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UNDERGROUND CABLE FAULT DETECTION USING ARDUINO

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ABSTRACT

The objective of this project is to determine the distance of underground cable fault from base station in kilometers. The underground cable system is a common practice followed in many urban areas. While a fault occurs for some reason, at that time the repairing process related to that particular cable is difficult due to not knowing the exact location of the cable fault. The proposed system is to find the exact location of the fault.

The project uses the standard concept of Ohms law i.e., when a low DC voltageis applied at the feeder end through a series resistor (Cable lines), then current would vary depending upon the location of fault in the cable. In case there is a short circuit (Line to Ground), the voltage across series resistors changes accordingly, which is then fed to transistors to develop digital data which the programmed microcontroller of 8051 family would display in kilometers.

The project is assembled with a set of resistors representing cable length in KM's and fault creation is made by a set of switches at every known KM to cross check the accuracy of the same. The fault occurring at a particular distance and the respective phase is displayed on LCD interfaced to the microcontroller.

KEYWORDS: Underground cable, fault location, fault detection, location methods,microcontroller.

I. INTRODUCTION

Over the years, the use of underground cables has increased due to its many advantages over overhead cables, such as being less affected by adverse weather conditions and being more eco-friendly. However, locating faults in underground cables is more difficult as the cables are not visible. This project proposes a fault distance locator model for underground power cables using an Arduino Uno, which will detect the exact location of the fault and the distance of the fault from the based station in kilometers. This will facilitate faster repairs, improve reliability, and reduce outage time.

The project utilizes the concepts of Ohm's law and a tracer method to detect faults, and is equipped with a set of resistors, power supply, switches, Arduino Uno, and LCD. Embedded systems are used to optimize the performance and reduce the size and cost of the product.

The use of underground cables is a common practice in many urban areas, and this project aims to improve the fault detection process to ensure better system reliability. With the increasing digitization of the world, this project uses a digital approach to locate faults in underground cables.

EXISTING SYSTEM

The proposed fault distance locator system for underground power cables using an Arduino Uno includes a set of resistors, power supply, switches, Arduino Uno, and LCD. The system utilizes Ohm's law and a tracer method to detect faults and determine the distance of the fault from the based station in kilometers. The system will send information about the fault location to the control room via a relay, enabling faster repairs and reducing outage time.

To use the system, the user will connect the system to the underground power cable, and the system will detect the location of the fault through the voltage drop measurement. The fault location and distance will then be displayed on the LCD screen. This system is designed to improve the fault detection process and ensure better reliability of the underground cable system, particularly in urban areas where underground cables are commonly used. The use of embedded systems in the design also optimizes the system's performance and reduces its size and cost

II. PROPOSED SYSTEM

The proposed system is useful to find the distance where the fault occurred. System consisting of power supply part which comprises of AC supply, transformer, voltage regulator, filter, micro controller, current sensing cables, relays and liquid crystal display.

III. HARDWARE DESCRIPTION:

ARDUINO MODULE:

An Arduino module is a small, low-cost, programmable circuit board designed for use in electronics projects. It is based on a microcontroller, input/output pins, and a programming interface. The microcontroller is the main component of the module, responsible for processing data and controlling various components of the circuit. The input/output pins allow the module to communicate with other electronic devices and sensors, and the programming interface allows users to write and upload code to the module. Arduino modules are popular in hobbyist and educational settings, as well as in professional applications, due to their flexibility, ease of use, and low cost.

Fig.1 Arduino Uno.

GPS MODULE:

A GPS module is a device that receives signals from multiple satellites orbiting the Earth and uses those signals to determine its own precise location, as well as speed and direction of movement. It consists of a GPS receiver, an antenna, and a processing unit. The GPS receiver picks up signals from multiple satellites, and the processing unit calculates the user's precise location by triangulating the signals from the satellites. GPS modules are commonly used in

Fig.2 GPS Module

TRANSFORMER MODULE:

A transformer module is a type of electronic component that is used to transfer electrical energy from one circuit to another through electromagnetic induction. It consists of two coils of wire wrapped around a magnetic core, which allows for the transformation of voltage levels between circuits. The module is commonly used in power supply circuits and electrical systems.

Fig.3 TRANSFORMER Module.

RELAY MODULE:

A relay module is an electronic component that is used to control the flow of electricity in a circuit. It consists of a switch that is activated by an electrical signal, which in turn controls the flow of current to a separate circuit. Relay modules are commonly used in automation systems, robotics, and other applications where precise control of electrical signals is necessary.

Fig.4 RELAY Module.

GSM MODULE:

A GSM module is a type of electronic component that allows for wireless communication between devices over a cellular network. It contains a small computer and a modem that enable it to transmit and receive data, voice, and SMS messages. GSM modules are commonly used in mobile phones, modems, and other devices that require wireless connectivity. They can also be used in IoT applications, such as remote monitoring and control systems, to enable wireless communication with sensors and other devices. GSM modules can operate on a variety of frequencies and are widely available from electronics manufacturers.

Fig.5 GSM Module.

