NETWORK BASED SENSOR DATA COLLECTION APPROACH FOR INDUSTRIAL PROCESS MONITORING USING IOT

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ABSTRACT

The Industrial applications based on the Wireless Sensor Network is a spatially distributed sensor that demands the most efficient techniques for monitoring with low cost, less power, and memory consumption. The sensors are deployed in our project to monitor industrial parameters like temperature, pressure, flow, gas, etc.These parameters were carefully selected based on the potential hazards they can cause to the normal working of the Industry machine. In this project, the monitoring framework incorporates a smoke sensor, level sensor, flow sensor, air pressure sensor, temperature sensor, PIR sensor, with Zigbee for data transmission and IoT to upload the data in the cloud server.The network coordinator connected to the main processing unit which displays the sensor value in a graphical user interface (GUI). The main processing unit also uploads data to the cloud server to monitor settings on the Internet from any location on the dedicated monitoring website for the organization with proper authentication details.The Data are collected, stored and can be accessed from all over the world at any moment with the secured Login details for the authorized user.

Keywords: IoT, WSN, Zigbee, cloud, website, Industrial monitoring

1. INTRODUCTION

In the development of network and communication technology, the trouble of wiring is solved with WSN especially within the area of remote sensing, industrial automation control. WSN has good functions of information collection, transmission, and processing. it's many advantages compared to traditional wired networks like convenient organizing networks, small influence on the environment, low power dissipation, low cost, etc. Nowadays, near field wireless communication technology has been used widely, especially Bluetooth, wireless local area network (WLAN), infrared, etc. But, they need several disadvantages, as an example, complexity, large power dissipation, short distance, networking on alittle scale. so as to satisfy the demand of low power dissipation and low speed among wireless communication devices, a brand new kind of wireless net technology-Zigbee emerges because the times require. during this paper, we'll introduce the networking technology and application of Zigbee within the industrial application because it consists of certain hazards while monitoring the parameter through wires and analog devices like transducers. to beat this problem here we use wireless devices to observe the parameters in order that we will take certain steps even within the worst case. the most use of this module helps in an industry during the worst cases because the analog devices could also be damaged maybe during the fireplace accident, etc. But with wireless transmission, we don't have accurate data but compared to the analog failure the errors are very minimal so we use wireless to observe the parameter in an industry where there's no means of a personality's operator to watch the parameters. It ends up in cheap wireless technology so it may be used for the low rate of information transfer. The Zigbee technology is commonly used in industrial automation. The system consists of two parts one could be a transmitter and another may be a receiver part and both may be any number. The transmitter consists of gas sensors, peripheral interface controller (PIC), and Zigbee and also the receiver part consists of a PC interfaced with Zigbee through a PC interface. Here we monitor LPG, CO, and Air Quality with the assistance of MQ6, MQ7, MQ135 respective sensors. the information from the sensors are collected by the microcontroller and transmitted to the receiver section through a wireless medium. All the parameters are viewed by the PC employing a visual basic program at the receiver side. of these data mail to the mail id so we are able to access them from anywhere.

2. EXISTING SYSTEM

In The existing system it uses two or more gas sensors to detect leakage in two or more locations around the gas tube and its distribution line. If the gas leaks, the sensor will send its data to Arduino. Then, explosion prevention system will be activated. The sensor node attains early gas detection using a semiconductor gas sensor (usually an oxide), an arduino nano microcontroller, an arduino UNO microcontroller, X Bee and an arduino GSM shield. The detection model is built with the feature extracted from normal concentration signals and The node receives leaked gas signal from the leakage area and communicate it to the network coordinator wirelessly through the X Bee. When such an emergency is detected, the network coordinator alerts the user by sending SMS through the GSM shield and may autonomously control the source of gas emission through the exhaust fan.

3. PROPOSED SYSTEM

The Industrial Parameters are detected at various points, and the data of the parameters are sent to the main processing unit. In the main processing unit, we are using a well-designed dashboard that provides on-demand access to all of your most important metrics and also better visualization of the data for a better understanding.Then the main processing unit uploads the data to the cloud server through IoT. “Internet of Things” (IoT) providing a helping hand to achieve Industrial automation through remote access. In IoT, each device or device constituting a system able to communicate with the other devices or system on the same premises over a common platform.We can access the data uploaded in the cloud through our webpage with the proper Authentication Details from anywhere in the world. Also, we can store the data in the cloud server can track those data at any time. Hence this leads to the exchange of relevant data, statistics, logs, and various other parameters information among various devices to improve their performance, which will help industries to have better productivity, management, and increased throughput.

