Environment Monitoring and Prediction of Planting of Trees

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Abstract: **For last few years, challenges of monitoring and control of distant environmental parameters accurately has emerged as new field of research. Monitoring the environmental parameters and initiating a control action from internet is also part of this concept. To ensure a safe and wealthy life of humans, it is important to monitor environment. Monitoring requirements are extremely different depending on the environment, leading to specially appointed usage that needs adaptability. This paper describes an implementation of WSN that can be adjusted to various applications. And it also inserts the adaptability required to be conveyed and updated without necessity of arranging complex infrastructures. The solution is based on small autonomous wireless sensor nodes, small wireless receivers connected to the Internet, and a cloud architecture which provides data storage and delivery to remote clients. The solution permits supervisors on-site to monitor the current situation by using their smart-phones. All measurements are stored at different levels to guarantee a safe back-trace and to access data stored in case of network failure or unavailability. A look up table is generated which contains the values of temperature and humidity (taken from DHT11), carbon monoxide (MQ7), air quality monitoring (MQ135) and is used for predicting the quantity of plants to be planted in order to minimize greenhouse effect and maintain healthy environment in future.**

Keywords: *DHT11, environment monitoring, prediction, MQ7, air quality sensor*

I. INTRODUCTION

Environment monitoring system is a system that is capable of measuring several environmental parameters like temperature, humidity, pressure, illumination and quantity of gasses like LPG etc. These parameters are important in many applications like in industry, smart homes Greenhouse and weather forecasting. Advanced Environment monitoring systems offer many features like remote access to the measurement data and also can initiate some control action from distant location. These systems use Wireless sensor Networks for sensing the environment parameters. Because of growing air pollution in cities, industries, in surrounding area there is need to know the changing air parameters. To monitor this changing environment parameter we are implementing such a system having sensors interfaced with Node MCU controller having inbuilt Wi-Fi. Android App is connected to this system through cloud, through which data of environment or value of sensors are accessed by user. A Python based GUI is developed to predict quantities of tree to be planted to keep in check pollution.

In reality, clean air is a basic requirement for daily life. Air pollution affects human health and considered as a major serious problem globally, especially in countries where gas and oil industries are ubiquitous. According to the United States Environmental Protection Agency (USEPA), the air quality is characterized by measuring certain gases that affect the human health, which are: carbon monoxide (CO), ground-level ozone (O3), and hydrogen sulfide (H2S). The main intention of environmental monitoring is not only to gather data from a number of locations, but also to provide the information required by scientists, planners, and policy-makers, to enable those making decisions on managing and improving the environment, in addition to presenting helpful information to end-users.

Air pollution in India is a serious health issue. Of the 30 most polluted cities in the world, 21 were in India in 2019. As per a study based on 2016 data, at least 140 million people in India breathe air that is 10 times or more over the WHO safe limit and 13 of the world's 20 cities with the highest annual levels of air pollution are in India. The 51% of pollution is caused by the industrial pollution, 27 % by vehicles, 17% by crop burning and 5% by fireworks. Air pollution contributes to the premature deaths of 2 million Indians every year. Therefore it is important to monitor environmental condition and control Air pollution.

For determining temperature and humidity of atmosphere we are using temperature and humidity sensor (DHT11) which will help in predicting environmental conditions. MQ7 sensor is used for detecting Carbon Monoxide in environment, whereas MQ135 is used for monitoring of Air quality. The server stores and displays the current values of all 4 parameters. A look up table is generated which contains the values of temperature and humidity and is used for predicting the current environmental conditions like if humidity is more and temperature is less, then chances of rain is more etc.

II. LITERATURE SURVEY

Several experiments are conducted on environment monitoring parameters data sets using multiple prediction techniques. There is little research on the prediction of trees plantation, some of them are given in table 1.

Table 1: *literature on prediction of environment monitoring*

Title	They are proposed	Improved Things
A Low-Cost Microcontroller-based Environment Monitoring System [1]	The device has many advantages as compared to other Environment monitoring systems in terms of its smaller size, huge memory capacities, on-device display, lower cost and greater portability.	Cost related things are considered from this project.
Environment Monitoring System using Microcontroller [2]	Analysis and achieving purposes, the data can be transferred over GSM and receiver section that is mobile. The device has many advantages compared to other Environment monitoring system in terms of its smaller size, on-device display, low cost and portable.	Mobile related information is gathered from this project
WI-FI BASED ENVIRONMENT INFORMATION SYSTEM [3]	It was developed using an Atmega 8 bit microcontroller, Environment sensors, display system and wifi module. It measures temperature, humidity, barometric pressure, rainfall etc , displays it on LCD and share it on a Wi-Fi network .	Sensor & wireless communication considered from this project
A Low-Power Wireless Sensor for Online Ambient Monitoring [4]	This project can be used for the Remote gathering and further processing of measurement data. Testing revealed that the system can operate continuously for up to three years on a single 3 V small battery.	Power related concept & sensor data management is considered.
Zigbee based Environment monitoring system [5]	In this application, Wireless sensor network can solve the problem, where parameters calculations and controlling will be precise even over the larger area.	Sensor data is converted from digital to physical value.

