Underground Cable fault finding Robot Using GSM Technology and AT MEGA 16 interfacing

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Abstract— *Up to last decade the cables where made to lay overhead but because of urbanization, weather conditions like ice wind. The concept of underground cable is started, which is superior to the earlier method. Underground cables are not affected by adverse weather conditions but it has some challenges such as, difficulties in laying the cables & once it laid, if fault occurs it is hard to find & clear it . In this project this difficulties will removed. Currently a robot is designed who will find out correct location of fault then by using GSM technology SMS will send to main control room. So the engineer can directly dug at that point & fix the issue. The rising demand for electrical energy increases the importance and priorities of uninterrupted service to customer.*

Keywords— AVR microcontroller, GSM technology, wireless control, robotic platform.

I. INTRODUCTION

This project is basically to locate the faulty part of underground system. Currently a robot is developed which can be used to locate the break from an external point. When an underground cable is broken or Short-circuited then our robot will move over it and locate the exact position of discontinuity.[1] Hence it is an advantage for repairing the same. The other instruments that can be included are odometer, video cam, remote navigation etc.

For most of the worldwide operated low voltage, medium voltage and high voltage distribution lines underground cables have been used for many decades. To reduce the sensitivity of distribution networks to environmental influences underground high voltage cables are used more and more. They are not influenced by weather conditions, heavy rain, storm, snow and ice as well as pollution. The rising demand for electrical energy increases the importance and priorities of uninterrupted service to customer. Thus, faults in power distribution networks have to be quickly detected, located and repaired.[1]

In the urban areas ,the electrical cables run underground instead of running overhead. Whenever any fault occurs within the underground cable, it becomes difficult to detect the exact location of fault for the process of repairing that particular cable. The proposed system finds the point of the exact location of the fault voltage is applied at the feeder end through a series resistor (cable lines), then the current would vary depending upon the location of the short circuit fault in the cable.[1,3]

II. IMPLEMENTATION

Current sensor

Sensor is a electronic device that used to sense the magnetic field generated by the charged cable. There are many types of sensors that can be used for sensing purpose. One of them is CD4017. Is a decade counter which count the magnetic field in the form of pulses. If there is no magnetic field counter will be off, and signal will be send to controller. But problem with this sensor is, it gives continuous blink operation and controller may get confused, that it indicates low or high signal. So we are not using this sensor.

Transistor- amplifier sensor :

This sensor is a basically amplifier which amplify signal. Because magnetic field created by cable is very low it needs to amplify, microcontroller sense only 5v. For amplification purpose 2N3904 NPN transistors are used. Which amplifies low voltage magnetic field into required output signal. Resisters used for current limiting purpose. Amplified signal is given to the special purpose 2N3904 NPN transistor. Which works on principle-

Table I. Working of amplifier

Base	Collector	Emitter
5v	0v	Ground
0v	5v	Ground

Emitter of this transistor is always grounded. When sensor sense magnetic field, transistor base indicates 5v. Collector is interface with controller output is 0v, as a base indicates 5v. Normally controller set as FF (11111111). As there is no magnetic field(fault occur) base provides 0v, collector gives 5v that is sensing signal of fault occurrence. As per set program in controller it sense faulty condition gives low signal as FE (11111110). LED continuously gives low or high signal as

per condition. 9v battery supply is required for its operation.

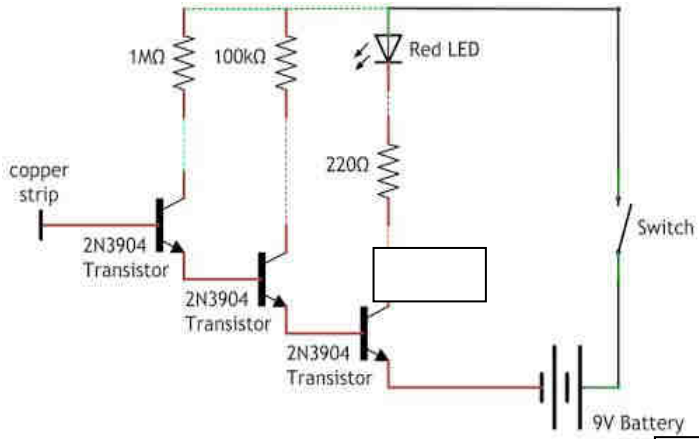

Fig.1: Current sensor

III. HARDWARE DESIGN FOR ROBOT

COMPONENT USED:

A. Hardware for fault detection

1. AVR At mega 16 Microcontroller
2. DC motor
3. current sensor
4. GSM modem
5. LCD display

B. Hardware for Robotic platform

1. Robot chassis
2. RF Transmitter and Receiver
3. DC Motor driver IC

By the use of all this equipment we are going to construct hardware. And some software are used to construct the hardware.

The current sensing circuit is interfaced to the microcontroller. The 16*2 LCD display connected to the microcontroller is used to display the information .GSM will send the SMS to the control room as fault detected. In case of short circuit (line to ground) the voltage across the series resistors changes accordingly. Then this precise digital data fed to programmed microcontroller of ATMEGA AVR family in order to display the fault in kilometers. Motor driver IC L293D and DC Motor is used as wheels to robotic chassis.

A cable fault can be defined as any defect, inconsistency, weakness or non-homogeneity that affects the performance of a cable. All faults in underground cables are different and the success of a cable fault location system depends to a great extent on practical aspects and the experience of the operator.[2] To accomplish this, it is necessary to have personnel trained to test the cables successfully and to reduce their malfunctions. An efficient cable fault location service must include, taking full control of electrical safety, pinpointing the position of the fault, excavation, repair of the cable, testing of the repaired cable and return to service reinstatement of the ground service.

