Multi-Sensor System for Air and Water Quality Monitoring

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Abstract— **IOT based Air and Water quality monitoring which identifies and help to solve the problem in quality of the air and water samples. It is useful to check and monitor the quality of the samples for healthier life. Air pollution monitoring tends to be primarily focused on human health and prolong the earth's life and ozone layer, conservation and protection of aquatic environment and keeping the quality check of water for future uses.. One of the key ideas in IoT is decentralization. Rather than centralizing compute and storage resources in a single place, they are distributed to where it makes sense. This decentralization was fueled by small low-power microprocessors that could handle the compute needs at the edges of the internet and NAND-based devices which provide fast high-capacity storage in a small space. The input is in the form of samples through sensors which has a digital and analog output. Arduino is the heart of this project which controls the entire process. There are Multi Sensors used to check the quality of the samples at different places. The values are checked, displayed and they are sent to Blynk App and they are displayed on the app. Wi-Fi module connects the whole process to internet and LCD is used for the visual output. The main idea behind the project is to increase the quality of human life and serve the Mankind.**

Keywords: Internet Of Thing, Arduino, Blynk, MQ-135 Sensor, DHT Sensor, Turbidity Sensor

1.INTRODUCTION

Air and water pollution is the biggest problem of every nation, whether it is developed or developing. Health problems have been growing at faster rate especially in urban areas of developing countries where industrialization and growing number of vehicles leads to release of lot of gaseous pollutants. Harmful effects of pollution include mild allergic reactions such as irritation of the throat, eyes and nose as well as some serious problems like bronchitis, heart diseases, pneumonia, lung and aggravated asthma. According to a survey, due to air pollution 50,000 to 100,000 premature deaths per year occur in the U.S. alone. Whereas in EU number reaches to 300,000 and over 3,000,000 worldwide. IOT Based Air and water Pollution Monitoring System monitors the Air and water quality over a web server using Internet and will trigger an alarm when the air/water

Means when there are sufficient amount of harmful gases present in the air like CO2, smoke, alcohol, benzene, NH3, LPG and NOx. It will show the air quality in PPM on the LCD and as well as on webpage so that it can monitor it very easily. LPG sensor is added in this system which is used mostly in houses. The system will show temperature and Moisture. The system can be installed anywhere but mostly in industries and houses where gases are mostly to be found and gives an alert messages when the system crosses threshold limit.

The IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer based systems, and resulting in improved efficiency, accuracy and economic benefit, when IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure.

Organization of the Paper – The below Modules contains Basics of IOT, literature Survey, Overview of the project, Methodology, Experimental Results
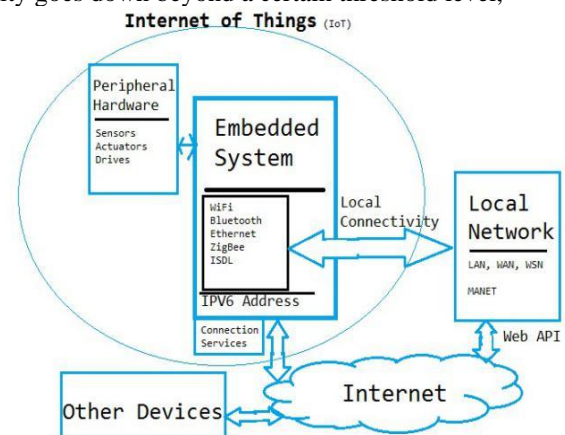quality goes down beyond a certain threshold level,

Fig.1Basic Structure of IOT

2.LITERATURE REVIEW

Below given are some Papers which we referred for our project

Nikhil Kedia entitled "Water Quality Monitoring for Rural Areas-A Sensor Cloud Based Economical Project." Published in 2015 1st International Conference on Next Generation Computing Technologies (NGCT-2015) Dehradun, India. This paper highlights the entire water quality monitoring methods, sensors, embedded design, and information dissipation procedure, role of government, network operator and villagers in ensuring proper information dissipation [1].

Smart Water Quality Monitoring System Using IoT https://circuitdigest.com/users/**debasis-parida.** This Project highlights the checking of parameter of soil and water for efficient harvesting. The various parameters that can be monitored are Soil moisture, pH of water, Temperature, etc. [2]

M.Mukta, and team "IoT based Smart Water Quality Monitoring System," This Paper Helps to check the quality of Ph and Other Parameters of water by using Ph Sensor. It mainly focuses on Water Parameters to make water clean [3].

A. R. Memon, and team, "IoT Based Water Quality Monitoring System for Safe Drinking Water in Pakistan. This Paper was developed to enhance the quality of water and to make the water safe for drinking in Pakistan. It was very helpful for the people of Pakistan as there were many cases of hard water and increase of salinity in water [4].

S.Faiazuddin, and team "IoT based Indoor Air Quality Monitoring system using Raspberry Pi4. This Paper was built to check and monitor the quality of air samples by using raspberry and MQ-135 sensor to check the quality of air samples. They mainly focused on gases like Co2, Carbon Monoxide etc [5].

