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Automatic Industrial Fault Detection and IoT based Remote Monitoring

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***Abstract* --- Internet of Things (IoT) technology is advancing quickly. Many home and commercial IoT applications are automated. Currently, monitoring and automation refer to the ability for a user to control something from everywhere in the world, rather than just when they are physically present in a given location. IoT, or things that are embedded with sensors, software, electronics, and network connectivity, refers to a network of actual objects that can gather and share data. Controlling physical goods remotely through the Internet is another use for IoT. Different sensors are used to monitor industrial features including temperature, variations in current and voltage parameters, gas, etc. By considering the potential threats to the normal operation of the industry equipment, these variables were carefully selected. The sensors used here are Flame sensor LM393, Current Sensor ACS712ELCTR-05B-T, Voltage sensor, Ultrasonic Sensors HC-SR04, Temperature sensor DHT11, Gas sensor MQ9, These Sensors will collect their respective data and send the data to Node MCU ESP which also acts as a wi-fi module Using the IoT idea, the project is being controlled and monitored via fault detection, status monitoring, and alarm/alert generation when a fault arises and promptly reports it to the appropriate service Centre. This attempts to improve productivity, regulate access, and produce high-quality industrial goods.**

Keywords— IoT, Node MCU, Sensors, WIFI Module.

I. INTRODUCTION

Technology development is a continuous process, it is essential that remain prepared and informed of any new advancements. Thus, these technological advancements have made daily living easier for people. The current trend is toward automation [1]. Nowadays, all systems and data can be accessed over the internet, and web technology is rapidly evolving. A network interface for embedded device remote administration and control is provided by embedded web technology system. Web controller, the most well-known web development methodology widely, is used to monitor Internet of Things (IoT) devices [2-7]. A software and a combination of embedded components make up a web-based controller [8]. The need for server-based systems for data administration, monitoring, and handling has been replaced by the creation of a distributed web control system that uses web pages integrated with web applications [9]. These IoT web control systems stand out for their capacity to conserve energy, offer comfort, and function effectively. Our main aim is to combine the Internet of Things with an Internet control system so that customers may access the application from any location in the world with an Internet connection [10]. Because they supply all the data that the defect detection system will need to deal with, sensors are a crucial part of the system, however data from production management systems may occasionally be helpful. Automation factories and processes must be extremely adjustable and flexible because it would be too expensive to rebuild them for every alteration and design change [11]. Direct access to all of a production line's control elements, such as switches, valves, motors, and drives, is required to totally rebuild a production line or process [12].

The Industrial Internet of Things is made up of these interconnected mechanical and computing components (IoT). In this work, an effort is being made to create a system for monitoring the industry that will protect the workers from any type of disaster by buzzing them. Node MCU is act as Wi-Fi Module, it is better than Bluetooth control it is easy to handling through Web applications [13-15]. This study aims to keep industrial employees in a safe atmosphere in order to prevent tragedies and increase production, as the primary goals of IoT are to boost industrial productivity and minimize waste content through the use of new advanced technologies. Ultimately lowering the waste content [16].

II. PROBLEM STATEMENT

- To identify any device errors and to educate oneself on factors like vibration, current, light, temperature, humidity, and voltage
- A laptop or computer continuously collects data from sensors and controls the gadget based on sensor values.
- Any issues or flaws in the sensor's design were discovered during analysis, by using Visual studio web application through the server receives live analysis of the reading.
- We can connect a variety of users via cloud servers, and they allow multiuser capability.

III. METHODOLOGY ADOPTED

The proposed automatic industrial fault with remote monitoring block diagram is shown in the Fig. 1. The major components used are Node MCU, Buzzer/Alarms, LCD display, Cloud storage, Sensors used: Flame sensor, Current Sensor, Ultrasonic Sensors, Temperature sensor, Gas sensor. The voltage sensor senses the voltage and its transfers the information to the Node MCU board [17].

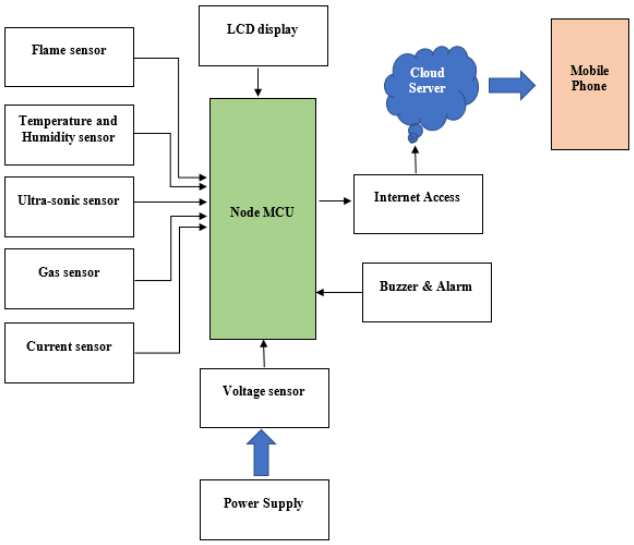

Fig. 1 Proposed automatic industrial fault with remote monitoring.

