Industry Protection System Using Node MCU and IoT

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Abstract— **With the rapid elevation in the internet users over the past decade has made internet a part of life internet of things is the advanced internet technology. Automatic systems are beginning adopted over manual system because of their self-regulation behavior. The system consists of three sensors interfaced with NodeMCU. The sensors data is constantly scanned to record values and checked. The scanned sensors data is sent to the ThingSpeak IOT platform using the NodeMCU to the client webserver API. The sensors used in this project are MQ-2 (gas sensor), LM35 (temperature sensor), LDR (light sensor).**

Keywords— **Internet of Things (IoT), Application Program Interface (API), Light Dependent Resistor (LDR).**

I. INTRODUCTION

Internet of Things is basically, the network of things by which physical thigs can exchange data with help of sensors, electronics, software, and connectivity. These systems do not require any human interaction. NodeMCU based system sends the signal from different sensors, i.e. Smoke, Temperature and Gas sensor to the micro-controller-NodeMCU. The micro-controller then sends this to the IOT platform. In case a fire takes place, the smoke sensor and the temperature sensor would detect the presence of smoke and temperature changes and send the information to the NodeMCU. The micro-controller is connected to the Wi-Fi, buzzer and exhaust fan. In case of any changes in lighting conditions the information is send to NodeMCU which will turn on the backup light. NodeMCU is programmed in such a way that it turn ON the buzzer when the temperature sensor detects temperature greater than a threshold value, when any smoke or gas detected by the gas sensor greater than the threshold value the exhaust gets turned ON and in case any reduction in light the light sensor detects the light data if the data is less than the threshold value the backup light gets turn ON. This value can be programmed as needed. At the same time, the sensor values will be sent to the website (ThingSpeak). Since the data is monitored LIVE by the client on a IOT platform, immediate action can be taken. Gas sensor is used for LPG gas leakage detection. In case there is a leakage of gas, the sensor would detect it and send the signal to the NodeMCU, which would turn ON the exhaust fan and at the same time, send the same information over IOT. Light sensor is used for light conditions detection. In case there is any abnormal light conditions like less lighting in the working space the sensor would detect and send signal to NodeMCU, which would turn ON the backup light. The Pre-requisite for this project is that the Wi-Fi should be connected to a programmed Wi-Fi SSID.

II. LITERATURE SURVEY

Industrial protection using Arduino uses the external Wi-Fi modem which will increase the cost of the system. Here in this system the overall cost of the system is effectively reduced to half. Previous Protection system using NodeMCU can monitor the one analog sensor only whereas the Arduino can connect up to the four analog sensor but in order to reduce the overall cost and increases connectivity of the sensor the 16-CH analog multiplexer is connected to the single analog pin of the NodeMCU.

IOT domain ThingSpeak create instant visualization of the live data and also send the alert using the webservice like Twitter and Twilio with MATLAB analytics inside ThingSpeak

III. BLOCK DIAGRAM

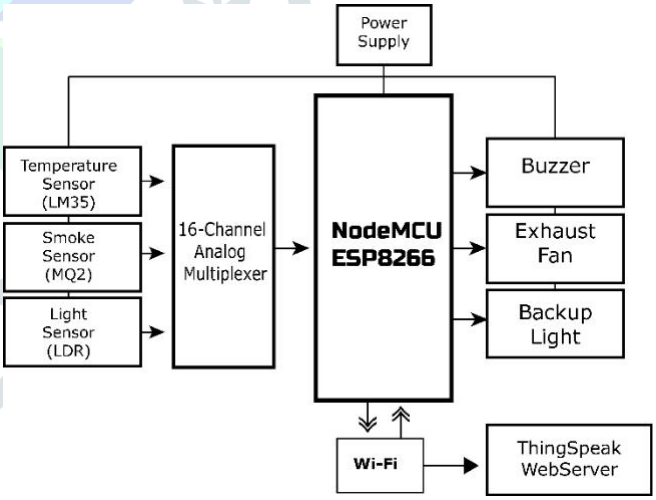

Fig1: Block diagram

A. NodeMCU

NodeMCU is an open source interactive programmable micro-controlled specially designed for the IoT platform. It has on board Wi-Fi based on Lua firmware for ESP8266 Wi-Fi SOC from Espressif and less cost compared to other MCU Features:

