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Circuit Breaker Monitoring By IOT

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ABSTRACT—

India is There is a growing interest today in IoT-based applications because they provide efficient solutions to a wide range of real time problems. In this paper, a smart circuit breaker system is developed using an ESP32 microcontroller based on IoT technology. In order to monitor the electrical parameters of the connected circuit, a ZMPT101B AC voltage sensor and a ZMCT103c current sensor are integrated into the system. Through Wi-Fi connectivity, the ESP32 connects to the Blynk IoT platform, allowing for mobile app-based remote control and real-time monitoring. The project has an automatic cutoff mechanism that is triggered by excessive current levels and a manual control option that can be accessed by a button on the Blynk app. A relay is used as part of safety measures to interrupt circuits, protecting users. The Blynk app receives the voltage and current readings continually for monitoring, offering a complete solution for effective and safe circuit control.

INTRODUCTION

We The way we communicate with and manage objects remotely has been completely transformed by the Internet of Things (IoT). In this regard, the Internet of Things-based Circuit Breaker project offers a clever and effective way to control electrical circuits. An ESP32 microcontroller with Wi-Fi capability is used in this project to establish a stable link between the physical circuit and the Blynk IoT platform. The ZMPT101B AC voltage sensor and the ZMCT103c current sensor, which track the circuit's electrical properties, are the main parts. Remote device control and interaction have been transformed by the Internet of Things (IoT). The IoT-based Circuit Breaker project offers an ingenious and practical way to manage electrical circuits in this situation. In order to establish a smooth connection between the physical circuit and the Blynk IoT platform, the project makes use of an ESP32 microcontroller that has Wi-Fi capabilities. The two main parts that keep an eye on the circuit's electrical properties are the ZMPT101B AC voltage sensor and the ZMCT103c current sensor. This project's main goal is to provide a complete circuit management system that combines automatic cutoff mechanisms and manual control. Users can remotely activate and deactivate the circuit breaker by using the Blynk smartphone app, enabling on-demand operation. In order to protect users and avoid overloads, the system also has a safety mechanism that automatically closes the circuit when the current exceeds a predetermined level. The Internet of Things (IoT) has revolutionized how we interact with and manage devices remotely, and the Circuit Breaker project is a great example of how IoT can be used. This project monitors and captures critical electrical properties of the circuit using sensors such as the ZMPT101B AC voltage sensor and the ZMCT103c current sensor. IoT-based Circuit Breaker's primary objective is to provide an integrated circuit management system that integrates both automatic and manual cutoff mechanisms. Utilizing the Blynk smartphone app, users can remotely activate and deactivate circuit breakers, enhancing their convenience and enabling on-demand operation.

As soon as a predefined level of current is exceeded, the system automatically triggers a cutoff to ensure the safety of the user and protect the electrical components. By combining these two layers, the circuit management system is enhanced in terms of efficiency as well as user safety in the event of an electrical malfunction. With technological advancements, projects such as the IoT-based Circuit Breaker demonstrate how IoT can be applied to create intelligent, user-friendly solutions to manage and control electrical circuits. IoT-based Circuit Breakers demonstrate how IoT can be used in practical ways to create smart, user-friendly solutions to manage and control electrical circuits as technology continues to advance.It contributes to smart environments' ongoing evolution through the combination of automation, remote accessibility, and safety features. As a result of the use of automation, remote accessibility, and safety features, the project contributes to the ongoing advancement of smart and connected environments through the application of circuit management systems. As a result, this project places itself at the forefront of modern circuit management systems, contributing to the ongoing evolution of smart and connected environments by using automation, remote access, and safety features.

I. REVIEW OF LITERATURE

This comprehensive literature study delves into the forefront of research, technology, and applications in the interdisciplinary domain of IoT-based circuit breakers, smart home automation, and the integration of sensors for electrical parameter monitoring. The exploration encompasses recent advancements in IoT-based circuit breakers, elucidating their utilization of IoT capabilities to enhance functionality, user control, and integration with communication protocols and security measures. Additionally, the study scrutinizes the evolution of smart home automation, emphasizing the pivotal role of IoT- based circuit breakers in seamlessly automating electrical circuits and safety mechanisms. An essential focus is placed on the exploration of sensor technologies, such as the ZMPT101B AC voltage sensor and ZMCT103c current sensor, analyzing their accuracy, response times, and adaptability to various circuit configurations.

Identifying emerging technological trends and innovations, investigating real-world applications and use cases, and addressing challenges and proposing future directions contribute to providing valuable insights into the current landscape and potential advancements in these interconnected fields. In order to better understand IoT-based circuit breakers, smart home automation, and the integration of sensors for electrical parameter monitoring, the literature study examines the state-of-the-art in research, technology, and applications. The literature study examines the state-of-the-art in terms of research, technology, and applications that are pertinent to the integration of sensors for electrical parameter monitoring, smart home automation, and Internet of Things-based circuit breakers.

A. Project Scope

At The future goals of the IoT-based Circuit Breaker project are focused on improving scalability, predictive maintenance, integration with smart grids, cybersecurity measures, energy efficiency optimization, and enhancing user-friendly interfaces. The project aims to accommodate a wider range of circuit configurations, predict potential failures through advanced analytics, integrate seamlessly with smart grids for optimized energy distribution, ensure robust cybersecurity, and contribute to energy efficiency and sustainability goals. Ongoing efforts also prioritize developing intuitive interfaces for easier interaction and management. In conclusion, the project is a significant advancement in electrical circuit control, leveraging intelligent sensors and IoT technology. The future direction of the IoT-based Circuit Breaker Monitoring initiative is centered around key objectives aimed at creating a substantial impact. A primary focus involves enhancing scalability to ensure seamless adaptation to various circuit configurations prevalent in diverse industries. Additionally, the project is actively exploring predictive maintenance, employing advanced analytics machine learning to anticipate potential issues and facilitate proactive maintenance, ultimately reducing downtime. Another notable aspect involves the integration with smart grids, envisioning a comprehensive energy management system. Real-time communication within the electrical grid is intended to optimize energy distribution, making a note worthy contribution to overall grid stability and efficiency. Acknowledging the complexities of the digital landscape, the project emphasizes robust cybersecurity measures, encompassing the implementation of encryption protocols, fool proof authentication, and intrusion detection systems toup hold the integrity and confidentiality of data.

