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IoT based Noise Control Clock

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Abstract

Growing population, industrialization, and modernization leads to several deleterious effects including pollution and climate change. Noise pollution and the increased global temperature associated with climate change affect human behaviour and health. The present report was carried out to reduce the effects of both noise pollution and increased global temperature can be solved to an extent by IOT. A clock was designed to solve the problems to an extent by indicating surrounding noise frequency and temperature to the user. This IOT based clock alerts the user by an alarm on high sound frequencies and by changing its background color with the temperature of the room. The implementation of the clock is made in such a way to do both the tasks simultaneously.

Keywords

Clock, Sound Sensor, temperature sensor, IOT, Background colors, Sound and temperature sensing clock

1. Introduction

Previously many projects were made in which sound sensors were made to sense the surrounding sounds and just glow the led light as output and the same case is with the temperature sensor. No projects were made in which sound and temperature sensors can work simultaneously. We have researched all these projects and decided to make an effort on making sound and temperature sensor to work simultaneously and for this, we proposed this research paper in

which we are implementing there two sensors to be installed on a wall hanging clock either analog or digital and these sensors will help the society to live a healthier and peaceful life.

The sound sensor warns the user if the surrounding noise is harmful or not. To warm the user it will raise a high- frequency alarm or an led indication.

The temperature sensor is mainly used to just change the background color of the clock but it will also be used to know if the temperature is very low or very high. The changing

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background colors not only gives attraction to the clock but also let the user know about low and high temperatures.

Growing population and urbanization while helping for economic growth also leads to nuisances like pollution and global warming[14]. Noise, one of the atmospheric pollutant have deleterious effects on human health. The safe noise level for humans was found to be 70 decibels (loudness of the noise is measured in logarithmic units- decibel).[1] The personal music system we use can generate a 100 dB noise loud enough to cause permanent damage after 15 minutes per day. Permanent hearing loss will occur to some extent in people repeatedly exposed to over 105 dB.[2]

Global warming resulting in increased earth's average temperature also has adverse effects on human health. The global temperature has increased at an average rate of 0.07°C per decade since 1880. Such increased temperature can lead to heat cramps and stroke.[3]

In both cases, one can manage to stay healthier if provided with some indication of a change in temperature/loudness of the noise.

With this background, the present research paper was carried out on **Sound and temperature Sensing Clock** based on the **Internet of Things** (IOT). The main objective of this research is to reduce noise pollution to some extent to maintain a healthier society.

2. Review of Literature

The research papers that are made and researched until today are focused only on alarms generated by digital and analog clocks.

Before researching and implementing the paper some issued research papers had been checked and found that sound sensors are mostly used as hardware in wireless sound systems and machines like laptops, mobile phones, etc.

Our research paper shows how we can implement a sound sensor in clocks and use them for warnings to its users.

In previous research papers, we found no idea for how a temperature sensor can be used to change colors of the clock's background but in our paper, we have also shown how temperature sensors can be implemented in a clock and can change its background-color.

Until today's date, researchers made their research papers to allow a clock to show the temperature in Celcius or Fahrenheit but we made our research paper to allow a clock to change its background color according to the temperature.

3. Proposed System

A clock was designed to solve the problems to an extent by indicating surrounding noise frequency and temperature to the user. This IOT based clock alerts the user by an alarm on high sound frequencies and by changing its background color with the temperature of the room. The implementation of the clock is made in such a way to do both the tasks simultaneously.

4.1. Components Related to the clock

4.1.1. Sound Sensor – The sensor works accordingly with the sound it hears and alerts the user about the sound. This sensor will be installed on the clock which makes the clock a sound sensing clock. The best part of this sensor is that it will be user-controlled making it

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an IOT based report.

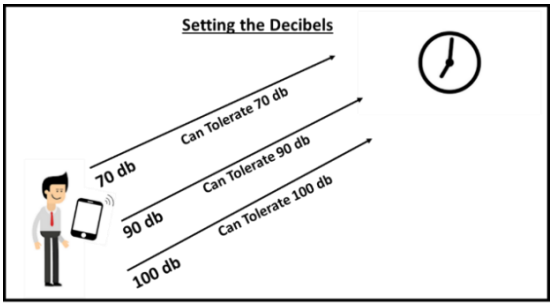

Fig 1.1 Working of Sound Sensor

3.1.2. Working of Sound Sensor:

1) There is a software that will sense the ongoing frequency in the room. Frequencies above the set higher limit will be detected by the sensor and alert the user by beeping alarm.
2) The software needs a system to work upon. Therefore, the software is installed on the user's clock system to work accordingly and to perform things as justified in point 1.
3) Our report is an **IOT** based facilitating easier user interaction with the system. In Aspect III, the software enables the user to set a higher limit according to the circumstances. For example, if users hold a party or occasion in the room in which frequency is higher, the user can turn off the system or increase the frequency so that the system can allow higher frequencies.
4) As mentioned above the sound sensor is installed on the clock and the sensor is connected to a high-frequency alarm. The alarm can be raised in such a way that it can be heard even in the 80-decibel noise.

sound sensor is installed to do both the tasks simultaneously.

