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Underground Cable Fault Detection System Using Iot

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ABSTRACT
The purpose of this project is to determine the distance (in kilometers) of an underground cable fault from a base station. Underground cable fault systems are common practice in many urban areas. Even if it fails for some reason, the repair process associated with that particular cable is difficult because don't know exactly where the cable failed. The proposed system consists of finding the exact location of the fault. This project uses the standard concept of ohm's law i.e. For example, when a low DC voltage is applied to the supply side through the series resistor (cable), the current varies depending on the location of the fault in the cable. In the event of a short circuit (line to ground), a corresponding voltage change across the series resistor terminals is then transmitted to the ADC to generate accurate digital data, which is displayed in KM by a series programmable microcontroller 8051.This project is constructed from a set of resisters representing the cable length in the KM, and error generation is generated b a set of switches at each known KM to check accuracy. Faults occurring at specified distances and the corresponding phases are displayed on an LCD screen interfaced with the microcontroller. Also, this project could be improved by using a capacitor in the AC circuit to measure and even detect the impedance of an open wire, unlike the project suggested above where only resistors are used in the DC circuit for faults of short circuit.

I. INTRODUCTION

Underground cables are used to lift the array from the resistance frame. These underground cables are not affected by climatic conditions such as rainfall, rest day, etc. There may be problems with underground cables due to earthquakes or any excavation procedures. Because the problem area is not obvious, the correction process is difficult. This obstacle is solved with the help of fiber optic frames. Many optical stands are placed along the power cable. The fiber optic frame continuously quantifies various parameters at multiple control points placed at usual intervals on the power cable. In the event of a problem, the estimates of the parameters of the bounding regions change abnormally. This information is obtained from environmental factors at the control point where the fault occurred. Using this strategy, in accurate cable fault separation was found. When the area is identified, we begin to send a high voltage to the broken wire to locate the specific problem area prolonged power outages can lead to major health and safety issues as well as financial loss. Concerns about overhead line reliability, increased maintenance and operating costs, and public safety and quality of life concerns are leading more and more utilities and municipalities to realize that converting underground overhead distribution lines is a good way to provide high quality service. Way to serve their customers. For utilities, laying underground cable offer potential benefits by reducing operation and maintenances (O&M) costs, reducing tree trimming costs, reducing storm damage and reducing the daily energy waste when customers lose power after a storm. Underground cable system are important for power distribution, especially in metropolitan areas, airports and defense services. The goal of this project is an IoT based underground cable fault detection system to detect electrical leakage, cable damage, etc. This will detect problems and provide a warning message to the web page.

SCOPE OF THE PROJECT

In this proposed system of IoT-based underground cable fault detection system, some cable fault detection is provided. This facilitates the work of electricians who cannot physically enter.

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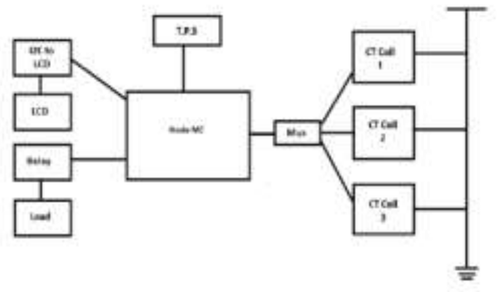
This error detection system is easy to use. We can find the exact extent of the error. It can be used for overhead and underground cables.

BLOCK DIAGRAM



II. EXISTING SYSTEM

Electricity is distributed to various loads generated by power plants and then consumed by cities, towns and cities. The increases the voltage during this process to minimize thermal energy loss in the line. The network site sends the increased voltage to the user after being reduced by the local transformer. Physical cable splicing is the basic method for locating cable faults. For fault location, we started dividing the cable into smaller sections so that the search area was narrower and the fault was detected. For example, let's take a 1000 foot wire that needs to be split and cut.

III. PROPOSED SYSTEM

The fundamental objective of this approach is that any transmission network can introduce failures. Generally, underground cables transmit electricity. If there is any damage to this cable, we mean we need to check it end to end. If there is a fault at some point, the condition cannot be reported for an extended period. To solve this problem, a model was built to find the voltage value change using a microcontroller-based circuit. Each time a predetermined cable is crossed, the microcontroller sends a message within seconds to the relevant personnel and then to the control node indicating the specific road area where the fault occurred. An important motivation behind the 's constant discovery of problems is to protect the transformer as quickly as possible.

