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BASICS OF IOT BASED CURRENT, VOLTAGE & TEMPERATURE, MONITORING SYSTEM

Jayanta Gohate[1], Payal Kutemate[2], Ritabai Maraskolhe[3], Ramprakash Ramtekkar[4]

Prof. Vivek N. Mahawadiwar[5]

Department of Electronics & Telecommunication Engineering, RTMNU University, Nagpur City, Maharashtra[1-5]

Abstract: This project focuses on monitoring the voltage of AC-powered equipment and developing an automated temperature ventilation system to regulate the temperature of a space and protect appliances from overheating. The Node MCU microcontroller and IP networking are used for remote access and control, allowing users to automate various electrical appliances such as lamps, fans, lights, and refrigerators through an Android smartphone app even when they are not physically present. This technology is particularly valuable in environments where temperature control is critical. The proposed voltage control scheme has been tested with AC lamps, AC fans, and DC cooling fans to assess its feasibility and effectiveness. With the increasing use of the Internet of Things (IoT), this technology is becoming more sophisticated and widely utilized. In real-world scenarios, electricity usage data can be calculated by the electricity board and sent to users via email or EB card for billing purposes.

Keywords: IoT, Microcontroller, Voltage Control, Temperature Sensor, Current sensor

I. INTRODUCTION

In our modern world, it is crucial to work efficiently and intelligently to ensure technological and economic development, particularly in the industrial sector.

The effectiveness of industrial equipment, such as induction motors, depends on both mechanical and electrical factors. As such, continuous monitoring of induction motors is necessary to maintain their safety and reliability at an industrial scale.

Faults in these machines can occur due to electrical, mechanical, or environmental reasons. Electrical faults may result from unbalanced voltage or current supply, overloading, or other issues.Mechanical failures are more common in motors than in other equipment, and environmental factors such as temperature, moisture, and vibration can also cause faults. Unmonitored faults in induction motors can lead to unplanned downtime for industries, which is why condition monitoring is essential. By monitoring the operating parameters of machines, problems can be detected and resolved before they cause any downtime.

Condition monitoring of induction motors can help reduce maintenance costs, enhance operating efficiency, and prevent motor damage. The use of the Internet of Things (IoT) in motor condition monitoring allows for remote access to health data and provides valuable insights into the condition of the machines. Sensors can detect winding temperatures, voltage, and current to assess the health of the motors, and an ESP-32 microcontroller can process this data. The IoT philosophy involves assigning an IP address to each device, allowing easy identification on the internet. The Internet of Things is rapidly expanding, and its implementation in motor condition monitoring has the potential to revolutionize the industry.

II. LITERATURE REVIEW

Motor failures of electrical origin are primarily related to the temperature of the motor and the aging of the insulation, which leads to faults of inter-turn short-circuit, short-circuit between phases, or coils connecting to ground. [1] To prevent premature failure of engines, it is important to use the right motor for loading and keep in mind the ambient temperature during motor operation.

During maintenance, it is essential to check the power quality of the network in order to identify voltage fluctuations, voltage harmonics, overvoltage, and voltage imbalances. Here, use GSM module is made for electric machine

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monitoring but it was realized that it has some disadvantages which can be overcome by IoT systems. From it was realized that ESP-32 is a low-cost IoT Wi-Fi module that has a full TCP/IP stack and also possesses an onboard microcontroller. We are using the Node MCU module which has a Wi-Fi module as well as a microcontroller which helps in programming such devices easily. For data capture, we can use Things peak, IBM, Blynk IoT, amazon web services, etc.