Addressing sustainability concerns, the project is committed to optimizing energy efficiency by analyzing usage patterns. This entails proposing strategies to reduce energy consumption during non-peak hours, aligning with broader environmental objectives. Concurrently, efforts are directed towards enhancing the user experience through the continuous development of user- friendly interfaces and applications. The overarching goal is to furnish operators and maintenance personnel with intuitive tools for efficient system interaction.

II. OBJECTIVE OF PROPOSED SYSTEM

The A Give consumers the option to remotely operate the circuit breaker by means of an intuitive mobile application. Add functionality to activate and deactivate linked electrical circuits on demand. Provide a method for tracking AC voltage and current characteristics continuously. Give consumers access to real-time information about the electrical properties of the linked circuit

III. METHODOLOGY

Before we started This project requires an ESP32 microcontroller, a relay module, a biometric sensor, and two sensors for measuring AC voltage and current (ZMPT101B and ZMCT103c). You also need a Blynk app on your smartphone. The ESP32 will connect to the Blynk app via Wi- Fi and send the voltage and current data from the sensors. The relay module will work as a switch for the circuit breaker, which you can control remotely from the Blynk app or locally from the biometric sensor by using your fingerprint. You can also set a limit for the current, and if it goes beyond that, the circuit breaker will automatically turn off. You will check how well your system works by trying out different situations and seeing the outcomes.

1) The Fabrication of mechanisms to drive the system: The mechanism which are used to drive the entire system are fabricated in this phase.
2) The Tilling attachment: The tilling attachment is the part of chassis and hence the motor power is not required for moving the tilling attachment. The tilling should be done by simple pushing the machine. In this phase the tilling attachment is fabricated as shown in the Coneptual diagram.
3) Assembly: The components fabricated in the above phases areassembled to form a complete machine in this phase
4) Testing The testing is carried out in this phase and optimizations if any are done.

REQUIREMENTS

Following material/facilities is required for project

a) ESP32 microcontroller
b) ZMPT101B AC voltage sensor

c) ZMCT103c current sensor

d) Relay module

e) Biometric sensor

f) Blynk app

g) Ethernet Shield

h) LCD display

i) Power supply

j) Breadboard, wires, resistors, capacitors, transistors, diodes, and other components

k) Soldering iron, multimeter, screwdriver, and other tools

1. An ESP32 microcontroller, a small device that can connect to Wi-Fi and Bluetooth networks1.
2. Two sensors that can detect the voltage and current of the circuit: ZMPT101B for voltage and ZMCT103c for current2.
3. A relay module that can turn the circuit breaker on or off3.
4. A biometric sensor that can read your fingerprint and let you control the circuit breaker locally4.
5. A Blynk app that can help you design and manage IoT projects from your phone.
6. An Ethernet Shield that can link the ESP32 microcontroller to the internet.
7. A LCD display that can show you the status of the circuit breaker and the circuit parameters.
8. A power supply that can give the circuit the needed voltage and current.
9. A breadboard, wires, resistors, capacitors, transistors, diodes, and other components that can help you create and connect the circuit.
10. A soldering iron, a multimeter, a screwdriver, and other tools that can help you put together and test the circuit.

IV. ADVANTAGES, DISADVANTAGES Advantages

i. Instant Monitoring: The Internet of Things-powered circuit breaker monitoring system provides instantaneous insights into the state and functionality of electrical circuits, facilitating prompt problem- solving and action.

ii. Remote Control Capability: This feature allows users to efficiently reduce downtime by adjusting, fixing problems, and performing maintenance on the circuit breaker system from a distance.

iii. Preemptive Issue Handling: By enabling the system to recognize possible issues in advance, preventive measures can be taken to reduce the likelihood of critical failures, improving system reliability overall.

iv. Better Energy Management: The system uses Internet of Things (IoT) concepts to better control energy use. It does this by optimizing usage patterns and encouraging more energy-efficient electrical circuits, which is in accordance with environmentally friendly practices.

Disadvantages

i. Limited Privacy Assurance: Because the Internet of Things (IoT)-based circuit breaker monitoring system continuously collects data, there may be worries about illegal access to and use of private information.

ii. Dependency on Connectivity: The system's dependence on a dependable internet connection for remote control and monitoring is a disadvantage. When there are network failures or disruptions, the system's effectiveness could be jeopardized, which would affect its dependability.

V. Conclusion &Future Scope

Conclusion

In conclusion An important advancement in the field of electrical circuit control is the IoT-based Circuit Breaker project. Through the utilization of intelligent sensors and Internet of Things technology, the project has effectively developed an intelligent system that can be controlled remotely, providing numerous advantages. The project's improvement of real-time monitoring and control capabilities is one of its major accomplishments. By utilizing intelligent sensors, the system can continuously gather and evaluate data, offering previously unheard-of insights into the functionality and condition of electrical circuits. This enhances circuit management's overall effectiveness and makes it possible to proactively identify and address possible problems before they become more serious. Future scope

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