UNDERGROUNDCABLEFAULT DETECTION USING ARDUINO GPS AND GSM MODULE

Nandu TK
dept. of computer science & engineering
Mahaguru Institute Of Technology
Alappuzha,Kerala
email id:
nanduthankachan2001@gmail.com

Akshay Anil
dept. of computer science & engineering
Mahaguru Institute Of Technology
Alappuzha,Kerala

Prazoon P
dept. of computer science & engineering
Mahaguru Institute Of Technology
Alappuzha,Kerala

S Sreelekshmi
dept. of computer science & engineering
Mahaguru Institute Of Technology
Alappuzha,Kerala

Sreelekshmi B
Asst Professor
dept. of computer science & engineering
Mahaguru Institute Of Technology
Alappuzha,Kerala

Abstract*— The underground cable fault detector based on Arduino, GPS, and GSM module is a system designed to detect faults in underground cables and communicate their location to a remote location .The Arduino microcontroller is the heart of the system and is responsible for controlling the various components of the system. The GSM module is used to send this information to a distant location, while the GPS module is utilised to locate the malfunction.. The sensors used in the system are used to detect changes in the electrical properties of the cable, such as voltage, current, and resistance. The location of the fault can be found using these alterations. When a fault is detected, the system records the location of the fault using the GPS module and sends this information to a remote location via the GSM module. This allows for quick and efficient repairs, minimizing disruption to service. The system can be powered by a battery, allowing it to operate even in the event of a power outage. The system can also be easily installed and maintained, making it a cost-effective solution for detecting faults in underground cables.

Keywords—Fault Detection, GPS&GSM module, location identifier

I. INTRODUCTION

The underground cable fault detector based on Arduino, GPS, and GSM module is a system designed to detect faults in underground cables and communicate their location to a remote location. However, these cables are vulnerable to faults, which can cause disruptions and even outages .The traditional method of detecting faults in underground cables involves manually inspecting the cables, which can be time-consuming and expensive. In contrast, the underground cable fault detector based on Arduino, GPS, and GSM module offers a faster and more efficient method of detecting faults in underground cables .The system uses sensors to detect changes in the electrical properties of the cable, such as voltage, current, and resistance. The location of the fault can be found using these alterations. Additionally, a GPS module is included in the system, which is utilised to locate the defect. When a fault is detected, the system records the location of the fault using the GPS module and sends this information to a remote location via the GSM module. This allows for quick and efficient repairs, minimizing disruption to service. The underground cable fault detector based on Arduino, GPS, and GSM module offers several advantages over traditional methods of detecting faults in underground cables. It can be easily installed and maintained, making it a practical solution for many infrastructure projects .In conclusion, the underground cable fault detector is an innovative solution for detecting faults in underground cables and communicating their location to a remote location for quick and efficient repairs.

II. PROBLEM STATEMENT

The goal of the problem statement for the underground cable fault detection using Arduino is to offer a quick and affordable way to find and fix defects in underground cables, which can increase the dependability and accessibility of the customer's power supply.

III. OBJECTIVES

The main objective of detecting underground cable faults using Arduino is to develop a reliable and cost-effective system for identifying faults in underground cables.
To reduce the time and cost of repairing the underground cable by identifying the exact location of the fault.
To enhance the safety of maintenance personnel by minimizing the need for physical inspection of underground cables

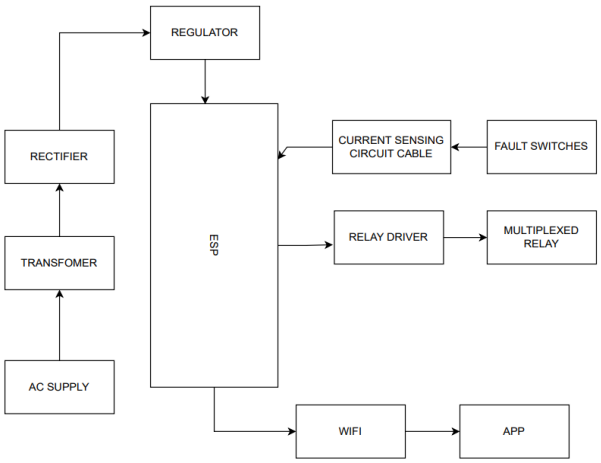
IV. EXISTING SYSTEM

Currently, finding defects in underground cables requires experienced employees to perform physical inspections. Particularly in difficult-to-reach areas, this technique can be time-consuming, expensive, and hazardous. Furthermore, conventional methods of fault detection could not locate the defect until it has significantly disrupted operations.To find defects in underground cables, some fault detection systems now in use employ ground-