IV. RESULT:

The practical representation of an experimental board is shown below

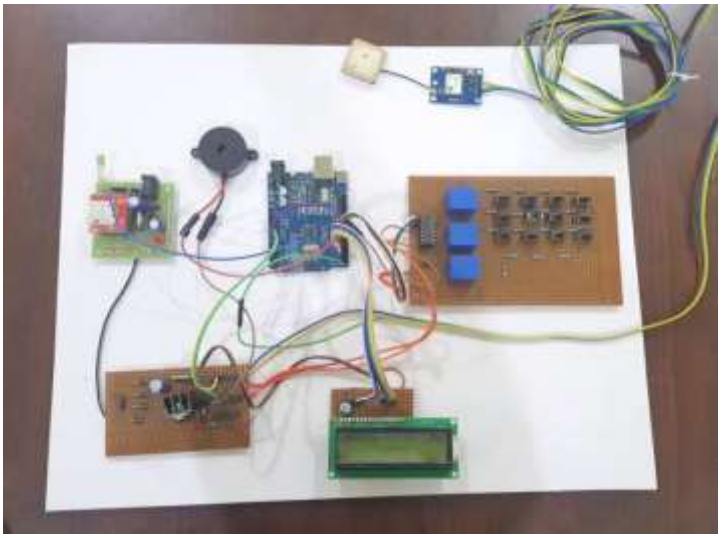

Fig.6 Before Giving Power supply.

When there is a fault in the current flow, The cable Fault detector circuit detects the fault and shows it in the L.C.D Display. As Fig.6.1 shows there is a fault occurred at main 3 in the range of 5-10 Km.

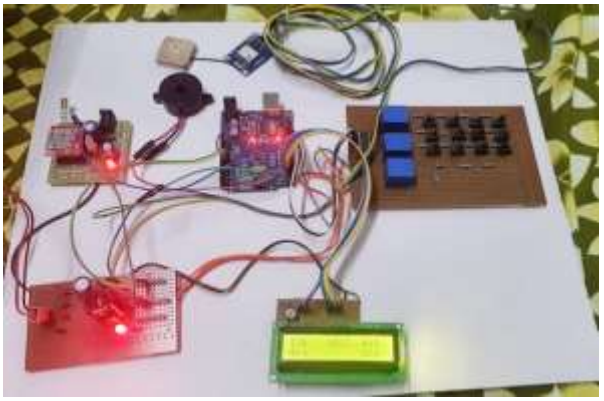

Fig.6.1 After Giving Power Supply.

VI. OUTPUT:

The proposed project aims to develop a fault distance locator model for underground power cables using an Arduino Uno and a GSM module. The underground cable system is commonly used in urban areas, but when a fault occurs, it can be challenging to locate the exact fault location. The project utilizes Ohm's law principles to detect faults using the tracer method. The prototype includes resistors, switches, a power supply, an LCD, an Arduino Uno, and a GSM module. The system will detect the faulted cable, send the information to the control room through a relay, and provide the exact fault location and distance from the base station. The project's objective is to facilitate faster repairs, improve system reliability and reduce outage durations.

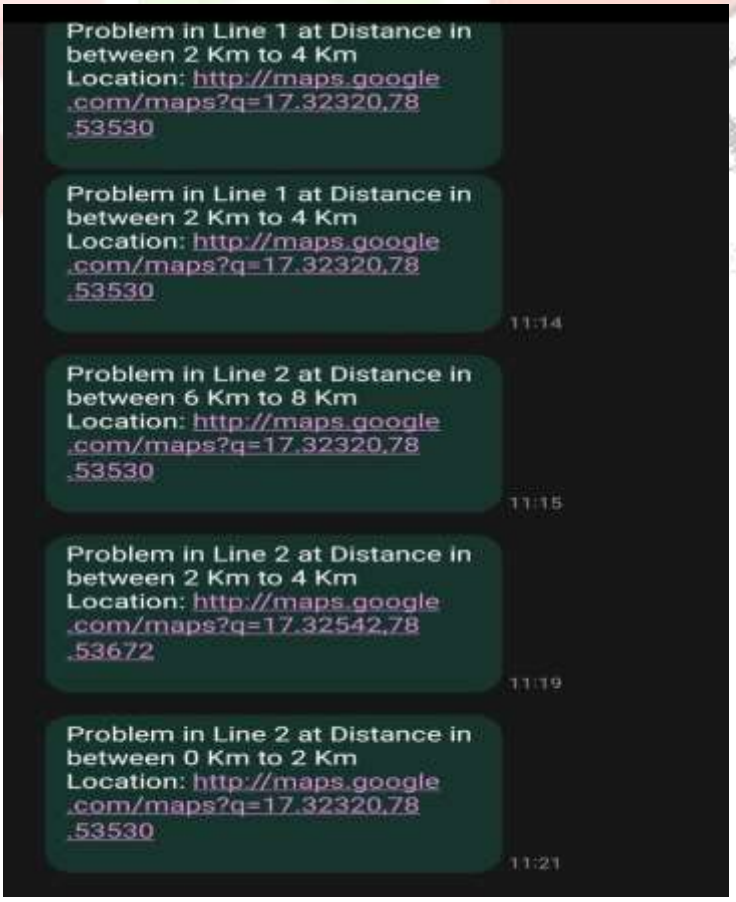

Fig.7 Fault Detection Information sent to the user.

VII. ADVANTAGES

1) Less maintenance

2) It has higher efficiency.

3) Less fault occur in underground cable.

4) This method is applicable to all types of cable ranging from 1Kv to 500Kv.

5) It can detect other types of cable fault such as short circuit fault, cable cuts, Resistive fault, Sheath faults, Water trees, Partial discharges.

VIII. CONCLUSION

In this project we detect the distance of cable fault in the underground cable fromfeeder end in km by using microcontroller .For this we use simple concept OHM's law so fault can be easily detected and repaired. we did not use any ADC converter in this project. we have done this by using transistors so the system complexity is decreased for somehow.

IX. FUTURE SCOPE

In this design we describe only the position of short circuit fault in underground string line, but we also describe the position of open circuit fault, to describe the open circuit fault capacitor is used in ac circuit which measure the change in impedance &- calculate the distance of fault. we can find the exact position by using ADC, in which we can get the exact distance in numbers too. The distance of the fault can be transferred to line men using GSM module.

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