With the aid of the Node MCU, the sensor may identify and alert the user to any environmental faults that occur in industries or machine overheating problems if it detects any of these faults [5]. The Wi-Fi module collects data, which the IoT server with an internet connection user upload data to server, where it is saved on a virtual machine on a physical server.

IV. MITIGATION OF AUTOMATIC FAULT DETECTION WITH REMOTE MONITORING

a. *Simulation model of automatic fault detection with remote monitoring.*

The PROTEUS programme was used to develop the simulation model for the suggested automatic fault detection IoT based remote monitoring, which is shown in the Fig. 2., a Node MCU is connected to them through a control circuit The sensors are also linked to the Node MCU board in order to monitor and detect conditions.by the web applications to monitoring the sensors readings [19].

Voltage and current sensors are used to detect any parameters variation in both AC and DC can be measured using these sensors which can be used to track energy consumption and often diagnostics for electrical driven equipment, and the Node MCU reacts to this by analysing the output from the panel to ascertain whether the issue is caused by erroneous wiring [20] [21]. And other sensor were used to sense the temperature, gas ,vibration are sense and it will intimate by the result

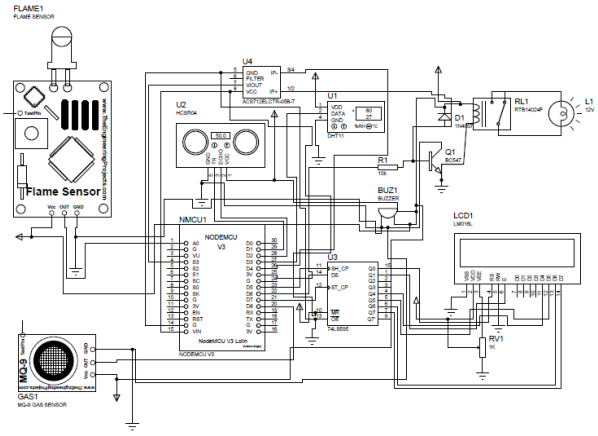

Fig. 2 PROTEUS Simulation circuit diagram of proposed work

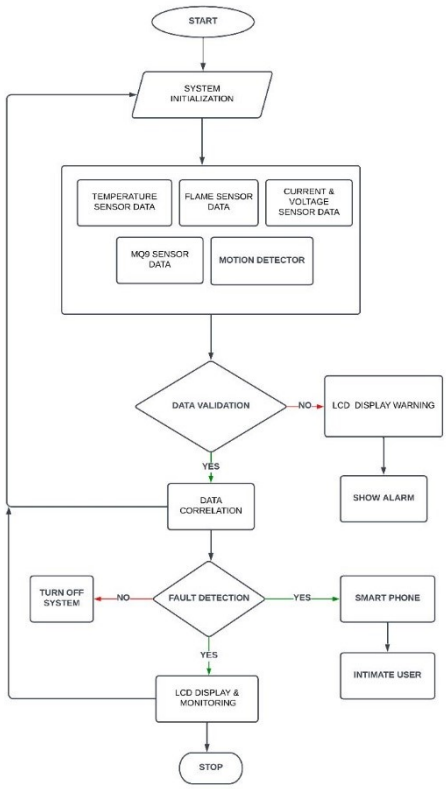

Fig. 3 Flow Chart of Automatic fault detection & remote monitoring

b. Simulation model of Flame Sensor detection:

Normal Condition:

During the simulation, the sensor pin was set to Normal Condition, indicating that it was assumed to be Not Flame. The output shown in the LCD Fig. 4 demonstrated the output measurement.

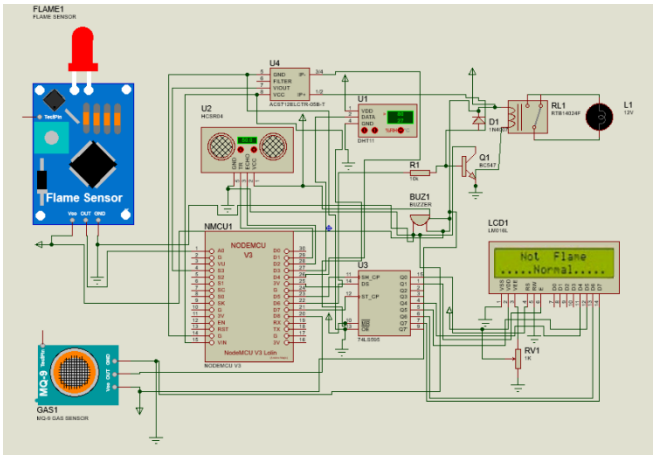

Fig. 4 Simulation of flame sensor in normal condition.