penetrating radar or acoustic emission techniques. To operate these devices successfully, though, requires specialised training and they are frequently expensive. Utilising a system with optical fibre sensors to find and diagnose defects is an alternative method. These integrated sensors can detect changes in temperature and strain, which enables the detection of flaws. Although this strategy works, it can be expensive to set up and maintain. Overall, the speed, effectiveness, and cost-effectiveness of current technologies for finding defects in underground cables are constrained. A novel approach is required that can rapidly and precisely identify defects in underground cables and transmit their location to a distant site for prompt repairs. These issues are addressed by the proposed underground cable fault detector based on Arduino, GPS, and GSM module, which offers a quicker, more effective, and more affordable method of identifying defects in underground cables. The location of the fault can be found using these alterations. Additionally, a GPS module is included in the system, which is utilised to locate the defect.

V.PROPOSED SYSTEM

The Arduino, GPS, and GSM modules serve as the foundation for the suggested system for finding defects in subterranean wires. The system employs sensors to locate the defect by detecting changes in the cable's electrical characteristics, such as voltage, current, and resistance. The GSM module is then used to transfer this information to a remote location for analysis and action after the GPS module has determined the specific location of the malfunction.The suggested system has a number of benefits over the current ones. It can identify issues in real time and convey their position for quick and effective repairs, making it faster, more effective, and more affordable. There is also less need for manual inspections and specialised training because the system is simple to install and maintain. Power grids, communication networks, and transportation systems are just a few of the infrastructure projects that the suggested system can be applied to. It is also adaptable. Additionally, it can identify problems in both low-voltage and high-voltage cables and is adaptive to various cable types.The proposed technique is additionally intended to be environmentally beneficial because it doesn't involve any soil disturbance or excavation. This lessens the negative effects on the environment and the chance of harm to other subsurface equipment.



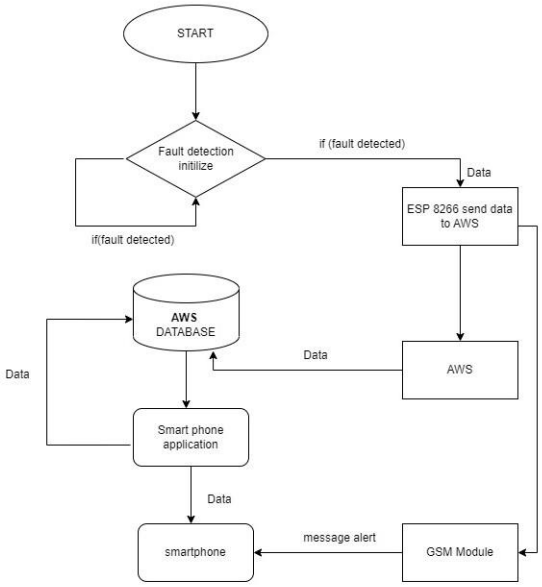
VI.TOOLS & METHODOLOGY

- Arduino Uno Board: The Arduino board is used as the microcontroller that receives signals from the sensors and processes the data.
- Sensors: The system uses sensors to detect changes in the electrical properties of the cable, such as voltage, current, and resistance. These sensors can be Hall Effect sensors, Current transformers (CTs), or Rogowski coils.
- GSM Module: The GSM module is used to transmit the location of the fault to a remote location. The module can be connected to the internet or a mobile network to send SMS or MMS messages.
- GPS Module: The GPS module is used to determine the precise location of the fault. It uses the Global Positioning System (GPS) to determine the latitude and longitude of the fault location.
- Software: The system requires software that can process the data received from the sensors and transmit the location of the fault using the GSM module. The software can be developed using Arduino IDE or other programming languages.
- Power Supply: The system requires a stable power supply that can power the Arduino board and the sensors. The power supply can be a battery or a solar panel.
- The methodology for the proposed system involves the following steps:
- Sensor Installation: The sensors are installed at specific intervals along the underground cable. The sensors are connected to the Arduino board, which receives the signals.
- Data Processing: The Arduino board processes the data received from the sensors and identifies any changes in the electrical properties of the cable. If a fault is detected, the system proceeds to the next step.
- GPS Location: The GPS module determines the precise location of the fault. The latitude and longitude are calculated and stored in the system.
- Communication: The GSM module transmits the location of the fault to a remote location using SMS or MMS.

