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AUTOMATIC FIRE DETECTION, MONITORING AND CONTROLLING IN INDUSTRIES USING IOT

Dr. V. SAILAJA[1], M. NANDINI[2], K.SRI NAGA LAKSHMI[3]

[1]Professor, Dept. of ECE, PRAGATI ENGINEERING COLLEGE

[23]UG Students, Dept. of ECE, PRAGATI ENGINEERING COLLEGE

ABSTRACT

Security and automation are a prime concern in our day-to-day life. The approach to industrial automation and security system design is almost standardized nowadays. In this project, we have tried to increase these standards by combining new design techniques and developed low cost industrial automated security systems. Everyonewants tobeasmuchassecureaspossible.The design ofprojectenablesevery user to use this wireless industrial fire and safety security system with fire sensors. The system is fully controlled by the Arduino based NodeMCU Single Board Computer.The NodeMCU will continuously monitor all the sensors and if it senses any fire then that information will be update in the IoT web server using in-built WIFI module and DC water pump will ON to sprinkle the water and buzzer will activate as alarm to alert the employees.

INTRODUCTION

This project is an Internet of Things (IoT) based fire detection, monitoring and controlling system that best suited for industrial applications. This work focused on using the low cost ESP8266 Wi-Fi module that triggers the alarm and send the email with the help of SMTP server. Fire is the major cause of accidents claiming valuable lives and property.

The chemical reaction between carbon-based materials in presence of oxygen generates flammablevapor causing a steady rise in temperature and results in a fire.The major characteristic of fire is that it extends exponentially with time. Hence, timely detection of fire is critical for avoiding a major accident. In this report, fire detection system is integrated with IoT platform.

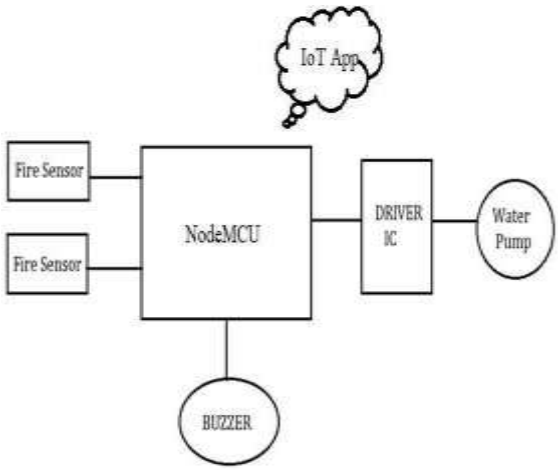

Figure1 Block diagram

LITERATURE SURVEY

Introduction to IoT and Fire Safety in Industries:

Explore papers and articles that provide an overview of IoT and its applications in industrial settings.

Look for literature that discusses the importance of fire detection, monitoring, and control in industrial environments and the challenges associated with traditional systems.

IoT-Based Fire Detection Systems:

Investigate research that focuses on the development of IoT-based fire detection systems.

Identify different sensor technologies (e.g., smoke detectors, temperature sensors, gas sensors) and communication protocols used in these systems.

Evaluate the effectiveness and reliability of IoT-based fire detection compared to traditional methods.

Real-Time Monitoring and Data Analytics:

Review studies that emphasize real-time monitoring of environmental parameters relevant to fire risk (e.g., temperature, humidity, gas concentration) using IoT devices.

Look for literature discussing the integration of data analytics techniques (e.g., machine learning, predictive modeling) for early detection of fire hazards based on sensor data.

Remote Monitoring and Control:

Explore how IoT enables remote monitoring of industrial facilities for fire detection and prevention.

Look for examples of IoT-enabled control systems that can automatically trigger fire suppression mechanisms (e.g., sprinkler systems, foam suppression) or initiate evacuation procedures in case of a fire.

PROPOSED SYSTEM

The circuit diagram depicts the hardware prototype that has been developed to realize the proposed methodology. It is composed of flame sensors, NodeMCU and alarm appliances (buzzers or devices that produce loud noises), fire control units (sprinkler systems or fire extinguisher systems), driver IC, power supplies and wirings and an IOT based Blynk interface.

