Title of the project : Fault Detection of Underground Power Cables using Arduino

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Keywords :

Underground Cable, Micro-controller, Arduino UNO, Detection, GSM & GPS service, Google map, Ohm's law.

Introduction :

In the downtowns, underground cables are used rather than overhead transmission lines. Underground cables are used for electrical power transmission from one substation to another substation especially in cities and densely populated areas such as hospitals, airports etc. Unusual or unexpected faults occur in the cables during power transmission from one point to another. The conventional method of detecting cable faults in underground cables involves manually identifying the location of the fault by physically inspecting the cable. This method is timeconsuming and can result in unnecessary digging, which can lead to additional damage and increased repair costs. So we have proposed a project which is implemented using embedded system devices like Arduino. We aim to find out the distance of cable fault from the control room of the base station in kilometers. This distance value is sent to the LCD integrated to the embedded system device board and it displays exact location of the fault from the base station in kilometers. The proposed system offers an efficient and

cost-effective solution for identifying and tracking underground cable faults. The use of GSM and GPS modules makes the system more reliable and automated. The Arduino will initialize the GSM module to send SMS about location data i.e., distance of the fault location in kilometers and also latitude and longitude coordinates. These coordinates will be sent as a google map link to know exact fault location, which allows the maintenance team to respond quickly to any fault occurrence.

Objectives :

- Develop a system capable of detecting faults in underground power cables.
- Implement algorithms and techniques to accurately identify the fault line in the underground power cables.
- Develop methods to calculate the distance of the fault from the base station.
- Integrate an LCD screen into the system to display the identified fault distance.
- Incorporate GSM and GPS modules into the system to send SMS notifications to the maintenance team's mobile devices.
- The SMS should contain detailed information about the fault line, the calculated fault distance, and a geolocation link.

Methodology :

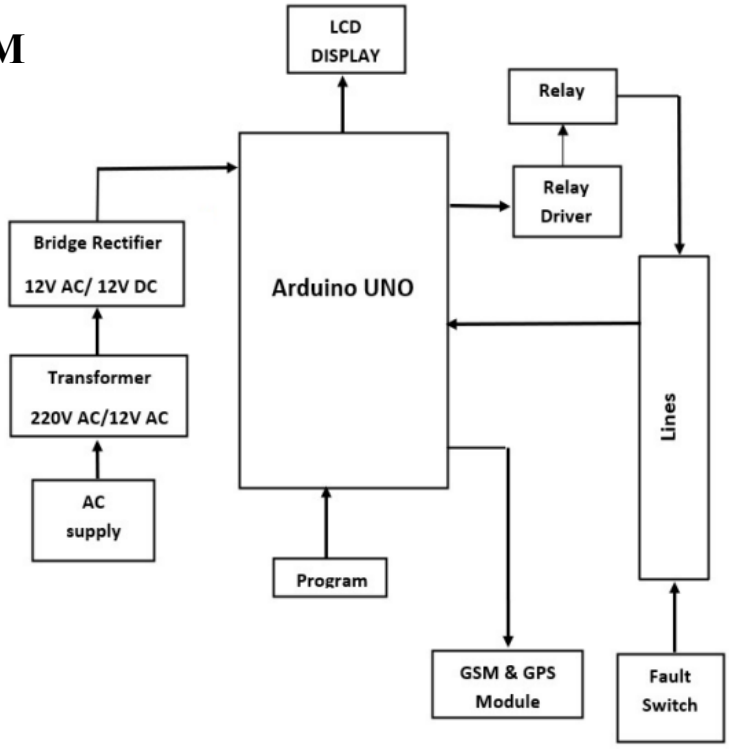
The proposed system design is based on an Arduino microcontroller. An electrical switching device and a relay is used as a disconnecting switch that will switch between the lines and it will disconnect the line if any fault occurs.

Then the relay gives feedback to the microcontroller and the display unit is connected to the Arduino that displays the fault and their fault location. Using a GPS module, the microcontroller detects the location of the fault.