In [6], a low cost and holistic approach to the water quality monitoring problem for drinking water distribution systems as well as for consumer sites is described. Their approach is to develop sensor nodes for real time and in-pipe monitoring, assessment of water quality on the fly and to calculate the amount of water delivered. The main sensor node consists of several in-pipe electrochemical and optical sensors and emphasis is given on low cost, lightweight implementation, and reliable long time operation. Such implementation is suitable for large scale deployments enabling a sensor network approach for providing spatiotemporally rich data to water consumers, water companies, and authorities. Based on selected parameters, a sensor array is developed along with several microsystems for analog signal conditioning, processing, logging, and remote presentation of data. Testing are performed to estimate and validate these calculated contamination events of various concentrations of escherichia coli bacteria and heavy metals (arsenic). Experimental results indicate that this inexpensive system is capable of detecting these high impact contaminants at fairly low concentrations.

Appalaraju Yarra and Siva Krishna Kotha design and implement a WSN-based water quality monitoring system in their paper [7] test bed with an information portal and an alternate sleep mechanism to prolong the network lifetime. The framework proposed can monitor the water quality

in real-time and also contains an alarming component that can quickly give a warning email in case any abnormal event occurs. Simulation results show that the lifetime of the proposed WSN framework with sleep scheduling mechanism is longer than the traditional WSN framework for water quality monitoring.

The work described in [8] links development of new knowledge discovery and numerical modeling methods with decision making research designed to evaluate and optimize sensor deployment plans.

The system proposed in [9] depends on the advancement of minimal effort fluffy based water quality observing framework utilizing remote sensor systems which is fit for estimating physiochemical parameters of water quality, for example, pH, temperature, conductivity, oxidation decrease potential and turbidity. In light of chosen parameters a detecting unit is created alongside a few microsystems for simple flag molding, information conglomeration, sensor information examination and logging, and remote portrayal of information to the shoppers. At last, calculations for intertwining the constant information and basic leadership utilizing fluffy rationale at nearby dimension are created to evaluate the water sullying hazard. In view of the water pollution level in the conveyance pipeline the drinking water quality is named satisfactory/dismiss/alluring. At the point when the tainting is identified, the detecting unit with ZigBee sends signs to close the solenoid valve inside the pipeline to keep the stream of polluted water supply and it imply the customers about drinking water quality through versatile application. Exploratory outcomes demonstrate that this ease ongoing water quality observing framework goes about as a perfect early cautioning framework with best location precision. The inferred arrangement can likewise be connected to various IoT (Internet of Things) situations, for example, keen urban areas, the city transport framework and so on.

In [10], author concluded that the adaptability, adaptation to internal failure, high detecting devotion, minimal effort, and fast organization attributes of sensor systems make numerous new and energizing application zones for remote detecting. Later on, this wide scope of use regions will make sensor arranges a necessary piece of our lives. Be that as it may, acknowledgment of sensor arranges requirements to fulfill the limitations presented by elements, for example, adaptation to non-critical failure, versatility, cost, equipment, topology change, condition, and power utilization. Since these imperatives are exceedingly stringent and explicit for sensor systems, new remote specially appointed systems administration procedures are required. Numerous scientists are, as of now, occupied with building up the advances required for various layers of the sensor systems convention stack.

III. SYSTEM ARCHITECTURE

Gas sensor (MQ6), air quality monitoring sensor (MQ136), temperature and humidity sensor (DHT11) are interfaced with Node MCU (Wi-Fi module and controller) to sense CO2 gas, quality of air, temperature and humidity respectively.

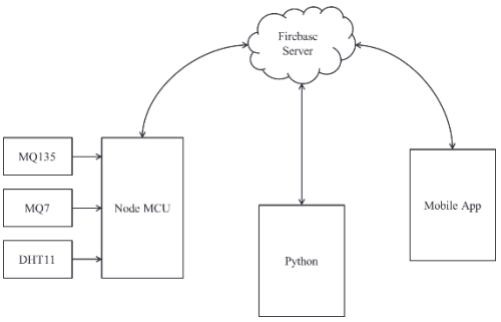

Fig 1 ***Architecture of proposed system***

The sensed data is sent to cloud (firebase server). The same data is displayed on mobile app so that user can monitor data in real-time. We are going to design python based system, which fetch real-time data of CO2, air quality, temperature and humidity from server and accordingly predict how many trees one should plant now to maintain/reduce pollution level in future. The real-time data of sensor is used for training CNN.

IV. CONCLUSIONS

Environmental monitoring is a tricky activity as the environmental conditions can easily change from point to point even at small distances. This is especially true inside buildings where temperature, humidity, and pollutants can be different not only in different rooms but also within the same room especially when showcases and closed furniture are used. All nodes have a

unique identifier and are designed to work for years without manual intervention. All measurements are permanently stored inside the node and can be altered only by tampering the sensor and breaking its case. Under normal conditions, buffered receivers and distributed cloud storage can deliver the measurements to the users in either real time or quasi real time, but there is the assurance that raw measured data are always retrievable.

The system gets significantly slower as the number of examples and/or predictors/independent variables increase, to avoid we can use LSTM or RCNN for better results. It can be used for disease prediction from environmental condition. It can be used to monitor greenhouse effect. It can be used for environmental condition prediction especially for polyhouses and greenhouse

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