IOT BASED NOISE POLLUTION MONITORING

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PHASE 4 SUBMISSION DOCUMET

PROJECT: NOISE POLLUTION MONITORING

INTRODUCTION:

*sound pollution is at an alarming rise these days. It is necessary to monitor the air and sound pollution to saveThe environment and its dependant lives. With the rapid technological advancement and increased industrial plants, environmental issues and its effects on living beings influenced the need of pollution monitoring systems. Due to its low cost, high efficiency and easy usage and implementation, Internet of Things (IOT) has become an effective tool, now-a-days. Internet of Things (IOT) allows communication between the devices and humans through the internet. It forms a connecting medium from human to a system. In earlier days, data lines had to travel and cover large distance, to the various locations to collect data after which the ana*

*lysis was done. But now, sensors and microcontrollers connected to the internet can make environmental parameter monitoring more flexible, accurate and less time consuming. When the environment monitored with sensors and devices it forms a smart environment. This embedded system makes the environment communicate with the objects. In this project, we are using a Raspberry Pi microcontroller, which will has a gas sensors and a sound detector connected to it, to monitor the fluctuating environmental parameters, mainly their pollution levels. Today, the noise pollution is one of the principles types of urban natural contamination. What is more, it is responsible for the negative effects that are harmful to the Earth and the personal welfare of the people. The increase in noise pollution relies upon numerous elements and in addition, they increase in the urban population and thus the expansion in the number of development exercise and vehicles. Noise pollution can be considered as one of the significant present in urban areas. Its assessment, control, and decrease are among the major natural well-being concerns for specialists.*

FEATURE ENINEERING

HARDWARE :

*Raspberry Pi: Raspberry pi 3b module is used which has an arm based single board computer which has a Wi-Fi and Bluetooth module already present in it. This controller is connected with the necessary sensor modules and GSM module .using these system we can acquire data and send it over the internet to a Cloud based storage area. The raspberry pi has the advantage of faster processing and better compatibility.*

SOUND SENSOR

*sensor these can give immediate results and can be interfaced with raspberry pi module. To monitor sound pollution a sound sensor is used – LM393. When the sensor detects sound, it processes the sound into output voltage raspberry pi. This sensor has an independent output voltage comparators that are designed to operator from a single power supply. This can help to perform the necessary sound monitoring for the system. The gas sensor used to monitor the air quality and Raspberry pi determine It’s the value proposed by the government to the public as to the pollution levels is MQ135 sensor. It operates at 5v and how pollution affects the environment or will. As the AQI can detect NH3, CO2, NOx and smoke. This sensor has a wide increase various health issues come up. The AQI can be range of detection, fast response and good sensitivity. It has computed by calculating the average pollutant concentration an ion specific membrane which helps it to react selectively over a specific period of time. for specific ions and gases. these also makes it better choice for monitoring in building as well as urban are temperature and humidity is being monitored with DHT11*

MODEL TRAINING:

NOISE PREDICTION MODELS STUDY:

*Noise prediction is one of the essential tools for decision-makers to reduce the adverse effect of noise and their control. The prediction models are generally used by three major sections of society. 1. Acoustic Engineers: Acoustical engineers are generally worried about the plan, investigation, and control of sound.*

*2. Acoustic specialist: They are generally part of the team to prepare an environmental impact assessment report.*

*3. Decision maker: Prediction models are generally used by decision-makers to identify the distribution of noise in the upcoming days. This procedure is a unique way, after the directives by ministries, to control the environmental noise, wherein noise maps have been suggested for transportation sources and urban agglomerations. Consequently, many logical sound prediction models have been created as of late, focusing on this angle and presenting only source outflow and sound engendering observational details. Lots of prediction models have been developed and validated by researchers for their respective countries. They have been successfully used by various agencies for the development of noise maps. Aside from the source interpretation, progressed numerical strategies including wave condition and equation of continuity are utilized to resolve the sound engendering impacts. Thus, it is very important to logically investigate and compare these models so as to discover their reasonableness by and large and furthermore to discover the best methodology among them for traffic noise modeling. [Steele, 2001] conducted a thorough review of the major traffic noise models.*

FHWA Traffic Noise Model Version 3.0 :

Federal Highway Administration (FHWA) Traffic Noise Prediction Model [Anon, 1978] was developed for the United States of America (USA) Department of Transportation Federal Highway administration by Barry and Reagan (1976); they received help from preceding National Cooperative Highway Research Program (NCHRP) [Anon, 1976]. The prediction noise model was published as a Report No.

