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Underground Cable Fault Detection

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Abstract: ***As India rising as a developing country, civilized area is also growing day by day. As underground cables are best under such conditions its utilization is also growing because of its obvious improvement like lower transmission losses, lower maintenance cost and they are less susceptibility to the impact of severe weather and so many. But it is having few disadvantages too like costly installation and finding of fault location. As it is not detectable it becomes not possible to find correct fault location. This paper is about to detect the fault spot in underground cable lines in kilometers using an Arduino micro controller. The proposed is working on the principle of ohm's law. When any faults occur voltage drop occurs depending on the distance of the fault in the underground cable. Since current varies a set of resistors are used to represent the cable and DC voltage is given through transformer when fault is identifying by detecting change in voltage, using ADC and microcontroller to make that fault distance is popup on LCD display and buzzer produces alarm to alert.***

Keywords: Short circuit fault, Open circuit fault, underground cable, Arduino kit, LCD, buzzer

I. INTRODUCTION

Till the last decade the cables are made to place on overhead and currently a day's mostly uses land cables. There are some techniques in overhead cables like phasor gauge system which is able to identifying the accurate location of faults and its types. The underground cables are essential in some places particularly in cities, Air ports and defense services. We can't easily identify the faults in underground cables. This project deals with Arduino microcontroller, resistor circuit, fault switches, LCD and buzzer. This system operates capably. Many times faults are happen because of construction works and other reasons .When fault is happen it is difficult to hollow out cables because of not knowing the correct fault location .In the recent years the development of the fault analysis has been developed with the signal processing algorithms and results in transient study base techniques.

II. LITERATURE SOURCES

There are some general methods of locate faults are,

A. Time domain reflectometry (TDR)

The TDR fed a signal through the cable happening without any insulation degradation. If no faults occur in the cable the signal comes back without any losses i.e. in a known shape. The consequence of TDR is that it does not give exact faults.

B. Murray loop test (MLT)

In this model a bridge circuit used for detecting faults in underground or water cables. It uses the principle used in potentiometer experiment. The drawback of MLT is that it assumes only one fault exists at a time.

C. Ohm`s Law

When a fault is identified, voltage drop will change depending on the distance of fault in cable, then the current also varies with voltage.

III.DIFFERENT CABLE FAULTS

There are different types of Faults are there. Frequently occurs the faults are given as

1) *Short circuit fault:* Short circuit fault Short circuit means when the conductor and insulator make contact then it is known as short circuit.