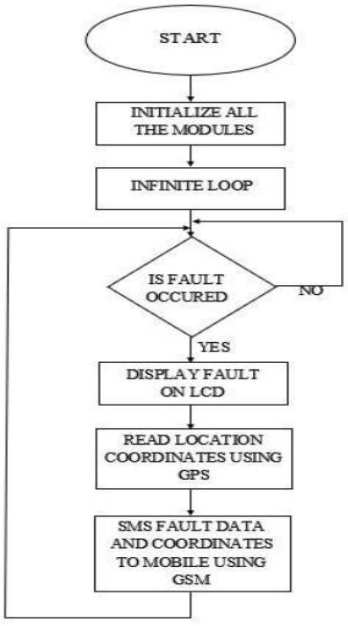
Subsequently, the micro-controller sends the location data in a short messaging service (SMS) form by utilizing the GSM module. For finding the accurate underground cable fault location from the base station, an underground cable fault detector is utilized. In the Arduino microcontroller, the input and output ports as well as GSM and GPS modules are set up, which will inspect the underground cable faults. The fundamental Ohm’s law is applied at the feeder end via a series resistor if a open circuit fault occurs the current flowing in the faulty sections will vary depending on the length of the line and also the voltage drop at the reference point changes if the fault has occurred .The resistance of a cable varies depending

on its length. As the length increase, the resistance value increases as well. If ther e is a difference in the resistance value, it refers to a fault point. With the help of a microcontroller, the fault point can be identified and detected .The display unit displays the value of that fault point, which indicates the standard of distance in kilometer, from the base station. The controller will issue an alert if a fault occurs. The results are displayed on the LCD. The fault distance is sent to the respective person through mobile. Also, the fault distance will be displayed on the Google map.

BLOCK DIAGRAM



FLOW CHART:



Results and Conclusions :

In conclusion, the Arduino micro-controller based underground cable fault identification and tracking system using GSM and GPS techniques is a significant contribution to the field of fault detection and location in underground cables. It provides a cost-effective, efficient, and user-friendly solution for detecting and locating cable faults. The proposed system has the potential to revolutionize the way cable faults are detected and located in various sectors such as urban infrastructure, hospitals, telecommunication networks, and power distribution companies. The addition of features like IoT implementation and advanced fault detection algorithms can further enhance the performance and reliability of the system. The development of an underground cable fault identification and tracking system using GSM and GPS techniques is a significant advancement in the field of fault detection and location in underground cables. The prototype has been successfully tested and has shown promising results in detecting and pinpointing the exact location of cable faults on a google map.

Innovation in the Project :

Integration of GSM and GPS modules with the underground cable fault detection system. This combination allows for real-time identification and tracking of cable faults, as well as the ability to send fault details and geolocation information to the maintenance team via SMS.

the use of Arduino microcontroller and various sensors enhances the automation and reliability of the system. By combining these technologies, the project offers a comprehensive solution for efficient fault detection and tracking in underground cable systems.

Future Work :

The Arduino micro-controller based underground cable fault identification and tracking system using GSM and GPS techniques is an innovative project aimed at enhancing the efficiency and effectiveness of cable fault detection and repair

processes. In order to further improve this project, several potential future works can be explored.

The development of an integrated system that combines the functionalities of the GSM and GPS modules into a single module could reduce complexity and make the system more compact and cost-effective. Also the real-time data analysis and reporting capabilities could be developed, enabling immediate notifications and alerts to be sent to relevant stakeholders, facilitating quick response to cable faults and minimizing downtime. Also remote monitoring and control of the underground cable system could be investigated. Utilizing IoT technologies, the health of the cables could be monitored remotely in real-time, and remote control functionalities could be implemented to minimize the impact of cable faults.

Lastly, developing an IoT-based system by integrating various sensors and devices could create a more advanced and comprehensive solution, allowing real-time monitoring of the power grid and alerting the maintenance team of potential issues. These future works have the potential to enhance the functionality and performance of the underground cable fault identification and tracking system, further improving the efficiency and reliability of the power distribution network.