FAULT DETECTION AND DISTANCE FINDING IN UNDERGROUND CABLE BY USING GSM MODEM

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ABSTRACT

The objective of this paper is to determine the distance of transmission line fault from base station in kilometers USING AN ARDUINO UNO board. While a fault occurs for some reason, at that time the repairing process related to that particular cables difficult due to not knowing the exact location of the cable fault. The proposed system is to find the exact location of the fault.

The paper uses the standard concept of Ohms law i.e., when a low DC voltage is applied at the feeder end through a series resistor (Transmission lines), then current would vary depending upon the location of fault in the cable. In case there is a short circuit (LG, LL, LLG, LLL and LLLG), the voltage across series resistors changes accordingly, which is then fed to inbuilt ADC of ARDUINO UNO board to develop precise digital data for display in kilometers.

INTRODUCTION:

The progress of science and technology, the unprecedented advances taking place in the field of communication technologies such as GSM, Wi-Fi, and Bluetooth and so on. The application of the wireless communication technologies are very extensive and the smart home is one of those important application area. With modern electronic science and technology development and the improvement of people's living standard, people living environment of increasingly high demand. Previously only the pursuit of living space and luxury decoration, now more to the pursuit of security, comfortable room, convenient and intelligent, so intelligent home furnishing concept has been gradually understand and accept.

The aim to this paper is to research a valuable wireless system that will providing controlling of home appliances remotely and able home security against intrusion when the home host is absence of home. The user to automate their homes remotely is the main

ISSN: 2278-4632
VOL-10 ISSUE-7 NO. 11 JULY 2020

target of this system. There was a need to automate home so that users can take advantage of the technological advancement in such a way that a person can send a message to home control centre when he forget to turn off air conditioner instead of returning home. In addition home security has been a major issue. Therefore this paper proposes a system that allows user to be control home appliances wherever and whenever.

BLOCK DIAGRAM:

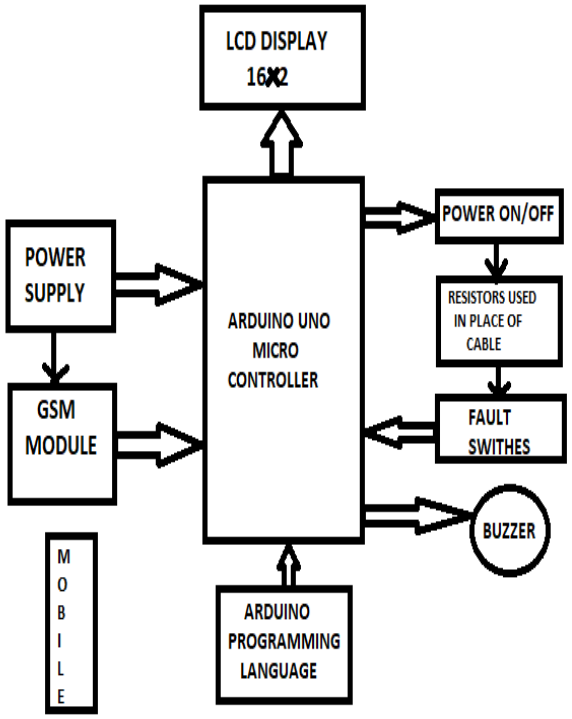

Fig.1: Block Diagram

LCD display: Normal. Abnormal condition 3 Phases should be there and each phase 4 switches. (Each switch 2KM) GSM to send the message regarding distance and fault phase

BLOCK DIAGRAM DESCRIPTION:

Power Supply:

This section is meant for supplying Power to all the sections mentioned above. It basically consists of a Transformer to step down the 230V ac to 9V ac followed by diodes. Here diodes are used to rectify the ac to dc. After rectification the obtained rippled dc is filtered using a capacitor Filter. A positive voltage regulator is used to regulate the obtained dc voltage.

Microcontroller:

This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced.

LCD Display:

This section is basically meant to show up the status of the project. This project makes use of Liquid Crystal Display to display / prompt for necessary information.

Relay Section:

This section consists of an interfacing circuitry to switch ON / OFF the system whenever any unhealthy conditions i.e. overload is detected. The project uses the standard concept of Ohms law i.e., when a low DC voltage is applied at the feeder end through a series resistor (Transmission lines), then current would vary depending upon the location of fault in the cable.

In case there is a short circuit (Line to Ground),the voltage across series resistors changes accordingly, which is then fed to an ADC to develop

ISSN: 2278-4632
VOL-10 ISSUE-7 NO. 11 JULY 2020

precise digital data which the programmed microcontroller of 8051 family would display in kilometers.

The paper is assembled with a set of resistors representing cable length in KM's and fault creation is made by a set of switches at every known KM to cross check the accuracy of the same. The fault occurring at a particular distance and the respective phase is displayed on a LCD interfaced to the microcontroller.

