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IOT BASED UNDERGROUND CABLE FAULT DETECTION THROUGH ESP8266 MODULE

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Abstract: The civilized field is booming every day as India gains prominence as a progressing country. In urban areas, Underground cables, are rather used than overhead transmission lines. Even though Underground lines are beaten under some conditions, their usage is increasing as a result of simple advantages such as lower line losses, lower maintenance costs, and less vulnerability to severe climate effects. It's difficult to pinpoint the exact location of the flaws in underground cables. Since it's not obvious.

In this paper, we used an IoT-based technique with a Google database to detect faults using the Esp8266 IoT module. It is based on the Internet of Things. In this case, we used the Esp8266 IoT module, which connects Arduino sensors to the Internet. For communication, we had set up a Hot Spot on the router. We connected each Module to the transformer and used the Google database to check the transformer status. When compared to other techniques, our proposed method is more accurate and efficient.

Index terms- Short circuit fault, Open circuit fault, underground cable, IoT, ESP8266 module.

I. INTRODUCTION

Underground links have been widely utilized for power dissemination networks over the course of the years [1]. This is a result of their reasonableness for underground associations, better security from exercises of miscreants and criminals, and protection from unsafe climatic conditions, for example, rainstorms and hurricanes [1]. They are modest, simple to keep up with, and harmless to the ecosystem [2]. They have decreased support and working expenses, for example, lower storm reclamation costs. Moreover, underground links dispense with the danger of wind-related tempest harm. They are not exposed to the annihilation brought about by flooding which normally riches and interferes with electric help [4]-[8]. They guarantee fewer brief interferences through a tree falling on wires or electric posts tumbling down consequently improving public security. Life-wire contact wounds are decreased [9]-[14]. It prompts the disposal of ugly posts and wires on the roads in this manner upgrading the visual scope of the drivers and walkers on the roads [2]

To decrease the danger presented by ecological effects on the exceptionally delicate circulation organizations, underground high voltage links are progressively utilized [3]. Despite these benefits, finding flaws in underground links can be a lumbering errand. It is accordingly important to foster an extremely proficient method for identifying issues in these links. These papers are equipped towards planning a framework that can find the broken focuses in an underground link all together is to work with a faster fix, improve the framework unwavering quality, and decreased the blackout period to the barest least. The underground link framework is extremely helpful for circulation essentially in metropolitan urban areas, air terminals, and protection administrations [3], [15]. At the point when issues happen, the forced stream is diverted towards the issue, and the stock to the area is blocked [9].

It is less exorbitant for bigger distances, eco-accommodating, and low support cost. However, on the off chance that any issue happens in the cable, it is hard to find the fault and its type. So, this proposed method is utilized to distinguish the area and sort of flaw in an advanced manner. The prerequisite of finding the fault point in an underground cable altogether is to work with a speedier fix, improve the system reliability, and diminished blackout.

II. REVIEW OF PREVIOUS WORK

Throughout the long term, specialists have put forth a few attempts to plan and execute an electronic underground link deficiency locator that will assist with conquering the issues just as difficulties experienced in the utilization of underground links and discovery of shortcomings that happens in the underground links however shockingly, there were limits to their plans. Bhuvneshwar et al., [16] proposed a flaw area model for the underground force link utilizing a microcontroller. The equipment model of the Underground Cable Fault Locator is executed and positive outcomes were presented. This equipment model can find the specific flaw area in an underground link. There needs to additional improve the work with the goal that it can likewise find an open-circuited link.

Dhivya et al., [17] Developed a model that utilizes the possibility of OHMs law to recognize flaws in links. The proposed framework utilizes a bunch of resistors addressing link distance in Kilometres and deficiency discovery is by a bunch of switches at each Kilometre (km) to approval the exactness of the identification. The sort of shortcoming at a specific distance is shown on the LCD interfaced with the microcontroller. Their work is just recreation as no plan and development work is included. Singh et al., [18] Presented a framework that can identify the area of the open circuit and short out a deficiency in the underground cable from the base station in km with the assistance of the Atmega16 microcontroller. Just the re-enactment was finished utilizing the PSIM test system. Reference [19] proposed a microcontroller-based underground link shortcoming distance finder. In any case, there was no assessment to know the exhibition of their proposed framework. Shahir et al.,[20] Introduced a brilliant GSM-based issue discovery and area framework that can be utilized to precisely find the particular spot where a flaw had happened.

All the above work has one impediment or the other. So, we have designed a device with help of IoT to locate the exact fault and location using Google Database.