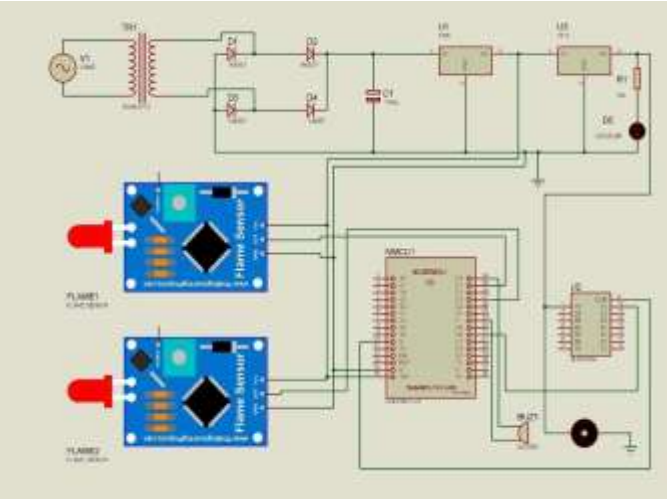

Figure2 Schematic diagram

Whenever the Flame sensor detects the fire, it sends signal to the NodeMCU and then NodeMCU board will be connected to the blynk. cloud through the internet and the informationwill be updated in the IOT web server usingin-built Wi-Fi module. We can turn ON and OFF this system using the blynk.app interface. The smartphone receives a push notification as soon as buzzer is activated in the event of a fire.

