International Journal of Scientific Research in Science and Technology
Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijsrst.com)
doi : https://doi.org/10.32628/IJSRST

IoT Based Machine Monitoring System

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Article Info
Volume 8, Issue 3
Page Number : 586-590

Publication Issue
May-June-2021

Article History
Accepted : 15 May 2021
Published : 30 May 2021

ABSTRACT

The Internet of Things (IoT) is a fast evolving technology. IoT refers to a network of physical objects or things that are implanted with electronic software, sensors, and network connectivity, allowing them to collect and exchange data. The internet of things then deals with bringing control of physical devices through the internet. Using the IoT concept, we are designing a system that will automatically monitor industrial applications and create Alerts/Alarms or make intelligent decisions. In our project, a variety of sensors are used to monitor industrial characteristics such as temperature, pressure, gas, and so on. These settings were carefully chosen based on the potential threats they could pose to the normal operation of the industry machine. The sensors utilised in our project are the MQ2 gas sensor, the LM35 flame sensor, the IR sensor, and the PIR sensor. These sensors will collect data and communicate it to the NodeMCU ESP8266, which also functions as a Wi-Fi module.

Keywords –IoT, Machine, Performance, Industrial Automation.

I. INTRODUCTION

Technology development is an ongoing process, thus we must be well-equipped and informed of new technological advancements. As a result of these technological advancements, people's daily lives have become more convenient. Automation has become a need. Today, all data and systems are accessible over the internet, and web technology is rapidly evolving. An embedded system using web technology allows for remote management and control of embedded devices via a network interface. The Internet of Things (IoT) devices are managed by a web controller or E- controller, which is a collection of embedded systems and software stacks and is the most well-known approach for web development in the world. Remote login and monitoring are currently utilised instead of large server systems for monitoring, managing, and handling data by establishing a distributed web control system with the help of web pages generated in web applications.

These web control systems with IoT are distinguished by the following characteristics: energy savings, comfort, and efficiency. Our primary goal is to adapt

the Internet control system to the Internet of Things, so that clients can access the application from anywhere in the world over the Internet.

Sensors are an important component of the defect detection system because they offer all of the information that the system must deal with, however information from production management systems can be valuable in some instances. In other circumstances, the sensors can be shared with other duties such as control or supervision, and they are designed into the machine or facility. However, in most cases, predictive maintenance is not considered during machine design, and new sensors are usually necessary. This happens especially when predictive maintenance is required for outdated machines because they become a bottleneck in the plant owing to unforeseen breakdowns.

Because it is too expensive to rebuild automated factories and processes for every modification and design change, they must be extremely adaptable and versatile. To properly redesign a complete manufacturing line or process, direct access to the majority of its control elements — switches, valves, motors, and drives – is required. Customers order online, with computerized transactions that negotiate batch quantity (in some cases as low as one), price, size, and colour; clever robots and sophisticated machinery seamlessly and rapidly create a variety of customized products on demand.

II. LITRATURE REVIEW

This survey involved many such monitoring devices for electrical machine which are already in existence. [**1**] It was realized that there is a meter based on IoT which is being implemented. a non-invasive current sensor was used because it had the advantage of small size and ability to be used wherever the power is being consumed. [**2**]It was understood that there are some algorithms which can be implemented in the microcontroller to calculate the power factor and frequency. [**6**]From this it was realized that MSP430 is low power consuming microcontroller of Texas instruments which can be used for long time running. Also the mentioned algorithm could be applied on this controller as its sampling rate is high. [**4**]Here, useGSM module is made for electric machine monitoring but it was realized that the it has some disadvantage which can be overcome by IoT system. From [**5**] it was realized that ESP8266 is a low cost IoT Wi-Fi module which has a full TCP/IP stack and also possess an onboard microcontroller. We are using NodeMCU module which has a Wi-Fi module as well as a microcontroller which help in programming such device easily. For data capture we can use Thingspeak, IBM, azure amazon web services etc.

The major challenge in the project lies in proper integration of multiple subsystems and their successful simultaneous operation. All the subsystems like sensors, microcontroller, communication with Wi-Fi module and upload to the cloud, should work in synchronization and should provide the expected result, with a fair and tolerable accuracy. Developing a familiarity with programming of MSP430 microcontrollers is of paramount importance for successful implementation of necessary algorithms and communication.

