**IOT BASED AIR, SOUND AND WATER QUALITY MONITORNING SYSTEM**

**ABSTRACT**

The level of pollution has increased with times by lot of factors like the increase in population, increased vehicle use, industrialization and urbanization which results in harmful effects on human wellbeing by directly affecting health of population exposed to it. In order to monitor In this project we are going to make an IOT Based Air Pollution, Sound Pollution and Water quality Monitoring, System in which we will monitor the Air Quality over a web server using internet and will trigger a alarm when the air quality goes down beyond a certain level, means when there are sufficient amount of harmful gases are present in the air like CO2, smoke, alcohol, benzene and NH3. As well The Water parameters such as temperature, PH, turbidity, flow sensor of the water can be measured. Sound like science fiction, but some of the more practical and realistic sounding possibilities can be measured. The measured values from the sensors can be processed by the microcontroller. It will show the air quality in PPM on the LCD and as well as on webpage so that we can monitor it very easily. In this IOT project, you can monitor the pollution level from anywhere using your computer or mobile.

**INTRODUCTION**

The main objective of IOT Air, Sound and Water quality Monitoring System is that the Air pollution and Sound Pollution is a growing issue these days. It is necessary to monitor air quality and keep it under control for a better future and healthy living for all. Due to flexibility and low cost Internet of things (IoT) is getting popular day by day. With the urbanization and with the increase in the vehicles on road the atmospheric conditions have considerably affected. 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. Monitoring gives measurements of air pollutant and sound pollution concentrations, which can then be analyzed interpreted and presented. This information can then be applicable in many ways. Analysis of monitoring data allows us to assess how bad air pollution and sound pollution is from day to day,

• Degradation in Air Quality costs the global economy $5 trillion annually.

• 1 in 8 deaths around the world linked to air pollution.

• 92% of world population lives with dangerous air pollution.

Under these circumstances it is crucial for each and everyone to be able to monitor the situation of Air Pollution and Water Quality around us. Asian cities have some of the worst Air Qualities around the world, with the concentrations of poisonous and flammable gases having consistently high concentrations. In India the situation is becoming worse by the day. Our capital has been worst hit by Air Pollution, with 2016 winter recording some of the highest numbers ever. Current air pollution and water quality networks consist on few stations instrumented with costly air quality and water quality monitors, which provide accurate data but only in few static locations, and which are further complemented with dispersion models.

**LITERATURE REVIEW**

Nikhil Kedia entitled “Water Quality, Air quality Sound 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 theentire water quality monitoring methods, sensors, embedded design, and information dissipation procedure, role of government, network operator and **villagers** in ensuring proper information dissipation. It also explores the Sensor Cloud domain. While automatically improving the water quality is not feasible at this point, efficient use of technology and economic practices can help improve water quality and awareness among people.

[1] Jayti Bhatt,Jignesh Patoliya entitled “Real Time Water Quality Monitoring System”.This paper describes to ensure the safe supply of drinking water the quality should be monitored in real time for that purpose new approach IOT (Internet of Things) based water quality monitoring has been proposed. In this paper, we present the design of IOT based water quality monitoring system that monitor the quality of water in real time. This system consists some sensors which measure the water quality parameter such as pH, turbidity, conductivity, dissolved oxygen, temperature. The measured values from the sensors are processed by microcontroller and this processed values are transmitted remotely to the core controller that is raspberry pi using Zigbee protocol. Finally, sensors data can view on internet browser application using cloud computing.