GSM Module SIM900:

The SIM900 is a complete quad band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. It can communicate with controllers via AT commands. This module support software power on & reset. It is designed with a very powerful single chip processor & it has low power consumption.

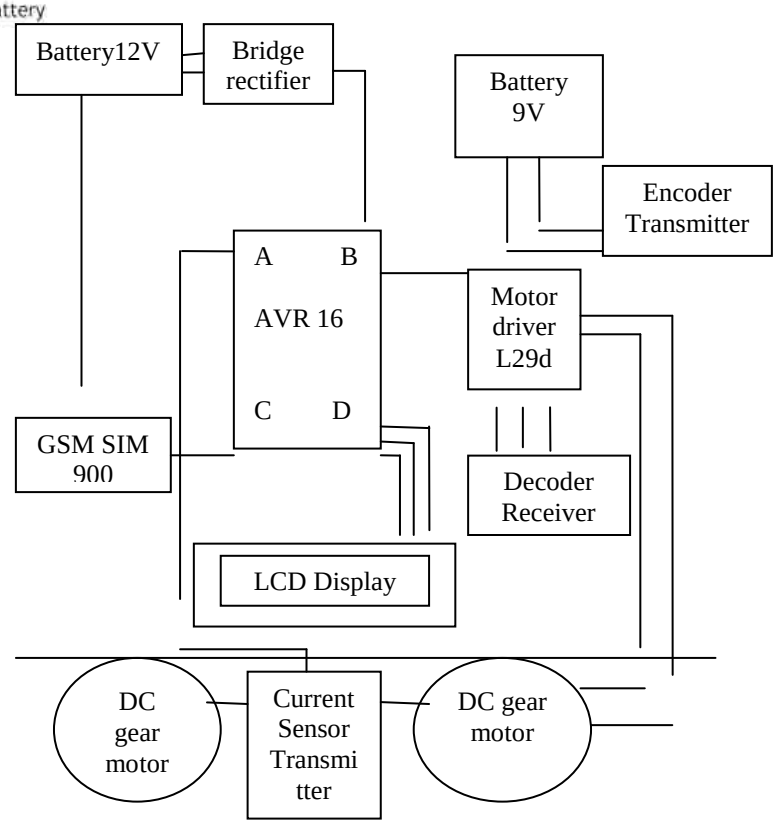

Fig.2: Block diagram for fault detection robot.

IV. SOFTWARE REQURIED

Code Vision AVR /AVR Studio AVR ISP Programmer Pony Prog/AVR Dude software to download the hex file. Proteus 8 for simulation of various circuits.

V. RESULT

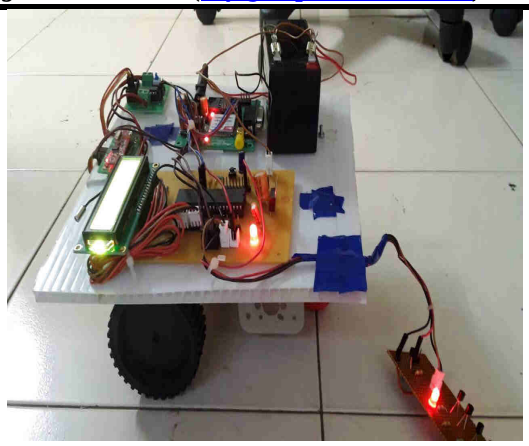

Fig.(3)

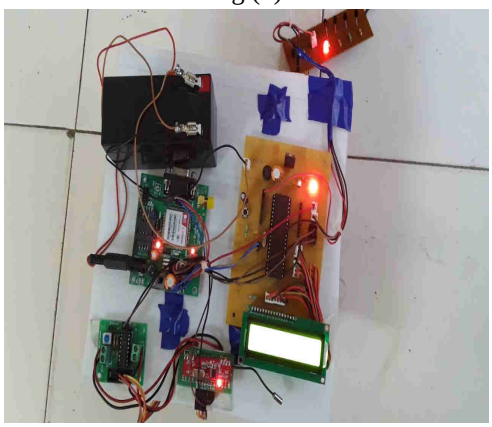

Fig.(4)

Fig. (3) and (4) shows the hardware for fault detection robot.

In this, results of the main hardware for fault detection robot. Fig 5 shows the screenshot of SMS send to the control room.

Fig.5:SMS to control room

VI. CONCLUSION

Current scenario of digging along the cable laid and then pulling the cable out and checking whether the fault exists in the cables is a tedious work. This is not only is wastage of manpower and money for the companies, but this also causes a lot of inconvenience to the normal public. We believe that our cable fault detection robot will solve this issue to a great extent and will be really helpful for such application. The robot that we have designed is very much user-friendly and can be easily controlled. Also, the robot is cost effective. The project in future can be implemented by using a capacitor in an AC circuit to measure the impedance which can even locate the open circuited cable

ACKNOWLEDGMENTS

The goal of this paper is to design “Underground cable fault finding robot with GSM technology and AT MEGA 16 interfacing” The function has been realized successfully. We wish to place on record our sincere thanks and whole hearted thanks to guide Prof. Talewad Gururaj. under whose supervision this dissertation work has been carried out. It was his keen interest encouraging disposition and full co- operation that has made it possible for us to complete this work. We wish to place on record our sincere thanks and also acknowledge my indebtedness to Prof. Lalit kumar, Head of Electrical Department, whose critical analysis, careful comments and valuable suggestions have been immense help in completing this work. Lastly, We are thankful to all those persons, who have contributed directly or indirectly in the completion of this project.

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