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RESEARCH ARTICLE

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IOT BASED UNDERGROUND FAULT DETECTOR

[1]K.R Kavitha[·], [2]S.Vijayalakshmi, [3]V.B.Kripal, [3]D.Sathishkumar, [3]K.Kishorekumar, [3]S.Dinesh

[1]Professor, Department of ECE, Sona College of Technology, Salem
[2] Assistant Professor, Department of ECE, Sona College of Technology, Salem
[3]Student, Department of ECE, Sona College of Technology, Salem

ABSTRACT

Cables are put underground to stay away from pointless obstruction. These force cables convey electrical force and when these cables are put underground it is extremely hard to decide the specific area of the deficiency happened. There are numerous elements or purposes behind a deficiency to happen as, for example, burrowing, tremor, development work and so forth. As it don't have a clue about the specific area of the issue happened to the cable the fixing procedure identified with that cable is troublesome. Underground cable framework is a most basic practice followed in the urban zones. This paper is expected to find the flaw in an underground cable lines from the base station to a precise area in kilometres. The framework identifies flaw with the assistance of potential divider organize laid over the cable. When a defect is found in a cable line, a voltage gets produced according to the resistors organize blend. This voltage is detected by the microcontroller and is refreshed to the client.

ARTICLE HISTORY

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KEYWORDS

Underground cable framework, cable lines, Potential divider

INTRODUCTION

Underground cables are being utilized for the advancement of intensity framework matrix. These underground cables are not affected by any climate conditions like rainfall, day off, factors and so forth. An issue may happen in an underground cable just because of earth tremors or any burrowing procedure. Since the area of the issue happened is obscure it is very hard for the fixing procedure. This hindrance is handled with the assistance of optical fibre framework. A lot of optical strands is put alongside the force cables. The optical fibre framework continually quantifies different parameters, (for example, power, current and temperature of the cable) at numerous checkpoints situated at customary interims on the force cable. When an issue happens the estimations of the parameters of the encompassing territories change unusually. The information is acquired from the environmental factors of the checkpoints from where the shortcoming is happened. Utilizing this strategy, the inexact separation of the cable shortcoming is found. When the area has been recognized we start to transmit high voltage over the broken cable to locate the specific area of the issue.

LITERATURE REVIEW

A broad deficiency area model for underground force cable in conveyance framework utilizing voltage and current estimations at the sending-end has just been proposed by Yang, Xia, in a paper distributed in November 2008. The paper presents an investigation of a proportional circuit that models a blamed underground cable framework utilizing circulated parameter approach. Investigation of succession organizes in three-stage arrange by applying the limit conditions is additionally introduced. Utilizing the examination,

[·] **Contact**: K.R Kavitha, Professor, Department of ECE, Sona College of Technology, Salem

the area of the issue is resolved with the assistance of current and voltage conditions [1].

Westrom distributed in February 1997, clarifies how infusing a progression of tweeted beat streams into the blamed cable, soon after the event of the cable flaw utilizing a heartbeat generator unit can be utilized for an exact count of the area of the cable deficiency. It has been named as 'shortcoming separation locator'. [2].

Zhao, W in August 2000, proposed a superior way to deal with cable flaw area framework, basically comprising of synchronized testing method, wavelet investigation and voyaging wave standard. Alongside the prologue to three significant methods and a blueprint of the new plan, this paper presents a definite wavelet examination of broken transient waveforms and consequently decides the best wavelet levels for this specific application. [3]

Gilany et.al distributed in January 2007, introduced a wavelet-based issue area conspire for matured cable frameworks when synchronized advanced deficiency recorded information are accessible at the two terminals of the cable. The wavelet peculiarity identification hypothesis is utilized as an amazing sign handling device to appraise the area of the issue in multiend-matured cable frameworks. [4].

Schulze, Member, IEEE et.al Peter Schegner, "Two Terminal Fault Location on Unsymmetrical Transmission Lines",IEEE,2010 , introduced the blackout of a line because of an issue can be costly, subsequently the issue must be cleared as quick as could be expected under the circumstances. Computerized security transfers comprise of shortcoming locators dependent on a few strategies [5].

