Industrial Pollution Monitoring and Controlling System

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Abstract: The growth in an industrial and infrastructural frameworks leads to the environmental affairs like pollution. Pollution is becoming serious issue so there is need to build such a flourishing system which overcomes the problems and monitor as well as control the parameters. Industrial Automation is the control of electronic devices in our industrial whether we are there or aware. This system is designed to be low cost, low energy and expandable allowing a variety of devices to be controlled. It is a voice based industrial automation system which will be very useful for old aged people and disabled people, basically for one's who cannot perform basic activity efficiently. The main aim of this project is to make life easier and control industrial appliances by android voice command using Wi-Fi as communication protocol between raspberry-pi and Android device. It includes controlling industrial appliances remotely through phone, laptop etc. The main objective is to design a smart industrial automation which can be controlled and monitored by the Raspberry Pi via the Internet of Things(IoT). This will help the industrial owners to provide a simple, fast and reliable way to automate and manage their industrial.

Keywords: IoT, Raspberry-Pi, Android Application.

INTRODUCTION

Now a days wireless technologies are becoming more popular. Industrial automation is used to control the devices of the industrial easily without any human interaction .When people are going out from industrial they have to check manually for all running electrical appliances but by using this industrial automation there is no need of manual checking because everything can be operated from the smart phone or through a personal laptop itself from anywhere. Hence the industrial automation saves the time, energy and money. When the user gives the command to switch on or off the light or fan through the smart phone it gives input to the raspberry pi and the raspberry pi does the automation.

In today's day to day life automation can play a major role. The main attraction of any automated system is reducing human labour, efforts, time and errors due to human negligence. This project is based on Internet of Things (IoT). Internet of Things is a network of devices such as electrical appliances for connectivity which enables these devices to connect and exchange data. This project represents a flexible way to monitor and control the parameters. This project includes an android application where a user will provide voice commands for controlling devices such as "Turn light on" which will be connected to raspberry pi and according to it the required process will work Bluetooth is required for connectivity. This automation can be used majorly not only in industrial but offices and hospitals where user can

register and authenticate himself/herself in android device and after successful login can give the input commands and operate the devices. It also provides security from third party users. It allows controlling number of industrial appliances simultaneously. Thus it act as an smart industrial automation system.

PROPOSED SYSTEM

The system to be developed is the wireless sensor network for monitoring and controlling the industrial pollution parameters. The system provide the users with mobile control of various devices by using Bluetooth low energy along with Raspberry pi. The main objective of this project is to control electrical industrial appliances by android voice commands using Wi-fi as communication protocol between Raspberry Pi and android device. For this purpose software is created. Through this software the electrical industrial appliances can be switched on and off. The software and the raspberry pi are connected by using the Bluetooth technology.

WORKING PRINCIPLE

The Fig 1 consist of various sensors used in industrial and these sensors are connected to raspberry pi which is connected to Wi-Fi module. Relays can be interfaced with Raspberry Pi and appliances, respectively, for their controlling. All the sensor outputs that is the real time data is sent to the cloud for storage. The voice command

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is given as input to android device which is connected to raspberry pi and the output from raspberry pi is given to relay switch. The android application is used to control the appliances via internet . Using the android application the user can control the appliances from anywhere. The IR sensor is used when anyone enters the industrial so camera will capture the image and stores in the OS. Whenever fire is detected data is passed to the IoT that shows fire has detected. And an alarm is generated. And when CO2 is detected buzzer is on and data is sent to the IOT. Similarly all the sensor data is sent to the cloud so that a person who is authorized for that cloud can see the data from sitting anywhere from the world.

BLOCK DIAGRAM

Fig.1. Proposed system

HARDWARE:

1. RASPBERRY PI
The Raspberry Pi is a small, cheap, tiny computer on a single circuit board, and has been designed in such a way that it consumes less power than the regular computer. The raspberry pi consist of the micro USB power, display port, micro SD slot, HDMI, port, audio video jack, CPU, GPIO pins. Through the micro USB power the power supply for the raspberry pi is given. With the help of the

