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Research Article

A Novel Approach for Hybrid Automatic Fault Detection and Location System for Transmission Lines

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I N F O

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A B S T R A C T

A fault in transmission lines is a general problem rising due to a number of factors like wind, heavy snowfall, and rainfall etc. The paper presents a smart error detection and location system that is developed to effectively and perfectly specify and establish the precise spot where the fault has occurred. The system is developed using the Microcontroller programming concept and ensure an intelligent fault detection system to shorter to answer time for technological staff to identify and fix these faults. The advantage of the system is that it repeatedly detects faults, analysis, and categorizes these faults and then calculates the accurate error space from the grid station.

Keywords: FT, FDI, GSM, Global Positioning System (GPS), Intelligent Electronic Devices (IED), Lab-DER, PIC, ST, WT

Introduction

Fault discovery and categorization are two vital aspects of authority cable protection. Over the days, the researchers are in search of to appreciate the quick and correct finding and classification of faults in transmission lines by mistreatment varied strategies, so the faulted system is protected against potentially damaging effects caused by the fault. moreover, the knowledge provided by fault detection and classification will greatly facilitate the situation of fault, therefore reducing the fault clearing time[2] strategies for fault detection, classification, and site in transmission lines and distribution systems are intensively studied over the years. With the ideas related to a good grid attracting growing concern among researchers, the importance of building associate degree intelligent fault observation and designation system is capable of classifying and locate different types of faults that cannot be overdone. The past twenty years have witnessed the fast progress in varied fields about the detection, classification, and site of faults in power systems. The advance in signal process techniques, computing and machine learning, a Global Positioning System (GPS) and communications have enabled additional and more researchers to hold out studies with high width and depth in this the restrictions of ancient fault protection techniques will best retch moreover, the 2 major restrictions of on-line fault designation systems are being resolved. The primary restriction is that the problem in information acquisition in addition to ancient measuring instrumentality like potential electrical device, current electrical device, and the terminal unit, fresh developed Intelligent Electronic Devices (IEDs) are being deployed to get data at several nodes within the grids. Self-powered non-intrusive detectors are being developed with the potential to make a sensor network for good on-line observation of smart grids. Moreover, within the case wherever the classifier or the locater is capable of distinguishing between faulty and non-faulty states, there's no bound to implement

extra fault detection strategies. One technique to perform fault detection during this case is to use a private classifier to differentiate faulty and non-faulty states. Another idea is to feature the non-faulty state to the output classes, and a fault is detected whenever the output is apart from the non-faulty state. Considering the learning talents of the models used for classification, there's no essential difference between each scheme. Thus, for clarity, we have a tendency to exclusively gift here either strategy that is engaged in some special cases or representative methods that are irregular of the classification methods. Negative sequence elements were calculated certain fault detection. For an extra stable detection of faults, the authors designed a joint fault indicator by convoluting the partial degree of difference with regard to time of negative series elements with a triangular wave, so the odds of issuance false alarms are reduced. This fault detection technique mistreatment the joint fault indicator additionally shows lustiness in cases of frequency deviation and amplitude variation.

Problem Formulation

In order to improve the reliability of power supply to consumers, many electricity service providers are looking for methods to deploy the latest and emerging technologies. Fault detection in transmission lines is also a challengeable task to minimize the duration of outages and response time to major faults faced to optimize the reliability of supply. The transmission lines can be underground and overhead hence we need a much-optimized fault detection and location system to enable the smooth power supply to consumers.

Methodology

In this system, we are using the same resistance because the principle of cable fault detection is to find the resistance of the cable. This system uses the fact when any fault like short circuit occurs the voltage drop varies as a resistance between the distance changes. A set of resistors are used in this system to represent the cable and the dc voltage is fed at one end and the fault is detected by detecting the change in voltage using an Analog to Voltage converter. Analog to Digital converter I used to detect the fault current and show the distance of the fault. An LCD display on voltage drop principle and SMS Notification will be sent to the electric city department with the exact location of fault using GSM Technology. The system is prepared by a set of resistors arranging in 4 rows for underground cable fault detection and set of another 4 rows for overhead cable fault detection. A set of three rows represents the three phases for overhead and underground cable faults. Each row is checked through a relay every 1 sec in order to find faults. The fourth row of resistors is connected to 15 V supply through a resistor the common point of resistors and cable series resistors are connected to an Analog to Digital converter. In this system, the switch is used which is connected in series to each resistor t represent the fault (Table 1).

