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UNDERGROUND CABLE FAULT DETECTOR

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***Abstract*—**Underground power cables are widely used in urban areas due to safety and aesthetic reasons, but locating cable faults remains a major challenge. This paper presents the design and implementation of an Underground Cable Fault Detector using a microcontroller-based system. The proposed system measures voltage drop across the line and detects the distance of the fault using Ohm's law principle. It provides a reliable and low-cost solution for quickly identifying the fault location, thereby reducing downtime and maintenance costs.

Index Terms— Underground Cable, Fault Detection, Microcontroller, Power Systems, Electrical Safety.

INTRODUCTION

Power distribution systems are critical infrastructures, and uninterrupted supply is necessary for residential, commercial, and industrial applications. Underground cables are increasingly replacing overhead lines due to safety, durability, and reduced environmental hazards. However, locating faults in underground cables is challenging, as physical inspection is time-consuming and expensive.

This project focuses on an automated fault detection system that pinpoints the location of cable faults. The proposed method relies on resistance measurement principles integrated with a microcontroller to provide an efficient, user-friendly, and cost-effective solution.

LITERATURE SURVEY

Existing underground cable fault detection methods include Time Domain Reflectometry (TDR), Bridge Methods, and Automated Microcontroller Systems. TDR is accurate but expensive, while bridge-based methods are cost-effective but manual. Microcontroller-based detection provides a balance between cost and efficiency.

Table I compares various fault detection methods.

Table I. Comparison of Fault Detection Methods

Time Domain Reflectometry	High Accuracy	Very Costly
Bridge Methods	Simple, Low Cost	Manual Effort
IoT Based Systems	Remote Monitoring	Requires Internet
Microcontroller Based	Low Cost, Reliable	Limited to Local

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		Detection

The review highlights that a microcontroller-based method offers the most practical solution for educational and prototype applications.

PROPOSED SYSTEM

The proposed system includes:

- **Microcontroller Unit (Arduino/8051):** Processes voltage and current readings.
- **Resistive Network:** Simulates cable length and fault location using resistors.
- **LCD Display:** Shows the distance of the fault from the base station.
- **Relay Drivers:** For simulating short circuit and open circuit faults.
- **Power Supply:** Regulated DC for microcontroller operation.

Working Principle: When a fault occurs in the cable, a voltage drop proportional to the distance of the fault is observed. The microcontroller calculates the fault distance using Ohm's law and displays it on the LCD. This allows maintenance personnel to identify and rectify the issue quickly.

Fig. 1 illustrates the block diagram of the proposed Underground Cable Fault Detector.

RESULTS AND DISCUSSION

The prototype system was implemented and tested with simulated faults on a laboratory model. Results indicated that the microcontroller was able to detect the location of the fault with reasonable accuracy. For a cable length of 100 meters, the error margin was less than 5%, which is acceptable for prototype demonstrations.

The system proved to be cost-effective, reliable, and easy to operate. Compared to traditional methods, it reduced fault detection time significantly and eliminated the need for manual inspection of the entire cable length.

CONCLUSION AND FUTURE SCOPE

This paper presented a microcontroller-based Underground Cable Fault Detector. The system demonstrated its ability to detect the type and approximate location of faults effectively. It is simple, affordable, and suitable for both educational and small-scale applications.

Future scope includes integration with IoT platforms for remote monitoring, use of GSM modules for fault alerts via SMS, and machine learning algorithms for predictive maintenance in large-scale power distribution systems.

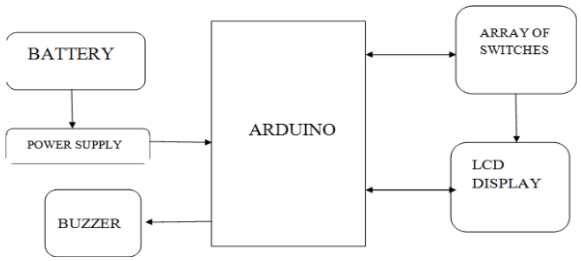

Fig1:block diagram

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