Xu Sun, Wing Kin Lee1, Yunhe Hou1, et al, Philip W. T. Pong1" Underground Power Cable Detection and Inspection Technology Based on Magnetic Field Sensing at Ground Surface Level ",IEEE ,2014 introduced that IOT based underground cable line shortcoming discovery framework being useful to discover flaws and its area in simple way .Underground cables have been broadly utilized with the advancement of intensity framework lattice. [6].

Manish Paul et.al, Raj Kamal Kakoti on, 'Underground Cable Fault Locator 'says that before endeavoring to discover underground cable blames on direct shrouded essential cable, it is basic to realize where the cable is arranged and what course it takes. On the off chance that the issue happens on the auxiliary cable, at that point realizing the specific course is much progressively basic. Since it is very hard to locate a cable deficiency without realizing where the cable is, it bodes well to ace cable finding and following before start the shortcoming finding process [7].

Ms Pradnya introduced paper on IoT based innovation visit deficiency in underground cables because of the cessation of paper plastic protection because of compound response or poor workmanship during establishment and the challenges in finding the inexact shortcoming territory have been a major issue. Most Underground Faults are situated by means of uncovering the whole section of cable to empower visual aid review to be completed. On the off chance that where visual examination isn't useful then the whole size of cable is supplanted. This manual strategy isn't just costly yet in addition brings about substantial loss of income to the force dispersion organization [8].

Snehal R. Shinde, A. H. Karode et.al Dr. S. R. Suralkar states that this paper audits on IOT based condition checking framework. The primary target of proposed framework is to give ecological parameters at remote area utilizing web. The proposed framework gives a feasible and direct answer for natural and surrounding checking applications. [9].

PROPOSED METHOD

Numerous techniques are being polished during the most recent couple of decades for cable line shortcoming recognition. The most widely recognized strategy being utilized is overhead cable lines. The deficiencies are handily recognized in this technique however the issue in this strategy is that in some overpopulated urban areas we cannot utilize this technique. So we utilize underground cables. IoT innovation has been actualized in this paper which will examine over the deficiencies over web and this can be observed by a person. With the assistance of potential divider arrange over the cable the framework will have the option to recognize the shortcoming. When an issue is made at a juncture shorting two lines together ,a specific measure of power gets created according to the resistor organize blend. Since existing framework is not effective ,in this paper we propose a framework dependent on IoT. The goal of this venture is to discover the separation of the underground cable shortcoming from base station in kilometers utilizing an IoT Gecko stage. The underground cableline framework isn't exceptionally well known in provincial territories however are being utilized in numerous urban regions. Different flaw finding strategies like the sectionalizing techniques, acoustic location strategy, Murray circle techniques are not utilized much by and because they have numerous impediments. Most usually blames happen because of development works and different reasons. It is hard to uncover cable lines totally as we don't have the foggiest idea about the specific area of the cable line shortcoming. On the off chance that the issue had happened because of

short out, the voltage across arrangement resistors changes likewise. This voltage is detected by the microcontroller and is refreshed to the client. The data passed on to the client is the separation to which that voltage compares to the flaw happening at a specific separation and the individual stage is shown on a LCD.

WORKING OF SYSTEM

This paper points in finding the specific area of the deficiency. The paper uses the standard idea of Ohms law which is low DC voltage being applied at the feeder end through an arrangement resistor (Cable lines), at that point current would differ contingent on the area of deficiency in the cable. The activity of the framework expresses that when the present moves through the deficiency detecting circuit module the current would differ contingent on the length of the cable from the spot of flaw that happened if there is any short out shortcoming with the Single Line to ground issue, or twofold line to ground issue, or three stage to ground issue .The voltage drops over the arrangement resistors changes appropriately and afterward the issue signal goes to interior ADC of the microcontroller to create computerized information. At that point microcontroller will process the advanced information and the yield is being shown in the LCD associated with the microcontroller in kilometers and stage according to the issue conditions.

BLOCK DIAGRAM

The goal in this venture is to decide the separation of underground cable shortcoming from base station in kilometres USING a PIC microcontroller. The underground cable framework is a typical practice followed in numerous urban zones. If a flaw happens for reasons unknown, around then the fixing procedure identified with that cable is troublesome since we do not know the specific area of the cable shortcoming. The proposed framework is to locate the specific area of the deficiency.