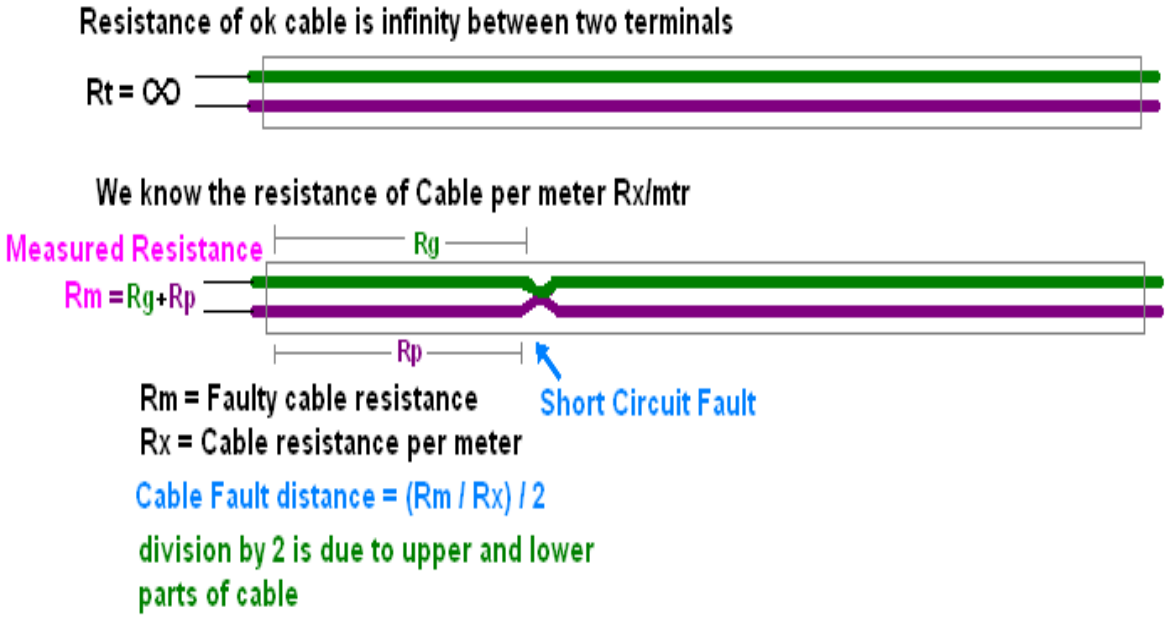

Fig. 1 Short circuit fault

2) *Open circuit Fault:* If the circuit is not closed that is called open circuit fault. The length of cable varies based on the location of cable cut.

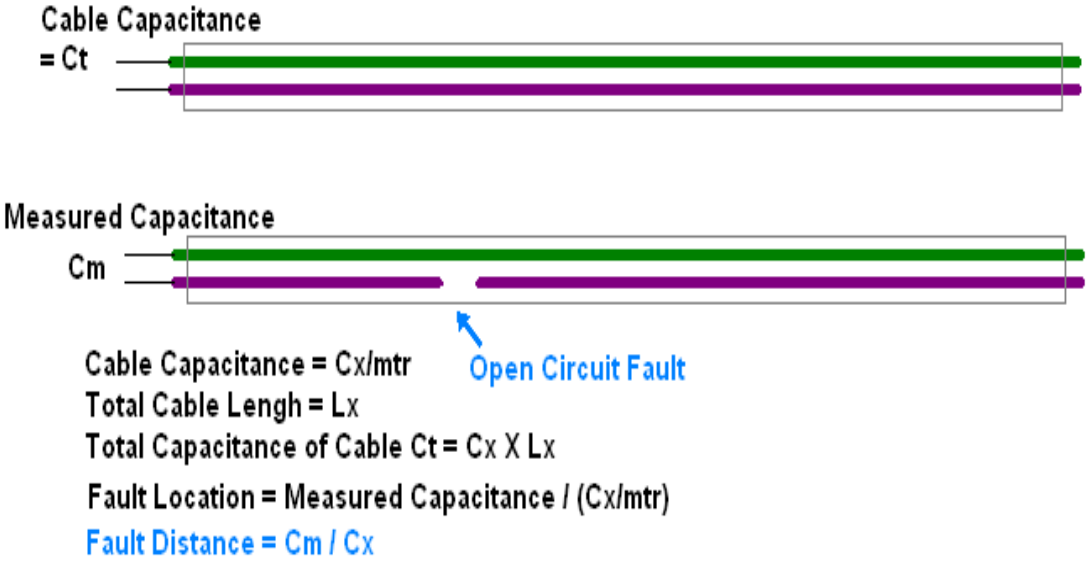

Fig. 2 Open circuit fault

3) *Earth fault:* When the conductor wire of a cable makes contact with ground then it is known as earth fault or ground fault.

IV. EXISTING SYSTEM

Underground fault detector deals with finding of exact fault location from the base station itself. Cables have some resistance. We are mostly focus on that resistance only. Resistance can vary with respect to the length of the cable. If the length of the cable is enhance, the value of the resistance will also enhanced. If any variation happens in the resistance value, we will take that is fault spot and finding that spot through Arduino technology. That fault spot is represents the standard of distance (kilometre) from the base station. This value display by the display division.

