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IOT BASED UNDREGROUND CABLE FAULT DETECTION

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ABSTRACT

In power system the generated electrical energy is transmitted to the consumer premises with the help of Overhead or Underground transmission system. The Underground system has several advantages as compared to Overhead system but the major problem is we cannot able to detect the exact fault location.

In order to overcome this problem, we proposing a new method that is Underground Cable fault detection using IOT. By using this method, we can detect the fault location from the base station in km. It detects the exact fault position that makes repairing work very easy. The repairmen know exactly which part has fault and only that area is to be dug to detect the fault source. This saves a lot of time, money and efforts and also allows to service underground cables faster.

This method is faster and efficient when compared to all other existing Methods. In Existing methods, we didn't upload any information to the cloud server. But in this method, the information is uploaded to cloud server.

INTRODUCTION

Power supply networks are growing continuously and their reliability getting more important than ever. The complexity of the whole network comprises numerous components that can fail and interrupt the power supply for end user. For most of the worldwide operated low voltage and medium voltage distribution lines, underground cables have been used for many decades. Underground high voltage cables are used more and more because they are not influenced by weather conditions, heavy rain, storm, snow and pollution. These cables are prone to a wide variety of faults due to underground conditions, wear and tear, rodents etc. Also detecting fault source is difficult and entire line is to be dug in order to check entire line and fix faults. So here

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we propose an cable fault detection that detects the exact fault position that makes repairing work very easy. The repairmen know exactly which part has fault and only that area is to be dug to detect the fault source. This saves a lot of time, money and efforts and also allows to service underground cables faster.

The system detects fault with the help of potential divider network laid across the cable. Whenever a fault gets created at a point shorting two lines together, a specific voltage gets generated as per the resistors network combination. This voltage is sensed by the microcontroller and is updated to the user. The information conveyed to the user is the distance to which that voltage corresponds to. The microcontroller retrieves the fault line data and displays over LCD display. The fault in the cable will be identifying by measuring the change in voltage value measured across the resistor is then fed to the in-built ADC of the Arduino. This value is processed by the Arduino and the fault is calculated in terms of distance from the base station. This value is sent to the LCD interfaced to the Arduino board and it displays exact location of the fault from the base station in kilometers for all the three phases. This project is arranged with a set of resistors which represent the length of the cable.

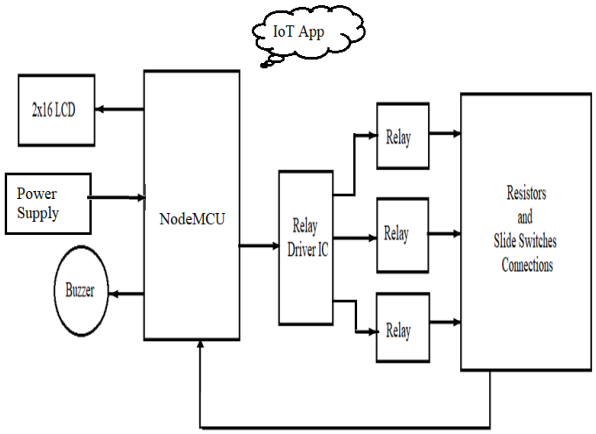

Figure.1 Block Diagram

OBJECTIVE OF THE PROJECT

The objective of this project is to detect the exact fault position of the underground cable and revolutionize the efficiency and reliability of power distribution infrastructure. This innovative approach aims to reduce service interruptions and downtime by leveraging real-time monitoring through IoT sensors deployed along underground cable networks.

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The primary goal is to enable rapid, automated detection and precise location identification of faults, eliminating the need for extensive manual inspections. By utilizing IoT technologies, the system seeks to provide a cost-effective solution, optimizing resource utilization and minimizing operational expenses associated with fault detection and repair processes. Additionally, the objective includes enhancing safety measures by reducing human intervention in potentially hazardous conditions.

LITERATURE SURVEY

Review of Existing Systems: Explore previous studies and projects that have implemented underground cable fault detection systems. Look for systems that utilize various technologies such as sensors, IoT devices, data analytics, and communication networks.

IoT Integration: Identify studies or projects that have integrated IoT technologies into underground cable fault detection systems. This could include applications in power distribution, telecommunications, transportation, and other infrastructure sectors.

Sensor Technologies: Investigate different sensor technologies used for detecting cable faults, such as acoustic sensors, temperature sensors, vibration sensors, and electromagnetic sensors. Evaluate the effectiveness, accuracy, and limitations of each sensor type in detecting various types of faults (e.g., insulation faults, short circuits, ground faults).

Data Analytics and Machine Learning: Review literature on data analytics and machine learning techniques applied to underground cable fault detection. Explore studies that use historical data, real-time sensor data, and predictive algorithms to identify fault patterns, predict fault occurrences, and optimize maintenance strategies.

Communication Networks: Examine research on communication networks for transmitting sensor data from underground cable fault detection systems to centralized monitoring platforms. This could include studies on wireless communication protocols, network architectures, bandwidth requirements, and security considerations.

Proposed System

We proposed a IOT based underground cable fault detection by using NODEMCU. This underground cable fault detection system that not only identifies where an issue occurs in

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underground cables but also helps repair crews by pinpointing the exact location. This system uses a clever setup with a potential divider network laid along the cable.

When a fault, like a short circuit, happens, it generates a specific voltage based on the resistors network. This voltage is then detected by a microcontroller. The microcontroller communicates this information to the user, indicating the distance to the fault. The user gets real-time updates on a LCD display.To identify the fault, the system measures changes in voltage across resistors. This data is processed by an NodeMCU microcontroller, which calculates the fault's distance from the base station. The result is then displayed on the LCD screen, showing the exact location of the fault in kilometers for all three phases.

