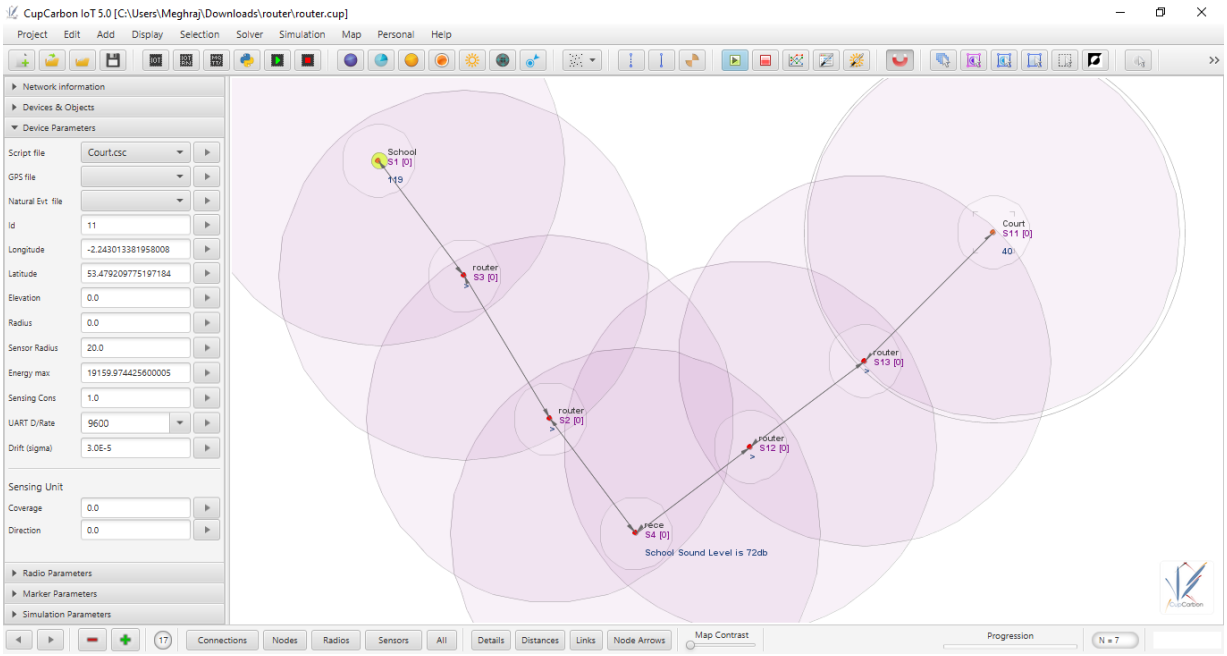

Fig. 5

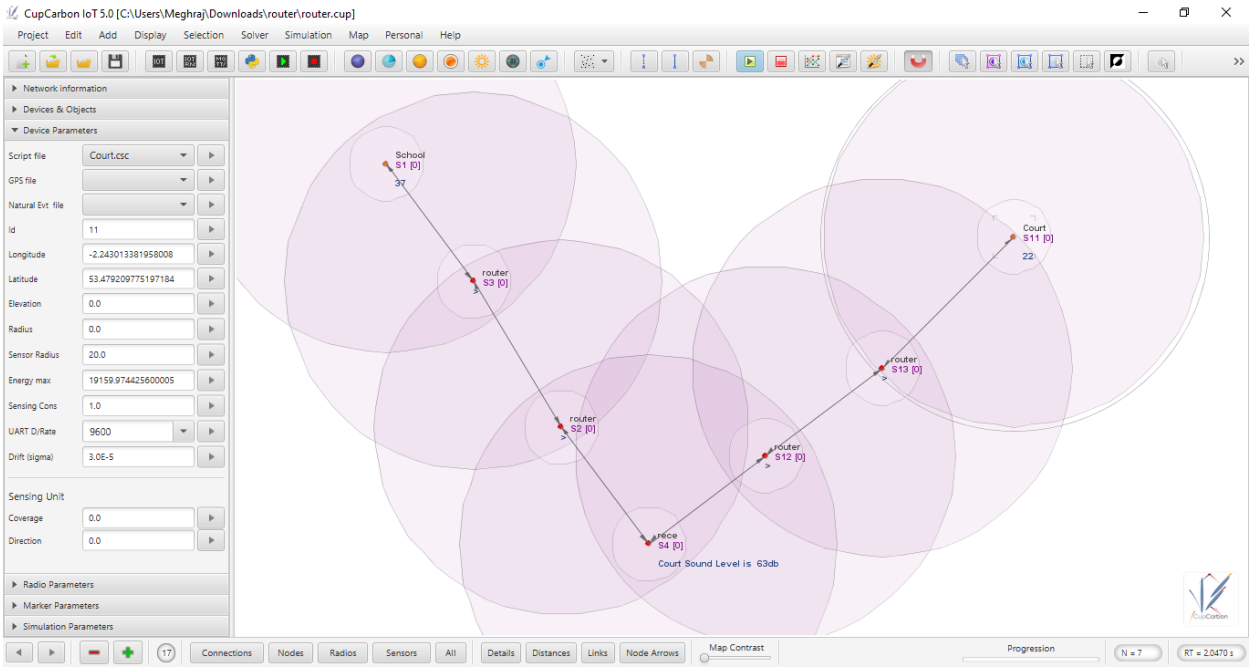

Fig. 6

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V. CONCLUSION

In this paper, a smart sensor unit for noise level measurement, inspired by the IoT concept is presented. This sound monitoring system helps us to overcome the problem of the highly sound polluted areas which is a major issue. This system supports new technology and also the healthy life concept. The system executed is easy, feasible, and cost-effective. This system can be used to monitor the sound levels in silent zones or in places with high sound pollution and hence allowing us to control the sound level efficiently. In big cities, this system is very much useful and effective because the implementation of this system is cost-effective compared to other systems.

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