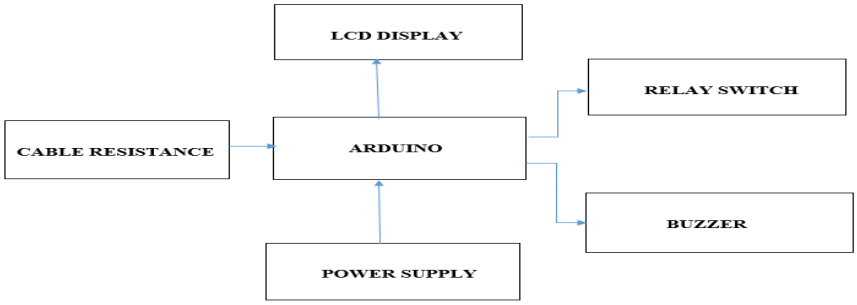

Fig. 3 Block diagram of the existing system

V. PROPOSED SYSTEM

The projected system deals with finding of exact short circuit fault location and open circuit fault location from the base system. The project uses the conception of Ohm`s law where a commercial voltage (230v) is apply at the feeder end through step-down transformer. This step-down voltage goes to rectifier unit, which translate an AC supply into DC supply. In this project we were using bridge rectifier. This voltage moves to voltage regulator unit. The regulator maintains a unvarying voltage. This voltage is sufficient the resistor circuit to work. Here we assume the underground cable as a set of resistances in the series. Each resistor represents the resistance of the underground cable for a specific distance in km.

If any variation occur in the resistance value, we will call that is fault point and finding that place through Arduino technology. That fault is represents the standards of distance (km) from the base station. In this method the open circuit fault detection is not possible , so we assumes two positions and create open circuit fault manually and detect that position by the system. The position is display by display division and also buzzer will produce the alarm to alert and to take an instantaneous action by field employees.

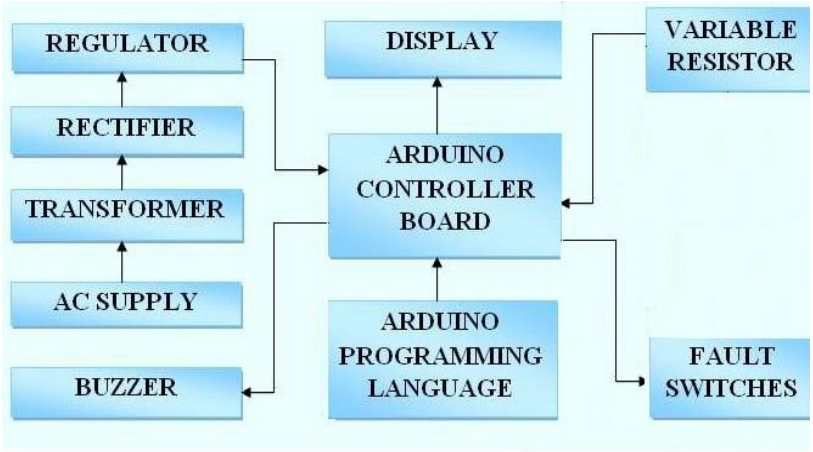

Fig. 4 Block diagram of the proposed system

VI. WORKING

For the working of the proposed system it has different modules like power supply unit, Arduino Uno, resistor circuit, fault switches, display unit and buzzer. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit.

The power supply is the very important unit of any electronic circuit. The power supply unit has AC supply, transformer, rectifier, and voltage regulator. The AC supply is given to the step-down transformer. Transformer transfers the electrical energy between the circuits through electromagnetic induction. By using the transformer we can increase or decrease the AC voltage in electric power applications. The step-down voltage is goes to the rectifier unit. Rectifier is used to convert an AC supply into DC supply, in this project we use bridge rectifier. This DC voltage is moves to the regulator unit. Regulator maintains the constant voltage. Here we use 7805 voltage regulator which maintain the 5V DC supply. This voltage is fed to the Arduino kit.

A program was written if any fault occur in the cable, then it will divert working of the system. Otherwise the system works as usually. Now days all embedded systems are not works without Arduino Uno. The Arduino kit has microcontroller which is used to store the program. We uploaded the program in the kit.

In the resistor circuit the resistors are connected in series which is used as an underground cable and is useful to detect the short circuit fault. There are two fault switches are used which assumed as a positions of the open circuit faults.

Liquid Crystal Display (LCD) is used to display the Alphabets, Numbers as well as special symbols. Here 16x2 LCD display connected to the Arduino kit to display the information. A buzzer is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers include alarm devices, timers, and verification of user input such as mouse click or keystroke.