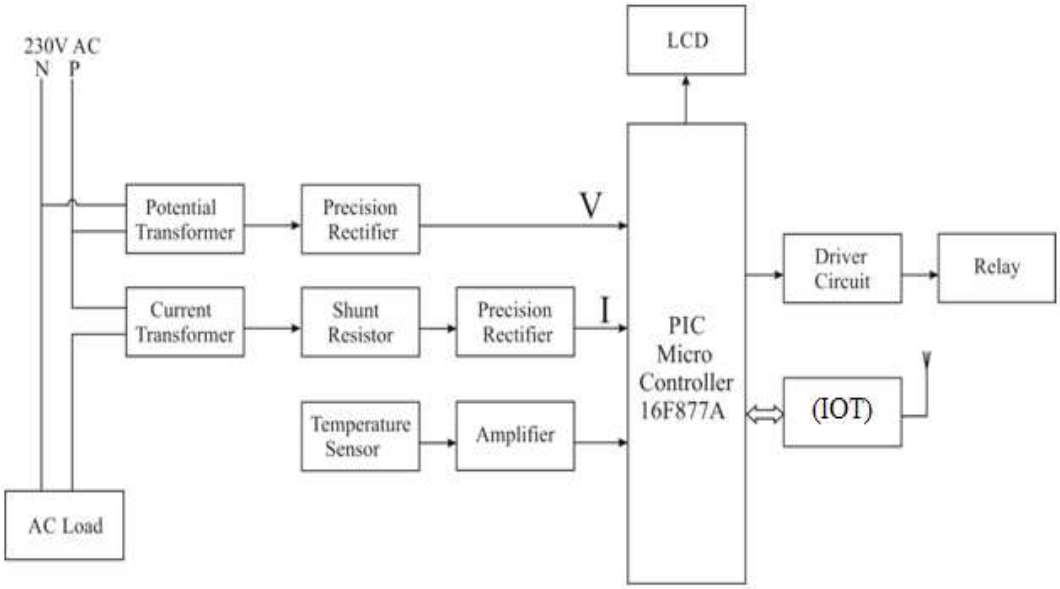

Figure 1: Block diagram of underground fault detector

The above Figure 1 shows the block diagram of underground fault detector. The main parts of the system are described as follows:

PIC microcontroller

The microcontroller which is being used in this project is from PIC arrangement.PIC microcontroller is the main component in this project which fetches instruction from various hardware components and then displays in the LCD display.

Figure 2: . PIC microcontroller

LCD Display

LCD includes two glass boards, with the fluid gem material in the middle of them. The inward surface of the glass plates are covered with anodes. This LCD display is used to display the fault locations occurred in the underground cable system. Using an LCD display the user can easily know where the defect is located and can repair it easily.

Figure 3 : LCD Display

Potential Transformer

Voltage transformers (VT) or potential transformers (PT) are another sort of instrument transformer, utilized for metering and insurance in high-voltage circuits. From the AC load when voltage is being fed the potential transformer will fetch the voltage and determine if it is a high voltage or low voltage when the correct amount is measured the potential transformer will supply it to the precision rectifier.

Figure 4: Potential Transformer

Current Transformer

The current transformer used in this project is used to determine if the current flowing through out the kit is either low current or high current. After determining the current the current transformer will then send it to shunt resistor. From the shunt resistor it is then sent to precision rectifier.

Figure 5 : Current transformer

Temperature Sensor

The temperature sensor will detect if there is any abnormal temperature in the cables. Optical fibres are used in this project as the cables lie underground there is a higher chance of cables getting heated up and due to this the cables are damaged. If there is any temperature rise the sensor will alert the user usually the temperatures are(-90 Celsius to 130 Celsius)

Relay

The Relay is an electrical switch. Current moving through the curl of the transfer makes an attractive field which draws in a switch and changes the switch contacts. The relay acts upon the instructions of PIC microcontroller given to driver circuit which then given to relay.

