SSRG International Journal of Computer Science and Engineering
ISSN: 2348 – 8387 /doi:10.14445/23488387/IJCSE-V8I4P102
Volume 8 Issue 4, 4-7, April 2021

Iot Based Power Monitoring System

[1]Jaiganesh P M , [2]DR. B.Meenakshi Sundaram, M.E., Ph.D
[1]PG Scholar,[2]Professor and PG Head/SIT

Received Date: 08 April 2021
Revised Date: 10 May 2021
Accepted Date: 22 May 2021

Abstract

Internet of Things (IoT) is an emerging technology where the sensors interconnected with an embedded controller to receive or transfer the data to the cloud. Today, industrial monitoring has an important part in the industrial field to monitor and control industrial machines' health conditions. In this project, IoT based solution is proposed for industrial equipment monitoring. The proposed system consists of an ARDUINO controller, sensors, and WI-FI module. The vibration sensor is used to measure the health condition of machines, and the temperature sensor is utilized to sense the heat level of machines. The collected data updated to the server by node-MCU. Implementation results show that the usefulness of the proposed system with low cost and maintenance.

INTRODUCTION

Due to the advancements in wireless sensor network technology and the Internet of Things (IoTs), industries have become smart and automated[1-5]. The entire industrial process is computerized with concurrent monitoring. the network topologies like Bluetooth, RFID, and WIFI have shaped a new IOT based industrial health monitoring to the digitization of Industry or Industry 4.0

The four important concepts of Industry 4.0 are data collection, connections between sensors, processing, and predictions. Industry 4.0 includes the overall transformation machine handling in a smart way process by using intelligent engineering and digitization.

Predictive maintenance is one of the main advantages of IoT-based data collection [10]. There are two methods to maintain industrial equipment: Condition-based and age-based. In both methods, the machine health or conditions monitored for particular intervals, and the machine is replaced by a new one after the reset period. It ensures the proper operation and increases the efficiency of maintenance tasks.

RELATED WORK

Picot, H. W et al. 2019 have addressed a need for IOT of based industrial monitoring. To monitor industrial parameters, developed a Modbus TCP protocol combined with LabVIEW software.

Shahzad et al. 2018 have analyzed the design challenges of IOT based data acquisition. By using vibration and some other sensor, the health of industrial parameters is monitored. Arduino based controller used for communication between server to the cloud

D'Aloia et al. 2020 have designed a real-time monitoring system for indoor monitoring. The proposed system includes controller, sensor, and GSM module with GPRS for wireless communication .the collected data processed further for prediction or classification

Addabbo et al. 2020 have presented iot based machinery fault detecting system. The proposed system includes a vibration sensor to measure the vibration level of machines.IOT cloud server compared with a particular threshold to detect a fault condition. The proposed systems also applicable for monitoring bearing faults with Mems sensors.

Yingfeng Zhang et al. 2013 have proposed iot based manufacturing industry monitoring system. all operators, machines, materials, and pallets are equipped with embedded sensors to transfer the data to iot server. Then, the data-driven algorithm is used to control the manufacturing process through iot to improve the quality.

Ur Rehman et al. 2015 have introduced a new type of Enterprise. It integrates both cloud computing and IoT solution to reduce man effort. The overall web server is used to monitor the entire process. The main advantage is .a single person can control all processes using IoT. Yen et al. 2017 have proposed a SaaS-centered framework for manufacturing industry health monitoring. They investigated fault detection and classification using iot big data. The predictions of fault are done by processing big data by applying machine and deep learning algorithms.

Adame et al. 2019 have presented an INTER-HARE protocol for a machine to iot server communication .all the sensor data transferred to a server by node MCU with a frequency range of 2.4 GHz. The implementation result proves the suitability of the proposed system for delay-sensitive application

The proposed protocol offers a new way to data delivery from industrial applications. Ramadan et al. have a systematic approach to develop an Industry 4.0-based smart manufacturing system. The proposed system transmits all collected to the server using RFID technology. The proposed system requires less installation cost and control of the entire manufacturing process.

Halvorsen et al. 2018 have presented a mobile alert system for individuals based on the weather report. The environmental data collected by embedded sensors processed by an iot server then send to individual users. This system is based on a series of problem-based learning (PBL) assignments for prediction and classification.

D'Emilia et al. 2019 have proposed iot based monitoring of a mechatronic system. The different conditions of a system, like positions of the kinematic linkage updated to a server for health monitoring. The collected features are used to identify the best working condition of machines. The implementation results indicate that the efficiency of the proposed approach in terms of accurate prediction and monitoring etc.

