Detection & Notification of Underground Cable Fault using Atmega328 over GSM Modem

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Abstract— Various environmental factors or environmental constraints such as snow, storms, heavy rain falls etc., affect the performance of the overhead cables. Due to this, and indeed due to technical faults occurring at underground, it becomes very difficult to identify exact fault location as they are buried underground. The project "Detection and Notification of Underground Cable Fault Using ATMEGA328 over GSM Modem" so designed aims to eliminate such problems and identifies the exact location of the underground fault. The GSM module has been implemented by which the information can be sent to the concerned person in the form of a text message specifying the exact type of the fault as well as its location from the base station. The primary aim of the project is to design a circuit that helps to identify the open and short-circuit faults in the underground cables using Arduino and also find the distance of the these faults accurately from the base station.

Key words: Arduino ATMEGA328, Global System for Mobile Communication (GSM), Higher Current Relay

I. INTRODUCTION

Fault location techniques rise nowadays an increasingly importance for distribution networks owing to modern power system control requirements. The benefits of fault location are: the fast repair to restore power system, improving system availability and performance, reduction of operating costs, and saving time. The fault location in complex urban cable distribution system is difficult and time consuming.

Consequently, a cable fault location technique with high accuracy and high efficiency is increasingly demanded with the increased use of underground cables nowadays in modern cities and large urban communities.

Underground cables are characterized with their own short circuit behavior resulting from the unique profiles of their electrical quantities, which are essentially based on the cable type, size, conductor spacing and adopted grounding configuration. Unlike overhead lines, cables have quite low impedances resulting from the smaller spacing between the cable conductors. This results in different problems in several areas including load sharing and short circuit levels. On the other hand, smaller spacing between the cable conductors and the sheath as well as the higher dielectric constants their insulations enlarges their capacitance significantly.

But once the fault occurs in an underground cable, identification and repairing of those faults is difficult and also time taking as they are buried underground.

Generally one comes across different types of faults such as short-circuit, open circuit and earth faults in the underground cables , and the process of fault tracking without knowing the location related to that particular cable is very difficult.

A. *Aim & Objectives of the Project*

On studying the cable faults occurring underground due to technical faults, or environmental factors, we want to come up with a system which would solve the increasing faults faster occurring at underground. Also, to stand in with the digital trend in technology, we want to send a text message to the concerned operator of specifying exact fault type, indeed its' location as the fault gets detected.

B. *Objectives*

- Determine the exact location of the fault
- Detect Open circuit fault
- Detect Short circuit fault
- Send text message to the operator or concerned person specifying the exact type of fault as well as its location from the base station
- Detect resistance difference to find out fault location

II. COMPONENTS

A. *GSM Module*

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. A wireless modem behaves like a dial-up modem

Fig. 1: GSM Module

B. *ATMEGA328*

Fig. 2: Arduino Nano ATMEGA328

Some of its features are high speed flash memory of 512KB, SRAM of 8 KB, 16 MHz clock. The microcontroller is responsible for counting the flow sensor pulses, and determines flow rate. When flow rate exceeds predefined limit, the solenoid valve for theft is turned off by the microcontroller. The microcontroller is also programmed to turn on/off supply water control solenoid valve according to the time of the day. At the end of fixed duration of time the microcontroller sends required data to central database via GSM. When theft is identified appropriate message is sent to particular responsible officer's mobile phone.

C. Features

- Microcontroller Atmel Atmega168 or Atmega328
- Operating Voltage (logic level) 5 V
- Input Voltage (recommended) 7-12 V
- Input Voltage (limits) 6-20 V
- Digital I/O Pins 14 (of which 6 provide PWM output)
- Analog Input Pins 8
- DC Current per I/O Pin 40 Ma
- Flash Memory 16 KB (Atmega168) or 32 KB (Atmega328)
- of which 2 KB used by boot loader
- SRAM 1 KB (Atmega168) or 2 KB (Atmega328)
- EEPROM 512 bytes (Atmega168) or 1 KB(Atmega328)
- Clock Speed 16 MHz

*D. 16*2 LCD Display*

A 16*2 liquid crystal display will be interfaced with the microcontroller to show the user the distance of the fault location.

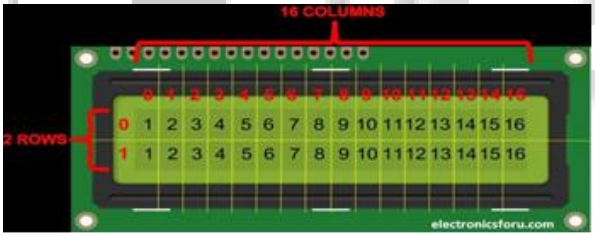

Fig. 3: Diagram of LCD Display

E. Relay

Relay is an electromagnetic device which is used to isolate two circuits electrically and connect them magnetically. They are very useful devices and allow one circuit to switch another one while they are completely separate.

They are often used to interface an electronic circuit (working at a low voltage) to an electrical circuit which works at very high voltage. For example, a relay can make a 5V DC battery circuit to switch a 230V AC mains circuit. Thus a small sensor circuit can drive, say, a fan or an electric bulb.

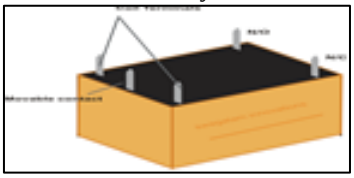

Fig. 4: Relay Pin Configuration

F. Hard Ware Implementation

The hardware & components used have their own specifications, requirements and drawbacks. To make them compatible with each other and help them communicate without errors, intermediate circuits are required to provide them with required ratings and take care of their threshold values helping them work effectively.

