UNDERGROUND CABLE FAULT DETECTION SYSTEM USING IOT

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ABSTRACT

Underground cables are prone to a wide variety of faults due to underground conditions, wear and tear, rodents etc. Diagnosing fault source is difficult and entire cable should be taken out from the ground to check and fix faults. The Project work is intended to detect the location of fault in underground cable lines from the base station in km using a MSP8266 WIFI MODULE. This prototype uses the simple concept of **OHMS LAW.** In the urban areas, the electrical cables run in underground instead of overhead lines. Whenever the faults occur in underground cable it is difficult to detect the exact location of the fault for process of repairing that particular cable. The proposed system finds the exact location of the fault. The prototype is modelled with a set of resistors representing cable length in km and fault creation is made by a set of switches at every known distance to cross check the accuracy of the same. In case of fault, the voltage across series resistors changes accordingly, which is then fed to an ADC to develop precise digital data to a programmed PIC IC that further displays fault location in distance. The fault occurring distance, phase, and time is displayed on a 16X2 LCD interfaced with the microcontroller. IOT is used to display the information over Internet using the Wi-Fi module ESP8266.A webpage is created using HTML coding and the information about occurrence of fault is displayed in a webpage.
KEYWORDS: Underground Cable, Fault Location, Location Methods, Microcontroller.

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. Even though the Cable manufacturing technology is improving steadily, there are still influences which may cause cable to fail during test and operation. A cable in good condition and installed correctly can last a lifetime of about 30 years. However cables can be easily damaged by incorrect installation or poorly executed jointing, while subsequent third party damage by civil works such as trenching or curb edging.

EXISTING SYSTEM

TRACER METHOD:

The tracer method is an exhaustive way to locate a faulted segment by walking through the cable circuits. A faulted segment can be determined from audible or electromagnetic signals and requires dispatching crew members to the outage area. There have been various techniques largely used in the industries, including the tracing approach through acoustic, electromagnetic or current.

TERMINAL METHOD:

The terminal method is a technique used to determine a fault location of a distribution cable network from one or both ends without tracing exhaustively. A bridge technique is one of the most popular terminal methods that links with a resistor to determine a fault location .It is a technique used to detect fault location of cable from one or both ends without tracing.

DRAWBACKS

1. The main disadvantage is that the underground cables have higher initial cost and insulation problems at high voltages.

2. Another main drawback is that, if a fault does occur, it is difficult to locate and repair the fault because the fault is invisible.
3.Angular value required time to read so some delay occur.
4. The NODEMCU and other component require 5V DC Supply. Relay requires 12V dc.

PROPOSED METHOD

The proposed system is an IOT enabled underground cable fault detection system. The basic principle behind the system is Ohms law. When fault occurs in the cable, the voltage varies which is used to calculate the fault distance. The system consists of Wi-Fi module,Microcontroller,four channel relay module,LCD Display,voltage regulator etc.,The power supply is provided using battery and voltage regulator. The current sensing circuit of the cable provides the magnitude of voltage drop across the resistors to the microcontroller and based on the voltage the fault is located.

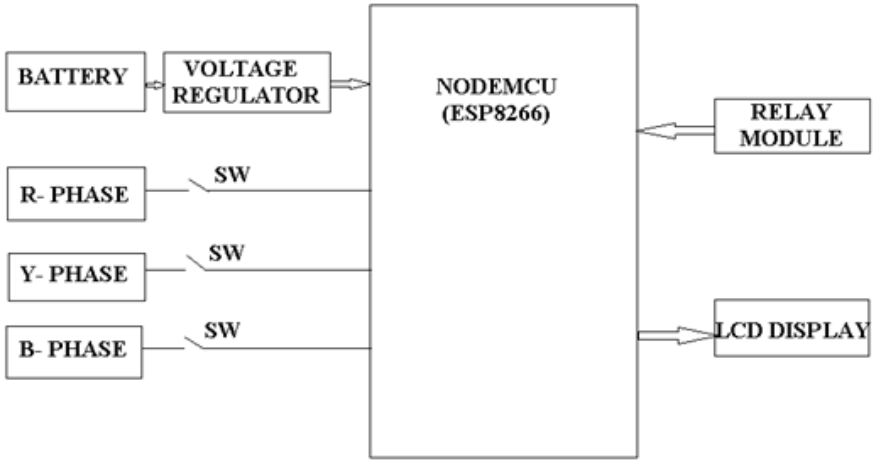

Figure-1: Block diagram of Underground Cable Fault Detection System using IOT

The figure 1 shows the block diagram of the proposed system.The supply is taken from the battery.Here we are using the 4 channel relay module.The ESP8266 MICROCONTROLLER.