[2] Michal Lom, Ondrej Pribyl, Miroslav Svitek entitled “Industry 4.0 as a Part of Smart Cities”. This paper describes the conjunction of the Smart City Initiative and the concept of Industry 4.0. The term smart city has been a phenomenon of the last years, which is very inflected especially since 2008 when the world was hit by the financial crisis. The main reasons for the emergence of the Smart City Initiative are to create a sustainable model for cities and preserve quality of life of their citizens. The topic of the smart city Water, Air, Sound quality Monitoring System Based on IOT 1109 cannot be seen only as a technical discipline, but different economic, humanitarian or legal aspects must be involved as well. In the concept of Industry 4.0, the Internet of Things (IoT) shall be used for the development of so–called smart products. Subcomponents of the product are equipped with their own intelligence. Added intelligence is used both during the manufacturing of a product as well as during subsequent handling, up to continuous monitoring of the product lifecycle (smart processes). Other important aspects of the Industry 4.0 are Internet of Services (IoS), which includes especially intelligent transport and logistics (smart mobility, smart logistics), as well as Internet of Energy (IoE), which determines how the natural resources are used in proper way (electricity, water, oil, etc.). IoT, IoS, IoP and IoE can be considered as an element that can create a connection of the Smart City Initiative and Industry 4.0 – Industry 4.0 can be seen as a part of smart cities.

[3] Zhanwei Sun,Chi Harold Li,Chatschik Bisdikian,Joel W.Branch and Bo Yang entitled “QOI-Aware Energy Management in Internet-of-Things Sensory Environments”. In this paper an efficient energy management frame work to provide satisfactory QOI experience in IOT sensory environments is studied. Contrary to past efforts, it is transparent and compatible to lower protocols in use, and preserving energy-efficiency in the long run without sacrificing any attained QOI levels. Specifically, the new concept of QOI-aware “sensor-to-task relevancy” to explicitly consider the sensing capabilities offered by an sensor to the IOT sensory environments, and QOI requirements required by a task. A novel concept of the “critical covering set” of any given task in selecting the sensors to service a task over time. Energy management decision is made dynamically at runtime, as the optimum for long-term traffic statistics under the constraint of the service delay. Finally, an extensive case study based on utilizing the sensor networks to perform water level monitoring is given to demonstrate the ideas and algorithms proposed in this paper, and a simulation is made to show the performance of the proposed algorithms.

[4] Sokratis Kartakis, Weiren Yu, Reza Akhavan, and Julie A. McCann entitled “Adaptive Edge Analytics for Distributed Networked Control of Water Systems” This paper presents the burst detection and localization scheme that combines lightweight compression and anomaly detection with graph topology analytics for water distribution networks. We show that our approach not only significantly reduces the amount of communications between sensor devices and the back end servers, but also can effectively localize water burst events by using the difference in the arrival times of the vibration variations detected at sensor locations. Our results can save up to 90% communications compared with traditional periodical reporting situations.

**WORKING OF MODULE**

Here we propose an air quality as well as sound pollution monitoring system that allows us to monitor and check live air quality, Water quality as well as sound pollution in an area through IOT. System uses air sensors to sense presence of harmful gases/compounds in the air and constantly transmit this data. Also, system keeps measuring sound level and reports it. The sensors interact with raspberry pi which processes this data and transmits it over the application. This allows authorities to monitor air pollution in different areas and act against it. Also, authorities can keep a watch on the noise pollution near schools, hospitals and no honking areas. Network Devices and the Internet of Things All kinds of ordinary household gadgets can be modified to work in an IoT system. Wi-Fi network adapters, motion sensors, cameras, microphones and other instrumentation can be embedded in these devices to enable them for work in the Internet of Things.

**SYSTEM OVERVIEW**

The fig.1 shows block diagram which gives you the overview of the proposed system. The brief description given bellow.

**2.1. Block diagram description:**

LCD 16\*2

ATMega328 Microcontroller

Co2

GAS SENSOR

Buzzer

PH SENSOR

ESP8266 Wi-Fi Module

TURBIDITY SENSOR

SOUND SENSOR

IOT Server

PC/LAPTOP

**2.2 Functional Unit description:**

In the figure 2.1 we shown the hardware requirements & Technical approach in the way to design the system. The system consist of mainly parts like Microcontroller (ATmega328), Sensor networks, which are described briefly below.

**2.2.1 Microcontroller ATmega328**

Arduino UNO is an open source prototyping platform based on ATmega328 microcontroller. It consists of 14 digital input/output (I/O) pins, six analogue inputs, a USB connection for programming the on-board microcontroller, a power jack, an ICSP header and a reset button. It is operated with a 16MHz crystal oscillator and contains everything needed to support the microcontroller.