SD card it can store mass storage. The GPIO pins are used to turn on the relay. When the user wants to switch on or off the particular industrial appliances, the command to do it is done through the software named voice controller in the smart phone or any other device that is used for industrial automation. The command given by the user is taken as the input by the software app it to the raspberry pi. Once the raspberry pi receives the command, the GPIO of the raspberry pi does the switching of the relay. Depending upon command the electrical appliances will be switched on or off.
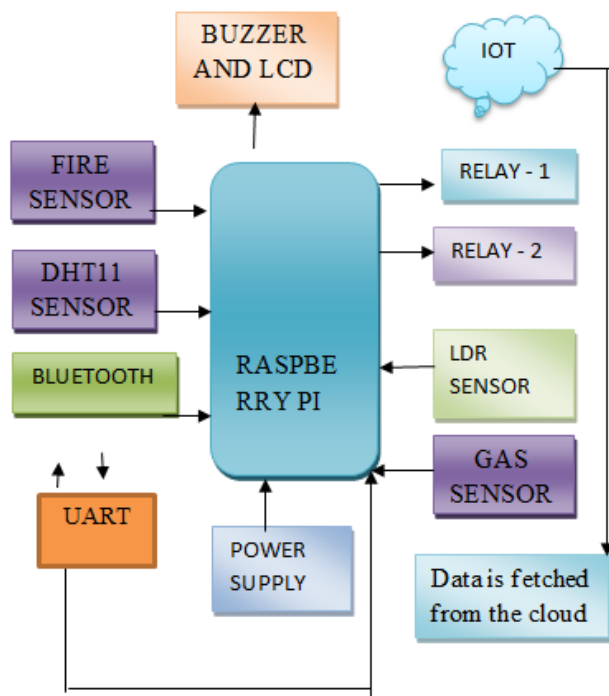

Fig.2. Raspberry Pi

2. BLUETOOTH MODULE
HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setupHC-05 module easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The Bluetooth module that HC-05.this Bluetooth module supports the model of communication. The master and slave model of communication is a type of communication where one device will be the master and it controls other devices which are the slaves of the master one device acts as controller and other devices are the ones that are being controlled. The user can simply for a serial port replacement to establish connection between MCU and GPS, PC.
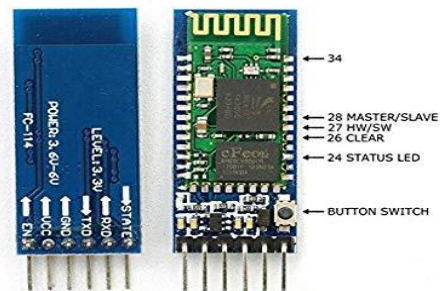

Fig.3. Bluetooth module:

3. RELAYS

The relay channel does the coupling between the input and output circuits. A relays Output Circuit is the portion of the relay that switches on the light, fan etc. A relay allows the circuit to turn on or turn of providing complete isolation between the low and the high-voltage and controls the load. The Fig.4. shows diagram of Relays.

Fig.4. Relays

4. FIRE SENSOR

A fire detector works by detecting smoke and/or heat. These devices respond to the presence of smoke or extremely high temperatures that are present with a fire. After the device has been activated, it will send a signal to the alarm system to perform the programmed response for that zone. The Fig.5. shows diagram of Fire sensor.

Fig.5. Fire sensor

5. GAS SENSOR

As detectors measure a specified gas concentration, the sensor response serves as the reference point or scale. Electrochemical sensors or cells are most commonly used in the detection of toxic gases like carbon monoxide and nitrogen oxides. They function via electrodes signals when a gas is detected. The Fig.6. shows diagram of Gas sensor.

Fig.6. Gas sensor

6. DHT11 SENSOR

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). Its fairly simple to use, but requires careful timing to grab data. The Fig.7. shows diagram of DHT 11sensor.
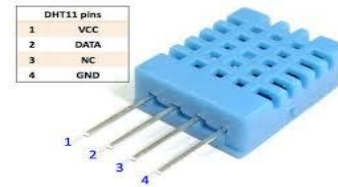

Fig.7. DHT11 sensor

7. LDR SENSOR

The LDR is a special type of resistor which allows a lower voltage to pass through it (high resistance) whenever its dark and higher voltages to pass (low resistance) whenever there is a high intensity of light.

Fig.8. LDR sensor

8. BUZZER

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke. The Fig.9. shows the Buzzer sensor.