- Maintenance: Once the fault location is identified, maintenance personnel can proceed to the location for repairs.

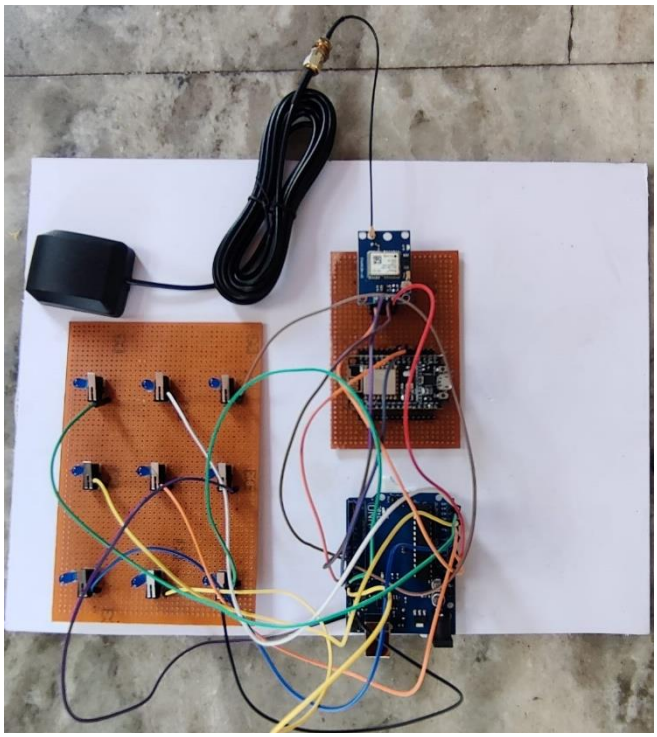
VII. PROPOSED METHODOLOGY

- Sensor Installation: The first step is to install sensors at regular intervals along the length of the underground cable. The sensors used can be either Hall Effect sensors, Current transformers (CTs), or Rogowski coils. These sensors will measure the electrical properties of the cable, such as voltage, current, and resistance, and detect any changes or anomalies in these parameters.
- Data Acquisition: The sensors will send the data to the Arduino board, which will receive, process, and store the information. The Arduino board will continuously monitor the electrical properties of the cable, and if there is a change in the values, it will be flagged as a potential fault.
- Fault Detection: Once a fault is detected, the Arduino board will trigger an alarm indicating that a fault has occurred. The fault may be caused by a range of factors, including cable damage, insulation failure, and short circuits. The system will then proceed to the next step.
- GPS Location: The GPS module will determine the precise location of the fault by triangulating the signals received from GPS satellites. The location data, including the latitude and longitude coordinates, will be transmitted to the Arduino board for processing.
- Communication: The GSM module will send the fault location data to a remote server or mobile device. The system will use SMS or MMS messages to transmit the fault location information. The messages will contain the latitude and longitude coordinates of the fault, which can be used to locate the exact location of the fault.
- Maintenance: Once the fault location is identified, maintenance personnel can proceed to the location for repairs. The system can also be used to schedule regular maintenance and inspections to prevent future faults.



IX. RESULT

- Accurate Fault Detection: The system is capable of detecting faults in underground cables accurately and quickly. The use of sensors, along with the Arduino board, helps to identify any changes in the electrical properties of the cable.
- Precise Fault Location: The GPS module used in the system helps to determine the precise location of the fault. This information is then transmitted to the maintenance team, who can quickly locate and repair the fault.
- Timely Repairs: The system helps to minimize downtime by enabling maintenance personnel to respond quickly to fault locations. This reduces the time required for repairs, ensuring that the system is back online as soon as possible.
- Cost-Effective: The system is cost-effective compared to other methods of fault detection. The use of sensors and Arduino board is more affordable than traditional methods of fault detection.
- Scalability: The system can be scaled up or down depending on the size and complexity of the underground cable network. This makes it suitable for use in various settings, from small networks to large power distribution systems.