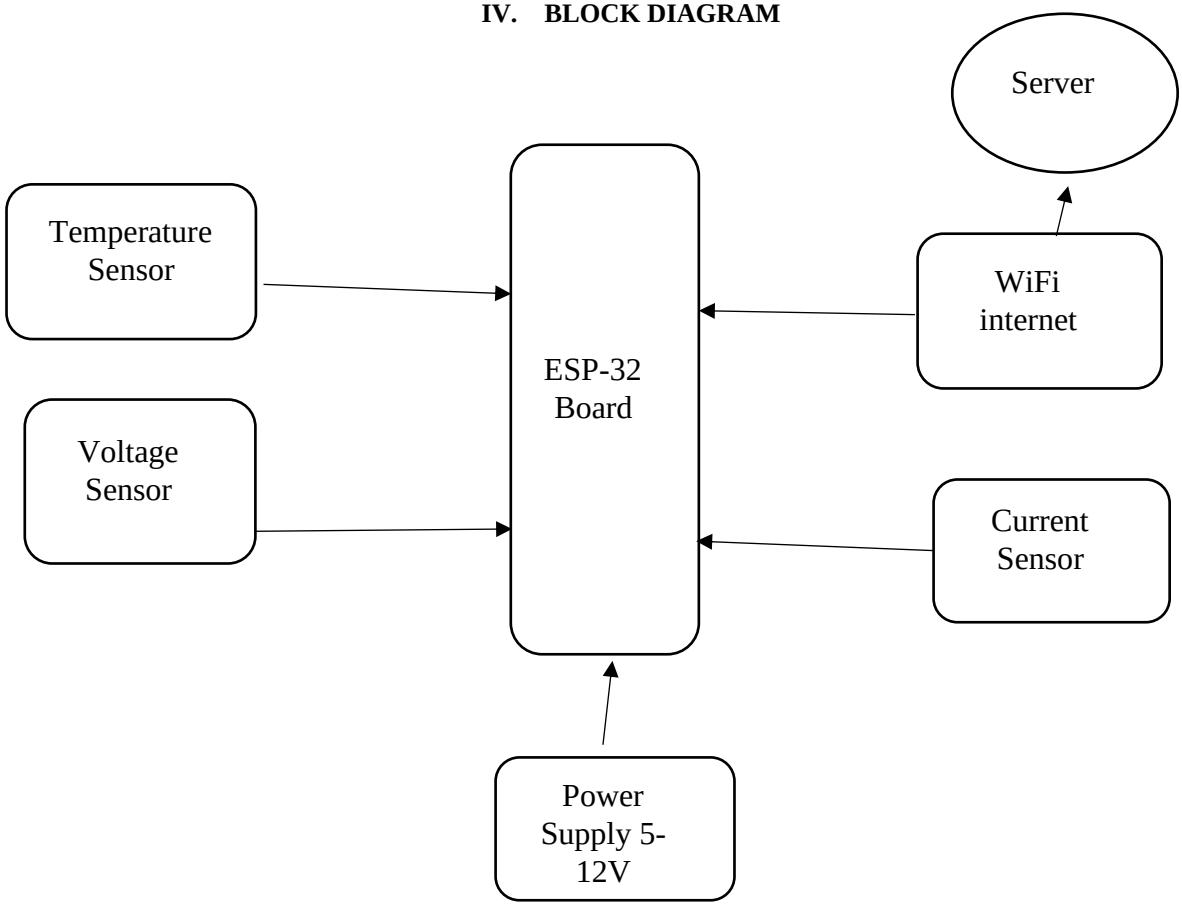
The major challenge in the project lies in the proper integration of multiple subsystems and their successful simultaneous operation. All the subsystems like sensors, microcontrollers, communication with
Wi-Fi module and upload to the cloud should work in synchronization.

III. PROJECT PURPOSE

The aim of this project is to develop a sophisticated system that can monitor the power and temperature of all types of electronic and electrical motors and machines. After conducting a literature review and researching various industries, it was found that there are no products available that link with IoT to measure and monitor the electrical parameters of an electrical machine. Thus, the proposed device will remotely monitor these parameters and store the data in the cloud, making it easily accessible for users to check the status of their machines and take precautionary steps if necessary.

To achieve this, the project will use various components, including the ESP-32, SCT-013 current sensor, ZMPT101B voltage transformer, and DS-18B20 temperature sensor, along with an electric machine motor. By measuring current, voltage, and temperature, the system will provide a comprehensive monitoring solution, allowing users to track and record the performance of their machines. Additionally, the use of the SCT-013 current sensor and ZMPT101B voltage sensor will allow for the measurement of power consumption, while the ESP32 Wi-Fi module will enable the data to be sent to a server for remote monitoring and access via a mobile app.

IV. BLOCK DIAGRAM



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V. FUTURE SCOPE

This project aims to develop an IoT-based monitoring system for measuring current, voltage, and temperature in various industries. It can also be used in homes or offices to monitor specific machines or objects, as well as track power consumption. The voltage sensor used in this project is a simple module that can be connected to an Arduino or any other microcontroller with a 5V input tolerance to measure external voltages. The current sensor operates at 5V and produces an analog voltage output proportional to the measured current, which can be read using a voltmeter or a microcontroller with an analog read pin or ADC pin. The temperature sensor is a 1-meter long waterproof and pre-wired digital probe that uses the DS18B20 sensor to measure temperatures from -55°C to +125°C with an accuracy of ±0.5°C from -10°C to +85°C. These sensors will constantly monitor the current, voltage, and temperature and send the data to the dashboard.

VI. CONCLUSION

The IoT-based Current, Voltage & Temperature Monitoring System was a well-planned and executed project that combined features from different equipment segments and programming in the C language. The project's success was due to the use of a highly advanced microcontroller and emerging technology, which resulted in an efficient and low-cost design that is easy to operate and has a fast connection build-up, low power consumption, and accurate follow of commands. However, the system has some limitations, such as internet and power failures, high maintenance costs, and sensitivity to certain substances. The system has many useful applications in various sectors such as farming, agriculture, small factories, and hotel rooms. This project is futuristic and has the potential to be even more useful in the future.

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