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Design an IoT Based Noise Detection and Alert System

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Abstract: *Noise pollution or sound pollution is the propagation of noise with ranging impact on activity of humans & animal life. Most of which are very harmful to humans. Source of outdoor noise worldwide is mainly caused by machines, transport and propagation systems. Noise pollution also impact the health and well being of wildlife. To control the noise pollution various systems models are present. Hence to overcome all problems and help our society we propose a IoT based system noise detection system using raspberry Pi and with high end noise detection sensor. This model is used in school area as well as any other places where noise is required in less amount. After one lecture second lecture is starting. In this gap teacher may came late between these students make noise. It will affect on nearby classes or office. That's why for controlling this noise we develop IoT based noise detection system is proposal which will help to control the noise. In this system model if noise range is High then it detect the noise and send notification to the to the respective authority or teacher. With the help of this model teacher or authority will take a preventive action . This model is helpful in various noise pollution area like in city , hospital , school , silent zone area etc*

Key Word: *Noise Monitoring; Smart Classroom; Noise Awareness; Iot, Raspberry Pi.*

I.INTRODUCTION

Internet of things or commonly called IoT refers to the network of physical devices, vehicles, electronic appliances and other items embedded with sensors, software and connectivity which enables these things to connect, collect and exchange data without requiring human-to-human or human-to-computer interaction . IoT is currently growing due to some factors such as convergence of multiple technologies, real time analytics, machine learning, commodity sensor and embedded systems. The term IoT was firstly coined by Kavin Ashtonof Procter and Gamble and later by MITs Auto-ID centre (1999). Cisco System estimated that IoT was developed between 2008 and 2009. It is widely used in today's applications such as consumer, commercial, industrial and infrastructure spaces. There is a lot of thing that can be implemented for the consumers' daily uses.

Sound pollution is becoming a growing problem around the world. It is important to control pollution in particular regions, as well as in particular industries , factories hospitals, school etc. For the noise level in various cities we proposed one IoT based system model. It will use this model to detect the noise . It is easy model to monitor noise level, such as level of sound in db. Here in this system , we have used mainly the raspberry pi. Python language is used to program the raspberry pi. That's why this system in school or college.

In this system used noise sensor lm324 to detect noise. In this system we have set the volume at three levels low medium and high. If the volume level is low, the system does not perform any action. When the noise level is moderate, this model gives appropriate instructions to the whole class such as students pay attention here, this is the last instruction if you raise your voice, a message will be send to the superior or the teacher.

However, if the volume does not decrease, this system will be send message to teacher or higher authority. By using this system, teachers can reduce the noise in the classroom. We can install this system in different places like hospital, school, silent zone area, traffic signal etc.

II.MATERIALS AND METHODS

Software Requirements

Software that is required for this project is as follows:

1. Rasp Bian Buster OS
2. Python IDLE3
3. Language :-: Python
4. Database:-: My SQL server

Hardware Requirements

Hardware required for this system is as follows:

1. Raspberry pi 3b+
2. Laptop
3. SD card
4. HDMI cable
5. ICLM342 sensor

6. Mobile
7. Camera

III.LITERATURE SURVEY

The paper [1] mainly deals with the feature engineering of the ECG signals in building robust systems with better detection rates, and uses the human visual perception paradigm as the image analysis method for the extraction of new features from the signals. After acquisition of new clinical electrocardiogram (ECG) signals the first step is often to pre-processed and have a signal quality assessment to uncover noise.

The aim of the paper [2] is to implement portable internet based sound detective prototype by using internet of things technology. The approach of this paper [2] is to make use of low prices components and sensors and single chip microcomputer like raspberry Pi with Wi-Fi connection ability to design a sound detective device to offer a better solution to noise pollution.

The article [3] devised a system which can automatically detect and recognise whether an environment is noisyor not The main aim of this paper[3] is the detection and recognition of the impulsive sounds caused by gunshots and the proposed gunshot recognition algorithm recognizes the gunshot among the same.

