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IOT BASED CONDITION MONITORING OF AN INDUCTION MOTOR

Mr. Kiran MR[1], Mithun HM[2], Harsha DK[3], Kotresh GV[4], Fardin Afzal[5]

[1]Assistant Professor, Department Of EEE, PESITM, Shivamogga, Karnataka, India.

[2,3,4,5]UG Students, Department Of EEE, PESITM, Shivamogga, Karnataka, India.

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ABSTRACT

In general, the predictive maintenance approach for the induction motor is useful for small to large-scale industries in order to minimize down-time and maximize efficiency and reliability. The different points associated with the induction motor are considered to acquire specific information regarding the prediction of the occurrence of failure in the motor. The deeply analyzed vibration signal clearly exhibits the difference in the operating capacity of the healthy and unhealthy motor. By using the concept of IoT, the Real Time Condition Monitoring System for Industrial Motors. The range includes the designing and development of the technology of IoT for the monitoring and diagnosis of the induction motor based on the identification of the essential operating parameters. The approach includes the technology of IoT for analyzing different factors associated with the induction motor. The identified information would be stored in the cloud system, and it would be available through the web page. In addition, notifications will also be generated for exceeding the specified limit regarding the observation factors.

Keywords: Internet Of Things, Adriano IDE, Induction Motor, Thing Speaks, Sensors, Gateway, And Node MCU.

1. INTRODUCTION

"The motto of all industries in this modern era is basically quality and quantity of production in a given time." More than 300 million industrial electric motors are used in the world. AC motors are selected in preference to DC motors, as it requires only one power source whereas DC motors require separate sources of power to the rotor and stator of the motor. Besides this, there are some other considerations that make induction motors preferable for use in industries, such as in construction, maintenance cost is low, high starting torque, efficient, and reliable.In addition, motors are an essential machine and also known to fail at a certain time. Based on the example of the motor in an industry, some of the reasons for the failure could be the amount of lubrication, electrical aspects, motor ventilation, alignments, and motor load. These are the reasons causing vibrations in the motor or high temperatures in the motor to critical levels or other failures.

2. METHODOLOGY

Based on the block diagram mentioned below, it will be possible to have an understanding of the complete process involved in performing the tasks. In order to complete the objective related to condition monitoring in terms of the induction motor, it requires continuous reading of the concerned parameters through the usage of a number of sensors. The reading concerning the values of acceleration sensors, which obtains values pertaining to vibration, reading values pertaining to temperatures of winding & bearings through LM135 Temperature Sensor, values pertaining to measurement of currents through ACS712 Current Sensor, & values pertaining to measurements of Voltages through Voltage Sensing Circuits, gets sensed by a number of sensors, which then sends it to an arduino microcontroller board.These readings can be observed using the serial monitor of the arduino IDE. These readings can be stored in the IoT cloud using the Wi-Fi module added to the IoT cloud.

Hardware components

Accelerometer is used for vibration measurement. Accelerometer is suited due to its lightweight and easy configuration. For data acquisition, the use of a microcontroller is preferred. ESP32 boards have been used in this research. ESP 32 boards can capture sensor readings, and also store information in local and cloud servers. It also provides alerts in case of fault occurrence.

Cloud storage

The data acquired from the sensors is then transmitted to the local and cloud servers via wireless communication. The data acquisition process is then followed by the designing of a system that will be capable of analyzing the data acquired from the sensors. The system will also be capable of analyzing the real-time data and will then store the data in the cloud via the thing speak cloud computing system. The data will also be easily accessible from anywhere with the help of an internet connection.

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Technology Adapted

IoT - Internet of Things: The internet of things is a network of devices/objects that by the use of sensors, actuators, and network connectivity are made intelligent and hence are enabled to collect and transmit data to other devices and users and in turn make them an integral part of a network.

IoT/Cloud Platform: This is the vital component of the internet of things that enables communication between the physical and virtual world, thus giving a mechanism that allows devices to interact and interact with other devices. The IoT platform used in this paper is that known as thing speak. It is an analytical platform service used for data visualization and analysis that is accessible via the cloud and is provided by math works. It immediately allows analytics via visualization to data uploaded by devices that are connected to the IoT platforms. Thing speak is widely used in the creation of proof and concept within IoT