Table 1.Status of Fault Occurrence

Swtich Status	LCD	GSM
1. PRESSED	Fault at present location	SMS sent with fault location
2. RELEASED	No fault occurred yet	No Action

The methodology starts with the analysis and review of previous work done on the selected topic. The work is based on simulation and for this, the selected software is Proteus for circuit designing and Arduino SDK for logic building. The other components used for this concept include ULN 2003 A Relay Driver, 4 Relays, and Switches for showing faults. The simulation will explain properly the modern fault detection and location system.

Results

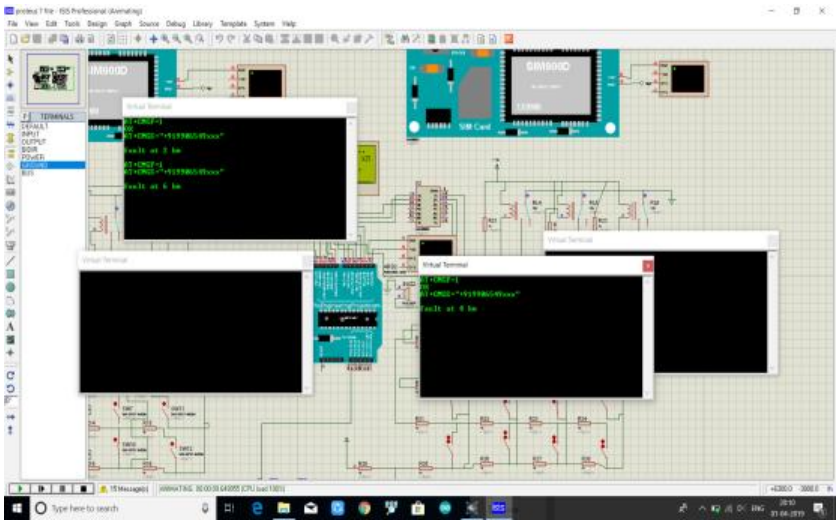

Figure 1.SMS Sent to Power Department

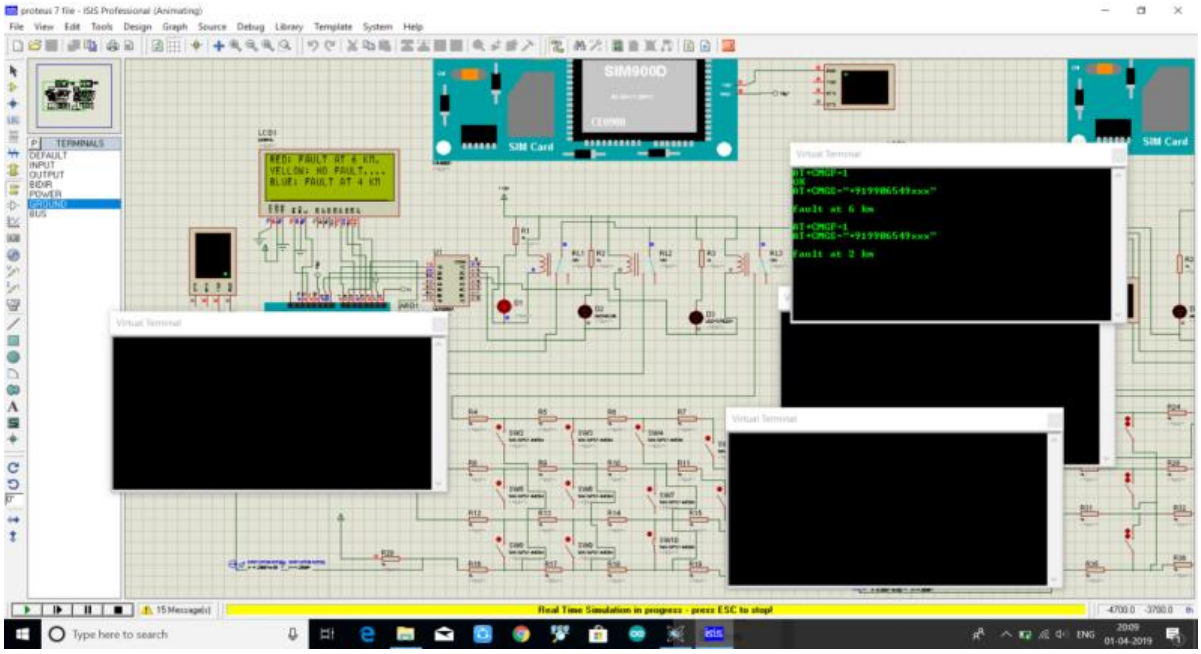

Figure 2.SMS Sent

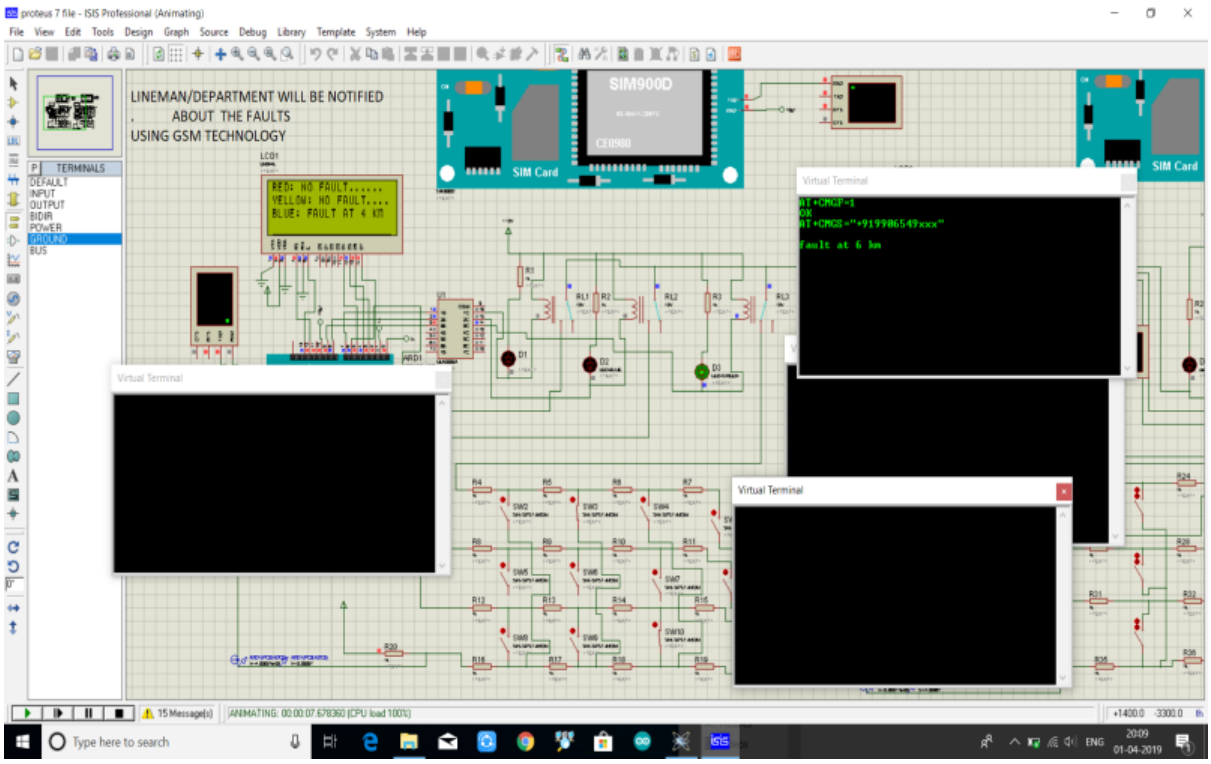

Figure 3.Department Will get notification about the faults

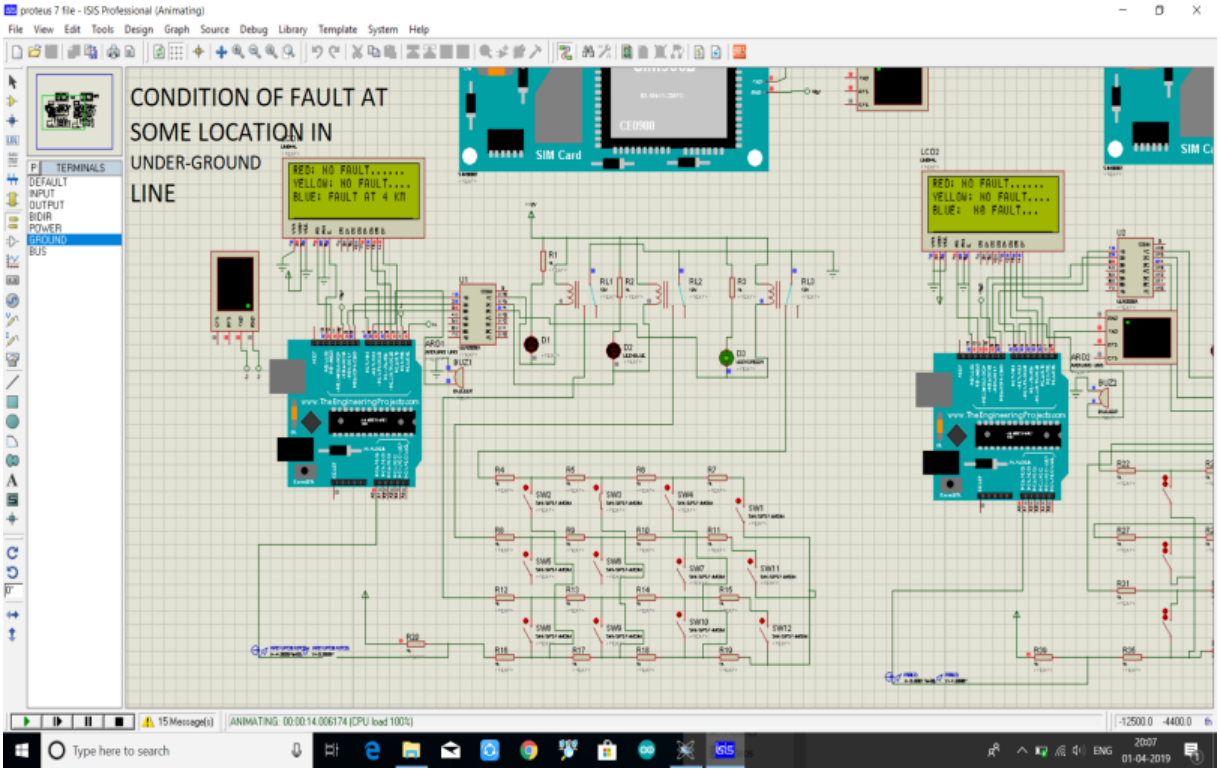

Figure 4.Condition of Fault At Some Location In Underground