- 802.11 b/g/n support
- Supports infrastructure BSS station mode/P2P mode/Soft AP mode support

- Supports MINO 1x1 and 2x1, STBC, and 0.4 µs guard interval
- Encryption WEP/TKIP/AES
- Security WPA/WPA2
- Network Protocols IPv4,

TCP/UDP/HTTP/FTP *B.* 16Channel analog multiplexer

16Channel analog multiplexer (CD74HC4067) device is digitally controlled analog switches that utilize silicon-gate CMOS technology.

They are bidirectional switches allow analog input to be used an output and vice-versa

Features:

- Fast Switching
- Low ON Resistance
- -55 °C to 125 °C Operating temperature range

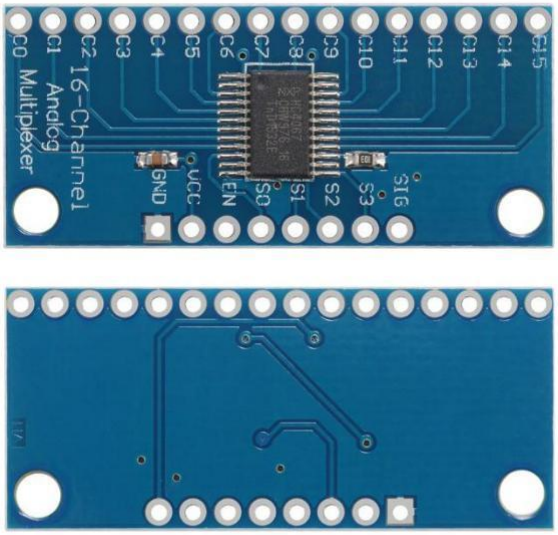

Fig2: 16-Channel Analog Multiplexer

C. LM35

The LM35 is a precision integrated-circuit temperature device where temperature sensor is calibrated in kelvin. It does not require any external calibration. This device draws only 60µA from the supply. As low self-heating of less than 0.1°C. Operates in the temperature range from -55°C to 150°C.

Fig3: LM35 Temperature sensor

D. MQ2

MQ2 gas sensor module is used for gas leakage detection it is suitable for detecting the gases like H2, LPG, CO, Smoke, CH4. The sensitivity of the sensor can be adjusted using the potentiometer provided back side of the module. This module is used in various application like industrial combustible gas detector, portal gas detector, domestic gas leakage detector. Main reason for using this module is low cost and long life

Fig4: MQ2 Gas sensor

E. LDR

Light dependent resistor (LDR) also called as cadmium sulphide (CdS) is known by many names photoresistor, photoconductor, photocell, photoconductive cell. The resistance is inversely dependent on the amount of light falling on the cell. The resistance of the cell changes when the light falls on it. LDR can be used to turn ON are turn OFF the light in darkness. Some applications of LDR are street light control, electronic scales, camera exposure control etc.

Fig5: LDR Light sensor

F. Buzzer

Buzzer is a piezo electronic device used to produce the sound. Here in this project this is used to make the sound. When the temperature sensor detects the rise in temperature that is when temperature is more than the threshold values then this buzzer makes the sound to alert the nearby user.

G. Fan

Fan a simple motor works on the faradays law rotates when the input power is given. Fan here in this project we are using a brushless DC fan for demo. This BLDC fan acts like a exhaust fan when the smoke are gas is detected by the MQ2 gas sensor.

H. LED

The LED light-emitting-diode is a simple semiconductor device emits light when current flows through the device. Here in this project the it is used as the backup light when there are improper lighting conditions are detected by the light sensor LDR.