III. EXISTING SYSTEM

For locating earth faults and short-circuit faults, the Murray loop test is the most popular method. A sound (good) cable must, however, be run along the defective cable to perform the Murray loop test. For fault spot, this test uses the Wheatstone bridge theory.

Short-circuit and earth faults in underground cables can also be found using the Varley loop test. The Wheatstone bridge theory is also used in this test. The Varley loop test differs from the Murray loop test in that the resistances R1 and R2 are set in the Varley loop test, and a variable resistor is inserted in the faulted leg. If the fault resistance is high, the Murray loop test's sensitivity is decreased, and the Varley loop test might be a better option.

A cable thumper is a high-voltage surge generator that can be carried around. It's used to send a high-voltage DC surge (roughly 25 kV) through the defective cable. The open-circuit fault will break down if you apply a sufficiently high voltage to the defective cable, resulting in a high-current arc. At the exact position of the fault, this high current arc produces a distinctive thumping sound.

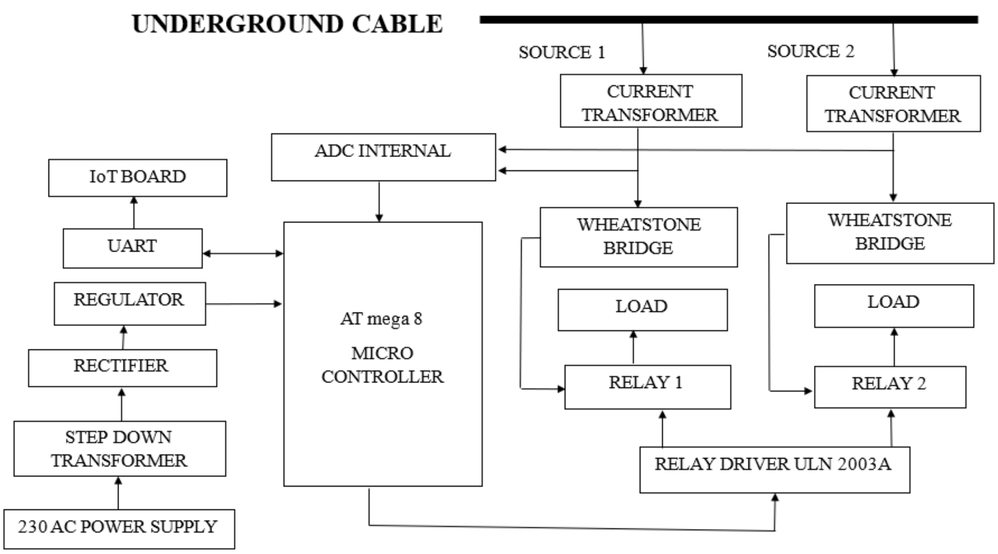
IV. LIMITATIONS OF EXISTING SYSTEM

The current method has several drawbacks. If a fault occurs in a cable, the entire cable is tested for the identification of the fault. It takes a long time and a lot of human effort to complete. This strategy is only used in the case of a short distance. The likelihood of a mishap increases as the repair work progresses. Since overhead cables are vulnerable to light, the disruption is triggered by it touching them. The use of bare conductors causes harm if they split. The voltage drop is important, as is the cost of maintenance.

V. PROPOSED SYSTEM:

In this paper, we propose a new technique for reducing fault-related damages in underground cables. Besides, when compared to a variety of methodologies, the accuracy of our proposed scheme is high. We used an IoT-based technique with a Google database for fault detection with the help of the Esp8266 IoT module. It is based on the Internet of Things.

VI. BLOCK DIAGRAM:



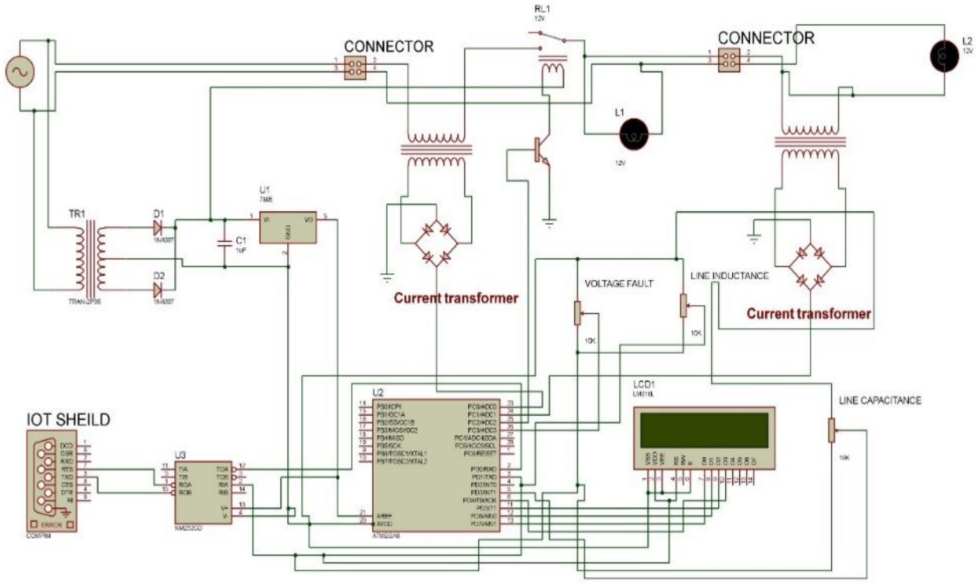
VII. METHODOLOGY:

This paper is intended to accomplish the checking of underground cables and to give data about the distinguished shortcomings. The cables will be monitored for the overvoltage, under-voltage, short circuit, and open-circuit conditions. It will also monitor the parameters such as capacitance and inductance.

If any issues happen that will be identified by a current transformer and conveys that message to ADC internal and Wheatstone bridge. The ADC internal will convert AC into DC and feed it into the microcontroller. The microcontroller investigates the got signal and initiates the UART board to send data about the checked boundaries to the concerned individual via the Esp8266 IoT board.

In the event of a fault, IoT would detect the exact location of the fault with the help of the Google database. The microcontroller also initiates necessary actions to cut off power to the load by triggering the relay driver ULN 2003A, which in turn triggers the particular relay connected to the area of the fault.

VIII. CIRCUIT DIAGRAM:



IX. DESIGN AND DEVELOPMENT OF HARDWARE:

The 230V is first, stepped down to 12V AC utilizing a stepdown transformer. This is then changed over to DC utilizing a middle tap full-wave rectifier. The AC swells are sifted through by utilizing a capacitor and given to the information pin of this controller. At the output pin of this controller, we get a steady 5v DC which is utilized for the microcontroller and different ICs in this task. This task is intended to accomplish the monitoring of underground cables and to give data about the identified shortcomings. Overvoltage, under-voltage, short out, and open circuit conditions will be observed by the current transformer. On the off chance that any deficiencies happen that will be recognized by the current transformer and conveys that message to the microcontroller through ADC internal. The microcontroller will analyze the parameters monitored and identify if the fault has occurred or not. It will simultaneously send the received data to the IoT board. In the event of a fault, the exact location of the fault will be identified with help of the Google database. And supply to the load would be cut off by triggering relay.

X. WORKING:

In this procedure, we are utilizing the Esp8266 IoT module framework. The capacity of the Esp8266 IoT module is, to give the availability between Arduino sensors to the web. For the web correspondence in the Esp8266 IoT module, we are making a Hotspot through a switch. We are associating each Esp8266 IoT module with a transformer (implies one hub MCU for each transformer independently). We are utilizing the Google data set for checking the status sign of the transformer, if there should be an occurrence of disappointment, the status signal will be sent.

It is IOT based program. Esp8266 IoT module is associated with Transformer sets, one MCU module for every Transformer. Esp8266 IoT module will take the signal, status of transformer sets and will pass it to the Microcontroller. It will continuously check the data, in case of abnormality such as low or high voltage warnings will be sent and saved in the Google data set for further analysis. If a signal is received by the Esp8266 IoT module that implies a shortcoming event is advised and activity against this flaw will be taken. By this strategy with the assistance of the Esp8266 IoT module association, we effectively identify the deficiency event of the line with a very quick activity.

XI. RESULT:

The underground fault detection system is being tested which shows the different types of underground cable faults in LCD of the system and also in mobile webpage through IoT Wi-Fi Module. This system sense fault in the circuit through a current transformer that's fixed in the line at certain intervals and a relay is connected to each unit. When a fault occurs the power to the load is cut off through the relay. For this project, various case studies were performed for all three phases (R, Y, and B) of the cable line separately in each phase.

XII. CONCLUSION:

The difficulty of detecting a fault in underground lines is addressed in the proposed effort using the Esp8266 IoT module. We devised an IoT-based model for more accurate cable fault detection. We suggested using the Esp8266 IoT module to detect the location of a fault in underground cables. This is given that it produces the best results and precision as compared to other approaches. This technique also has a high rate of operation, which is critical for power quality continuity and stability. Through connecting different sensors, we will be able to use this technique in the future to detect faults in power lines/cables as well as transformers.

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