4. HARDWARE DESCRIPTION

4.1 ARDUINO :

The Arduino Uno is microcontroller board grounded on the ATmega328 (datasheet). It comprises of 14 digital input/output pins (out of which 6 can be utilized as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a facilitation for USB connectivity, a power jack, an ICSP header, and a reset button.

4.2 PIR sensor:

PIR Sensor Module is used for human body detection. Complete with PIR, Motion Detection IC and Fresnel Lens. Advanced Accuracy Sensor with Low Noise and High Sensitivity. Wider Supply Voltage: 3.8-24Vdc. Delay Time Adjustable: 2 seconds to 70 minutes. Light Sensor Included with Adjustable Sensitivity: 3 to 10 Lux. Detecting Length Adjustable: 6 to 8 meters. Standard TTL Output.

4.3 Zigbee:

ZigBee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used for wireless networking. ZigBee (CC2500) is a low cost true single chip 2.4 GHz transceiver designed for very low power wireless applications. Transmission distances to 10–100 meters. Detection range: (10-30) m.ZigBee devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones.ZigBee is typically used in low data rate applications that require long battery life and secure networking (250 kbit/s).

4.4 Flow sensor yf-s201:

This sensor sits in line with your water line and contains a pinwheel sensor to measure how much liquid has moved through it. There's an integrated magnetic hall effect sensor that outputs an electrical pulse

with every revolution. The hall effect sensor is sealed from the water pipe and allows the sensor to stay safe and dry.

4.5 Temperature sensor:

A One of the easiest and inexpensive ways to add temperature sensing in your Arduino project is to use DS18B20 1-Wire Temperature Sensor. These sensors are fairly precise and needs no external components to work. So, with just a few connections and some Arduino code you'll be sensing temperature in no time!

4.6 Gas sensor:

A gas detector is a device that detects the presence of gases in an area, often as part of a safety system. Gas detectors can be used to detect combustible, flammable and toxic gases, and oxygen depletion. The MQ series of gas sensors use a small heater inside with an electrochemical sensor. They are sensitive to a range of gasses and are used indoors at room temperature. The output is an analog signal and can be read with an analog input of the Arduino.

4.7 Bmp180 air pressure sensor:

The pressure sensor BMP180 consists of a piezo-resistive sensor, an analog and digital converter, control unit with E2PROM and a serial I2C interface. ... The microcontroller of the sensor device sends the start sequence to measure pressure.

5. SOFTWARE DESCRIPTION

5.1 Arduino IDE:

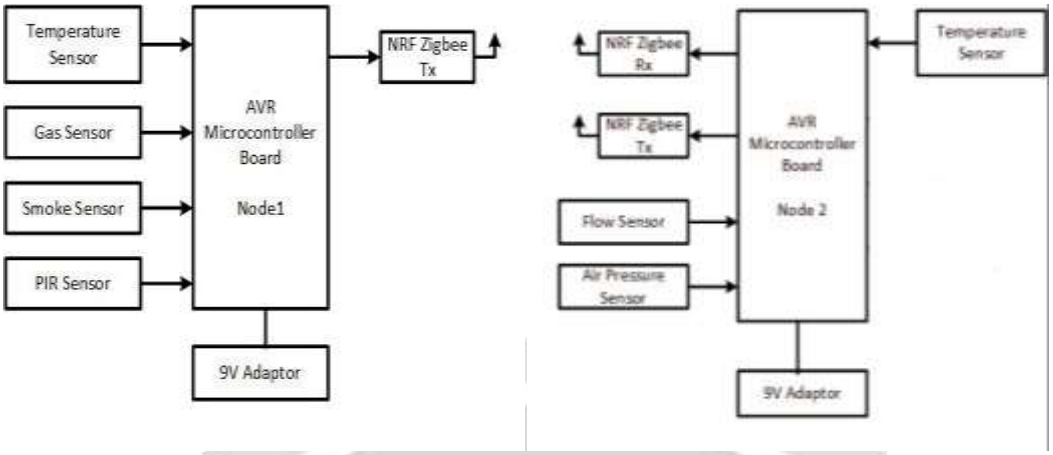
A program for Arduino may be written in any programming language with compilers that produce binary machine code for the target processor. This will convert the Embedded C language to microcontroller language. Then this is burned into the controller.