IV. LITERATURE REVIEW

Comparative Performance of Underground Cable Fault Detector with Other Detection Methods

This section provides information on cable fault detection investigations.

[1], the authors present a method for the design and detection of fault location zones for underground cables. It uses the idea of Ohm's law. According to this principle, when a small DC voltage is applied to one end of a cable using a network of resistors, the current changes depending on the location of the fault in the wire.

[2], the author proposes a design to detect the fault location of underground lines with this method, and this method is used to detect the type of circuit occurrence; as the current changes, the voltage drop varies with the default cable length. Use multiple resistors to represent the cable, add DC voltage at one end, detect the fault by detecting the voltage change in the fault area, and speed up the detection of buried cables.

[3], the frequent faults of underground cables caused by paper-plastic insulation failure due to chemical reaction or improper installation process, and the difficulty of locating the approximate fault area has always been a serious problem. Most underground faults are detected by digging the full length of the cable for visual inspection. If visual inspection does not help, replace the entire cable. Not only is this manual method costly, but it can also result in a huge loss of revenue for distribution companies. This research aims to design a remote sensing system for underground cable fault location to solve this problem.

[4] Underground cable transmission and distribution systems are susceptible to failure. Accurate fault location on transmission lines is crucial. Rapid fault detection and analysis is essential for electricity traders and distributors. To detect faults in a cable, the cable must first be tested for faults. This prototype uses the simple concept of Ohm's Law. The current varies depending on the length of the faulty cable.

ESP8266 Wi-Fi module

The ESP8266 WI-FI module is essentially a complete WI-FI solution, it has an independent operating system and an integrated TCP/IP protocol stack, and can be easily connected to a microcontroller to access any any Wi-Fi network to get. This module has the ability to provide or obtain applications and functions from other modules or processors, which means it also has the ability to host or download functions and applications. To connect this module to any WI-FI network, simply download the pre-programmed program defined in this module as firmware. This is a very profitable module with a large and growing communication community. This module has powerful data storage and processing capabilities, so it can be easily integrated with sensors and other processing units. It is an

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advanced on-chip integrated device with a very small PCB circuit area. It supports IPSD to export apps and can also connect to Bluetooth. The module does not require any external RF signal as it has an independent calibration signal. The ESP 8266 WI-FI module is shown in the figure below.

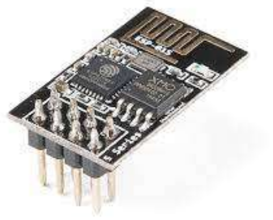

Fig.1.1: WI-FI Module.

RELAY

A relay is an electrical switch. Current flowing through the relay coil creates a magnetic field which attracts the lever and changes the switch contacts. The coil current can be turned on or off, so the relay has two switch positions and is a two-way (changeover) switch. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example, a low voltage battery circuit might use a relay to switch a 230 VAC power circuit. There is no electrical connection inside the relay between the two circuits, the connection is magnetic and mechanical. The relay

Coil carries a relatively high current, typically 30mA for a 12V relay, but it can be as high as 100mA for relays designed to operate at lower voltages. Most integrated circuits (chips) cannot supply this current, and transistors are usually used to amplify the small current from the IC to the higher value required by the relay coil. The popular 555 timer IC has a maximum output current of 200mA, so these devices can directly drive relay coils without amplification.

Fig 1.2: Relay

CURRENT SENSOR

A current sensor is a device that senses the current in a wire and generates a signal proportional to that current. The generated signal can be an analog voltage or current or a digital output. The resulting signal can then be used to display the current measured in an ammeter, or can be stored in a data acquisition system for further analysis, or can be used for control purposes.

Fig 1.3: Current Sensor

LCD DISPLAY

The most common character-based LCDs are based on Hitachi's HD44780 controller or other HD44580 compatible controllers. In this tutorial, we will discuss character-based LCDs, their interfacing with various microcontrollers, various interfaces (8-bit/4-bit), programming, special tricks and tricks you can do with these LCDs. simple, to give you a new appearance.