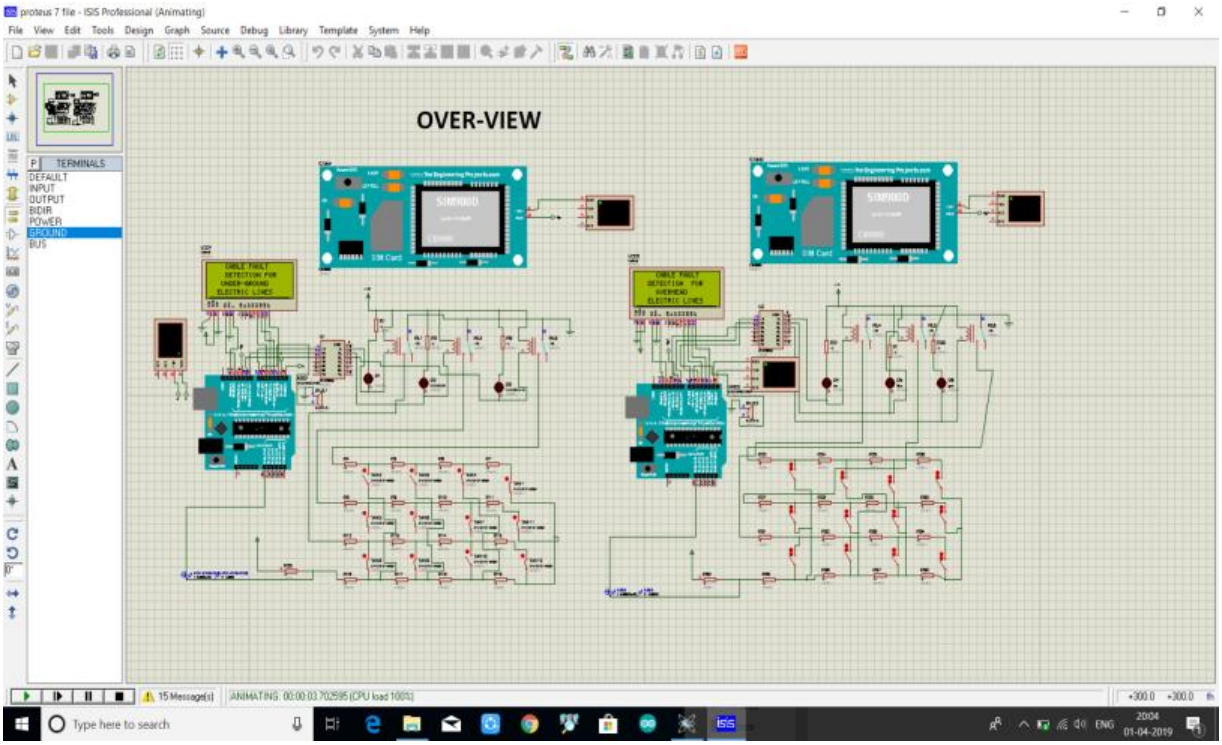

Figure 5.Overview

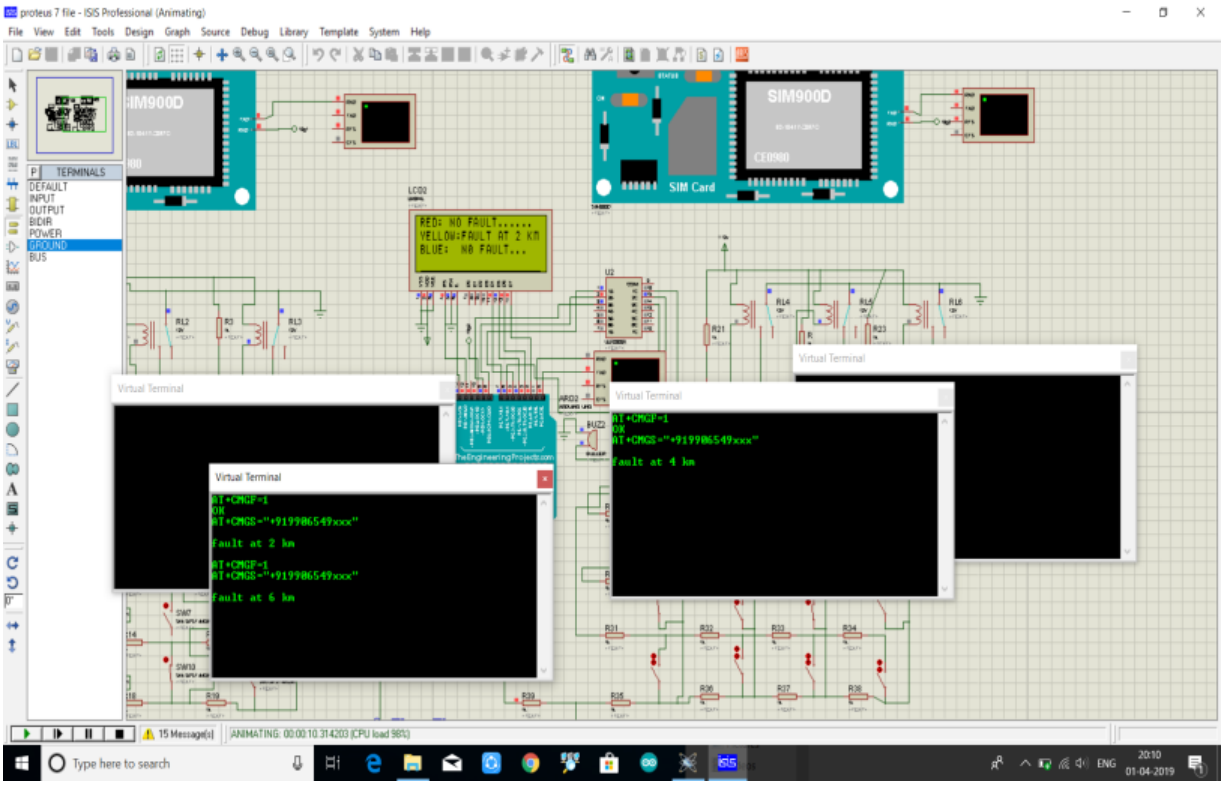

Figure 6.Notification about Fault location

Conclusion

The electricity consumers are facing tremendous electricity crises because of the common faults in transmission lines spread overhead or underground. To enhance the power supply reliability and minimize the response time taken by the technical staff for the restoration of power supply, we need a modern and technology-enabled fault location and detection system to ensure the uninterrupted electricity supply to the consumers. The proposed system is fully ICT based and capable of identifying the exact location and distance of a faulty spot from the grid station. Our proposed system is based on Arduino programming and offers a novel and reliable approach for identifying faults in overhead and underground faults.

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