5.2 Embedded C :

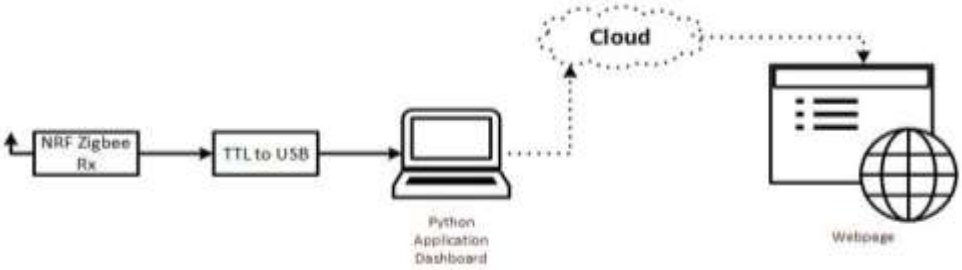
Embedded systems programming is different from developing applications on a desktop computers. Key characteristics of an embedded system, when compared to PCs, Embedded devices have resource constraints(limited ROM, limited RAM, limited stack space, less processing power) Components used in embedded system and PCs are different; embedded systems typically uses smaller, less power consuming components. Embedded systems are more tied to the hardware.

6. BLOCK DIAGRAM:

NODE1 NODE2



Main Monitoring unit



7. RESULTS

The industrial monitoring system was designed and the result was obtained while working on the model. The system is able to effectively monitor the industrial parameters using WSN and IoT. Here ZigBee provides all suitable data rates as compared to other wireless technology so this system withstands suitably for industrial applications and the data is received and stored in the cloud securely

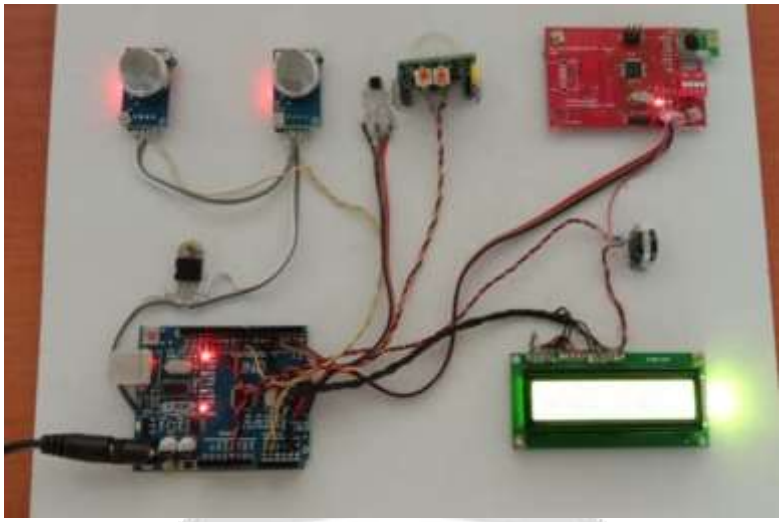


FIG 1a: Hardware output
NODE1

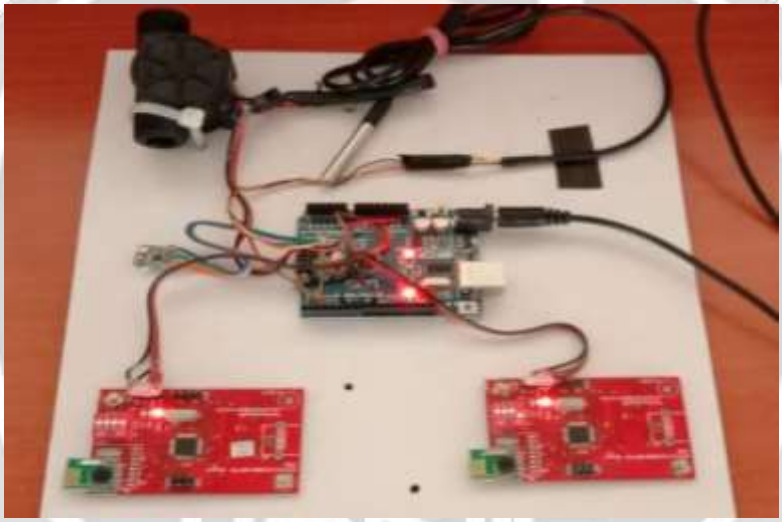


FIG 1b: NODE2

FIG 2a: Software output
Python Dashboard

FIG 2b: Website for viewing data

8. CONCLUSION

This project presents a system for measuring the industrial parameters using the IoT and Zigbee protocol for communicating node-to-node communication with other elements. The use of low-power WSN by the Zigbee module makes the collection of data from different places quicker and more secure as data can be received only through the website. Since the coordinator sends the received data to the cloud server and a dedicated website is synchronized with that server for monitoring from the authorized remote devices anywhere from the earth. IoT provides thing-related services such as privacy protection and semantic consistency. IoT-based systems are heterogeneous as different hardware and networks are connected together.

9. FUTURE SCOPE

This system has given successful results but the website can be modified by adding new features to it. The python dashboard can also be improved and modified. Commercial cloud services such as AWS or Azure can be used, it will pave the way for the development of more feature-oriented smartphone app., as these servers offer steady API.

10. REFERENCES

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