Iot Based Underground Cable Fault Detection

Dr. Komala M[1], Dr. Mallikarjuna Swamy[2], Md Asif[3], Manjunath K.C[4], Keerthiraj L[5]
Associate Prof, , Associate Prof, Students of 8th semester (B.E)
Dept of ECE,
SJBIT,karnataka, Bangalore,INDIA

Abstract : **The project is purposive for underground cable fault detection which measures the fault in underground cable from the base station in kilometer with the use of Renesas microcontroller. We use ohm's law as basic concept for this purposive project. The feeder end is connected through a series resistor to the lines, a low DC voltage is applied then current would change accordingly upon the location of fault in the cable. The system uses a Renesas microcontroller and a AC power supply which is rectified one. A microcontroller is interfaced with the combination of resistor and a current sensing circuit, and using a analog to digital converter device for providing digital data to microcontroller which represent length of cable in KM's. For demonstration purpose we are using watt resistor instead of cable and set of switch are used in between the watt resistor to create fault in the cable. Relay driver IC is used to control the relays, which intern switch power sequentially to all the lines. For displaying the information a 16x2 LCD is used also a GPRS module is used to send the same information to the server.**

IndexTerms**: Iot, cable, fault, underground, detection**

I. INTRODUCTION

Now a days cables are made to lay underground rather than laying overhead because it is superior than earlier method. The adverse weather condition like heavy rainfall, snow, storm as well as pollution will not affect underground cable. Occurance of a fault in the underground cable is difficult to detect so it is requires that we need to find a method to detect the exact fault location. Our approach is to find the location of the fault in the underground cable in the digital way because as now the world is becoming digitalized so our purpose is to serve the in the digital way. In many urban areas laying underground cable system is now more common practice. There are numerous reason of event of fault in the underground link and if the fault happen around then process identified with repairing that specific link is troublesome because of not knowing the correct area of cable fault. The equipment currently being used is heavy for locating the fault in the cable and also some time more than one method is required to detect the fault in the underground cable because one method is not enough to detect the fault. To diagnose the fault we need to organize multiple test with complicated equipment which is a time consuming task [5] [7]. To speed up the system renovation we need fast and precise fault location methods which can diminish great financial loss and operating loss.

II. CLASSIFICATION

Types of fault in the cable :

Short circuit fault: A short out fault happens when there is a protection failure between stage conductors or between stage conductor(s) and earth or both. A protection failure comes about into arrangement of a short out way that triggers a short out conditions in the circuit (i.e. strangely high current circumstances took after by noticeable impacts like arcing.)

Further short circuit fault can be categorized in two types:

Symmetrical fault: In this kind of faults, all the phrases are short circuited to earth, sometimes to each other. This fault is balanced when the system is symmetrical or 120 degree in three phase line.

Unsymmetrical fault: This fault only occurs when there is one phase or two phases. When this fault occurs, the 3 phase lines become unbalanced.

Open circuit fault: As the name recommends, this fault includes an open circuit in the conductors. When at least one link conductors (centers) break, it prompts brokenness. This irregularity additionally happens when the link leaves its joint because of mechanical pressure. This is known as Open circuit fault.

Method for fault location:

Online strategy: This technique use process the examined voltages and current to decide the fault focuses. Online strategy for underground link is not as much as overhead lines.

Disconnected strategy: In this technique extraordinary instrument is utilized to try out administration of link in the field.

III . methodology

Hardware Design

The prototype contains Renesas microcontroller, LCD, GSM/GPRS,voltage divider circuit,Transformer, Underground cables (resistors).

In this project Renesas is the heart of the project located at the centre of the block diagram, and control all the operation of the project. Resistors are connected in series to form two underground cables, and those two cables are connected to inbuilt ADC of micro-controller that converts analog inputs coming from cables to digital values these values are sent to the microcontroller. At the joining (series) point of two resistors toggle switches are used to create (show) fault, around 2 to 3 toggle switches are used in each of the cable to create faults at 1km,2km,3km on each cable. Consider in first cable, 2nd toggle switch is turned on then a less voltage (compared to the voltage which will get when there is no toggle switches are turned on) from cable to ADC will be receive and ADC will convert this analog voltage to digital value, this digital value is compared with the threshold value that is stored inside Renesas controller. If there is any variations occurred then microcontroller will send an alert to concerned authority (cloud) through GPRS.The underground cable condition is updated to cloud via GPRS and stored in database so that the data can be viewed anytime anywhere globally.

One more feature that is overload condition is detected by using different voltage consuming loads(bulbs-40W,60W,100W), if the load is more than specified one connected to kit then the condition will be detected by microcontroller and also sends an overload condition is updated to cloud.