The author presents in [4] recent progress on portable Doppler, frequency-shift keying (FSK) and frequency-modulated continuous-wave (FMCW) radar systems for life activity sensing and human localization, and machine learning is presented as an efficient approach to make the radar system smart for automatic classification and decision making. Also the paper[4] addresses noise and sensitivity issues in remote sensing and detection of vital signs based on a continuous wave biomedical radar operating at multiple harmonic carrier frequencies .

IV.METHODOLOGY

a. Proposed Work-

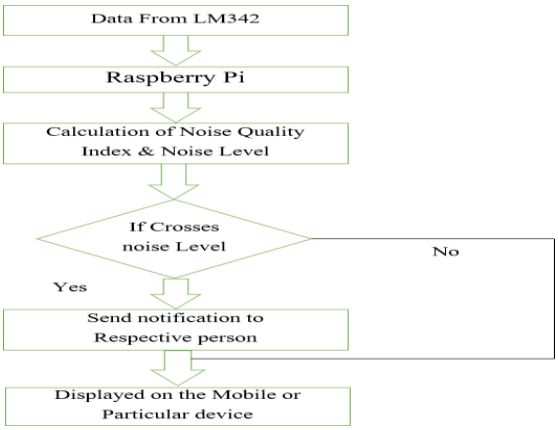

Figure 2-Flow Chart of Hardware Processing

The figure 2 is flowchart of hardware processing. It is our flow chart of our proposed system. It consists of following models noise quality index, noise intensity detection model. LM 324 noise detection sensor is utilized to measure the noise level with motive to monitor noise pollution in an area. When sensor detect the noise , it processes the output signal voltage which is sent to Raspberry Pi which again performs the necessaryprocessing required for monitoring the parameters. When the noise level is crosses the limit at that time this system send the notification to respective person to perform necessary action.

b. Hardware Connection –

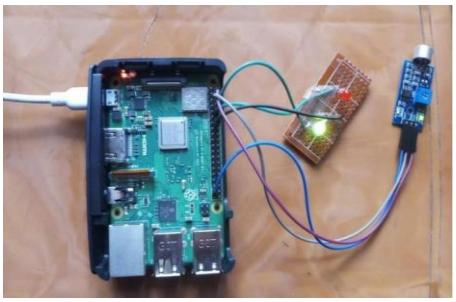

Figure 3 - Connection of Hardware

In today's world many pollution monitoring systems are designed by considering different parameters. Existing system model is presented in figure 3 uses Raspberry-pi based wireless sensor model to monitor noisy conditions with thousands of applications in different fields. With the help of this kind of project it is easy for the Police to identify the noisy zones. For Ganpati Festival or any festivals to control noise by Police Station. This project is useful for the control to a noisy in silent zone and any other places. To determine a frequency level of the noisy by using this "Voice Recognition Device" and solve the problem to creation of the noisy. It may use in the schools, colleges, court area, hospital and any silent zone areas to

control the noise. A noise detector with instinctive recording device is proposed, which provides frequent warning information to the userif the noise limit exceeds, and finds wide advantage for labours in industry. Talking loudly is an infuriating habit in an office environment as well as in industry the machine noise is quiet annoying.

The office environment with loud co-workers can distract the work and reduce the work efficiency. The machine noise in an industry environment above 85dBA affects the hearing capacity. To help and solve this issue, a noise detector with instinctive recording device is proposed. This device informs the user about the noise level and whenever the noise level exceeds the limit, it automatically records the sound and its duration. This system finds wide advantage for labours in industry, which provides frequent warning information to the user if the noise limit exceeds.

Pin Connection -

Take raspberry pi and LM 324 sensor for connection. Connect sensor to raspberry pi using pins. Sensor has three pins like VCC, Ground, general input output pin. Connect raspberry pi VCC to sensor VCC and groundto ground Connect sensor output pin to pi 14 pin (pi having 40 pin are present out of that 27 pin are available for GPIO (general purpose input output) pin) after that take memory card . In that memory Card install one operating system that name is Raspbian version 5.2 (Stretch OS). This OS is Linux like type. In this OS all operation performs on command prompt. After this process connect monitor, mouse and keyboard to raspberry Pi using HDMI cable. Supply power to pi and monitor in between 2 to 5 volts.