**2.2.2 CARBON DIOXIDE (CO2)**

Carbon Dioxide (CO2) – CO2 is colorless, odorless gas and non-combustible gas. Moreover, it is considered under the category of asphyxiate gases that have capability of interfering the availability of oxygen for tissues. Carbon Dioxide is a gas essential to life in the planet, because it is one of the most important elements evolving photosynthesis process, which converts solar into chemical energy. The concentration of CO2 has increased due mainly to massive fossil fuels burning. This increase makes plants grow rapidly. The rapid growth of undesirable plants leads to the increase use of chemicals to eliminate them.  


**2.2.3 GAS SENSOR**

LPG-Liquefied petroleum gas (LPG) is an odorless and colorless liquid which evaporates readily into a gas. Leakage is normally detected by adding an odorant into it. It is considered under the category of highly flammable gases and it can be classified as a carcinogen and mutagen if Butadiene content is more than 0.1%. LPG may leak in the form of a gas or a liquid. If it leaks in the form of a liquid it evaporates quickly and will eventually form large cloud of gas in air which is relatively heavier than air thus drops to the ground. Whereas, LPG vapors travel along the ground for a long distance and gets collected in drains or basements. Gas leads to burn or explode after getting in touch with a source of ignition.

**2.2.4 PH SENSOR**

The pH of a solution is the measure of the acidity or alkalinity of that solution. The pH scale is a logarithmic scale whose range is from 0-14 with a neutral point being 7. Values above 7 indicate a basic or alkaline solution and values below 7 would indicate an acidic solution. It operates on 5V power supply and it is easy to interface with arduino.The normal range of pH is 6 to 8.5

**2.2.5 TURBIDITY SENSOR**

Turbidity is a measure of the cloudiness of water. Turbidity has indicated the degree at which the water loses its transparency. It is considered as a good measure of the quality of water. Turbidity blocks out the light needed by submerged aquatic vegetation. It also can raise surface water temperatures above normal because suspended particles near the surface facilitate the absorption of heat from sunlight.

**2.2.6 SOUND SENSOR**

The sound sensor module provides an easy way to detect sound and is generally used for detecting sound intensity. This module can be used for security, switch, and monitoring applications. Its accuracy can be easily adjusted for the convenience of usage. It uses a microphone which supplies the input to an amplifier, peak detector and buffer. When the sensor detects a sound, it processes an output signal voltage which is sent to a microcontroller then performs necessary processing.

**2.2.7 IoT SERVER**

IoT is the network of physical devices, vehicles, buildings and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. In 2013 the Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT as "the infrastructure of the information society." The IoT allows objects to be sensed and/or 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.

**2.2.8 Node MCU (ESP8266)**

Node MCU is a microcontroller which is connected to IOT server through internet. MCU will receive the ON OFF packets from server and switches appliances respect to server signal. Expressive Systems’ Smart Connectivity Platform (ESCP) is a set of high performance, high integration wireless SOCs, designed for space and power constrained mobile platform designers. It provides unsurpassed ability to embed Wi-Fi capabilities within other systems, or to function as a standalone application, with the lowest cost, and minimal space requirement.

**APPLICATIONS**

1) Industrial perimeter monitoring

2) Indoor air quality and water monitoring.

3) Site selection for reference monitoring stations.

4) Making data available to users.

**ADVANTAGES**

1) Easy to Install

2) Updates On mobile phone directly

3) Accurate Pollution monitoring

4) Remote location monitoring

**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 the using of MQ135 gas sensor gives the sense of different type of dangerous gas and Arduino is the heart of this project which controls the entire process. Wi-Fi module connects the whole process to internet To used for the visual Output. The Automatic Air management system is a step forward to contribute a solution to the biggest threat. The air & sound monitoring system overcomes the problem of the highly-polluted areas which is a major issue. It supports the new technology and effectively supports the healthy life concept. This system has features for the people to monitor the amount of pollution on their mobile phones using the application.

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