R. K. Jha, "Air Quality Sensing and Reporting System Using IoT," This Paper Helps to enhance the quality of air by detecting the abnormalities present in it. They used Arduino and microcontroller for this project [6].

After referring all the papers we decided to make a product which will check the quality of both water and air samples. Our Paper tends to focus on all the parameters like Air, Temperature, Soil, Moisture, humidity, Turbidity etc.

3.OVERVIEW

3.1 Problem Definition
Water pollution occurs when harmful substances often chemicals or microorganisms contaminate a stream, river, lake, ocean, aquifer, or other body of water, degrading water quality and rendering it toxic to humans or the environment.

An air quality monitor is a device that measures the level of common air pollutants. Monitors are available for both indoor and outdoor settings. Indoor air quality monitors are typically sensor based instruments. Some of them are able to measure ppb levels and come as either mixed gas or portable units. Sensor based instruments and air quality monitoring systems are used widely in outdoor ambient applications

3.2 Objective

An IoT based system will provide easy installation, costless & maintenance free for proposed system. The DHT sensor is used for measuring Moisture & temperature. MQ-135 sensor is used for measuring CO2 in air. Moisture, temperature, CO2 & water quality measurements made in real-time are shown graphically. This information is received by specially designed application interface running on mobile connected through Wi-Fi wireless link. The data generated will be in excel as well as graphical form using Blynk software for analysis purpose.

Further we can extend the quality detection by finding other parameters like Salinity, turbidity, and dissolved ions

The objective of this Act is to provide for the prevention, control and abatement of air pollution, for the establishment, with a view to carrying out the aforesaid purposes, of Boards, for conferring on and assigning to such Boards powers and functions relating thereto and for matters connected therewith.

Water quality objectives are set to protect the most sensitive designated water use at a specific location. Designated water uses include: raw drinking water, public water supply and food processing, aquatic life and wildlife, recreation and aesthetics, agriculture (livestock watering and irrigation) and industrial water supplies.

4. METHODOLOGY

An IoT based system will provide easy installation, costless & maintenance free for proposed system.
The DHT sensor is used for measuring humidity & temperature.
MQ-135 sensor is used for measuring CO2 in air.
Humidity, temperature, CO2 & water quality measurements made in real-time by turbidity sensor are shown. These real time values are stored
The data generated will be stored and can be used further

The Given Below is the representation of our model which is mentioned as fig.2. It basically represents the connection of sensors to the arduino and we also connected WiFi module to the arduino which will be used to send the data to the Blynk app where we can read the current values.

The readings are displayed on the 2X16 LCD where the live readings are displayed
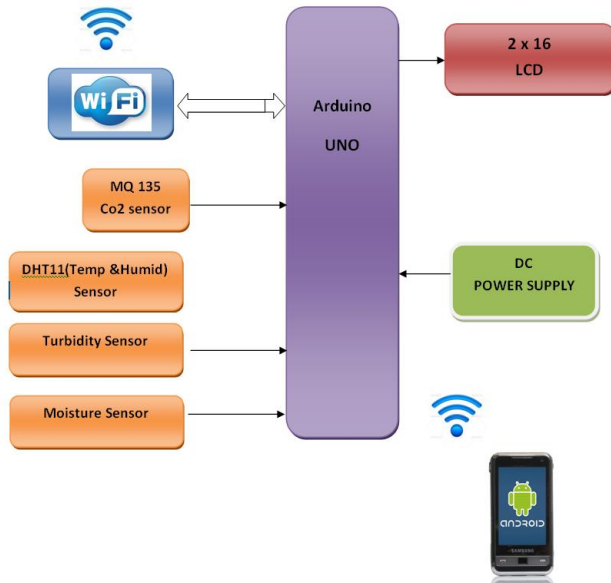

Fig.2 Diagrammatic Representation of Our Model

Fig.2 Represent that When Moisture sensor is immersed in liquid solution, smaller ions get penetrated in the boundary area of the glass membrane whereas larger ions remain in the liquid solution. This develops potential difference. Moisture meter measures potential difference between electrodes.

Moisture sensor output is connected with analog read input of the Arduino board. The Moisture sensor provides different analog outputs for different liquid solutions. By knowing Moisture value of known solution such as water one can easily determine Moisture value for other liquid solutions.

The Moisture meter with display can be constructed by interfacing LCD display with Arduino and Moisture sensor with Arduino.

Pollution Monitoring System is based on the block diagram as shown in Fig.2. The data of air is recognized by MQ135 gas sensor. The MQ-135 sensor can sense NH3, NOx, alcohol, Benzene, smoke, CO2. So it is dynamic gas sensored for our Air pollution Monitoring system. When it will be connected to Arduino then it will sense all gases, and it will give the Pollution level in PPM (parts per million). MQ-135 gas sensor will give the output in form of voltage levels and we have to convert it into PPM. So for converting the output in PPM, we have used a library for MQ135 gas sensor. Sensor is giving us value of 90 when there is no gas near it and the air quality safe level is 350 PPM and it should not exceed 1000 PPM.