Fig.9. Buzzer sensor

SOFTWARE

1. WEBSITE

A Website is a Collection of Publicly accessible, interlinked Web pages that share a single domain name. We are using Website to show the values of pollution in the Industry.

2. DATABASE

Database is used to store the values. We are using MYSQL Workbench tool which gives a nice Graphical User Interface to visually design and work with database table.

3. PYTHON IDE

Python IDE stands for Integrated Development Environment. It's a coding tool which allows you to write, test, and debug our code in an easier way, as they typically offer code completion or code insight by highlighting, resource management, debugging tools etc.

4. BLYNK ANDROID APPLICATION

Blynk is a new platform that allows you to quickly build interfaces for controlling and monitoring your hardware projects from your iOS and Android device. After downloading the Blynk app, we can create a projects dashboard and arrange buttons, sliders, graphs, and other widgets onto the screen

METHODOLOGY

The sensors output value are interfaced with internet of things. A web page is created and it contains all the readings and observation of the sensor devices. The output are continuously updated the values. The output values can be seen in the web page. The web page is Ubidots where we have created an account and we can access the account as in the Fig 10.
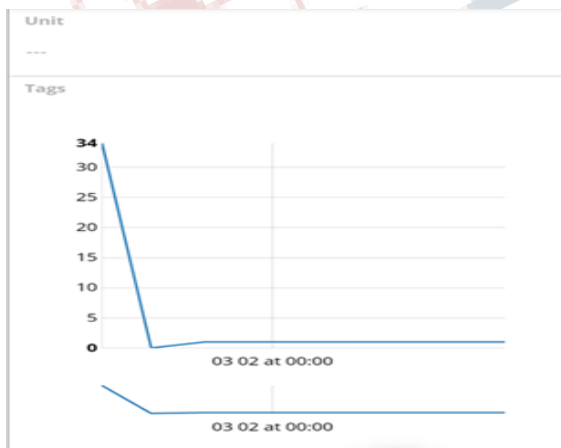

Fig. 10.Software output

Fig 11 is the hardware Implementation part for the sensor communication. Fig11 shows all the hardware including Raspberry pi, Bluetooth device and other sensors like temperature, humidity, fire, LDR and smoke sensors. This sensors are connected to the Raspberry pi.
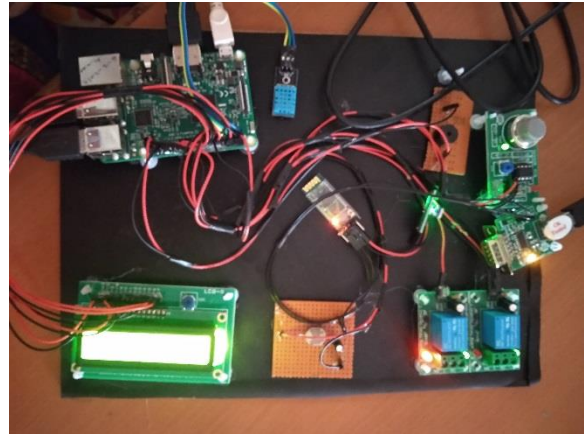

Fig .11.Hardware Implementation

RESULT

This system includes the sensors which will detect the parameters that causes pollution. Whenever the value increases the threshold value level of the parameter the sensor sense the value and alarm or buzzer will be generated. The message will be displayed in the LCD as shown in the Fig 12. This project can be accessed anywhere from any place .

Fig .12. Pollutants readings on LCD

CONCLUSION

In future this kind of industrial automation using raspberry pi can be implemented in every industrial .It makes life easier and the user can automate and manage their industrial more efficiently. This system is well

secured as it involves password for paring of device and hence it prevents access of unauthorized users, device like the raspberry pi plays a big role as it helps to implement all the automation at a very low cost. Now a days we need everything computerized. Earlier we can only monitor the situations with the help of cameras. In industries to reduce manual overhead we have implemented Internet of Things (IoT) in Industry to monitor as well as to inform the responsible person to take appropriate measures, but this will partially fulfil our requirement. As sometimes it will be late in this process and it will harm to property as well as life. For this purpose we are developing a system for Industrial Automation using IoT with the help of Artificial Intelligence to make system automated which will take intelligent decisions.

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