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Air Pollution and Noise Pollution Detector Using ESP8266

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Abstract

In the present era, air and noise pollution is the growing hazardous issue. It is necessary to monitor air quality and keep it under control for a better future and healthy living for all. Here we propose an air quality as well as sound pollution monitoring system that allows us to monitor and check live air quality as well as sound pollution in particular areas through IOT. The pollution of air and sound is increasing abruptly. To bring it under control its monitoring is majorly recommended. To overcome this issue, we are introducing a system through which the level of sound and the existence of the harmful gases in the surroundings can be detected. The growing pollution at such an alarming rate has started creating trouble for the living beings, may it be high decibels or toxic gases present in the environment leaves a harmful effect on human's health and thus needs a special attention.

System uses air sensors to sense presence of harmful gases/compounds in the air and constantly transmit this data to microcontroller. Also system keeps measuring sound level and reports it to the online server over IOT. The sensors interact with microcontroller which processes this data and transmits it over internet. This allows authorities to monitor air pollution in different areas and take action against it.

Also authorities can keep a watch on the noise pollution near schools, hospitals and no honking areas, and if system detects air quality and noise issues it alerts authorities so they can take measures to control the issue.

I. INTRODUCTION

The goal of building a smart city is to improve quality of life by using technology to improve the efficiency of services and meet residents' needs. Information and Communication Technology allows city officials to interact directly with the public to tell what is happening in the city, how the city is evolving, and how to enable a better quality of life. A Smart City is one with at least one initiative addressing one or more of the following six characteristics: Smart Governance, Smart People, Smart Living, Smart Mobility, Smart Economy and Smart Environment. In this system, an application was developed that is going to bear a hand in this campaign. An area that is being surveyed for estimating how much the area is affected by pollution. The constituents of air along with its proportion are calculated and if it is higher than normal then the officials are intimated about it. Then the people are evacuated to a safe place. The description about the integrated network architecture and the interconnecting mechanisms for the reliable measurement of parameters by smart sensors and transmission of data via internet is being presented. The longitudinal learning system could provide a self- control mechanism for better operation of the devices in monitoring stage. The framework of the monitoring system was based on a combination of pervasive distributed sensing units, information system for data aggregation, and reasoning and context awareness. Results are encouraging as the reliability of sensing information transmission through the proposed integrated network architecture is 97%. The prototype was tested to generate real-time graphical information rather than a test bed scenario [1].

II. MOTIVATION

In this research, a real time monitoring of three gases are simulated in real environment. Gases that are monitored in this implementation are Carbon monoxide, carbon dioxide & Sulphur dioxide. In this simulation, these three gases are successfully tested in four areas. Then extended the simulated results to update in web.

As the technology increase, the degree of automation (minimizing the man power) in the almost all sectors are also increases. Wireless Sensor Networks (WSN) are gaining the ground in all sectors of life; from homes to factories, from traffic control to environmental monitoring. The air pollution monitoring system contains sensors to monitor the interested pollution parameter in environment. They simulated the three air pollutants gases including carbon monoxide, carbon dioxide & sulphur dioxide in air because these gases decide the degree of pollution level. They also applied the approach in various applications like leaking cooking gas in our homes, to alert the workers in oil & gas industry to detect the leakage etc. This simulation creates the awareness in people in cities. Due to recent technological advances, the construction material for small and low cost sensors became technically and economically feasible. Even though, Industrialization increase the degree of automation and at the same time it increases the air pollution by releasing the unwanted gases in environment especially in industrial areas like Visakhapatnam. To implement the project, they selected four areas to deploy the application in Visakhapatnam. To detect percentage of pollution, we used the array of sensor to measure gas quantity in the physical environment in surrounding the sensor and convert them into an electrical signal for processing. Such a signal reveals some properties about interested gas molecule. A huge number of these sensors nodes can be networked in many applications that require unattended operations creates a wireless sensor network. Wireless sensors are devices that range in size from a piece of glitter to a deck of cards. Integration of various components create the air pollution monitoring system. They are functionally composed of: A Sensing unit that is designed and programmed to sense gas pollutants in air in four busy areas in Visakhapatnam. Some common examples of properties or parameters that are monitored are light, temperature, humidity, pressure, etc. a converter that transforms the sensed signal from an analog to a digital signal; A Processing Unit in the Microcontroller, process the signals sensed form sensor with help of embedded memory, operating system and associated circuitry. A Radio component that can communicate the sink node or ZigBee router which collects the sensed pollution gas level from sensor node and forwards to pollution server which is in our campus. Powering these components is typically one or two small batteries.. The sensors self-organize themselves in a radio network using a routing algorithm, monitor the area for measure the gas levels in air, and transmit the data to a central node, sometimes called a pollution server or base station (interfaced with coordinator), or sink node(interfaced with router), that collects the data from all of the sensors[2].