Fig 1.3: LCD Display

POWER SUPPLY UNIT

This chapter describes the operation of power supply circuits constructed using filters, rectifiers and voltage regulators. Starting from an AC voltage, a stable DC voltage is achieved by rectifying the AC voltage, then filtering to a DC level, and finally regulating to obtain the desired fixed DC voltage. Regulation is usually achieved from an IC regulator, which takes a DC voltage and supplies a slightly lower DC voltage that remains constant even if the input DC voltage or the output load applied to the DC voltage changes. A block diagram with typical power components and voltages at various points in the unit is shown in Figure 1. The AC voltage (typically 120 Vrms) is connected to a transformer which steps down the AC voltage to the level required for the DC output.

Internet of things (IoT)

The Internet of Things (IoT) is the network of physical devices, vehicles, appliances, and other things integrated with electronics, software, sensors, actuators, and network connections that allow these elements to connect and exchange data. Each thing is uniquely identifiable by its integrated computing system, but able to operate within the existing Internet infrastructure. Experts estimate that by 2020, the Internet of Things will consist of approximately 30 billion objects. The Internet of Things allows objects to be sensed or controlled remotely through existing network infrastructures, creating opportunities for more direct integration of the physical world into computing systems and increasing efficiency, accuracy and reliability. Economy while reducing human intervention. When IoT is complemented with sensors and actuators, the technology becomes an example of a more general cyber-physical system, which also includes technologies such as smart grids, virtual power plants, smart homes, smart transportation and smart cities.“Things” in the IoT sense can refer to a wide variety of devices, such as heart monitoring implants, biochip transponders on farm animals, cameras broadcasting live feeds of wildlife in coastal waters, vehicles with built-in sensors, environmental DNA-/food/pathogen monitoring equipment, or field equipment to assist firefighters in search and rescue operations. Lawyers recommend considering a "thing" as an "indivisible combination of hardware, software, data and services". These devices use a variety of existing technologies to collect useful data and then transfer data autonomously between other devices. The term "Internet of Things" was coined in 1999 by Kevin Ashton of Procter & Gamble (which later became MIT's Auto-ID Center).

ARDUINO IDE

In this chapter, we will discover the different components of the Arduino board. We will be reviewing the Arduino UNO board as it is the most popular board in the Arduino family of boards. Moreover, it is the best board to start electronics and coding. Some boards look slightly different than those shown below, but most Arduinos have most of these components in common. There are different types of Arduino boards available depending on the microcontroller used. However, all Arduino boards have one thing in common: they are all programmed through the Arduino IDE. The differences are based on the number of inputs and outputs (how many sensors, LEDs and buttons you can use on a board), speed, operating voltage, form factor, etc. Some cards are designed to be embedded and not programmed. Interface (hardware), which you need to purchase separately. Some will run directly from a 3.7V battery, others will require at least 5V.Arduino is an (open source) prototyping platform based on easy-to-use hardware and software. It consists of a programmable printed circuit board (microcontroller for short) and off-the-shelf software called Arduino IDE (Integrated Development Environment) to write and upload computer code to the physical board.

V. CONCLUSION

Cables help distribute electrical power. These cables face so many failures. Finding faults in these cables is a very complex task. The system, using an Arduino, finds the exact location of a cable fault in a base station in kilometers. In many non-rural areas these days, cables are often used underground rather than above the lines. When an underground cable fails, it becomes very difficult to locate the fault location for cable repair. The system will be used effectively for underground and overhead cables. The Arduino Mega development board used in this system. Here the Arduino is connected through a current sensing circuit made up of many resistors. Errors are generated by a set of switches. To increase the remote control capability of this industrial system, we offer a low cost solution. Completed this project for fault detection using Arduino, the distance of the fault in km from the ground station will be displayed on the LCD and web page. Whenever a fault occurs, a switch similar to the phase is identified as the faulty phase, and then the faulty switch is operated. This makes it easier to locate the failing sector. It is a durable, safe and energy-efficient device. This device can operate on multiple channels to avoid interference from appliances or other wireless devices. With the help of a single-chip microcomputer, we can precisely locate the location of the fault. When there is an error in the cable, the location of the error is displayed on the LCD screen.

FUTURE ENHANCEMENT

The system proposed in this paper only detects the location of short-circuit faults in underground cables, but also detects the location of open-circuit faults to detect open-circuit fault capacitors, which are used in circuits where the resistance changes are measured and the fault distance is calculated. For future research, the system will continue to estimate different types of defect sections and defect locations with similar neural network structure.

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