The same software used in point 1 of the sound sensor will also help to sense the temperature of the room. The sensor will change its background colors accordingly with temperature.

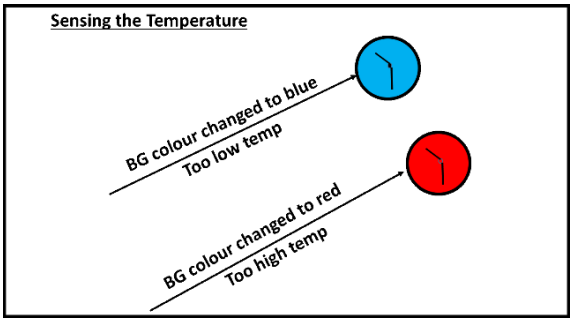

Fig 1.3 Sensing temperature

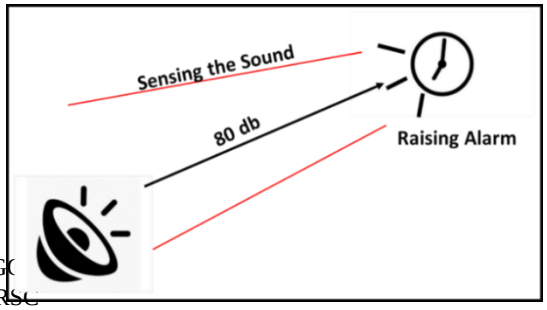

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Fig 1.2 Sound Sensing

The above diagram shows how the clock can sense the sound and raise the alarm when the frequency goes above the tolerated noise. Whenever the clock's sound sensor detects frequencies higher than the limit, then it will raise an alarm that sounds A-9 DBFS sweeping sine tone, from 22 kHz down to 8 kHz.

4.1.2. Temperature Sensor – Another sensor that works accordingly with the temperature it senses was used. The background wallpaper will be changed accordingly to the temperature making it attractive to the user. This sensor will also be installed on the same clock on which a

4.1.3. System Diagram

The system diagram is further divided into two parts:

I. (A) Sound Sensor

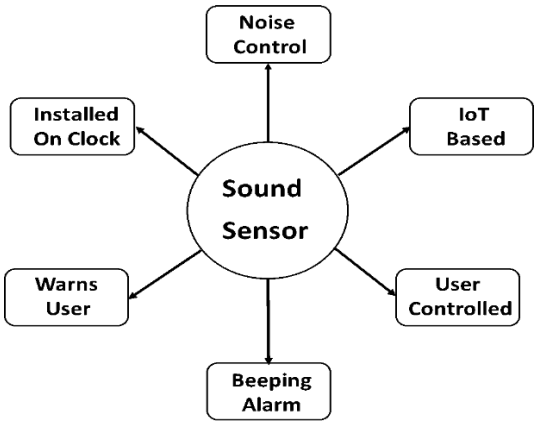

Fig 1.4 Sound Sensor Features

The above diagram(Fig. 1.4) shows the features of the sound sensor and its role. The sound sensor is capable of controlling the noise, it is IOT based and can be controlled by the user and has a beeping

alarm that works as a warning, and at the end, it is installed on the clock.

II. (B) Temperature Sensor

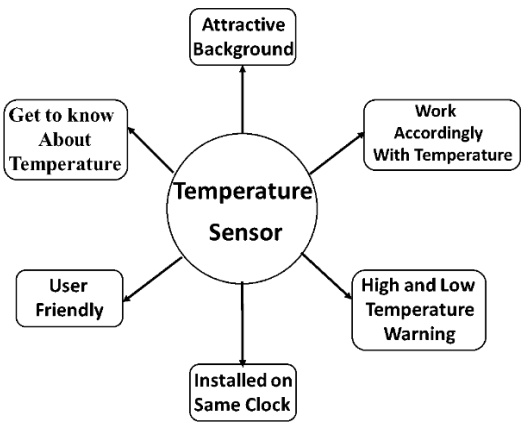

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Fig 1.5 Temperature sensor features

The above diagram(Fig. 1.5) shows the features of the temperature sensor and its role. The temperature sensor helps to change the background color of the clock and it also warns the user about high and low temperatures. The temperature sensor is installed on the clock with a sound sensor. Its user friendly and with changing of the background color it looks attractive and also helpful.

4.1.4. Methods and Findings

4.1.4.1. Hardware Implementation

(A) Sound Sensor

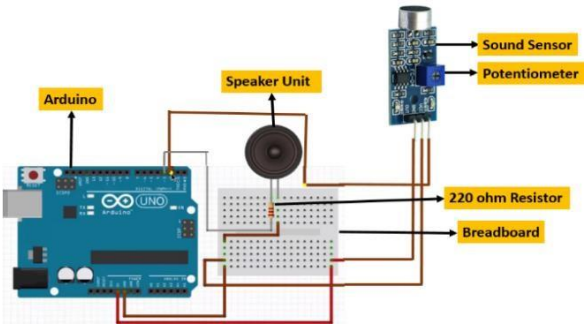

Fig 1.6 Sound Sensor Implementation

This hardware is used for sound sensor:

- Arduino
- Speaker unit
- 220-ohm resistor
- Breadboard
- Sound sensor

For the sound sensor, we have used Arduino to detect sound that exceeds the set limit of the sound.

