

AIR Pollution Monitoring System

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ABSTRACT

The position of pollution is adding fleetly due to factors like diligence, urbanization, adding in population, vehicle use which can affect mortal health. IOT Based Air Pollution Monitoring System is used to cover the Air Quality over a web server using Internet. It'll spark an alarm when the air quality goes down beyond a certain position, means when there's sufficient amount of dangerous feasts present in the air like CO₂, smoke, alcohol, benzene, NH₃ and NO_x. It'll show the air quality in on the LCD so that air pollution can be covered veritably fluently. The system uses MQ5 detector for covering Air Quality as it detects most dangerous feasts and can measure their quantum directly and it's largely sensitive SnO₂. A pH detector is one of the most essential tools that's generally used for water measures. This type of detector is suitable to measure the quantum of alkalinity and acidity in water and other results. When used rightly, pH detectors are suitable to insure the safety and quality of a product and the processes that do within a waste water or manufacturing factory.

Keywords : Air pollution, sensor, IOT, pH detector.

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I. INTRODUCTION

Overview

Environment refers to the girding of the natural world. It comprises of the air, water, land and its interdependence with other living beings on this earth. Everything- be it the foliage, the soil, the jewels, the swash, abysses and swell, the fauna along with the innards of the earth or the earth's climate, everything together empires to form the terrain. Etymologically speaking, pollution comes from the Latin word, 'polluter', which basically means to pollute. thus, as the name itself suggests, pollution is a reality that

contaminates the terrain. It basically means the presence of foreign patches in air, water or land which has a wide adverse effect on the living organisms and on the terrain in general. More specifically speaking, pollution is caused due to the release of dangerous pollutant- the poisons similar as the emigrations from the artificial factory, domestic waste, energy emitted from the transportation vehicles, thermal power shops, chemical waste, as well as manage waste. Pollution not only damages the general terrain, it also extensively affects the public health and hygiene of the population across the world.

II. LITERATURE REVIEW

2.1 Water Quality Monitoring System Based on IOT was presented by Vaishnavi V. et.al [2017]

Water pollution is one of the biggest fears for the green globalization. In order to ensure the safe supply of the drinking water the quality needs to be monitor in real time. In this paper we present a design and development of a low cost system for real time monitoring of the water quality in IOT (internet of things). The system consist of several sensors is used to measuring physical and chemical parameters of the water. The parameters such as temperature, PH, turbidity, flow sensor of the water can be measured. The measured values from the sensors can be processed by the core controller. The Arduino model can be used as a core controller. Finally, the sensor data can be viewed on internet using WI-FI system.

2.2 Suitable Recurrent Neural Network for Air Quality Prediction with Backpropagation Through Time was presented by Widya MasSeptiawan et.al [2018]

Air pollution currently occurs in developed and developing countries and can disrupt environmental conditions and public health. Determining the level of air pollution (air pollutants) or air quality can be seen from a group of sensitive parameters such as NO₂, O₃, PM₁₀, PM_{2.5}, and SO₂. This study predicts data on air pollutant concentrations over time (time series data) to determine future air quality conditions that are good or bad for health and the environment. Data predictions can use algorithms from artificial neural networks, one of which is the Back Propagation Through Time (BPTT) algorithm.

2.3 A Development of Low-Cost Devices for Monitoring Indoor Air Quality in a Large-Scale Hospital was presented by Phattaratorn Lasomsri [2018] Poor Indoor Air Quality (IAQ) is an issue of environmental health problems that cause headaches, fatigue, irritation of the eyes and skin. IAQ in hospital areas is a serious concern since there are many occupants i.e. patients, medical practitioners, and staffs.

Furthermore, medical material, medicine, medical gases can cause the quality of air deteriorate. IAQ then requires to regularly check the service areas in order to maintain a good level of air quality. The instrument to measure IAQ is usually expensive.