III. BLOCK DIAGRAM

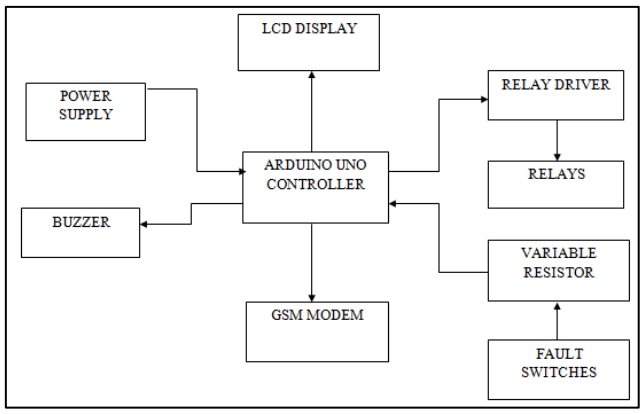

Fig. 5: Block Diagram of Detection & Notification of Underground Cables Using ATMEGA328 over GSM Modem

IV. AIM

On studying the cable faults occurring underground due to technical faults, or environmental factors, we want to come up with a system which would solve the increasing faults faster occurring at underground. Also, to stand in with the digital trend in technology, we want to send a text message to the concerned operator of specifying exact fault type, indeed its' location as the fault gets detected.

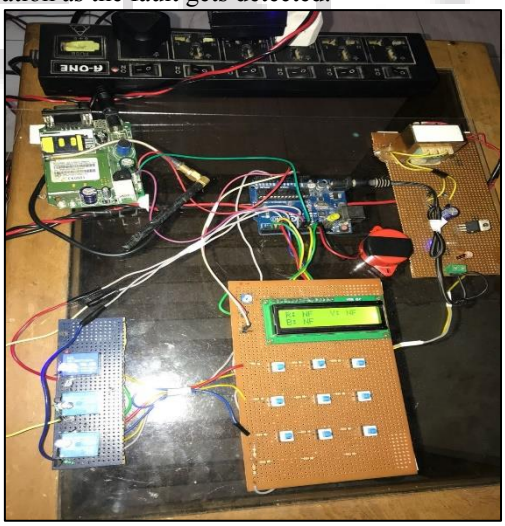

Fig. 6:

V. SOFTWARE IMPLEMENTATION

A. Proteus Professional 7

Proteus professional 7 is design suite software, part of Lab center Electronics, used for simulation of various project modules before the actual implementation. In this project, proteus was used to design the LCD interface, fault switches, and other modules.

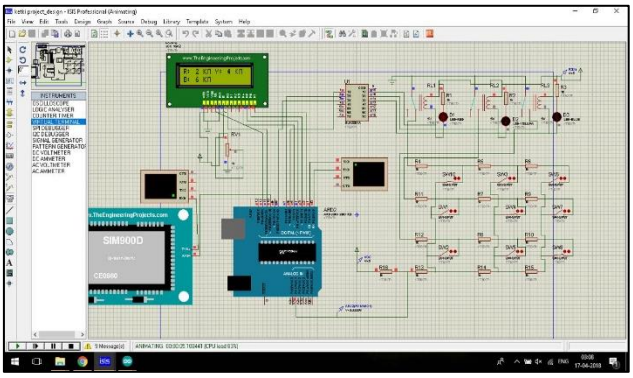

Fig. 7:

6. FLOWCHART

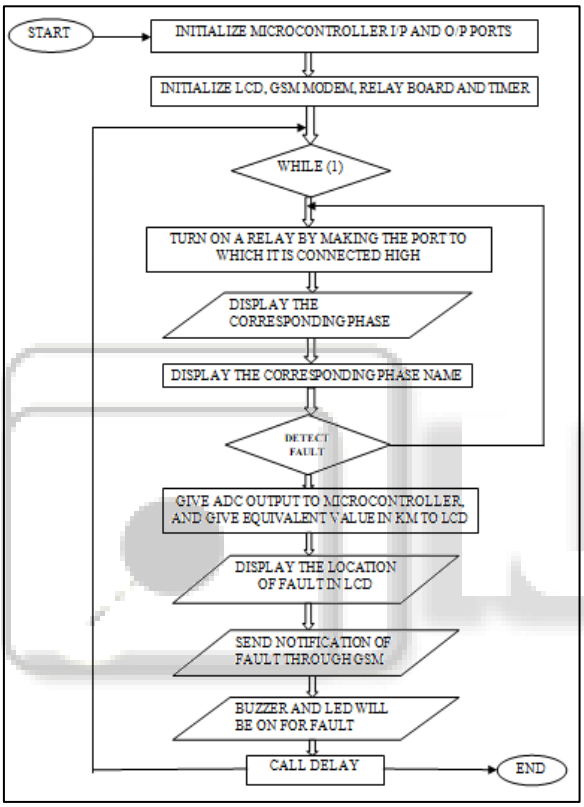

Fig. 8:

VI. Applications & Advantages

1) It is used to displace distance on operator mobile phone
2) It is used for detecting short circuit or open circuit default.
3) Works 24 hours working project model
4) Does not heat
5) Longer distance fault detection
6) 3-phase, 1-phase live wire

VII. Advantages

- Less maintenance
- It has higher efficiency
- The manufacturing cost is low
- Less damage during severe weather
- This product/ circuit is flexible in any environment

VIII. Conclusion

Using Underground cable fault detection using ATMega328 and GSM Module the fault is easily detected with exact location, and usage of module provides quick information through text message to the specifies state owned operator or private employee.

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Biographies

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