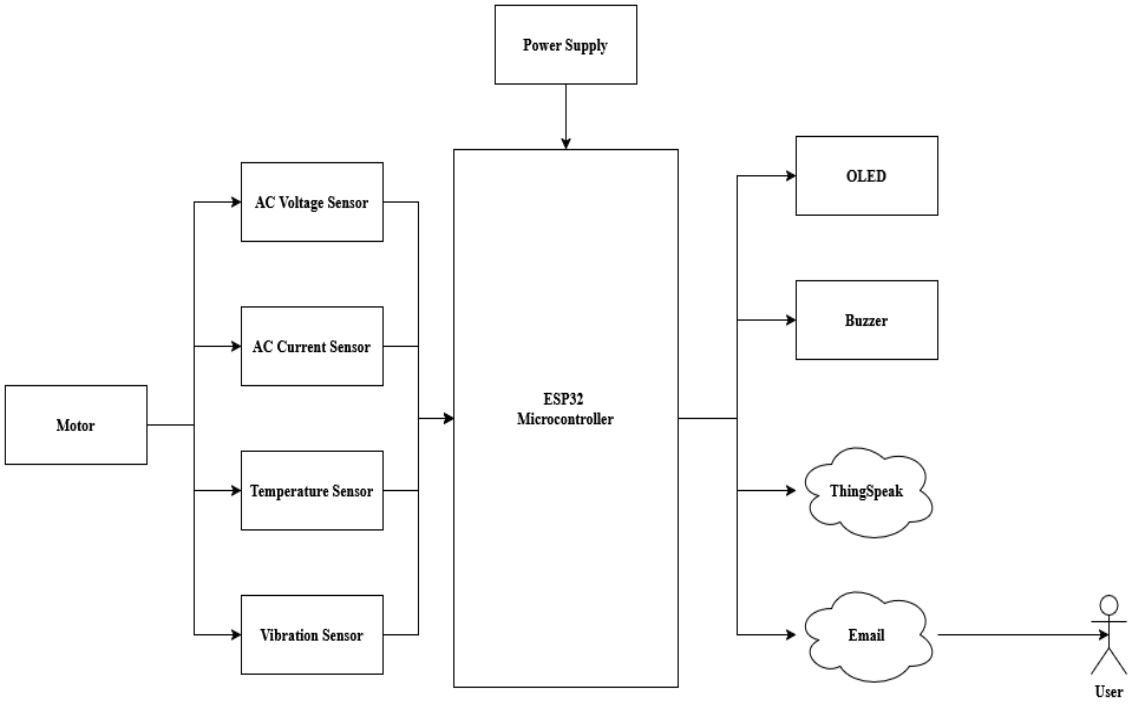

Figure 1: Block diagram of IOT Based Condition Monitoring of an Induction Motor

3. MODELING AND ANALYSIS

The sensors are wired to the microcontroller Arduino Uno, while the connection of the serial communication is done between the Arduino and Node MCU microcontrollers. As soon as the microcontrollers receive the power, the programs are uploaded to the respective microcontrollers. Later, the Parameter Data sensed is obtained by the serial monitor in the arduino IDE software. Therefore, the serial communication connection makes possible the transfer of the arduino microcontrollers to the Node MCU microcontrollers.

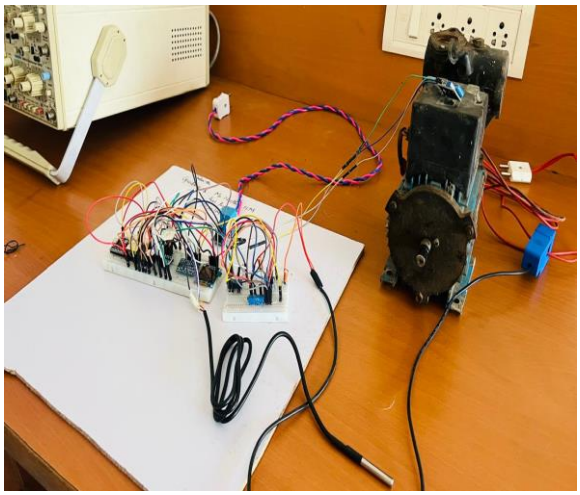

Figure 2: Experimental Setup

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4. RESULT AND DISCUSSION

Figure 3: Data uploaded to IoT platform

A prototype portable design has also been designed and discussed for the fault and anomaly detection of an induction motor, and effective results have been obtained. This procedure not only results in information regarding the type of motor, but it also results in diagnostic information regarding the status of the motors. This acquisition system can effectively be utilized for motor surveillance along with computerized systems even without any access to the motors.

Throughout this project, it has been observed that the induction motor can be monitored and controlled in a simple manner using the simple control circuit developed on the Adriano platform. The functioning of the circuit has been done on the Thingspeak platform, and in our point of view, the results have been satisfactory. The most preferable one is Adriano concerning the control unit due to its low cost in addition to the simplicity associated with the circuit when compared with the existing systems.

5. CONCLUSION

In my project, I researched how IoT technology can be used for monitoring the health of the induction motor in real-time. I utilized the sensors, microcontroller, and cloud system for implementing a health monitoring system related to vital signs like temperature, vibration, and currents. This system was designed for warning the user about the early signs of problems in the motor.

The system developed by us not only proves to be economical but is scalable too. As such, this project highlights the advantage of combining the knowledge existing within the engineering domain with the latest models based on the advancements in the IoT domain. The project has been developed on the basis of the needs specified below.

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