III. EXISTING SYSTEM

Air pollution monitoring is a growing concern in the field of environmental engineering. By air pollution monitoring we mean that discovery and communication of colourful pollutant attention similar as nitrogen dioxide, sulphur dioxide, carbon monoxide, carbon dioxide in real time. Pollution covering system consists of a single chip microcontroller, air pollution detector array which are integrated and communicated through GSM Transceiver. The conventional fashion of measuring the quality of water is to gather the samples manually and send it laboratory for analysis, but this technique is time inviting and not provident. Since it's not doable to take the water sample to the laboratory after every hour for measuring its quality. The water quality measuring system can measure the essential rates of water in real time. The system consists of multiple detectors to measure the standard of water, microcontroller and GSM to shoot the information to the watching centre.

DISADVANTAGES

- In this system we can't able to monitor the three types of pollution. Noise pollution is not in this system.
- Many of the GSM technologies are patented by Qualcomm and hence licenses need to be obtained from them.
- In order to increase the coverage repeaters are required to be installed.
- GSM provides limited data rate capability, for higher data rate GSM advanced version devices are used.
- GSM uses FTDMA access scheme. Here multiple users share same bandwidth and hence will lead to

interference when more number of users are using the GSM service. In order to avoid this situation, robust frequency correction algorithms are used in mobile phones and base stations.

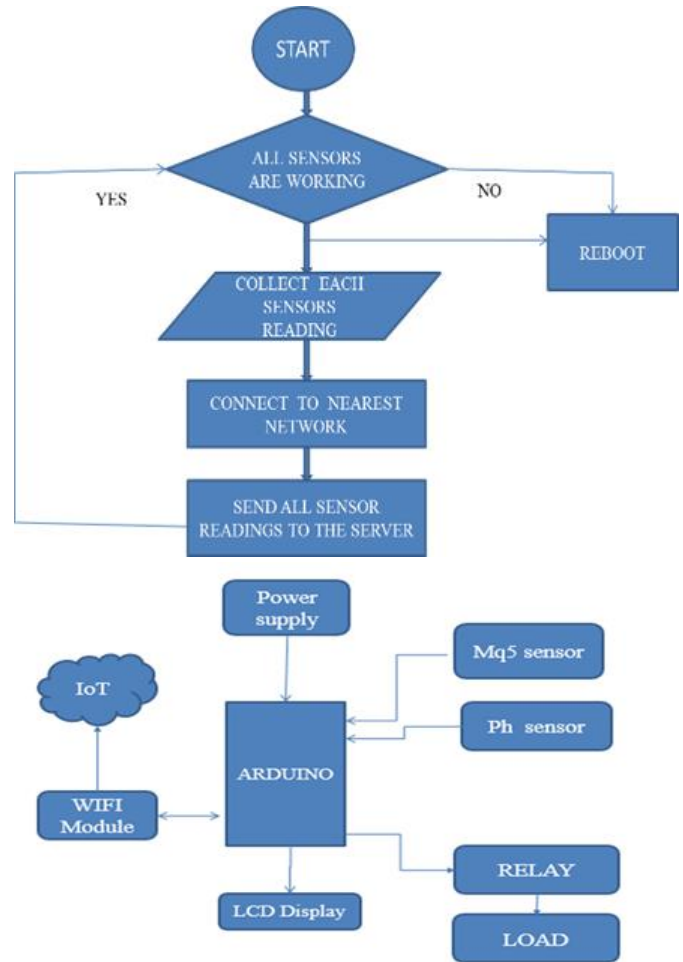
IV. PROPOSED SYSTEM

The main aim is to make a kit which will be installed in the required location for monitoring. The kit will basically include Arduino, on which all the sensors will be configured and Wi-Fi module for data transfer. Collect the respective pollution readings after certain time interval. All the readings recorded by the kit will be transferred to the main station (server) by Wi-Fi module. Readings from all the kits will be recorded and saved into the database at the server end. Visualization of collected data from the different location is done using statistical and user-friendly methods such as tables and line graphs. A website will spread the pollution data collected by all the sensors, different colours will be allotted for different ranges of pollution meaningfully to give an idea about the level of pollution. Generation of reports are done per week on a regular interval and also real-time notifications are sent by appropriate authorities when the pollution level exceeds the normal range threshold value.

ADVANTAGES

- A. Can monitor pollution with high accuracy
- B. It is easy to add or move Wi-Fi clients or Wi-Fi stations to the Wi-Fi network created by AP (Access Point).
- C. Installation is very quick and easy. It does not require technical knowledge of Wi-Fi rowlan system and its protocols.
- D. Access to the Wi-Fi network can be availed from anywhere within the Wi-Fi AP (Access point) coverage range.

