IOT BASED NOISE POLLUTION MONITORING SYSTEM

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 Ashton of 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. Take a smart home for instance, IoT is used in this invention to control lighting, heating, air-conditioning, media and security Systems.

PROBLEM DEFINITION

Noise monitoring is very crucial since 20% of the European Union (EU) population or close to 80 million people suffer from noise level that experts consider to be unacceptable . IoT allows an exchange of information to and from a device or thing and due to its flexibility and low cost, IoT is getting popular day by day . Thus, IoT is very suitable to be implemented in monitoring the noise level in some areas to deal with the problem. The demands of modern society lead to the creation of noise sources such as industrial sources, transport vehicles, defence equipment and construction. The most significant example is inside UTM. Noise coming from vehicles and construction sites have significantly distract the focus and the intellectual development of the students. This issue results in the needs of a system that will monitor the noise level at that areas. It is also an alternative for students to know the suitability to study via app.

Methodology

Hardware Development

For the hardware parts, LM 393 sound sensor is used to read the readings of the sound level for the environment. The reading of sound sensor calibrated using the real sound level meter to get the accurate readings of the sound level. The 16x2 LCD will show the values of sound level at that researched area and give the warning that says the level of sound is high when the measurement exceeds the set value. If the users could not read the readings due to poor eyesight, they can know the level of sound by using the light emitting diodes (LED) which in red, blue and green colour placed below the LCD. LED acts as an indicator to indicate when the noise is very high. It will turn to red, blue for low noise while green for intermediate level. All these components such as sound sensor, LCD, and LEDs will be connected to the ESP8266 NodeMCU.

App Development

As the app was created by using Android Studio, the app will display the data taken from the sound sensor. Android Studio is a software to create app

use JAVA language to design an Android development. The app has four features which are the reading of sound level in dBA, the level of warning based on the reading of sound intensity, the possible sound that contributes to the sound level and the suitability for students to study. The app gives different level of warning such as “low”, “normal”, “high” and “very high”.

Working Principle of the Prototype

The sound sensor will record the readings of sound level at the researched area. Then, the data is sent over to the cloud server called Firebase. Firebase is a development platform that is specialized for web application and mobile developed by Firebase Incorporation . Firebase is chosen as the cloud server for this system because it can easily be connected to Android Studio. The data is stored in Firebase real-time database which the user can also access via web browser. Then, data from Firebase is transferred to the app. The users can use the app to know the reading of sound level and they also can know which time is suitable to study and what factors contribute to the high noise based on the value of sound level.

Results

The prototype is calibrated using actual sound level meter to get the accurate measurement of sound level or sound intensity. The prototype is used to measure the sound level at five different times which are during morning, afternoon, evening, night and midnight at a place where UTM students are staying. The reading is taken 30 minutes per range of time. Within that time, the lowest and highest sound intensity were recorded and from the readings, the range of sound level was determined during that specific range of time.

Conclusion

People thought that noise pollution is merely an annoyance but it is actually very important to monitor noise level because according to research, people who are exposed to noise for a long duration of time can have hearing loss, sleep disturbance, high blood pressure and injuries . Besides, it can affect the learning process of people in terms of understanding and behaviour.

Thus, this research investigates and subsequently proposes the suitable time for students to study by utilising the cloud server and android application to realize an IoT based noise monitoring system. From the prototype, it also can be determined the dominant sound that increases the noise level in the researched area. The app can display the reading from the prototype successfully. Based on the results, it can be concluded that the students can study throughout the day starting from morning until midnight during weekends because the noise level is still under the allowable standard which is 60dBA according to CIBSE. As for weekdays, the suitable time to study is found out to be at midnight because the readings are below 60dBA for that time. The limitation of this study is that it is conducted within UTM campus only. In addition, the app can only show the reading from only a single prototype as well as the prototype and app can only operate when there is an internet connection. This system can be improvised in future to include measurements outside UTM such as at schools and airports.