The project includes a set of resistors representing the cable's length, and at every known kilometer, there are manual fault switches. This setup allows for testing and determining fault distances accurately. The gathered values are uploaded to an IoT web app using the built-in Wi-Fi capabilities of the NodeMCU microcontroller. This innovation saves time, money, and effort in repairing underground cables, making the process more efficient and faster.

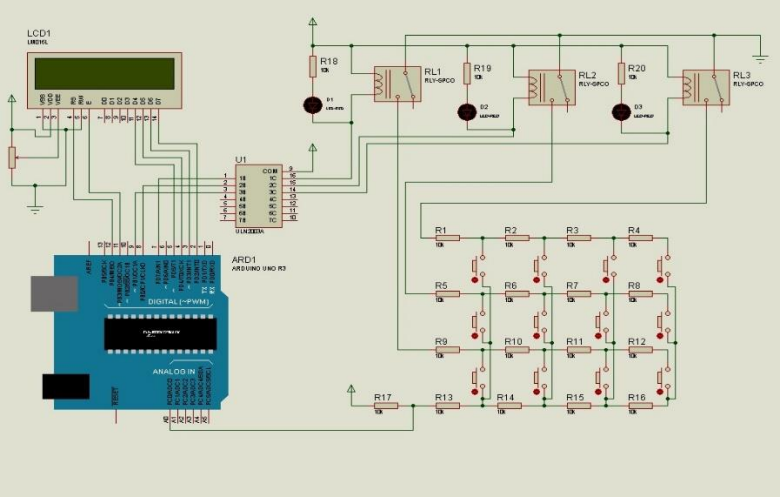

Figure.2 Schematic Diagram

RESULTS

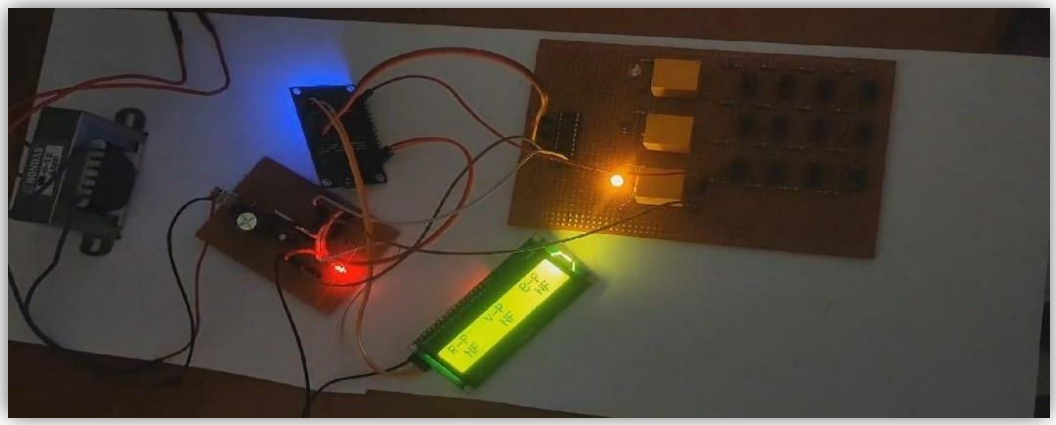

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Figure.3 No Fault indication on LCD

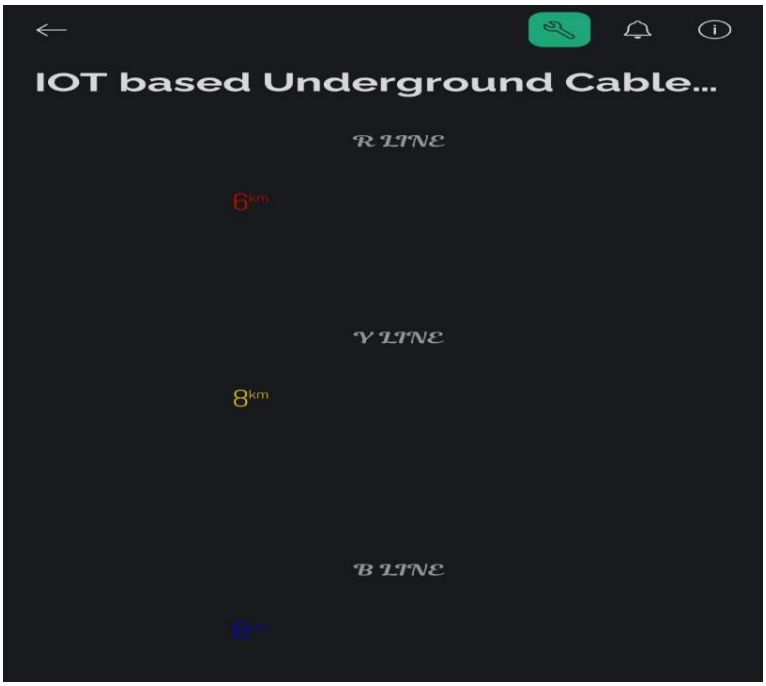

Figure.4 Result in Blynk App

CONCLUSION

The drawback we are facing in the Underground Cable Transmission System is we cannot detect the exact fault location from the base station. This drawback is overcome by using this method. By using NodeMCU, we can upload the information to the cloud server. It detects the faults in the Underground cable faster than Arduino. It works more efficient than all other methods which are used to detect the faults in the Underground cables.

FUTURE SCOPE

This project only detects the exact fault location in Underground Cable from the base station. In future it may be possible to do project on automatically clear the fault by designing a robot.

In future, the open circuit fault can be detected by using a capacitor in ac circuit which measures the change in impedance and calculate the distance of fault.

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