Leather Industry Pollution Monitoring and Alerting System

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Abstract: IoT in industrial area is an important component these days as they facilitate   fast and easy transmission of data over internet. This project monitors the pollution around Leather Industry and it sends live report to server of government personnel. The system consists of various sensors and measures the level of pollutants released from leather industry.The system detects the toxic gases that accidentally leaks from factory using corresponding gas sensor. These toxic gases slowly contaminate with air causing death of humans and animals. This system also checks for pollution of water bodies near the industry by corresponding sensor. It detects the contamination of water with toxic chemicals that cause death. Also the land surrounding the factory is checked for any harmful contamination. The values from sensors are processed by a Arduino Uno and data are sent through internet. All these parameters are monitored lively and sent to IoT server using Wi-Fi module. It helps corresponding government personnel to have a regular check over pollution level and create alert.

Keywords: IoT,pollution,Arduino,internet, sensor,monitor,Wi-Fi,server.

I. INTRODUCTION:

The IoT technology is a powerful tool in today's world and helps in transmitting real time values obtained from sensors. The IoT technology provides communication over machine to machine and machine to human interaction and can connect several machines, apps with it. These characteristics of IoT technology is used for pollution monitoring in industrial areas where the continuous measurement of pollutant level of various parameters like area water, etc. Nowadays there are various industries each having their own waste products released. It is the need to have check over the pollution level that is around the industry to ensure that there is no harm to people living around the industrial area. By having a proper monitoring system it would be easy to have continuous check over pollution levels from the industry and helps in taking necessary actions.

This paper provides a   pollution monitoring and alerting system that is used around industry for checking the level of contamination of land ,air water by using appropriate sensors. Nowadays there is a need to be cautious about pollution released from industries. This project helps in monitoring the pollution of air around leather industry by using MQ2 gas sensor.It also monitors the water pollution around water bodies that get contaminated with waste products from industry by using turbidity sensor. The soil around the industry is also checked to know if there is polluted soil which is unsuitable for usage by using Ph sensor.The sensor values collected from sensors are processed by Arduino Uno .The ESP8266 Wi-Fi module connects the Arduino to internet and sends data. The processed data are sent to the IoT platform called Thing Speak where the real time data can be monitored.

RELATED WORK :

A number of projects have been done on pollution monitoring using various techniques.

V.Ramya and B. Palaniappan [1] had proposed a method which uses an embedded system that consists of a PIC microcontroller which receives the input values from corresponding sensors.The gas sensors used in this model are MQ-2 and MQ-7 gas sensor. The gas sensors are used for detection of two gasses LPG and propane. The gas levels sensed are displayed in a LCD display. If the gas level exceeds the normal level, an alarm is generated and also a SMS is sent through GSM module.

The microcontroller used for processing the data and interfacing the circuits is PIC microcontroller which is more tedious to program. It also detects only two gasses Propane and LPG .The data is sent by GSM technology and program has to be changed every time the SIM card is changed.

Selvapriya,SathyaPrabha, Abdulrahim,Aarthi.K[2] had proposed a model that provides Leakage Monitoring and Alerting of LPG.The   Arduino Uno is used to process the input values from the gas sensors.The gas sensors used here are the MQ -5 gas sensor is used for detecting the methane and other combustible gasses and also alcohol and smoke. The system sends the gas levels through the GSM module.

In this   model the system detects only LPG gas and not any other toxic gasses. It uses GSM module and requires frequent change of programs when SIM card is changed.Also the model is not implemented in detection of toxic gasses from industry.

Anil.H.Sonune and S.M.Hambarde [3] proposed model that describes implementation of the air pollution monitoring and controlling system using ZigBee technologies and embedded system. This model uses an ARM Processor LPC21428 for processing the data and controlling the air quality.It uses ZigBee [IEEE802.15.4] technology which is a wireless technology for connecting devices.This model monitors the air quality and uses air conditioner for purifying the air.

This model   is used to monitor only air quality and also it uses air conditioner to purify air which cannot be implemented in large scale.Also it uses ZigBee which has lower data rates and short distance range and it is not secure like Wi-Fi based system.

V.S.Revathy, K.Ganesan, K.Rohini, S.TamilChindhu, T.Boobala[4]   proposed a model that is used for Air Pollution Monitoring and uses MSP430 Microcontroller for processing the input values from sensor. The gas sensor used is MQ7 gas sensor for detection of gasses like co and co2.Thi model uses GSM module and Wi-Fimodule for transmission of data.