IV. FLOW CHART

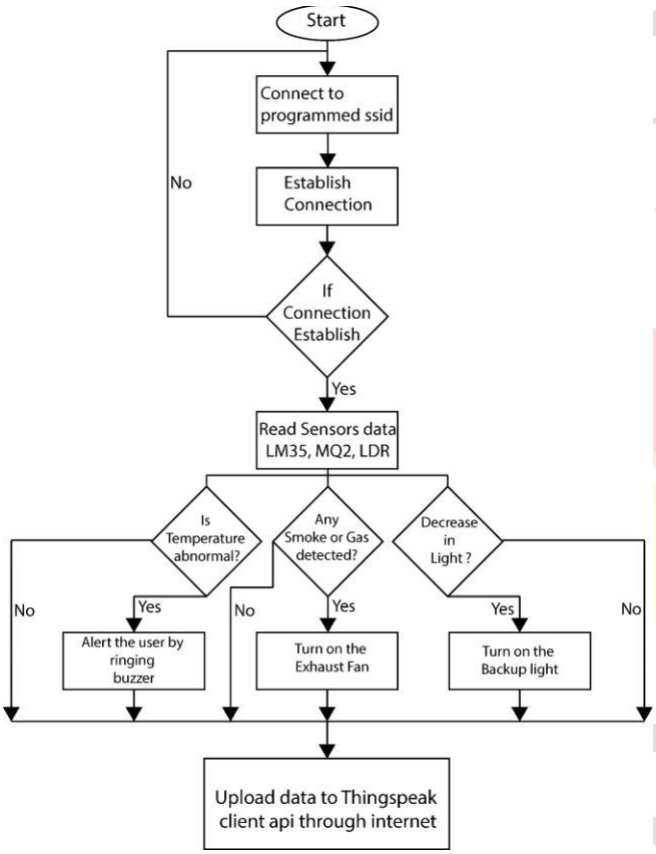

Fig:6 Flowchart

- Initially the NodeMCU is reset and flashed with the programmed file and connected to the Wi-Fi. Then the NodeMCU is started and simultaneously the sensor values are uploaded over internet to the ThingSpeak webserver.
- If any rise in the temperature than the threshold values programmed in the NodeMCU the signal is NodeMCU and this triggers the buzzer for alerting the nearby user.
- If any smoke is detected by the gas sensor a signal is sent to NodeMCU and this controller will turn ON, the exhaust fan for out letting the gas are smokes.

- If any decrease in the light the light sensor detects and sent signal to the NodeMCU controller than the controller will turn ON, the backup light for proper light conditions
- All these sensor data will be logged on the ThingSpeak webserver over the internet using the Wi-Fi.