III. IMPLEMENTATION DETAILS

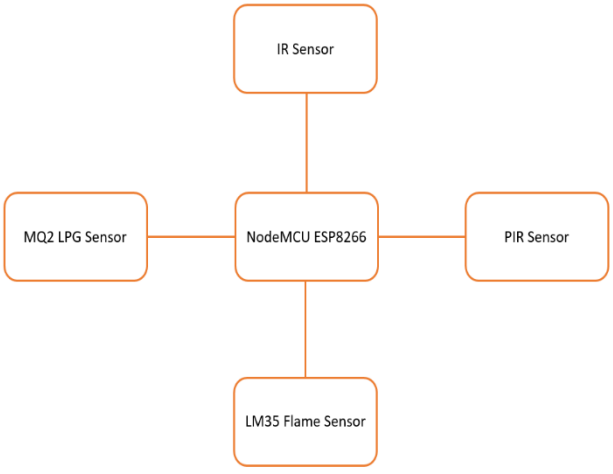

Fig 1. Block Diagram of the System

The signal from several sensors is sent to the microcontroller – ESP8266 by an IoT-based industrial monitoring and fault detection system. The data is then sent over the internet via the microcontroller. The ESP8266 is a Wi-Fi capable microcontroller. It has 4MB of flash memory, an 80 MHz system clock, 64 KB of SRAM, and an on-chip Wi-Fi transceiver. It connects to a Wi-Fi network, establishes TCP/IP connections, and sends data. Figure 1 shows the block diagram of the system.

In the event of a fire, the gas sensor and temperature sensor would detect smoke and temperature changes and relay the information to the ESP8266. The buzzer and LCD display are linked to the microcontroller. When the temperature sensor detects a temperature greater than the threshold value, the ESP8266 is configured to activate the buzzer. As needed, this value can be preset.

The buzzer is activated when the threshold value is achieved. Simultaneously, the LCD would display important notifications about the current condition. The data from the microcontroller will be transferred to the IoT platform as soon as the buzzer is switched on.

Because the data is available on the IoT platform in real time, instant action can be made. Similarly, an accelerometer is utilised in rotator machines to identify flaws or wear and tear. To draw attention to it, a notification or an email will be sent to the overseer or management. The PIR sensor is used to provide security. The buzzer alarm will ring if a person is discovered in an area where he is not supposed to be, such as the power room, or if there is some trespassing.

Sensors are crucial in our project since they serve as the foundation for examining the many Industrial parameters and then applying the knowledge of their changes to determine a threshold value for the same. With our project title in mind, we chosen a number of sensors that are already utilised in industrial applications or are precise enough to be used in future advancements. Following figure 2 shows the circuit diagram for the system.

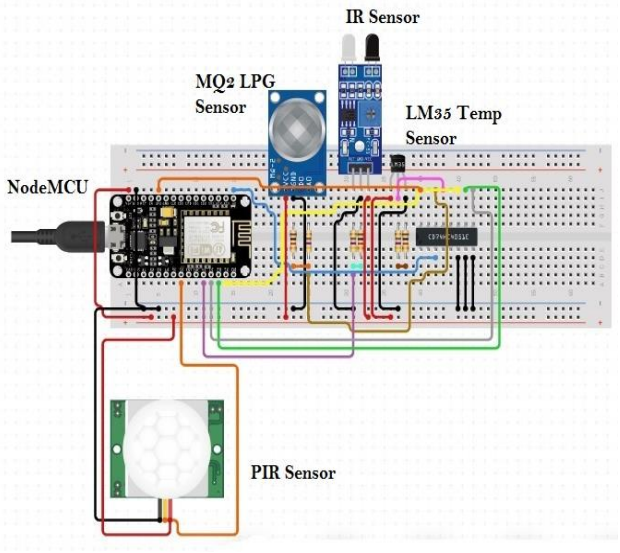

Figure 2. Circuit Diagram for the System

IV. RESULT AND DISCUSSION

Our project aims to study the industry parameters and also provide some small scale automated prevention if any of the mentioned parameters start deteriorating the plant. Thus components like fans, LEDs, buzzer are also interfaced with the main controller for preventive action. The LEDs and buzzer are used to raise an alarm for potential fire break out or any gas leakage. A fan will be helpful for providing cooling action and can also act as an exhaust if there is gas leakage. Along with all these applications we also plan to tackle a worst case scenario where the nearest fire station will be intimated when things go out of hand and there's fatal risk to life and property. The Implementation Circuit is show in figure 3.