 This model is used only for air quality monitoring and with only two gasses co and co2.The other toxic gasses cannot be detected using this method.

 G Robin and S.Sankaran [5] proposed a model that is used for air quality monitoring in a particular city.This model detects the various gasses like Co, No So2 and other toxic gasses. The High Volume Sampler is placed above the ground and air quality is measured by collecting the air samples.

This system is used only for monitoring the air quality in urban areas and at specified places. The air quality measured is only from the vehicles in the city and not from an industry. Also there is no alerting method for creating an alert regarding the emission.

PoonamPal, RitikGupta ,SanjanaTiwari , Ashutosh Sharma [6]proposed a model that uses Arduino Uno for processing the input values from gas sensor.The model usesMQ135 Gas sensor. The MQ 135 gas sensor is used for detecting chemicals like, smoke, benzene steam, sulphide and other toxic gasses. It uses IoT technology for transferring real time data to server. The Wi-Fi module ESP8266 is used for connecting the Arduino to internet.

This method is used for air quality in only cities and not near any industrial areas. The industrial toxic gasses and other wastes cannot be detected and alerted.Also other parameters like water quality are not obtained in this model.

Pradeep D. Landge,R.R.Harne [7] had proposed a model that uses gas sensor for monitoring various gasses likeCarbon Dioxide (CO2), Carbon monoxide(CO), Methane (CH4), Nitrogen Dioxide (NO2), Hydrogen Sulphide (H2S), Ammonia (NH3) and other Particulate Matter (PM) .The Real time data is sent by Internet of Things(IoT) technology to server and data is displayed on the website.

  This method is used for only air quality monitoring in a city and not near any industry. The air quality in a city is more different from the air quality near a industrial area. Also other parameters like contamination of water and soil near the industrial area cannot be detected.

GarimaPathak,Vishwanath,Bhadrashetti[8] proposed a model that uses GP2Y1010AU0F dust sensor which is used in detection of dust and suspended particles in air.The Arduino Uno microcontroller is used in processing the data. The real time values are transmitted using IoT technology to the server and data is displayed in the web browser. This model uses dust sensor for detecting only suspended particles whereas MQ gas sensors can provide additional capabilities in monitoring air quality.

 JAYTI BHATT, JIGNESH PATOLIYA [8] proposed a model that uses Raspberry pi for processing data from the sensors. The sensors used turbidity sensor, Ph sensor and temperature sensor for monitoring different parameters of water. The sensor values processed by the controller are transmitted by means of ZigBee module[IEEE 802.15.4] to the server. The data can be viewed through a web browser. The data are transferred in ZigBee module which has low data rates compared with a Wi-Fi module. This model does not provide deep monitoring of water body like detection of toxic elements.

A.N.Prasad, K. A. Mamun, F. R. Islam, H. Haqva [9] proposed a model that uses sensors to measure the following water parameters like Temperature, Conductivity and Hydrogen, Oxidation and Potential Reduction Potential .It uses Waspmote microcontroller for processing the data from sensors. The Waspmote microcontroller is a RISC based microcontroller. The data from corresponding sensors is collected and processed by microcontroller. It uses GSM module for transferring data .The data is viewed in a website. The model uses GSM module for transferring data which is less advantageous than Wi-Fi module .The Wi-Fi module has high data rate and battery life.Also the toxicity of water with contamination (turbidity) cannot be measured.

Vaishnavi V. Daigavane and Dr. M.A Gaikwad [10] proposed a model that uses Arduino Uno for processing the data from sensors. The sensors used are Ph sensor, temperature sensor, flow sensor, turbidity sensor. The Ph sensor is used in measuring the acidity and chemical properties of water. The turbidity sensor is used in measuring the cloudiness of the water that is contaminated. The water becomes turbid as chemicals slowly contaminate with water. The flow sensor is used in measuring the rate of flow of water through the pipe. The temperature sensor is used for finding out whether the water is hot or cool. The Wi-Fi module is used for connecting the Arduino to internet and data are viewed at website.
The model uses flow sensor and temperature sensor which is not needed for measurement of contamination of water. Also, due to uses of extra sensors system becomes bulky.