V. DESIGN

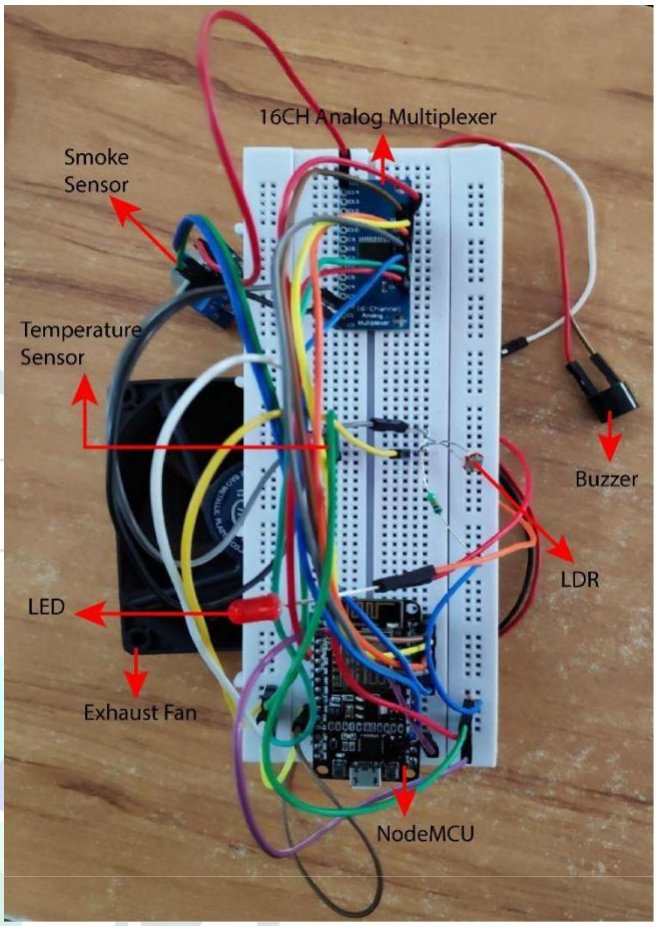

Fig:7 Hardware Kit

VI. RESULTS

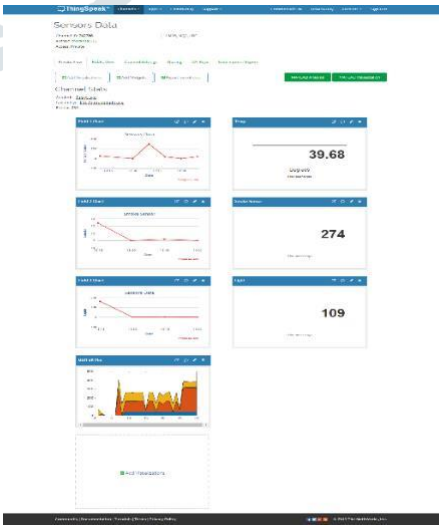

Fig:8 ThingSpeak Server Monitoring

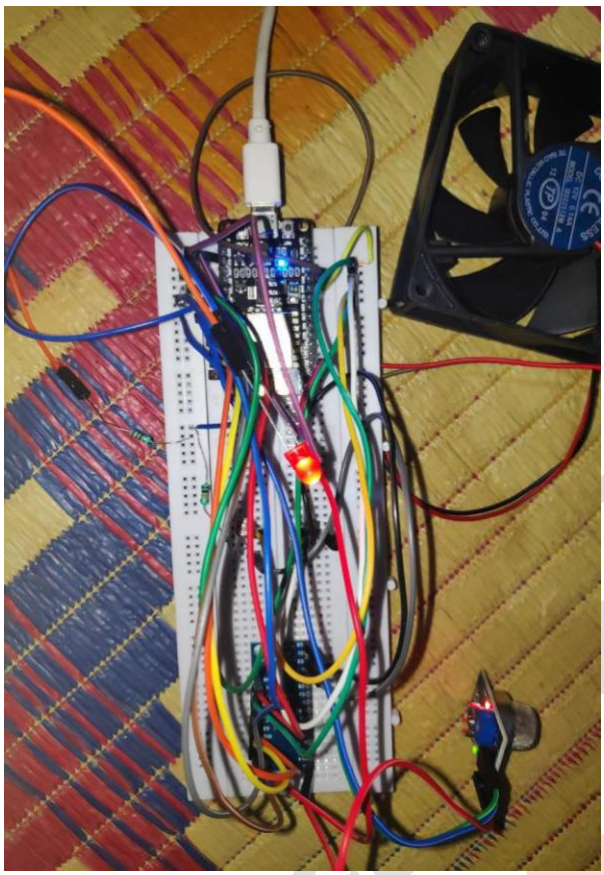

Fig:9 LED Glow due to low lighting

VII. CONCLUSION

We conclude that by implanting these systems we can access the live data. This project can be expanded to include various applications to achieve Industry security system like capturing the photo of the unauthorize person moving around the forbidden places and storing it onto the cloud, using motion detection sensor to detect the abnormal movements around the place, using gsm module to alert the authorized person if any abnormal activity detected by sending the SMS. The system can be expanded for monitoring or weather stations. The overall system efficiency can be improved using a powerful microcontroller like raspberry pie, vmos board.

This automatized project can be used in the very small-scale industries and large-scale industries based upon there requirement, for protection purpose. Overall cost of system is less compared to previous purposed system like using board like Arduino UNO, Arduino with ESP module and single monitoring system using NodeMCU. Where purposed system can monitor the 16-sensor data and requirement of additional Wi-Fi module and Arduino boards.

VIII.REFRENCES

[1] Li Da Zu" Internet of Things in industries: A Survey" IEEE transaction on Industrial on Industrial informatica, vol,no, November 2014