PROPOSED SYSTEM FLOW CHART



BLOCK DIAGRAM

V. METHADODOLOGY

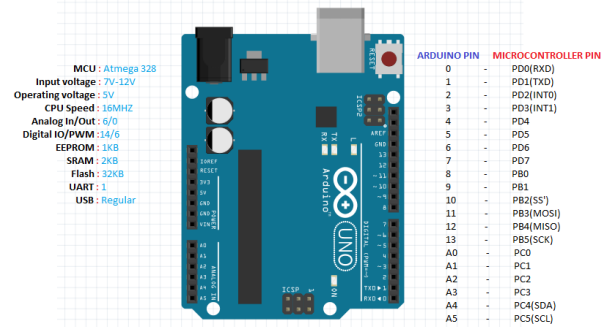
In hardware specification, the components for the proposed system are sensors, Arduino, Wi-Fi module. Three types of sensors are used for monitoring the different types of pollution. The Wi-Fi module is used to send the data collected by the different sensors to the main server. Due to low cost, easy interface, compactness and ability to connect to various devices, Arduino UNO was selected as a main controller. The board features 14 Digital pins and 6 Analog pins. It operates at 5V with input voltage ranging from 8-20V. Arduino has Static Random Access Memory of size 2KB along with flash memory of size 32 KB which makes it quite swift and efficient. ATmega328 is an MCU belonging from the AVR family; Arduino is an it

8-bit device hence its internal registers and data-bus architecture can handle 8 data signals parallel simultaneously. The Wi-Fi Module is a system on chip in which TCP/IP protocol stack is integrated such that can give any microcontroller access to any available Wi-Fi network. The Wi-Fi Module is used for hosting an application or it can offload all functions of Wi-Fi networking from any other application processor. AT commands are used to program the Wi-Fi Module. A program in AT commands is written to connect the Wi-Fi Module to the Arduino device. The Wi-Fi Module is extremely cost effective. Three different sensors are used in our kit. For monitoring the air pollution, the MQ-135 gas sensor is used. In clean air MQ5 Module sensor has less conductivity. The conductivity of the MQ-5 gas sensor is higher along with the gas concentration in the surrounding environment rises. Convert change of conductivity to correspond output signal of gas concentration. MQ5 gas sensor is highly sensitive to Ammonia (NH₃), Sulphide (S₂) and Benzene (C₆H₆). MQ-5 also senses the smoke and other hazardous gases in the surrounding. It enhances the system's ability to monitor pollution to a minute level. CZN-15E is second sensor

HARDWARE DESCRIPTION COMPONENTS DETAILS

1. ARDUINO CONTROLLER
2. POWERSUPPLY
3. WIFI MODULE
4. IOT
5. LCD DISPLAY
6. GAS SENSOR
7. PH SENSOR
8. RELAY

ARDUINO CONTROLLER



The Arduino Uno is one of the most common and widely used Arduino processor boards. There are a wide variety of shields (plug in boards adding functionality). It is relatively inexpensive (about \$25 - \$35). The latest version as of this writing (3/2014) is Revision 3 (r3): Revision 2 added a pull-down resistor to the 8U2 HWB line, making it easier to put into DFU (Device Firmware Update) mode · Revision 3 added o SDA and SCL pins are now brought out to the header near the AREF pin (upper left on picture). SDA and SCL are for the I2C interface o IOREF pin (middle lower on picture that allows shields to adapt to the voltage provided o Another pin not connected reserved for future use The board can be powered from the USB connector (usually up to 500ma for all electronics including shield), or from the 2.1mm barrel jack using a separate power supply when you cannot connect the board to the PC's USB port.

IOT

The Internet of things refers to a type of network to connect anything with the Internet based on stipulated protocols through information sensing equipment's to conduct information exchange and communications in order to achieve smart recognitions, positioning, tracing, monitoring, and administration.

LCD DISPLAY

- The 16×2 LCD Board makes it easy to interface a module with low cost microcontroller development

board which do not have built in support for LCD modules. This board has the following

- 16x2 LCD module (you can choose either a green or a blue backlight LCD)
- Backlight current limiting resistor.

