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A Survey on IoT Based Air Pollution Monitor and Gas Detection System

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Abstract:

This Paper provides an overview of IOT that enables technologies, protocols and application issues. Air pollution is a growing issue which is polluted with Hazardous gases. These gases affects human health and overall living things health. It is required to monitor air quality and keep it under control for a better future and healthy living. This paper deals with air pollution monitoring i.e, detection of harmful gases in air. The other part of the project deals with Gas detection system. Health safety is a major issue in current era and good safety systems are required to implement which is done using IOT.

Keywords

IOT, Sensors, Embedded systems, Gas Detection system, Microcontroller, Ambient Air Pollution, GSM Module.

1. Introduction

IoT has history of few years basic idea of IOT concept is the presence variety of objects such as RFID, NFC, Sensors so on . Air pollution can be defined as the presence of toxic chemicals or compounds in the air, at levels that pose a health risk. An urban IOT can provide means to monitor the quality of the air in crowded areas, parks, or fitness trails. Sensor devices are placed at different locations to collect the data to predict the behavior of a particular area of interest. The Several standards have been implemented for the gas leakage detection system. The objective of the proposed system is to continuously measure the weight of the cylinder and send alert message when minimum threshold is reached. the sensors will detect different combustible gasses like butane and propane. This is the combination of LPG. LPG leakage is difficult discover so, an odorant is added i.e, "Ethyl Mercaptyl" which helps the surrounding people to detect leakage. The proposed system uses GSM model to alert person regarding gas leakage via SMS and take further steps.

2. Technologies Used and Basics of IoT

Various technologies used to develop the concept of IoT.

Among are as follows,

- Radio Frequency Identification (RFID)
- GPS
- Machine-to-Machine Communication (M2M)
- Vehicle-to-Vehicle Communication (V2V)
- RFID Reader
- Internet Protocol(IP)
- Wireless Fidelity (Wi-Fi)

A) RFID:
The RFID is a unique identity of object or person wirelessly using radio waves in the form of numbers.

B) M2M:
Machine-to-machine communication (M2M)- Machine-to-Machine (M2M) refers to the communications between computers, embedded processors, smart sensors.

C) Wireless Fidelity (Wi-Fi)-
Wireless Fidelity (Wi-Fi) is a networking technology that allows computers and other devices to communicate over a wireless signal.

D) RFID READER- A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects.

3.IoT Protocols

We have broken the protocols into the following layers to provide some level of organization: 1. Infrastructure (IPv4/IPv6) 2. Identification (IPv6, URIs) 3. Transport (ex: Wifi, Bluetooth,) 4. Discovery (ex: Physical Web, DNS-SD) 5. Data Protocols (ex: MQTT, CoAP,)

6. Semantic (ex: JSON-LD, Web Thing Model) 7. Multi-layer Frameworks (ex: Homekit).

3. APPLICATIONS OF IOT

A.Smart parking- The new Smart Parking sensor's or switches to be buried in parking spaces to detect the arrival and departure of vehicles. The Smart parking provides extensive parking management solutions which helps motorists save time and fuel.

B. Smart Home- Smart Home clearly stands out, ranking as highest Internet of Things application on all measured channels. We are surrounded by various electronic gadgets around us such as microwave ovens, refrigerators, heaters, air conditioners, fan and lights. Actuators and sensors can be installed in these devices in order to utilize the energy sufficiently and also to add more comfort in life. These sensors can measure the outside temperature.

C.Smart City- Smart city spans a wide variety of use cases, from traffic management to water distribution, to waste management, urban security and environmental monitoring. Its popularity is fueled by the fact that many Smart City solutions promise to alleviate real pains of people living in cities these days. IOT solutions in the area of Smart City solve traffic congestion problems, reduce noise and pollution and help make cities safer.

D.Health- It can gather information about health and send the collective data to health monitoring center. These centers can, therefore, analyze health and provide the valuable report and information to the individual.

E. Smart Cars- Machine to machine (M2M) communications, and especially Smart Cars, could help to improve accident prevention. These driverless cars will provide functioning more than just safety such as they can save valuable time, reduce stress of driving etc.

F. Smart Water Supply- Smart cities must monitor water supply to ensure that there is adequate access for resident and business need. Wireless Sensor

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Networks provide the technology for cities to monitor their water piping systems more accurately and discover their greatest water loss risks. Cities that are addressing water leakage problem with sensor technology are producing high savings from their investment.

4. . IOT CHALLENGES

A. Availability Availability of the IOT must be realized in the hardware and software levels to provide anywhere and anytime services for customers. Availability of software refers to the ability of the IOT applications to provide services for everyone at different places simultaneously.

B. Security Concerns If the IOT devices are poorly secured, cyber attackers will use them as entry points to cause harm to other devices in the network. This will lead to loss of personal data out into the public.

C. Privacy issues These devices collect user data without their permission, analyze them for purposes only known to the parent company. The social embrace of the IOT devices leads people to trust these devices with collection of their personal data without understanding the future implications.