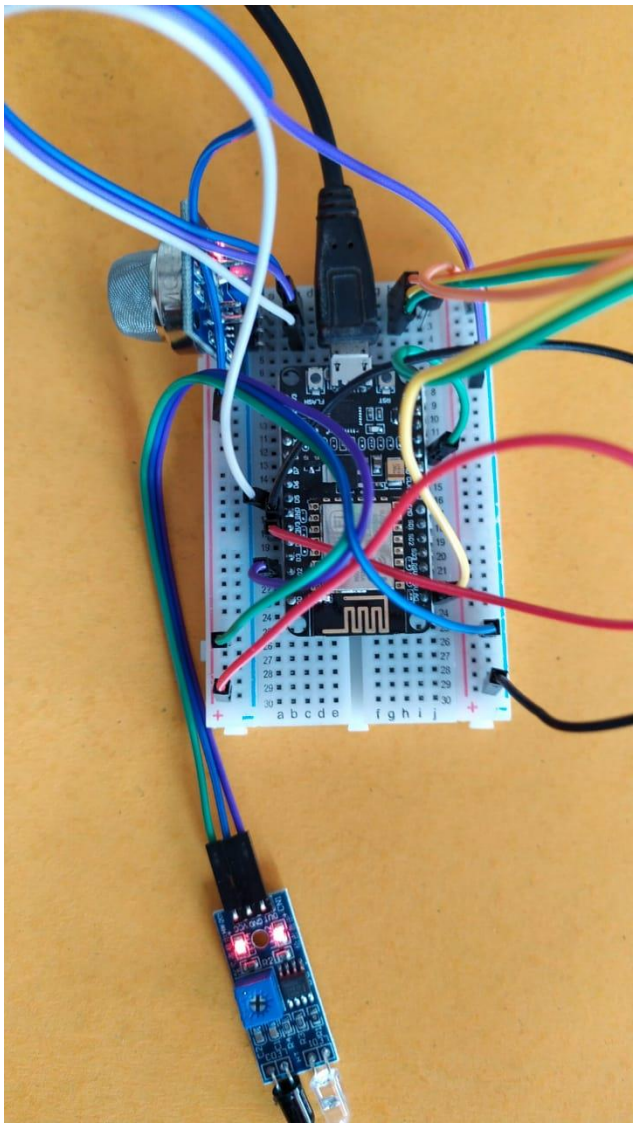

Figure 3. Implemented Circuit

The process will be begin only when the PIR sensor finishes the work by indentify the customer who is that after that only the process will starts. The PIR sensor used only for identifies the person. The monitoring of the behavior, activities, or other changing information, usually of people for the purpose of influencing, managing, directing, or protecting them. Surveillance systems are habitually used in home, office, factory or vehicle monitoring and image identification. More operations can be performed with each setup, and less lead time for setup and machining is required compared to conventional methods. Machine adjustments are easy to make with microcomputers. Tooling costs are reduced, since templates and other fixtures are not required. Flexibility of operation is improved, as is the ability to produce complex shapes with good dimensional accuracy, repeatability, reduced scrap loss, and high production rates. Programs can be prepared rapidly and can be recalled at any time utilizing microprocessors.

V. CONCLUSION

We intend to gain hands-on experience with the trending technologies of "Embedded System" and "Internet of Things" through this project. The concept of "Industrial parameter Surveillance and Fault detection" was chosen with the goal of learning about the many industry variables, tracking their changes, and determining the threshold for the same using NodeMCU and sensors. If these metrics diverge from the threshold, they pose a risk to the plant as well as the entire industry. As a result, we've integrated certain fault detection and prevention actuators such as fans, exhaust, LEDs, and buzzers. The Internet of Things (IoT) plays a part in our project by collecting data and communicating via the internet. For database collecting, we also employ the ThingSpeak software. We hope that our product will be beneficial enough to be implemented in industries across India, and that it would genuinely save lives and property from accidents and hazards that are overlooked by industry workers/users. The new era of instant needs can be better addressed by enterprises in the manufacturing and logistics sectors by increasing their usage of the Industrial Internet of Things (IoT). The usage of IoT technologies in manufacturing processes and across supply chains is what the Industrial Internet of Things entails. In addition to data from devices and sensors, Industrial IoT strategy should include machine learning and big data technology, using the combination of existing sensor data, machine to machine (M2M) connectivity, and automation technologies to deliver greater insight back to the business.

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Cite this article as :

Prof. Puneshkumar Tembhare, Atharva Punde, Arpit Rewatkar, Anshul Raut, Chintan Lambat, Tanmay Santoshwar, "IoT Based Machine Monitoring System", International Journal of Scientific Research in Science and Technology (IJSRST), Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 8 Issue 3, pp. 586-590, May-June 2021.
Journal URL : https://ijsrst.com/IJSRST2183101