The main aim of this paper was to design and implement an efficient monitoring system through which the required parameters are monitored remotely using internet and the data gathered from the sensors are stored in the cloud and to project the estimated trend on the web browser. A solution for monitoring the noise and CO levels i.e., any parameter value crossing its threshold value ranges, for example CO levels in air in an area exceeding the normal levels etc., in the environment using wireless embedded computing system is proposed in this paper. The solution also provides an intelligent remote monitoring for an area of interest. In this paper, we also present a trending results of collected or sensed data with respect to the normal or specified ranges of parameters. The embedded system is an integration of sensor devices, wireless communication which enables the user to remotely access the various parameters and store the data in cloud. –This work mainly aims to design and develop reliable, efficient, flexible, economical, real-time and realistic wellness sensor networks for smart home systems. The sensor and actuator

nodes based on wireless networking technologies are deployed into the home environment. These nodes generate real-time data related to the object usage and movement inside the home. Further extends the smart home system to smart buildings and models the design issues related to the smart building environment [3].

Some of the research works carried out for pollution monitoring system in wide area for making the smart environment, different techniques and algorithms used are discussed in this paper. Architectures, applications, and related design issues are discussed. In this work, they highlight how smart environments represent the trend towards increasing automated environmental monitoring with association of the wireless sensing devices to environmental events and phenomena. The environmental behaviours are collected actively as a streaming database to identify the environmental conditions and efficient decision making, dissemination by sensors is provided. A secure access standard and an intelligent remote protocol is delivered which is essential for operating, managing, reprogramming, and configuring the wireless sensor devices, for monitoring the remote.

III. PROJECT OBJECTIVES

The main objective of IOT Air & Sound Monitoring System is that the Air 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. Here we propose an air quality as well as sound pollution monitoring system that allows us to monitor and check live air 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 Arduino and raspberry pi which processes this data and transmits it over the cloud then to the application. This allows authorities to monitor air and sound pollution in different areas and act against it.

IV. LITERATURE SURVEY

In this research, a real time monitoring of three gases are simulated in real environment. Gases that are monitored in this implementation are Carbon monoxide, carbon dioxide & Sulphur dioxide. In this simulation, these three gases are successfully tested in four areas. Then extended the simulated results to update in web. As the technology increase, the degree of automation (minimizing the man power) in the almost all sectors are also increases. Wireless Sensor Networks (WSN) are gaining the ground in all sectors of life; from homes to factories, from traffic control to environmental monitoring. The air pollution monitoring system contains sensors to monitor the interested pollution parameter in environment. They simulated the three air pollutants gases including carbon monoxide, carbon dioxide & sulphur dioxide in air because these gases decide the degree of pollution level. They also applied the approach in various applications like leaking cooking gas in our homes, to alert the workers in oil & gas industry to detect the leakage etc. This simulation creates the awareness in people in cities. Due to recent technological advances, the construction material for small and low cost sensors became technically and economically feasible. Even though, Industrialization increase the degree of automation and at the same time it increases the air pollution by releasing the unwanted gases in environment especially in industrial areas like Visakhapatnam. To implement the project, they selected four areas to deploy the application in Visakhapatnam. To detect percentage of pollution, we used the array of sensor to measure gas quantity in the physical environment in surrounding the sensor and convert them into an electrical signal for processing. Such a signal reveals some properties about interested gas molecule. A huge number of these sensors nodes can be networked in many applications that require unattended operations creates a wireless sensor network. Wireless sensors are devices that range in size from a piece of glitter to a deck of cards. Integration of various components create the air pollution monitoring system. They are functionally composed of: A Sensing unit that is

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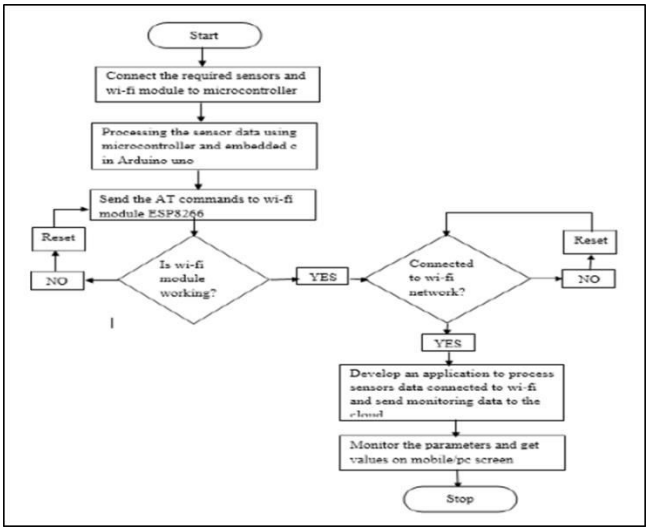
V. PROPOSED WORK