This module is used to check whether the sound has exceeded the setpoint you have selected. Sound is detected via the microphone of the sound sensor. The sound level setpoint is adjusted by a potentiometer on the sound sensor. When the sound level exceeds the setpoint, an alarm will be raised by the speaker unit connected on the breadboard via Arduino. 220-ohm resistor is also used to maintain the signal and the current flow of the circuit.

The whole circuit will be connected and

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runs on the clock's battery. The sound sensor acts on what it hears.

(B) Temperature sensor

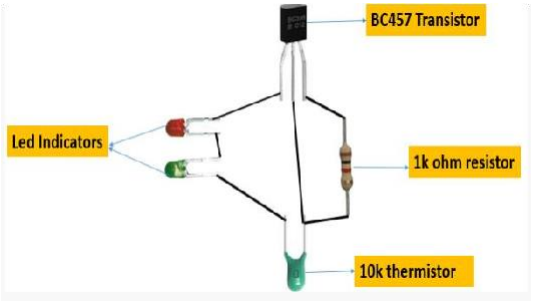

Fig 1.7 Temperature Sensor Implementation

This hardware is used for temperature sensor:

- BC457 transistor
- 1k ohm resistor
- 10k thermistor
  - Led for background

The thermistor is used to sense the temperature of the inside of the house. This thermistor is connected with a 1k ohm transistor that will maintain the signal the current flow. BC457 transistor is connected with circuit and led lights are connected to transistor and thermistor.

The thermistor is being touched inside of the clock that way it can detect the temperature. When the temperature is high then red led will glow and when the temperature is low then green or blue led will glow.

This circuit is also connected and runs on the clock's battery

4. Related color changing clocks

The clock only changes the background color randomly. Most of the clock either has a color selected according to a limited set of seconds or the color changes on clicking through a switch or a button. The new IOT based clock will change its color according to the temperature in a room. Furthermore, it will not require a switch or button to change the background. It will work on the temperature around it and batteries.

5. Result and Discussion

6.1. Sound Sensor

The following analysis and data are gathered by the sound sensor:

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```
int soundSensor = 2;
int LED = 3;

void setup()
{

  pinMode (soundSensor, INPUT);
  pinMode (LED, OUTPUT);
}

void loop()
{
  int statusSensor = digitalRead (soundSensor);

  if (statusSensor == 1)
  {
    digitalWrite(LED, HIGH);
  }

  else
  {
    digitalWrite(LED, LOW);
  }

}
```

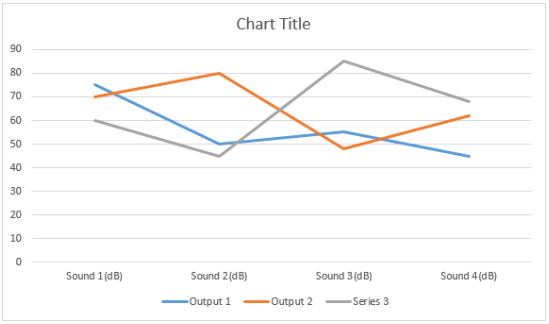

Fig 1.8 Sound Sensor data Graph

		Output 1	Output 2	Output 3
2	Sound 1(dB)	75	70	60
3	Sound 2(dB)	50	80	45
4	Sound 3(dB)	55	48	85
5	Sound 4(dB)	45	62	68

Fig 1.9 Sound Sensor data Graph

The above Fig. 1.8 shows the data graph that is gathered by the sound sensor. It's giving the output by sensing the sound in a room. As the graph shows the analysis like if sound noise is 70 dB then it's giving the warning according to the sound. Fig.

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1.9 shows different data gathered by the sound sensor.

6. Conclusion

An IOT based clock design to sense and alert people regarding the safe noise and temperature levels. The percentage of health issues will drop to some extent. The mood of the people at home will remain good and because of background changing color will help people keeping their body temperature normal and it will help them to lead a healthy and happy life.

The outcome of our report novelty is its not been implemented yet.

The practical implementation of the system can ensure comfortable and healthier surroundings for people mitigating the effects of noise pollution and climate change.

7. Future Scope

This IOT based clock has not been implemented yet but it may provide a wide range of facilities. It may also be installed on other appliances like refrigerators, televisions, etc.

It can also be customized as the alarm can be replaced by led indication so that it warns the user without disturbing the user.

The research paper includes the sensors and other parts with a total cost of 1225 Indian rupees. It will help reduce noise pollution and on the other hand, it will help take care of one's self by maintaining the temperature of the user's body.

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