RESULTS

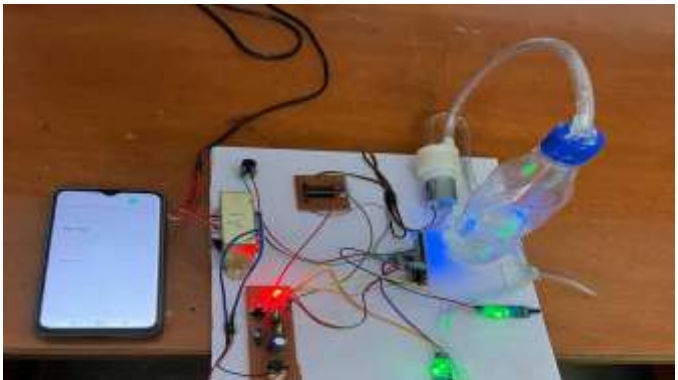

Figure 3 Photocopy of project

Figure.4 Photocopy of Blynk App

Figure.5 PhotocopyofNo fire at initial stage

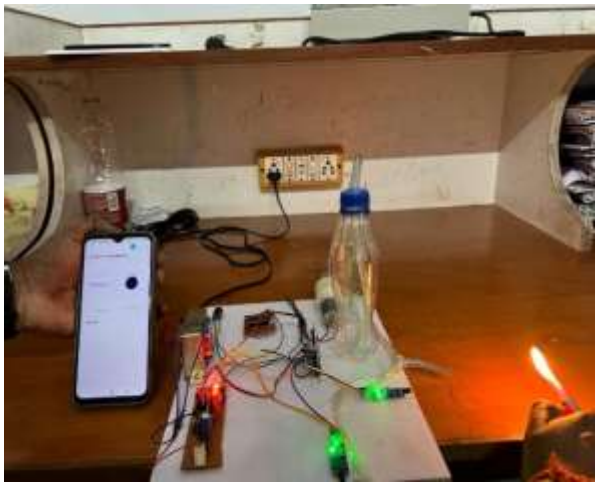

Figure.6 Photocopyof Fire at sensor 1

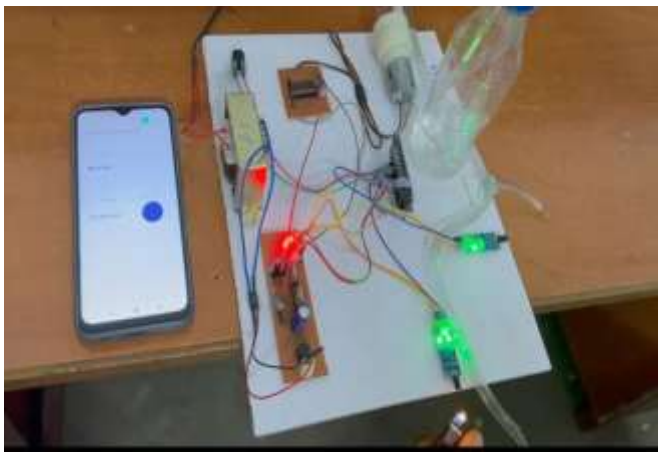

Figure.7 Photocopyof Fire at sensor 2

ADVANTAGES

Early detection: Automatic fire detection systems using IoT can detect fires at an early stage, allowing quick and effective response, minimizing damage and potential loss of life.

Remote monitoring: IoT-based systems allow remote monitoring of the environment and detecting any anomalies, even in hard-to-reach areas, providing real-time data and alerts for timely response.

Precisionmonitoring: IoTsensors canbe used to monitor and control different aspects of the industrial environment, such as temperature, humidity, and air quality, making it possible to detect and prevent fire hazards before they occur.

Automated response: IoT-based fire control systems can be programmed to respond automatically to specific situations, such as activating fire suppression systems or opening smoke vents.

Reduced downtime: By reducing the risk of fires, automatic detection and control systems can minimize downtime, improve productivity, and reduce costs associatedwith equipment replacement, repairs, and lost production.

APPLICATIONS

Manufacturing industries: In manufacturing industries, fire accidents can causesevere damage to equipment and materials. IoT-based fire detection systems canmonitor the temperature, smoke, and gas levels in real-time and alert the relevant personnel in case of any abnormal readings. The system can also automatically control the temperature and humidity levels to prevent any fire accidents.

Power plants: Power plants involve high voltage equipment and flammable materials. IoT-based fire detection systems can monitor the equipment and detect any abnormal temperature or pressure changes. The system can also automatically control the equipment to prevent any fire accidents.

Warehouses: Warehouses are usually stocked with flammable materials, and a fire can quickly spread and cause damage to the entire facility. IoT-based fire detection systems can monitor the temperature, smoke, and gas levels in real-time and notify the relevant personnel immediately. The system can also automatically control the temperature and humidity levels to prevent any fire accidents.

Hospitals: Hospitals have to deal with various kinds of medical equipment that are prone to fire accidents. IoT-based fire detection systems can monitor the equipment and detect any

abnormal temperature or pressure changes. The system can alsoautomatically control the equipment to prevent any fire accident

CONCLUSION

Fire safety is one of thecrucial factors toensure the safety of your premises. Itis essential to have a good quality fire detection system in place to protect the premises and warn people when a fire breaks out and take necessary actions to put off fire. The primary aim of installing a fire alarm system is to get warned when the fire is detectedto protect building occupants from injury and to prevent loss of life.The secondarygoal of fire safety is to prevent property damage.By preventing fires and limiting damage we can assure that work operations will continue. As IOT based fire detection and controlling system is flexible and accessible, they can be monitored on mobile devices and can receive messages from the alarm, including an alarm event and can be accessed from anywhere through the system or mobile remotely.

FUTURESCOPE

We can implement the project by adding GSM module which uses SMS tosend an alarm to the user's mobile phone. So, by using GSMmodule a SMS can be sent even in absence of internet and we can use Global positioning System (GPS) which provide information in the form of coordinates of the location of the point of firethrough GSM SIM900 Module Short Message Service (SMS) to the user. Through the use of thermistors and the software/firmware of the detector and the system, Response Time Index (RTI) of a heat detector can be reduced so that the detection of a thermal event could be more quickly detected. Smoke alarms with voice and location alerts will identify whether it is a fire or a carbon monoxide emergency, and in which area of the building the fire has detected.

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