FLOW CHART METHODOLOGY:

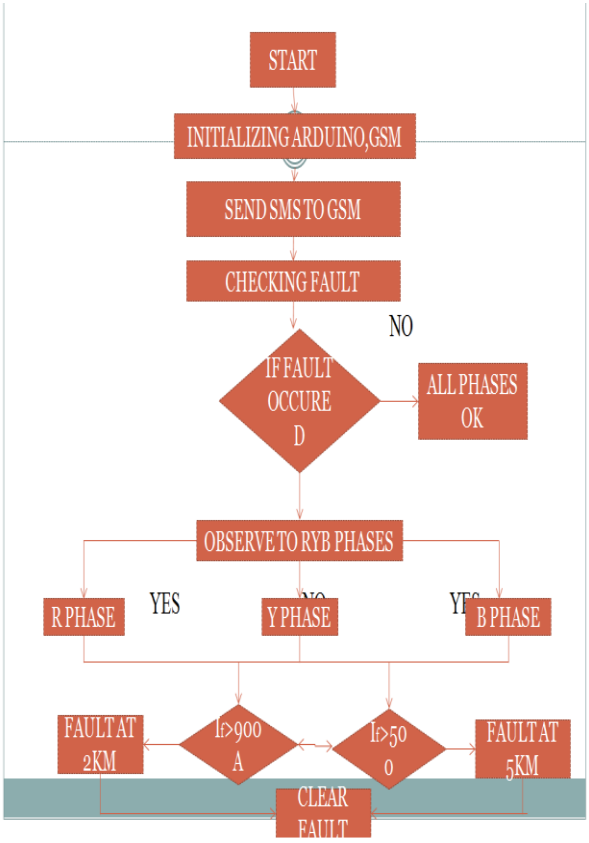

Fig.2: Flow chart

OPERATION:

While any of the fault 12switches are operated they impose conditions like line to ground (LG), line to line (LL), and line to line to line (3L) fault as per switch operation. The program while executed continuously scans by operating the 3relays in sequence of 1sec interval.

Fig.3: PCB circuit

Any NO point while driven to GND through the common contact point of the relay develops a current flow through R1 & any of the cable by the fault switch depending on the created fault. Thus the voltage drop at the ADC pin varies depending on the current flow which is inversely proportional to the resistance value representing the length of cable in KM. This varying voltage is fed to the ADC to develop an 8 bit data to the microcontroller port1. Program while executed an output in the LCD display upon the distance of the fault occurring in KMs.

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In a fault situation it displays R F 4KM if the 4KMs switch is made ON. Accordingly all the other faults are indicated .

The four set of resistors representing cables i.e. R1, R2, R3, R4 and R5, R6, R7, R8 then R9,R10, R11, R12. The twelve switches representing fault switches.

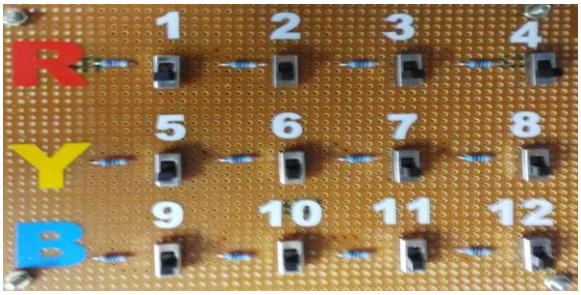

Fig.4: Switch Board Panel

In this project we are using three relays and three LED's which are referred as three phases (R, Y and B). In normal condition there is no glow in LED. While in fault condition the LED is glow respective with their phases. The normal and fault conditions LCD display as follows.

CASE STUDIES:

Case Study 1

In normal condition all switches are open. The LCD display as

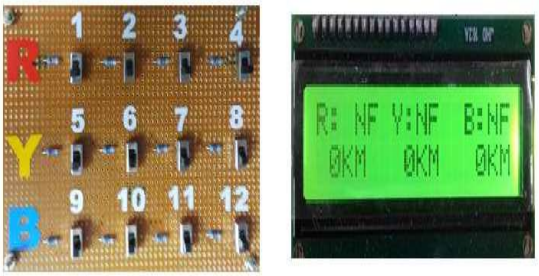

Fig.5: Normal Condition

Case Study 2

In fault condition any one of the switch is closed. The LCD display as

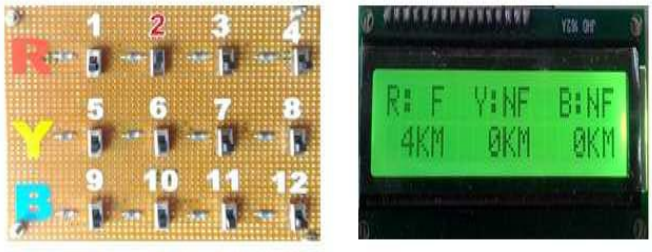

Fig.6: Fault Condition

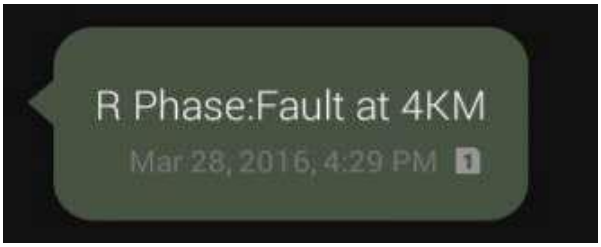

Fig.7: Fault in R-Phase through GSM modem

Case Study 3

In fault condition switch 12 is closed i.e. in B-Phase fault occurred at distance of 8KMs.