GAS SENSOR

A GAS sensor or a GAS Detector is a type of chemical sensor which detects/measures the concentration of gas in its vicinity. Gas sensor interacts with a gas to measure in concentration. They are used in various industries ranging from medicine to aerospace. Various technologies are used to measure Gas concentration such as semiconductors, oxidation, catalytic, infrared, etc.

Used for family, Surrounding environment noxious gas detection device, apply to ammonia, aromatics, sulphur, benzene vapour, and other harmful gases/smoke, gas detection, tested concentration range: 10 to 1000 ppm.



pH sensor

A pH sensor is one of the most essential tools that's typically used for water measurements. This type of sensor is able to measure the amount of alkalinity and acidity in water and other solutions. When used correctly, pH sensors are able to ensure the safety and quality of a product and the processes that occur within a wastewater or manufacturing plant.

VI. INTRODUCTION OF EMBEDDED SYSTEM

EMBEDDED SYSTEM

An embedded system is a computer system designed for specific control functions within a larger system, often with real time computing constraints .It is

embedded as part of a complete device often including hardware and mechanical parts. By contrast, a general-purpose computer, such as a personal computer (PC), is designed to be flexible and to meet a wide range of end-user needs.

Embedded systems contain processing cores that are typically either microcontrollers or digital signal processors (DSP). The key characteristic, however, is being dedicated to handle a particular task. Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance.

CLASSIFICATION OF EMBEDDED SYSTEM

HARD REAL TIME SYSTEM

HARD” real time systems have very narrow respond time.

The correctness of respond includes a description of timeliness. Deadlines are specified as points in time that occurs as fixed time interval following an event.

SOFTWARE REAL TIME SYSTEM

- “SOFT” real-time system has reduced constraints on “lateness” but still must operate very quickly and repeatable.
- Soft timeliness requirements are specified as time constraints that may be violated.
- Example: Railway reservation system-takes a few seconds the data remains valid.

APPLICATIONS OF EMBEDDED SYSTEM

- Communication device mobile phone, pager, PDA, etc.,
- Household appliance –home control systems, microwave oven, automatic washing machines, digital watch, video game player. etc.,

VII. SOFTWARE USED

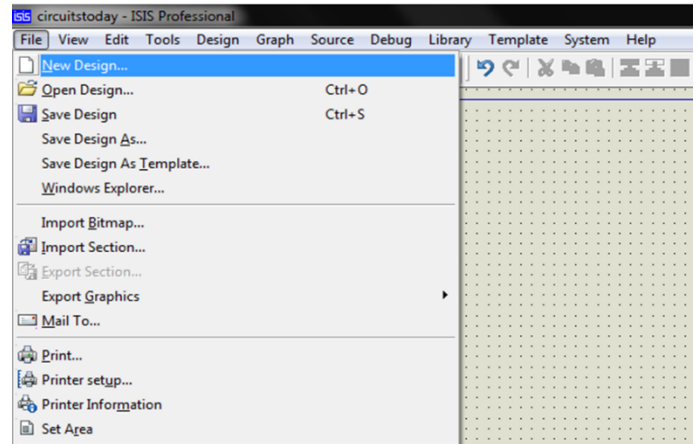
PROTEUS PROFESSIONAL

Proteus Professional design combines the ISIS schematic capture and ARES PCB layout programs to provide a powerful, integrated and easy to use tools suite for education and professional PCB design. As professional PCB design software with integrated shape based auto router, it provides features such as fully featured schematic capture, highly configurable design rules, interactive spice circuit simulator, extensive support for power planes, industry standard CAD/CAM and OD++ output, and integrated 3D viewer. We will use ISIS for simulating PIC response, it has many variety modelling libraries, and its powerful concentrates in MCUs and MPUs modelling, along with wide range of supporting chips such that AVR MCU series, 8051 MCU series, Basic stamp, HC11 MCU series, ARM CPU, Z80, Motorola 68K CPU, and most PIC's families, also it has a debugger, registers contents viewer and many other features.

About Proteus

It is a software suite containing schematic, simulation as well as PCB designing.