If it exceeds beyond 2000 PPM then it will cause increased heart rate and many different diseases. When the value will be less than 1000 PPM, then it is called as fresh air. When the value will increase from 1000 PPM, then it is called as "Poor Air". It will contain temperature and Moisture so it will possibly show the current temperature and Moisture of

the air. For temperature & Moisture we have used DHT sensor. According to the model the 2 sensors works as input data, they transmit data for temperature Moisture and CO2. LCD is the output devices. LCD shows the data of the gases in ppm (parts per million).

In Simple Terms We can say as

- Samples are tested through sensors.
- Value obtained is shown on the display.
- Temperature is shown in Celsius.
- Humidity in percentage of it present in air.
- Air quality is measured by ppm.
- Water quality in terms of turbidity.
- Values are stored and can be further used.

Arduino UNO – It is one of the most popular prototyping boards. It is small in size and packed with rich features. The board comes with built-in Arduino boot loader. It is an At mega 328 based controller board which has 14 GPIO pins, 6 PWM pins, 6 Analog inputs and on board UART, SPI and TWI interfaces.
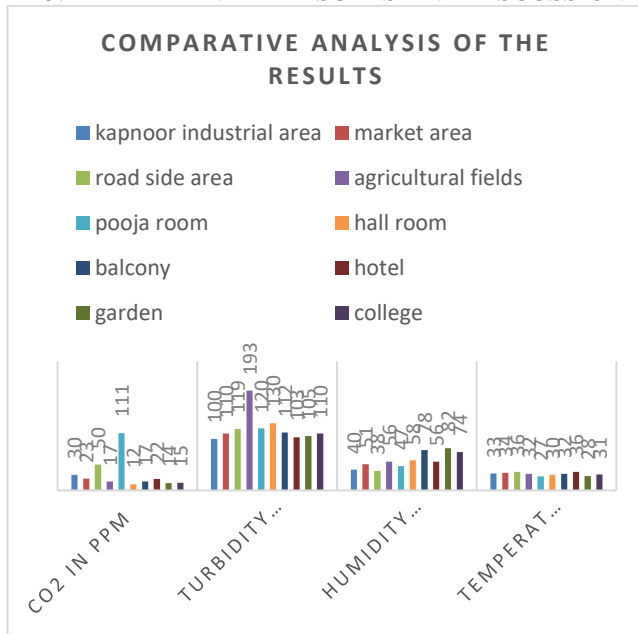
16X2 Character LCD – The 16X2 LCD display is used to monitor the sensor values read by the Arduino board from MQ-135. It is interfaced with the Arduino UNO by connecting its data pins D4 to D7 with pins 6 down to 3 of the controllers respectively. The RS and E pins of the LCD are connected to pins 13 and 12 of the controller respectively. The RW pin of the LCD module is connected to the ground.

MQ-135 Sensor – MQ-135 is a gas sensor which is used to measure the concentration of combustible gases. It has lower conductivity in clean air while its conductivity increases with the presence of the combustible gases in the air. The sensor is highly sensitive to gases like Ammonia, Sulphide Benzene steam. The sensor can detect the concentration of combustible gases in range from 100 PPM to 1000

DHT Sensor - The humidity sensing capacitor has two electrodes with a moisture holding substrate as a dielectric between them. Change in the capacitance value occurs with the change in humidity levels. The IC measure, process this changed resistance values and change them into digital form.

Turbidity Sensor - Turbidity is the degree or level of cloudiness or haziness of a liquid. This happens due to the presence of large numbers of invisible particles (with the naked eye) similar to white smoke in the air. When light passes through liquids, light waves get scattered Due to the presence of these tiny particles. The turbidity of a liquid is directly proportional to the free suspended particles, that are if the number of particles increases turbidity will also increase.

5. EXPERIMENTAL RESULTS AND DISCUSSION

COMPARATIVE ANALYSIS OF THE RESULTS

- kapnoor industrial area
- market area
- road side area
- agricultural fields
- pooja room
- hall room
- balcony
- hotel
- garden
- college

The experiment has been conducted at 10 different locations and sites by considering the parameters CO2 in ppm, Turbidity in NTU, Humidity in % and Temperature in Celsius and the obtained result is shown in the above graph

6. CONCLUSION

The system to monitor the air of environment using Arduino microcontroller, IOT Technology is proposed to improve quality of air. With the use of IOT technology enhances the process of monitoring various aspects of environment such as air quality monitoring issue proposed in this paper. Here, using the MQ135 or gas sensor gives the sense of different type of dangerous gas and Arduino is the heart of this project. Which control the entire process. Wi-Fi module connects the whole process to internet and LCD is used for the visual Output.

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