The hardware design of IoT based power monitoring system is shown in Figure-2. The load is connected to this hardware setup to evaluate its performance. A 16*2 LCD is used to show the real time results of the load and the Wi-Fi module communicates load data to Blynk server. The hardware is tested using the switches. The ESP8266 Wi-Fi module sends real-time data to the cloud server for storage. After a simulating program, our device receives data from the cloud through MQTT. MQTT is a protocol for collecting device data and communicates that data to the server.

RESULTS

Figure-3 shows the underground cable fault detection system using IOT with no fault. The fault phase displayed in LCD display and also displayed in the mobile screen through the Blynk app.

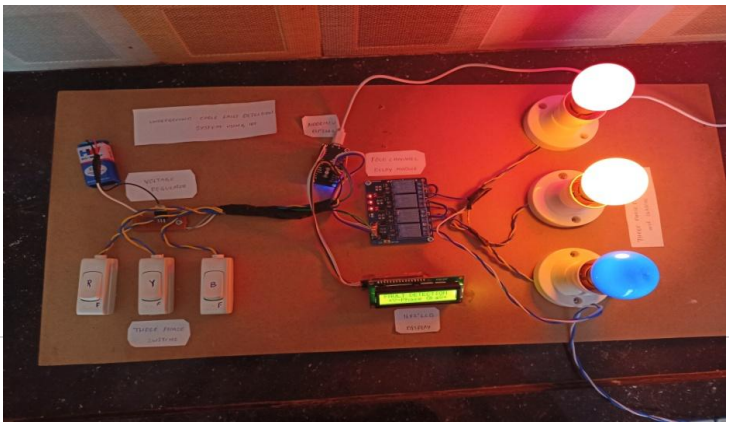

Figure-3: Underground cable fault detection System using IOT with No fault

Fig-4 shows the underground cable fault detection in R-PHASE.The Fault detection in R-PHASE is displays in LCD screen and also displayed in the mobile screen through the Blynk app.

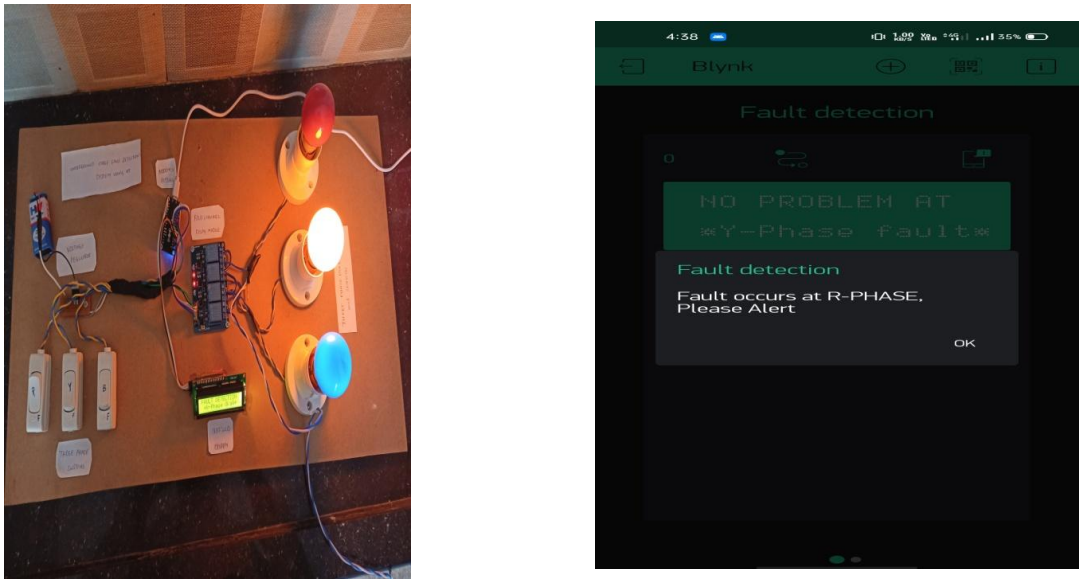

Figure-4:Underground cable fault detection in R-PHASE.

Figure-5 shows the underground cable fault detection in Y-PHASE.The Fault detection in Y-PHASE is displays in LCD screen and also displayed in the mobile screen through the Blynk app.