X.FUTURE SCOPE

- Integration with AI: The system can be integrated with Artificial Intelligence (AI) algorithms to predict and prevent faults before they occur. AI algorithms can analyze the data collected by sensors and predict potential faults. This will allow maintenance teams to take preventive measures to avoid faults and minimize downtime.
- Remote Monitoring: The system can be enhanced to enable remote monitoring of the underground cable network. This will allow maintenance teams to monitor the network from a central location and quickly respond to faults as they occur.
- Cloud-Based Solution: The system can be enhanced to provide a cloud-based solution. This will allow users to access the fault data and reports from anywhere and at any time. The cloud-based solution can also enable real-time reporting of faults and automate maintenance requests.
- Wireless Communication: The system can be enhanced to use wireless communication technologies such as Wi-Fi, Bluetooth, or LoRaWAN. This will eliminate the need for GSM modules and reduce communication costs.
- Integration with Smart Grids: The system can be integrated with smart grids to provide real-time data on the performance of the underground cable network. This will allow power companies to optimize their networks and reduce downtime.

XI.CONCLUSION

In conclusion, the proposed methodology for the Underground Cable Fault Detector based on Arduino, GSM, and GPS modules uses sensors to detect changes in the electrical properties of the cable, the Arduino board to process the data, GPS module to determine the fault location, and GSM module to communicate the fault location to a remote location. This system can help to detect faults in underground cables quickly and accurately, allowing for timely repairs and minimizing downtime.

XII.ACKNOWLEDGMENTS

To everybody who helped us complete this project, we would like to extend our deepest gratitude. We had several challenges while working on the project due to a lack of knowledge and experience, but these people helped us get over all of these challenges and in the successful realisation of our goal to make a sculpture. We want to thank Assistant Professor Mrs. Sreelekshmi B for her advice and Assistant Professor Mrs. Namitha T N for organising our project so that everyone on our team could comprehend the finer points of the project's work. We would like to thank our HOD, Mrs. Suma S G, for her constant guidance and support during the project work. Without a doubt, we would like to thank the Mahaguru Institute of Technology administration for providing us with this educational opportunity.

XII.REFERENCES

[1] Mr. N. Sampathraja, Dr. L. Ashok Kumar, Ms. V. Kirubalakshmi and Ms. C. Muthumaniyarasi: 10TBASED UNDERGROUND CABLE FAULT DETECTOR
[2] Mr. Prasad D. Kadam, Ms. Ajita Nigam. Mr. VipinPandey, Ms.Subhashini Samal: Underground CableFault Detection Using IOT.
[3] Henna Sam.E.J, Pavithra.U.H, Ramakrishnan.P. V , Riyash Basha.S and Mr.T.M.Sathish kumar: Underground Cable Fault Detection Using IOT.
[4] GG Rahul Ashok, Ramashankar Yadav, Pavan Kumar M L, Somashekar S N ,P Sudi
[5] P. Nduhuura, M. Garschagen and A. Zerga, "Impacts of electricity outages in urban households in developing countries: A case of Accra Ghana", *Energies*, vol. 14, no. 12, pp. 3676, Jun. 2021
[6] D. Owiro, G. Poquillon, K. S. Njonjo and C. Oduor, Situational Analysis of Energy Industry Policy and Strategy for Kenya. Institute of Economic, Nairobi, Kenya:Institute of Economic Affairs (IEA), 2021
[7] M. U. Mehmood, A. Ulasyar, A. Khattak, K. Imran, H. S. Zad and S. Nisar, "Cloud based IoT solution for fault detection and localization in power distribution systems", *Energies*, vol. 13, no. 11, pp. 2686, May 2020.
[8] R. Kufakunesu, G. P. Hancke and A. M. Abu-Mahfouz, "A survey on adaptive data rate optimization in LoRaWAN: Recent solutions and major challenges", *Sensors*, vol. 20, no. 18, pp. 1-25, 2020