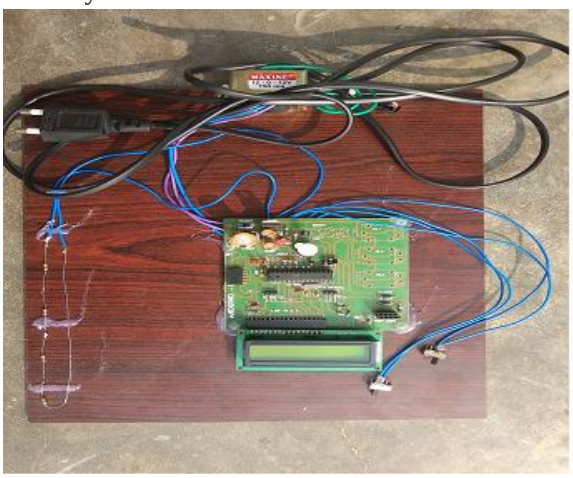

Fig.5 Hardware module

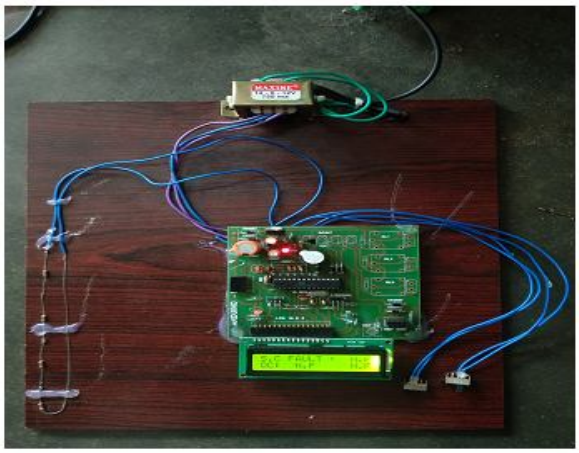

Fig. 6 No fault model

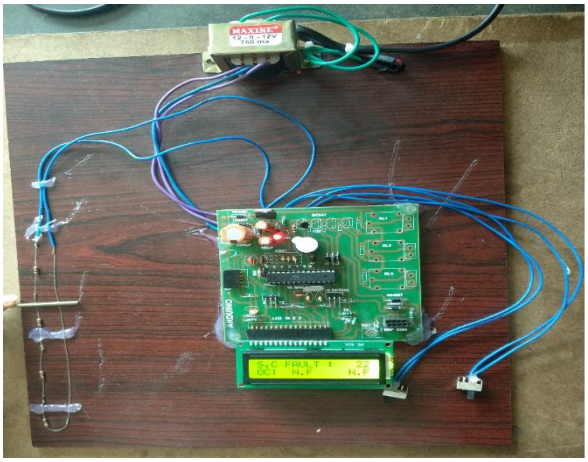

Fig. 7 Short circuit fault

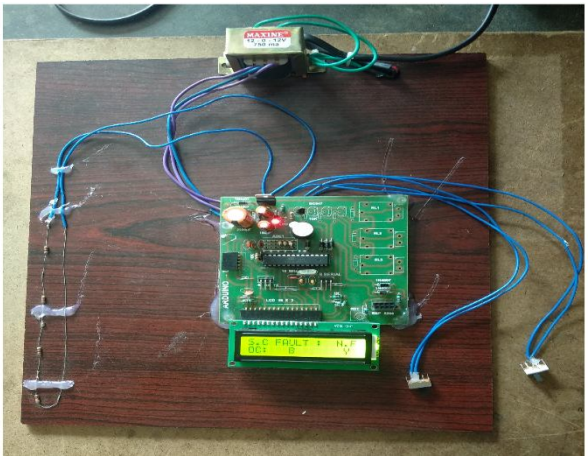

Fig. 8 Open circuit fault

VII. ADVANTAGES

A. Detect faults in underground cables.
B. Low cost
C. Less complexity
D. Less maintenance
E. Long distance applications.