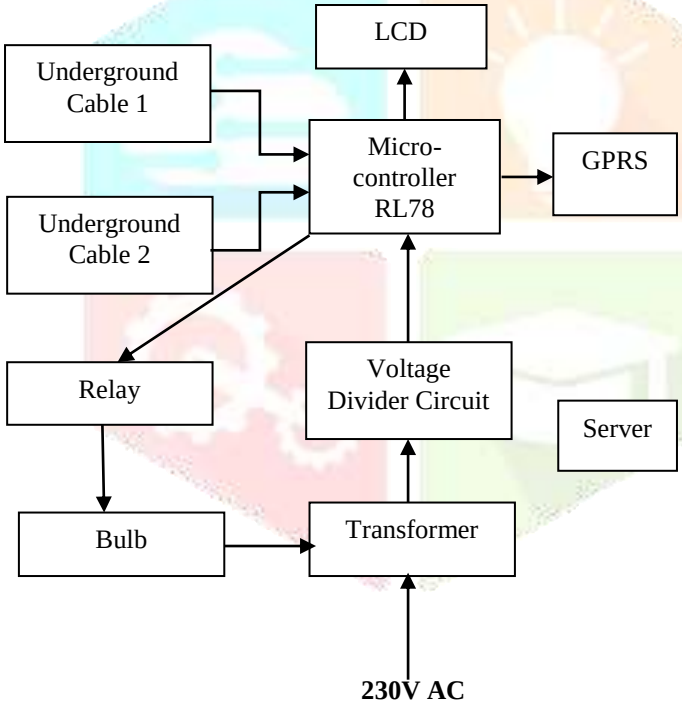
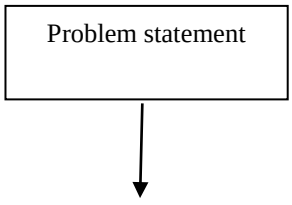
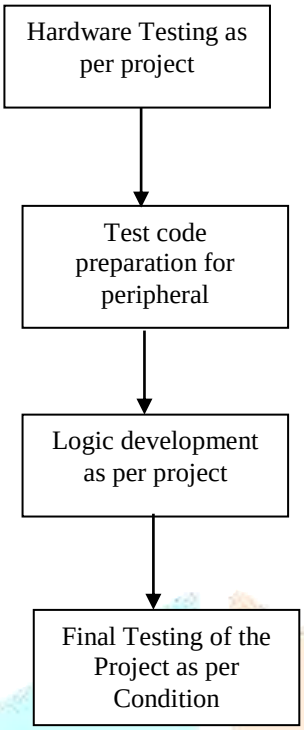


Figure1:Block diagram of prototype system

Software Design

The programming part is divided into two parts; one for the microcontroller and GPRS module which is written using embedded C and set to run on boot up. The second part is creating a web page and creating a account on amazon web service(AWS). Microcontroller sends the data to server through GPRS.





GPRS

Figure 2: Flowchart of prototype of project

IV. RESULT AND ANALYSIS

At the joining (series) point of two resistors toggle switches are used to create (show) fault, around 2 to 3 toggle switches are used in each of the cable to create faults at 200 unit,400 unit on each cable. Consider in first cable, 2nd toggle switch is turned on then a less voltage (compared to the voltage which will get when there is no toggle switches are turned on) from cable to ADC will be receive and ADC will convert this analog voltage to digital value, this digital value is compared with the threshold value that is stored inside Renesas controller. The fault which we create at 200 unit and 400 unit using the switch is as shown in the figure 3.

Figure 3. sample output displayed on LCD

Coming to the IOT part the same thing which is displayed on the LCD is to send to the server which is done using GPRS module. GPRS module connects the microcontroller to the server so that the information can be seen at the server from any part of world. The sample output is which will display on the web page is as shown in figure 4.

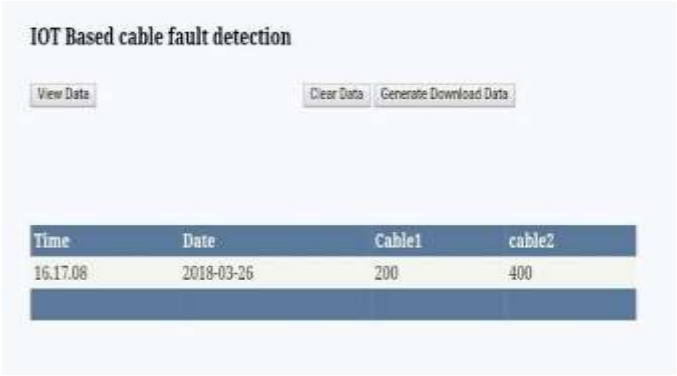


Figure 4. Sample output at webpage

V. CONCLUSION AND FUTURE SCOPE

The project model what we designed is capable of providing the desired results. The model can be successfully implemented as a RTS (Real time system) with certain changes. Science is evolving day by day and creating big breakthrough in different fields, hence for doing or accomplishing same thing we can use different technology and method. Moving ahead, many components can be fabricated on a single along with microcontroller, this makes the system small and therefore making the available system more effective and efficient. Component with high range and accuracy is required to implement for the real time system.
A prototype model is developed by us, and the same can be implemented to product level in the future. For any product to be user friendly and durable it must be compact and cost effective. Moving ahead, most of the component can be embedded along with microcontroller on a single board with using different technology which can reduce the size of the system making it compact.

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