1. **ISIS** is the software used to draw schematics and simulate the circuits in real time. The simulation allows human access during run time, thus providing real time simulation.
2. **ARES** is used for PCB designing. It has the feature of viewing output in 3D view of the designed PCB along with components.
3. The designer can also develop 2D drawings for the product.



Features

ISIS has wide range of components in its library. It has sources, signal generators, measurement and analysis tools like **oscilloscope**, voltmeter, ammeter etc., probes for real time monitoring of the parameters of the circuit, **switches**, **displays**, loads like motors and lamps, discrete components like resistors, capacitors, inductors, transformers, digital and analog Integrated circuits, semi-conductor switches, relays, microcontrollers, processors, sensors etc.

ARES offers PCB designing up to 14 inner layers, with surface mount and through hole packages. It is embedded with the foot prints of different category of components like ICs, transistors, headers, connectors and other discrete components. It offers Auto routing and manual routing options to the PCB Designer. The schematic drawn in the ISIS can be directly transferred ARES.

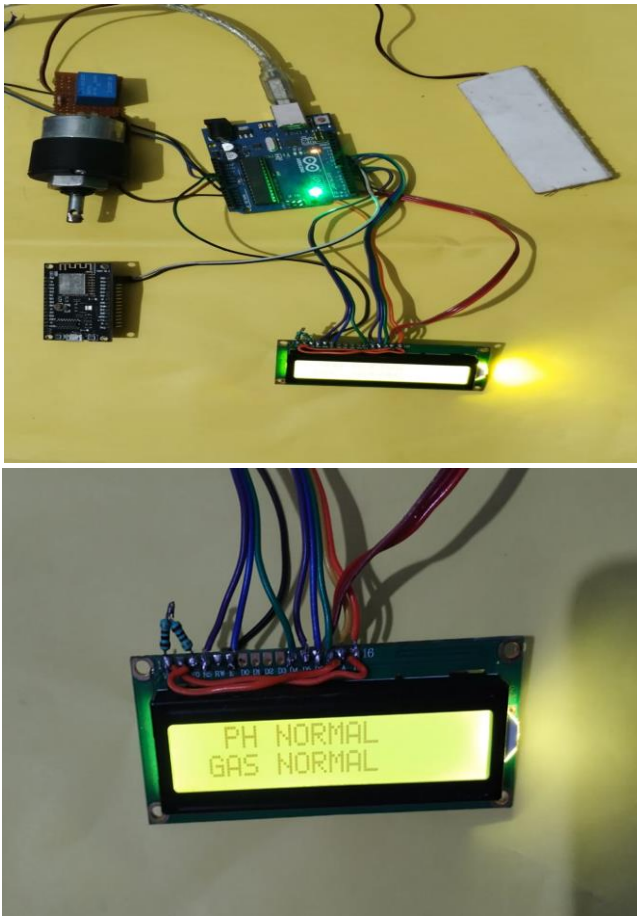
VIII. RESULT & DISUSSION

RESULT

The Arduino collects data from the different sensors. The sensors located in different places collect pollution details in the surrounding of the kit. These sensor readings are send to the server with the help of Wi-Fi-Module. These readings are displayed on a website. If the values obtained by the sensors are in normal range, then they are displayed in green colour on the website.

If the sensor readings exceed the threshold value set by the government then all those values are displayed in red on the website. Weekly charts and graphs are plotted and displayed on the website showing the pollution levels at different periods of the week. In a certain area if the pollution level is beyond the threshold value continuously then an alert message is displayed on the website, in order to make people aware of highly polluted areas. This way the common people will know about the pollution levels and their surroundings

OUTPUT



IX. CONCLUSION

The pollution monitoring system is solution to contribute to avoid the biggest threat. This monitoring system makes people aware about the highly-polluted areas in their surroundings. It supports the new

technology and effectively supports the healthy life concept. People can view the weekly statistics of the pollution in their surroundings. This will help them be aware about when the pollution around their surrounding is highest and can try to avoid it. So, it becomes very reliable and efficient for the Municipal officials along with the Civilians to monitor environment. Letting civilians also involved in this process adds an extra value to it. As civilians are now equally aware and curious about their environment, this concept of IOT is beneficial for the welfare of the society as well as it is implemented using the latest technology with a low implementation cost.

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