FHWARD-77–108 which included calculation and programmable program. The reference noise level is the maximum noise level of the vehicle, emitted by the vehicle passed at a distance of 15 m.

In the FHWA model, Leq (Near) and Leq (Far) were calculated and the average of far and near were taken into consideration for noise average Leq noise level.

Leq (near)=10log (∑alli 10Leq (hi) (near)/10) (1)noise level by FHWA 1. The vehicles will be represented as an acoustic source .

2. Noise emission levels will be assumed as group noise source such as (Bus, medium and heavy trucks) are normally distributed.

3. Noise propagation losses will be adequately represented by the effect of distance. Input Parameters required for prediction of noise level (FHWA) For validating the FHWA model, traffic noise monitoring, the characteristics of traffic, including its composition and volume of traffic on the road, are required. For the FHWA model, traffic composition is normally divided into each type of vehicle such as medium truck, heavy truck and passenger car.

RLS-90 model RLS90:

1. is an efficient model, able to determine the noise pollution level of road traffic and, in current days, is the main appropriate calculation method used in Germany. It is a German national model for the prediction of road traffic noise and parking noise. It is made up of two different models; the first corresponds to the determination of noise level emission (Lme) at a distance of 25 m from the center of the road and 4 m above the ground level.

2. Lme is determined by taking into consideration traffic such as the speed of the vehicle, distribution of the vehicle, road surface condition. The sound pressure level for a street: LT = Lm + K (4) where: Lm = mean A-weighted noise level K = Addition for increase in noise due to effect of traffic signal controlled intersections and other intersections Lme = L25 + Cs + Crs+ Cg + Cr (5) where: L25 = Standardized noise level for assumption of a speed amounting to 100 km/h for cars and 80 km/h for trucks.

3. Cs = Speed correction Crs = Road surface correction Cg = Gradient correction Cr = Multiple reflection correction L25 = 37.5+10×log10 [M× (1+0.082×P)] (6) where: M = Number of vehicles (h-1) P = tracks exceeding 2800 kg (%) The second model is for the transmission stage, in which, the noise level at a definite location is determined by making the suitable phase.

Stop and Go model:

Developed the Stop and Go model for the central part of Bangkok. The model gives emphasis on formulating an empirical model of the intermittent flow of traffic in Bangkok using two analytical approaches. The first is the single model analysis and the second is the separate lane analysis or dual model analysis. Traffic noises due to interrupted or stop and go flow of traffic situation on urban roads create considerably diverse noise.

EVALUATION

>> Noise pollution affects several animals including human life. Noise pollution generally occurs due to sound from vehicles and industries these noise pollution can cause stress and several other mental illness, specifically in urban areas.

>> Certain noise standards are being prescribed by government for safety levels to be maintained. These standards vary based on the environment that is being monitored. The objective is to monitor and detect the air quality and sound intensity of particular region.

>>The method involves cloud based monitoring of the environmental parameters using internet also these has alert system that ensure user about alarming condition to take safet precaution. Sound detection is done by LM393 sensor with the motive to monitor sound pollution in area. Sound is measured in the form of decibels and its intensity depends on the time and region of the sensor position. The peak hours in urban areas have a high noise levels than during night time.

>> Uploading data to the cloud for communication to cloud system we need to access internet. This is achieved by GSM module that connects to internet. The acquired parameters are converted to digital data and saved these can be used for monitoring purpose and analyzing over a period of time these also has alert system which sends anomaly notification. If one of the parameters exceeds the alarming value, steps are taken to send notification in the form of email or SMS which is addressed to an anomaly.

CONCLUSION :

Pollution of the environment is being done by human activities and his development in industrial, as well as scientific fields now pollution became a major threat to the planet. These system could help in many ways to monitor various environmental parameters. Incorporating the IOT helps to monitor various levels and accumulate data in cloud storage. By doing so, it helps the humanity to analyze various patterns in environmental change in the public.