Mr.Vasim K. Ustad, Prof.A.S.Mali , Mr.Suhas S.Kibile.[11] proposed a model that uses PIC Micro Controller (16F877) for processing the input data from corresponding gas sensors. The gas sensors used are MQ-131, MQ-135, and MQ-136. It uses two ZigBee modules at the transmitter and receiver sides. The data are transmitted from the PIC Micro Controller to the internet through ZigBee module.

The ZigBee module used has less advantage than Wi-Fi module. It has lower data rate less secure than Wi-Fi module. The programming of PIC Micro Controller has many complexities compared with programming an Arduino.

K.Nirosha, B. Durgasree, N. Shirisha[12] proposed a model that uses Arduino Micro Controller for processing the input data from gas sensors. The MQ135 Gas sensor is used for detecting chemicals like, smoke, benzene steam, sulphide and other toxic gasses. The sensor continuously checks for level of contamination. If level of contamination exceeds 1000 PPM it indicates the warning by creating an alarm using buzzer. The ESP8266 Wi-Fi module is used to connect the micro controller to internet and display values in web page. They have used Wi-Fi module for connecting to internet and display values on webpage and have additionally used LCD(Liquid Crystal Display) which is not needed while using a webpage. This leads to additional complexity of system.

Dr. A. Sumithra, PJ.Jane Ida, PK. Karthika ,P Pdr. S. Gavaskar.[13] proposed a model that deals about various methodologies to monitor the environmental pollution in a city. It uses IoT for real time transmission of various data collected from sensors. The gasses like Carbon Monoxide (Co), Nitrous oxide (NO2), SH2, CO2, PM-10 and O2. They have used Waspmote as a controller for processing the sensor values. They have developed an individual network called as CitiSense which allows individuals to track the level of pollution in smart phones. This model helps in monitoring only air quality at various parts of the city. Also other types of pollution in the areas near industries are not monitored.

EXISTING MODEL:

The previous monitored models monitored only air. The area of monitor was only in cities and not on Industry. The previous projects were not particularly focused on waste products from industry. It was not used for an industry point of view. The existing models were particularly used in monitoring air quality in some parts of cities. There was no system for monitoring the waste products from an industry.

PROPOSED MODEL:

The proposed model is to monitor air, water, soil. The project is to particularly monitor the pollution in Leather Industry area. It focuses on the hazardous waste products leaked from the industry. It collects contaminated level of air around leather industry using gas sensors. It creates an alert message if the pollution level is greater than the normal level. It also uses turbidity sensor to check the contaminated level of water around leather industry. The soil contamination level around the leather industry is monitored using   soil ph sensor. The data are collected and processed using Arduino   and sent live through the internet to IoT server of corresponding government officials.

II.   SYSTEM ARCHITECTURE:
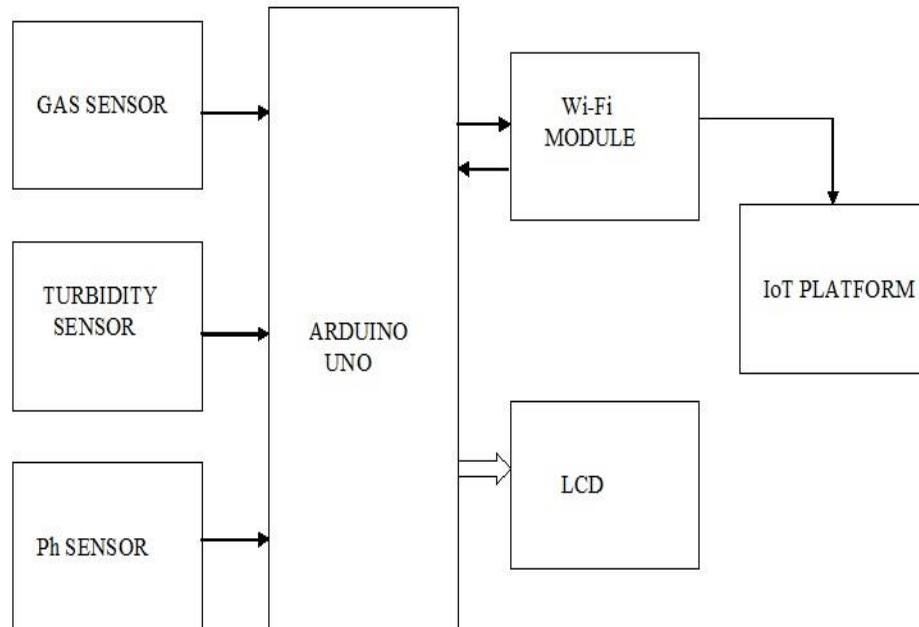
HARDWARE USED:

Arduino Uno:

It is an open-source computer hardware and software company, project and user community that designs and manufactures kits for building digital devices and interactive objects that can sense and control the physical world. Arduino boards may be purchased or preassembled at the same time, the hardware design information is available for those who would like to assemble an Arduino from scratch. An AVR microcontroller with other components along with a USB port make up the Arduino Uno board.

MQ2 GAS SENSOR:

The mq2 gas sensor is used in monitoring the air quality around industry .The MQ2 gas sensor is used for detection of various gasses like methane, LPG, carbon monoxide, propane. It consists of a exoskeleton made of steel and a sensing element is placed under it. The gases are ionized which come close to the sensing element. They are absorbed by the sensing element. The resistance value of the sensing element is changed and the value of the current is varied.

TURBIDITY SENSOR :

   The Turbidity Sensor measures the turbidity of fresh-water or seawater samples in NTU (Nephelometric Turbidity Units, the standard unit used by most water collection agencies and organizations). Wter flows through the sensor which consists of the photo transistor and the photodiode respectively.Whenever there is any suspended particles the path of light is blocked. This difference in amount of light sent and received is conveyed to the micro controller operating the sensor and decisions are taken in accordance to that.

Ph sensor:

PH meter is used to measure hydrogen-ion concentration (acidity or alkalinity) in solution. Fundamentally, a pH meter consists of a voltmeterattached to a pH-responsive electrode and a reference (unvarying) electrode.The Ph sensor contains within it a measuring electrode and reference electrode.The change in Ph is detected by measuring electrode with reference to a stable value.

LCD DISPLAY:

An LCD is a small low cost display. It is easy to interface with a micro-controller because of an embedded controller (the black blob on the back of the board).This controller is standard across many displays   which means many micro-controllers have libraries that make displaying messages as easy as a single line of code.

ESP8266 Wi-Fi MODULE:

The ESP8266 WiFi Module is a small chip can give any microcontroller access to your WiFi network.The ESP8266 has 8 pins and is capable of working in industrial environment and has wide range of temperature.The Wi-Fi module helps in connecting to internet and transmit the data to IoT server.

SOFTWARE USED:

ARDUINO IDE:

The Arduino IDE is software that is used to write programs and upload it to hardware. The programming language used to write programs in this software   is either C or C++.The two functions that are defined default in the program are setup() and loop().

PROTEUS :

The Proteus Design Suite is a software used for capturing the schematic,making layout design of PCB and simulating the circuit .Based on the size of design produced and requirements needed for simulation they are available in many configurations..

III.   WORKING :

The sensors used in this system are the gas sensors ,turbidity sensor and Ph sensor to monitor the air quality, water quality and soil quality. The mq2 gas sensor detects the various gasses like methane,Co,propane and sends the sensor values to Arduino.The turbidity sensor is used in monitoring the water quality around industry. The turbidity sensor is a water sensor that is used to measure the suspended solids in water by the scattered amount of light.. The turbidity sensor provides data on the contaminated level of water from waste products released from leather industry. The ph sensor is used to monitor the soil around the industry. The Ph sensor checks the Ph level of the soil and provides data on acidity and chemical contamination of soil.The sensor values are sent to the Arduino Uno and the values are processed and the values of level of pollution are obtained.The values are displayed in LCD for visual purpose.The Wi-Fi module connects the Arduino to internet and and transmits the data to IoT plaltform where the real time levels of pollution are viewed.Also alert messages are conveyed when the level of pollution exceeds beyond the normal level.

IV.   CONCLUSION:

   This project provides a solution to monitor different parameters like air, water and soil around the industry. This pollution monitoring system would help in keeping track of the pollution levels around industry and helps in creating alert when the amount of pollution exceeds beyond a certain limit. The IoT helps in transferring real time data to corresponding web server. This project would be useful for alerting the people around the industry regarding any enormous level of pollution and help in saving the patients and other people.

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