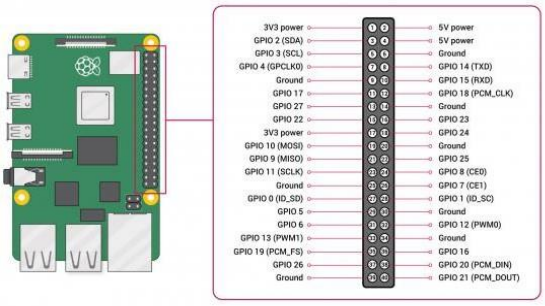

Figure 4 - Pin Connection

Model Description -

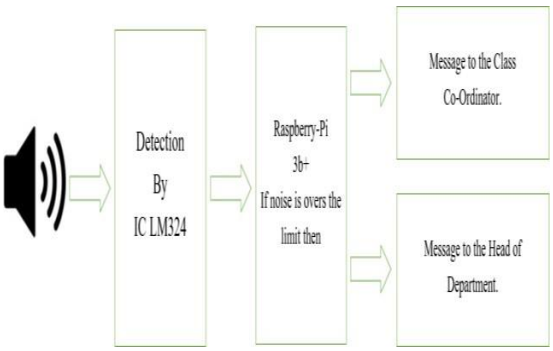

Figure 5- Model description

Initially, the system verifies if all the components that are being connected are in the position to work or not. A working model connection is established between Raspberry pi3b+ device and IC LM 342. This is one way connection is used to detect the sensitivity of noise and send message to class co-ordinator and Head of Department. Noise detection message will be send through mobile.

Technical Details -

1. Average cost.
2. To 5V power and I/O.
3. 2.5mA max current use during conversion (while requesting data).
4. No more than 1 Hz sampling rate (once every second).
5. Body size 15.5mm x 12mm x 5.5mm.
6. pins with 0.1" spacing.

V.RESULT

Our proposed system attempts to make practical model of Noise Detection based system which not only just detects noise but also is capable of distinguishing between normal sound and noise on the basis of intensity of sound and based on that comparison it makes decision to know about where the noise is high and it help to know where to put how much volume. In following result table 1, we used some range of noise level of various actions on the basis of google service. using this we calculate following results. Using this we can control the noise level in school. The advantage of this project is help in reducing the noise in school but also help in controlling the noise in silence zone area, maintaining the noise in hospitals, control the noise in various festival and it also used for traffic and also to vehicle riders to not honk unnecessarily at traffic signals.

Table 1 – Actions and its noise level

Sr. no	Actions	Idle Range	Low noise	Medium noise	High Noise	No Detection
1	Clapping	40 DB			✓	
2	Dropping Duster	55 DB		✓		
3	School Bell	110 DB				✓
4	Music	80 DB			✓	
5	Drag Table	65 DB			✓	
6	Communication	55 DB		✓		
7	Snapping the finger	35 DB	✓			
8	Shouting	70 DB			✓	

VI.CONCLUSION

The proposed model detects the noise detection which causes serious hearing capacity in humans. The device modelled with three cluster nodes is compatible with different environmental condition and finds application in the different field. The system provides frequent warning information if the cluster data exceeds the threshold limit of 85 dB Raspberry Pi interfaced with Think speak API provides IoT platform combined with cloud storage location to record the noise levels at different cluster nodes. Furthermore, the proposed model provides viability to fix cluster nodes based on the usage and also to vary the threshold value.

Advantage of the project is sensors are easily available. It is simple, compact and easy to handle. Sensors have long life time & less cost. It's drive circuit is very simple & system is real time. It will help to all researchers who are doing research based on noise control.

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