The Internet of Things (IoT) shall be able to incorporate transparently and seamlessly many different and heterogeneous end systems, while providing open access to selected subsets of data for the development of a plethora of digital services. In this paper, a general architecture for the IoT was built and hence a very complex task, mainly because of the extremely large variety of devices, link layer technologies, and services that may be involved in such a system. In this paper, focus was specifically done on an urban IoT system that, while STIL being quite a broad category, are characterized by their specific application domain. Urban IoTs, in fact, are designed to support the Smart City vision, which aims at exploiting the most advanced communication technologies to support added-value services for the administration of the city and for the citizens. This paper hence provides a comprehensive survey of the enabling technologies, protocols, and architecture for an urban IoT. Furthermore, the paper presented and discussed the technical solutions and best- practice guidelines adopted in the Padova Smart City project, a proof-of-concept deployment of an IoT island in the city of Padova, Italy, performed in collaboration with the city municipality. the objective of this paper is to discuss a general reference framework for the design of an urban IoT. They described the specific characteristics of an urban IoT, and the services that may drive the adoption of urban IoT by local governments. Then the overview of the web based approach for the design of IoT services, and the related protocols and technologies, discussing their suitability for the Smart City environment. Finally, we substantiate the discussion by reporting our experience in the "Padova Smart City" project, which is a proof of-concept deployment of an IoT island in the city of Padova (Italy) and interconnected with the data network of the city municipality. In this regard, we describe the technical solutionsadopted for the realization of the IoTisland and report some of the measurements that have been collected by the system in its first operational days.

VI. FLOW CHART



VII. REQUIREMENTS

A. Arduino Uno:

Parameters:

1. Microcontroller ATmega328

2. Operating Voltage 5V
3. Input Voltage (recommended) 7-12V
4. Input Voltage (limits) 6-20V
5. Digital I/O Pins 14 (of which 6 provide PWM output)
6. Analog Input Pins 6
7. DC Current per I/O Pin 40 mA
8. DC Current for 3.3V Pin 50 mA
9. Flash Memory 32 KB (ATmega328) of which 0.5 KB used by bootloader
10. SRAM 2 KB (ATmega328)
11. EEPROM 1 KB (ATmega328)
12. Clock Speed 16 MHz

B. Power

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

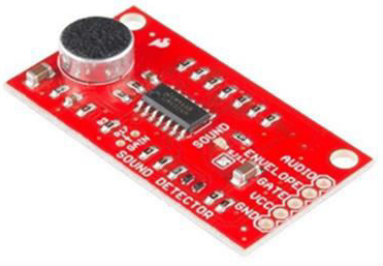
C. Mq135 Gas Sensor:

MQ-135 Module sensor has lower conductivity in clean air. When the target combustible gas exist, the sensors conductivity is morehigher along with the gas concentration rising. Convert change of conductivity to correspond output signal of gas concentration. MQ135 gas sensor has high sensitivity to Ammonia, Sulphide and Benzene steam, also sensitive to smoke and other harmful gases. It is with low cost and suitable for different applications such as harmful gases/smoke detection.

MQ135

D. Sound Sensor:

This module allows you to detect when sound has exceeded a set point you select. Sound is detected via a microphone and fed into an LM393 op amp. The sound level set point is adjusted via an on board potentiometer. When the sound level exceeds the set point, it automatically sends the message to the server through wifi connectivity.



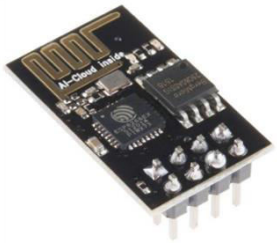
LM393

E. Esp8266 Wifi Module:

It is the leading IOT devices in the world in which it is very cheap and effective to use. The hardware connections required to connect to the ESP8266 module are fairly straight-forward but there are a couple of important items to note related to power:

1. The ESP8266 requires 3.3V power–do not power it with 5 volts.
2. The ESP8266 needs to communicate via serial at 3.3V and does not have 5V tolerant inputs.so you

needlevel conversion to communicate with a 5V microcontroller like most Arduinos use.



ESP8266 WIFI MODULE

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