Flame Detection:

The sensor pin was configured to detect flames during the simulation, indicating that the buzzer should sound if a flame is detected. The output indicated that the Fire is Detected [19], Alert will be output shown in the LCD Fig. 5.

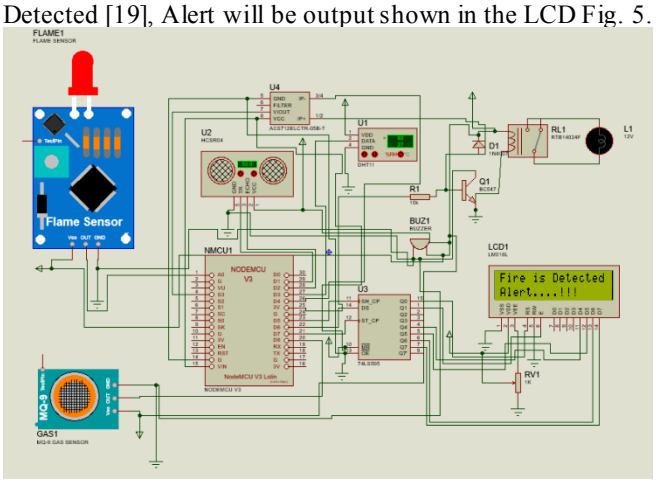

Fig. 5 Simulation of flame sensor in detect fire.

c. Simulation model of Temperature Measurement:

Temperature Measurement:

The sensor pin was configured to monitor the condition of the machines during the simulation, indicating that it was believed that any odd weather conditions would occur or that overheating problems might result from abnormal voltage or current [18]. The output shown on the LCD as well as in excel sheet data was shown in the Fig. 6 represents the output temperature measurement.

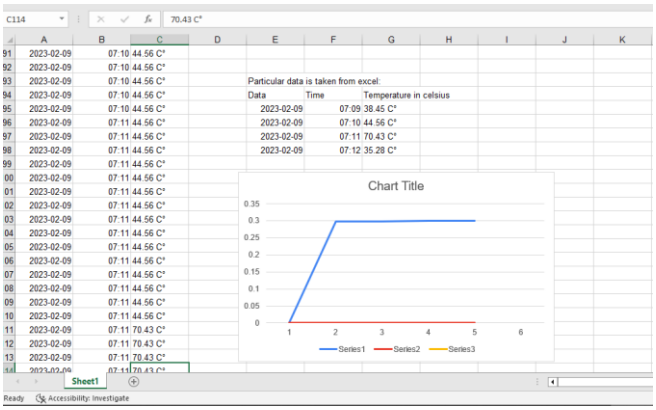

Fig. 6 Data shown in Temperature sensor detecting value in Celsius.

d. Simulation model of Current and Voltage Detection:

Current and Voltage Measurement:

During the simulation, the sensor pin was configured to measure the status of the machineries, indicating that it was believed that any abnormal condition that occurred in the machineries to show abnormal voltage or current. The output shown on the different value, thus we shown particular variation in Table 7 showed that output measurements in terms of volts and amps were made.

S. No	Current in amps	Voltage in Volts
1.	26	221
2.	23	223
3.	16	230
4.	16	230
5.	19	229

Table. 7 Table shown in Current and Voltage.

e. Simulation model of Gas detection:

It was believed that any wiring failure was what caused the industrial gas detection to ignite. This sensor is used to identify any other unwanted gas in industrial atmosphere it will detect and intimate to user, particular operator to exhausted the gas from the environment.

V. RESULT AND DISCUSSION

The proposed system's output indicates that the fault was located with the aid of cloud and IoT devices. The user and supplier in the local location (respected office) are then sent the defect, and they will get in touch with the user to fix it.
An app for smartphones has been created that enables users to command a number of devices and sensors. Everything is now automated and digitalized. For the goal of multiple automation, a system for connecting sensors, and other data sources is presented.
Additionally, it offers both a manual operational technique and IoT-based automation using various control coordinates.

VI. CONCLUSION

Our Goal is to gain in depth Knowledge in the technical aspects of IoT. The primary goal of Micro controllers and the digital sensors allow for the creation of the industrial monitoring systems, monitoring their changes and choosing a threshold for them using sensors and Node MCU. These specifications represent a risk to the plant and the whole industry if they deviate from the threshold. As a result, we have also added some actuators for defect detection and prevention, The internet-based data gathering and communication play a key part in our project's use of IoT . The IoT Visual studio web application to monitoring, and is also used by us to compile databases. We anticipate that our idea will be helpful enough to be implemented in industries all across India in order to reduce accidents and hazards that are neglected by industry people and users.

Businesses in the manufacturing and logistics sectors will be better able to satisfy the demands of the new instantaneous era with much more use of the Industrial IoT. IoT technologies are capable over supply chains and manufacturing processes via the Internet - of - things. Using the mix of sensor data, machine to machine connection, and automation technologies will provide the industry more information. Industrial IoT strategy should integrate machine learning and big data technology in addition to data from devices and sensors .

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