The LCD display as follow.

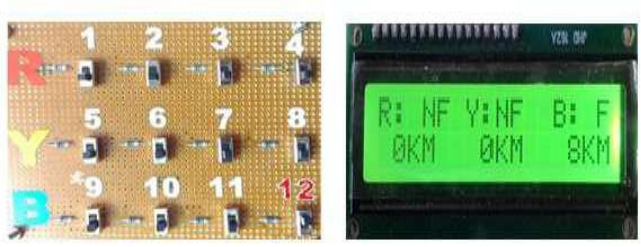

Fig.8: Fault in B-Phase

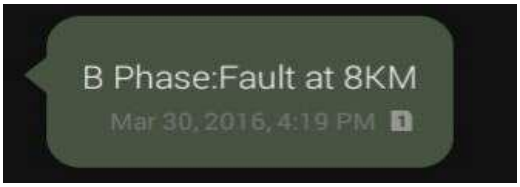

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Fig.9: Fault in B-Phase through GSM modem

Case Study 4

In fault condition switch 7 is closed i.e. in Y-Phase fault occurred at distance of 6KMs.

The LCD display as follow.

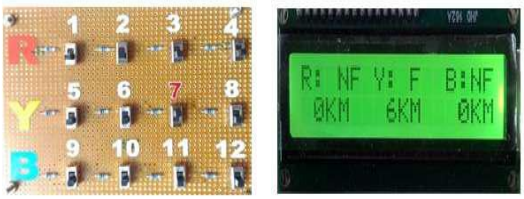

Fig.10: Fault in Y-Phase

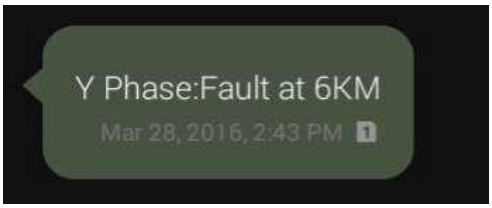

Fig.11: Fault in Y-phase through GSM modem

Case Study 5

In fault condition switch 2 is closed i.e. in R-Phase fault occurred at distance of 4KMs.

The LCD display as follow.

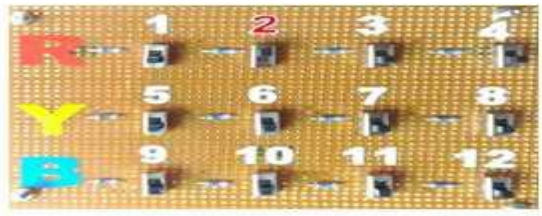

Fig.12: Fault in R-Phase

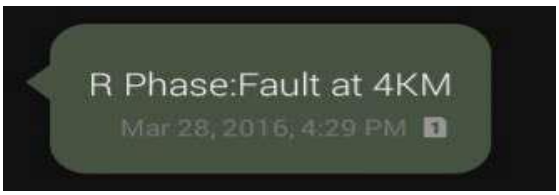

Fig.13: Fault in R-Phase through GSM modem

Case Study 6:

In fault condition switches 2, 7 and 12 is closed i.e. in R-Phase, Y-Phase and B-Phase fault occurred at distance of 4KMs, 6KMs and 8KMs respectively.

The LCD display as follows

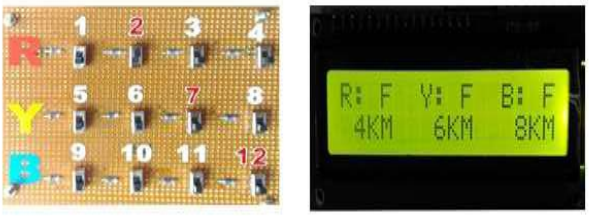

Fig.14: Fault in R, Y and B Phases

Fig.15: Fault in R, Y and B Phases through GSM modem

The results are shown in following tables

1. For R-phase switches are numbered as 1,2,3,4.
2. For Y-Phase switches are numbered as 5,6,7,8.
3. For B-Phase switches are numbered as 9,10,11,12.

ISSN: 2278-4632
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4. Each switch separated by a distance 2KM.

CONCLUSION:

The paper "distance calculation and fault finding in underground cable" has been successfully designed and tested. Integrating features of all the hardware components used have developed it. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced IC's and with the help of growing technology the project has been successfully implemented.

The microcontroller displays the message regarding the fault location on the LCD. GSM module present on the receiver unit transfers this message to the desired location. Thus fault detection and protection of the circuit is achieved. Nonetheless, there are still new ideas to improve it and to add new functionality to it. Parameters such as Current Rating and Impedance can be calculated.

GSM module is used to send a SMS to the sub-station about phase fault and distance calculated. Here, in this project we have designed a GSM based transmission line monitoring and indication system that sends information of the same to electricity board via SMS.

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