Him, L et al. 2019 presented iot based industrial monitoring with predictive maintenance. The multiple data collected from the welding machine send to the IOT server. A machine-learning algorithm was applied to mine the collected data to find out abnormal patterns of the machine. Finally, based on classification, healthy conditions are identified

PROPOSED SYSTEM

The proposed monitoring unit consists of a temperature sensor, current transformer, and vibration sensor. The current transformer is used to measure lad current. In case of an increase in current for the above threshold, the controller activates the relay to disconnect the main supply. In case of high temperature, the cooling system has been activated. Arduino controller used to monitor all the sensor values for defined threshold values. node MCU collect all these sensor values and updates to the IoT server for online monitoring

Vibration sensor

Figure 1 Vibration sensor

Above figure 1 shows a vibration sensor. It was working based on the piezoelectric effect. It has a transducer circuit to convert mechanical vibrations to electrical current to measure the vibration level.

Relay

Relay act as a switch to control the device. It has a coil, control pins high impedance. The output pin from Arduino control is used to energize a coil for controlling the device. The module is triggered when high trigger current received less than 5mA,

Figure 2 Relay

Arduino

Arduino is an open-source, user-friendly embedded controller, which contains ATmega328P IC. It has 14 input and output pins with a built analogue, digital converter, and Pulse width modulation scheme. Sensor connection programme written in c++ language. It fundamentally runs code on 'bare metal.' It has additional features of inbuilt library files for the IOT interface

Figure 3 Arduino

Lm35

In this work, lm35 temperature has been used. The output voltage was proportional to the temperature or heat level of the environment. It does not need any additional circuit for calibration

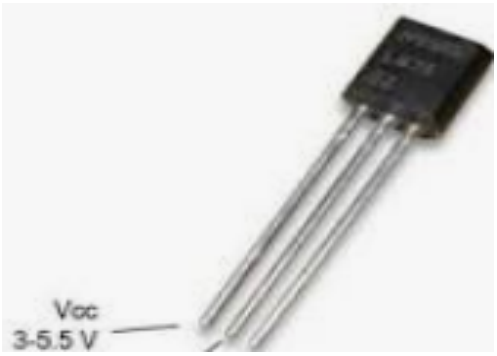

Figure 4 LM35

Current transformer

The transformer measured for currently used in this shown in fig. it can able measure ac currents less than 5A. It contains a board sampling resistor for compensation with a quality adjustable knob.

Figure 5 CT

IMPLEMENTATION RESULTS

Figure 6 shows, hardware implementation of the proposed industrial monitoring system. Atmega 328 families are used as controllers. The entire data collected from the sensor is transferred by the ESP module. The voltage from step down transformer is converted as DC voltage by using a rectifier and fed to the controller. The relay is switched when the sensor values reach defined thresholds.

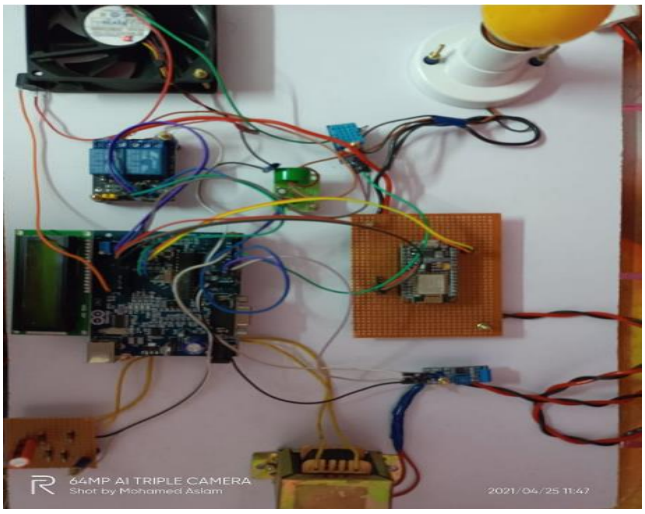

Figure 6 Hardware implementation

CONCLUSION

In order to provide effective monitoring and maintenance, this work proposes an IOT based industrial monitoring. IoT web server utilized to monitor machines parameters concurrently. In case of any variations in particular sensor values, the necessary action or alert signal send to the user. The collected data permanently stored in a server for further data analysis and fault condition prediction. In the future, deep learning algorithm used to forecast health conditions of the industrial machines

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