VIII. CONCLUSION

It is not easy to spot the faults in underground cables. By using Arduino controller we can find out accurate location of different faults. The project underground cable fault detection has been planned and tested. Using well sophisticated IC`s and with the help of

emergent technology the project has been effectively implemented. In this project we detect both short circuit fault and open circuit fault, but for open circuit fault we assume the fault locations. To avoid this assumption we have to work some more on this model.

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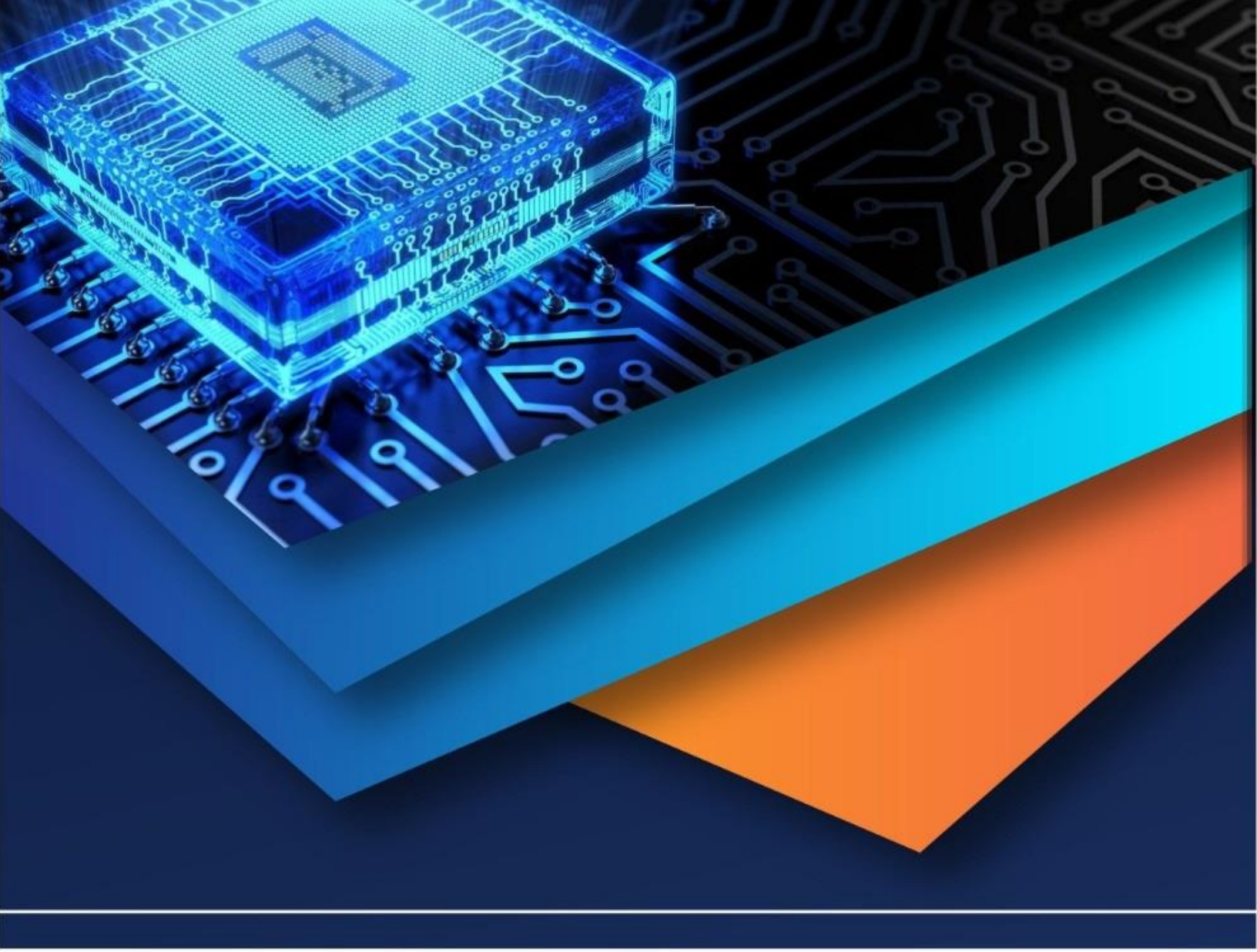

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