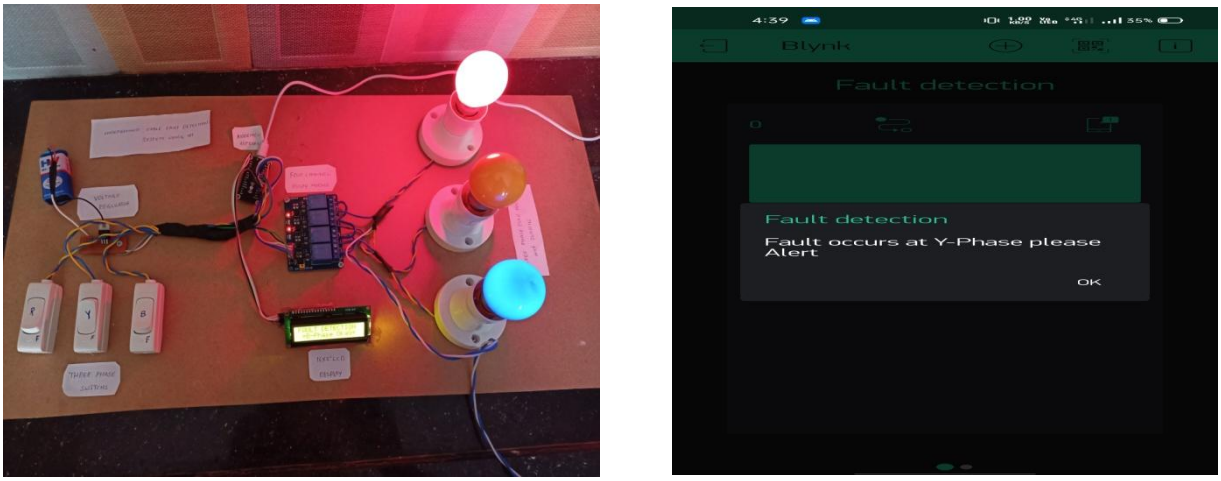

Figure-5:Underground cable fault detection in Y-PHASE.

Fig-6 shows the underground cable fault detection in B-PHASE.The Fault detection in B-PHASE is displays in LCD screen and also displayed in the mobile screen through the Blynk app. Various components used in the system are basically a current potentiometer, ATmega16, Wi-Fi modem, LCD display. The potentiometer is used for varying resistance of the cable. Here we have used ATmega16. ATmega16 will receive the input from the optocoupler and according to it, the controller circuit will perform some set operations like displaying of data in LCD display which is interfaced with it or serially communicating the realtime data through Tx pin of the microcontroller.

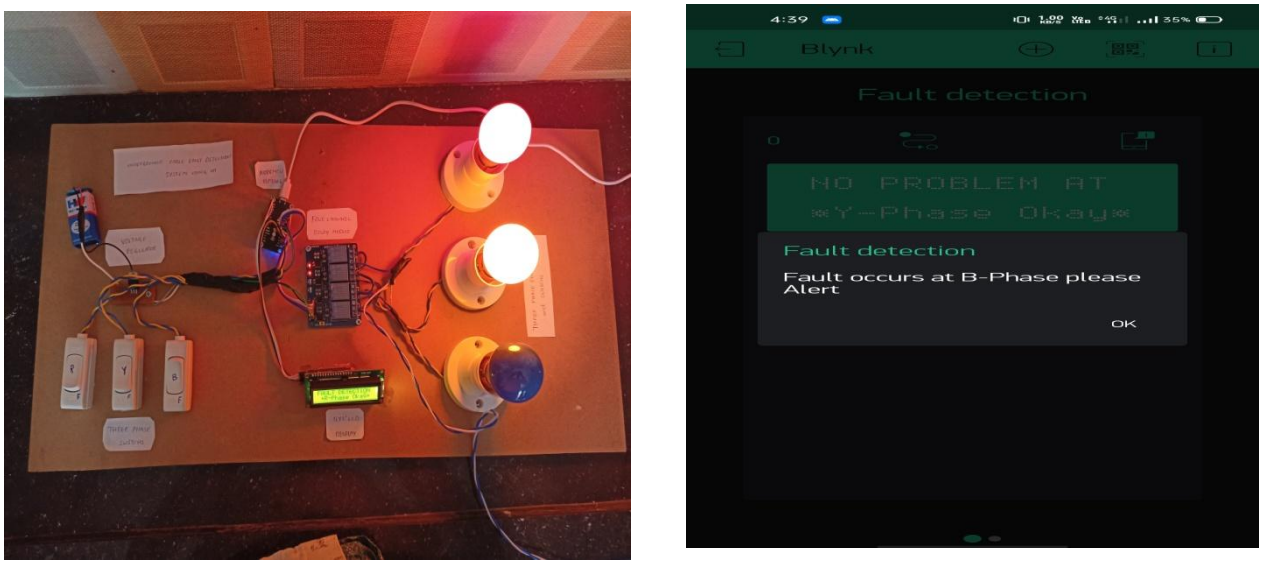

Figure-6: Underground cable fault detection in B-PHASE.

CONCLUSION

In this paper, the Underground cable fault detection system using IOT is implemented to detect the faults easily in underground cable using Nodemcu and Internet of Things technology. It can overcome the problem of time consumption for finding the faults in underground cables and man power. The work automatically displays in the LCD display, distance and time of occurrence of fault with the help of ESP8266 Wi - Fi module in the LCD display. The benefits of accurate location of fault are fast repair to revive back the power system, it improves the system performance, it reduce the operating expense and the time to locate the faults in the field.

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