D. Inter-operas ability standard issues – In an ideal environment, information exchange should take place between all the interconnected IOT devices. But the actual scenario is inherently more complex and depends on various levels of communication protocols stacks between such devices.

5. DIFFERENT TYPE OF AIR POLLUTANTS

The chemical compounds that lower the air quality are usually referred to as air pollutants. compounds will be found in two major forms:

- In a gaseous form (as gases),
- In a solid form

6. IoT DEVICES FOR AIR POLLUTION MONITORING

IoT devices applications make a real-time air pollution monitoring and forecasting.

6.1 Out Door Air Monitoring Devices:.
Figure.2. Aeroqual AQM 65
Figure.3. Dust Sentry PM10 Dust Monitor

6.2 Indoor Air Monitoring Devices:

7. ARCHITECTURE OF AIR MONITORING IOT DEVICES

Internet of Things (IoT) which is outcome of merged field of computer science and electronics. Here the sensing devices are connected to the embedded computing system to monitor the fluctuation of parameters like air pollution levels from their normal levels. Based on the framework shown in above figure, it consists of different sensor devices and other module. In this MCU could be an Arduino UNO or Raspberry pi e.t.c. Board with Wi- Fi module is as embedded device for sensing and storing the data in cloud. Arduino UNO board consist of analog input pins (A0-A5), digital output pins (D0-D13), inbuilt ADC and Wi-Fi module connects the embedded device to internet. Sensors are connected to Arduino UNO board for monitoring, ADC will convert the corresponding sensor reading to its digital value and from that value the corresponding environmental parameter will be evaluated. The Wi-Fi connection has to be established to transfer sensors data to end user and also send it to the cloud storage for future usage. Before sending the sensed data to cloud, the data will be processed in MATLAB for analyze. [5] ZigBee is a wireless networking standard that is aimed at remote control and sensor applications which is suitable for operation in harsh radio environments. It is connected to MCU. Various sensors like Sensors Carbon Monoxide – CO, Carbon Dioxide – CO2, Oxygen – O2, Methane – CH4, Hydrogen – H2, Ammonia – NH3, Isobutane – C4H10, Ethanol – CH3CH2OH, Toluene – C6H5CH3, Hydrogen Sulfide – H2

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e.t.c. These devices continuously sending data to the cloud data storage through Internet. Where data analyzed by IoT softwares and displayed to the users in their smart phones and computer screens.

8.HAZARDOUS GAS DETECTION SYSTEM

CModules: We are using three modules: Sensor module: CO2 sensor: CO2 is a major air pollutant present in the air. Level of the CO2 is measure by the this sensor.

Smoke sensor: The other renaming air pollutants like smoke are measure by these sensors.

LPG Sensor: It is gas leakage sensing unit. The LPG sensors used to detecting presence LPG gas in air. When gas leakage it gives signal to the microcontroller (MC).

Weight sensor: It is used to measure LPG cylinder weight with the LPG weight. This is used to provide user with an alert in case the LPG level goes below the set level.

Microcontroller: This is the controlling unit. It takes the signal from sensing And detecting units and gives controlling signal to the GSM and AC mains off circuit.

Communication module: GSM (Global system for mobile communication): This system receives the signal from MC and sends information (alerts, status of the units) to the user‟ s mobile number.

Application module: Alarm: This unit has an audio annunciation unit generally called as Piezo buzzer which beeps in case of LPG leakage or Fire alerts. It receives the signal from MC, when leakage or fire detected.

Display: This consists of 16 characters and 2 lines type

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JHD162A Display. continuously displays the air pollution level, weight of the gas and status of the sensors. It also signal from MC.

9.CONCLUSION

This study uses wireless sensor network technologies to acquire and record monitoring data for the goal of completely automatic air-quality monitoring. On the hardware side, we integrate sensor nodes with the CO sensors to perform airquality-monitoring tasks. The sensor nodes are able to communicate with each other based on the ZigBee protocol. Dependence & Power consumption of sensor nodes need to be minimized and functionality of the each step should be optimized. The selection of sensor and material used in construction of the sensor should select such that the there should be minimum changes in the accuracy of the system. As well As we shorted out the problems faced by LPG gas consumers so we come up with some solutions to meet the few requirements of them, as we made our system is completely automate the process of refill booking without human intervention. Our system is also reasoned to help customers to upgrade their safety

norms, act in accordingly with minimum requirements on environmental issues and mostly the basic function being prevented by major disasters and protect life and property from reputed Accidents. The primary objective of our project is to measure the gas present in the cylinder when weight of the cylinder is below the fixed load, this can be done using the weight sensors. The gas retailer gets the order for a new cylinder and the house owner receives the message regarding the status and the secondary objective is to provide any malfunction in gas servicing system in order to prevent damage or explosion of LPG. Thus the system developed by us will somehow help the LPG Gas Consumers to lead a comfortable life.

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