WIFI

A Wi-Fi-empowered contraption, for example, a PC, PC game comfort, cell phone or moved sound player, can associate with the Internet when inside degree of a remote system related with the Internet. The thought of at any rate one (interconnected)get to focuses called hotspots consolidates a territory as small as a few rooms or as wide a comparative number of square miles. Thought in the more prominent space may rely on a get-together of ways with covering consolidation.

CONCLUSION

The paper IOT based underground fault detector is used for detecting any flaws in an underground cable system. This system can clearly choose the region where the fault has occurred and can send

the co-ordinates to the user as well as displays in the LCD display screen. Henceforth the strategy used in this paper works in a consecutive way and ends up being helpful in discovery and area of deficiencies in underground cables.

RESULTS AND DISCUSSIONS

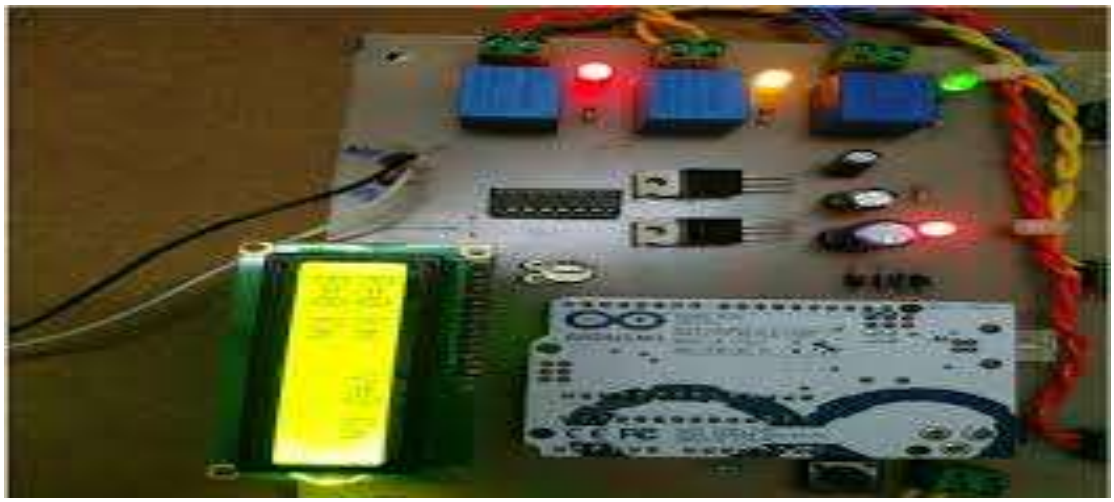

Figure 5: The figure 5 shows the location of the fault in the LCD display

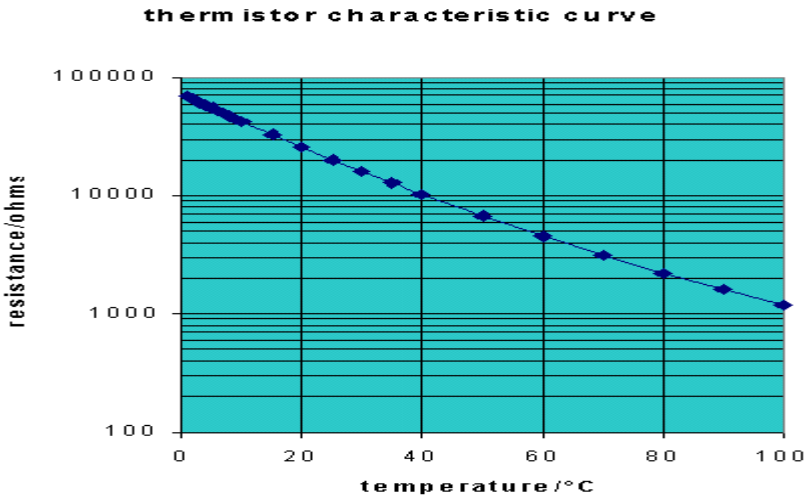

Figure 6: Graphical Representation Of The Temperature

The figure 6 shows the temperature recorded by the temperature sensor in a graphical method

The tables given below shows the input and output port functions
PORT A Functions

Name	Bit#	Buffer	Function
RA0/AN0	bit0	TTL	Input/output or analog input
RA1/AN1	bit1	TTL	Input/output or analog input
RA2/AN2	bit2	TTL	Input/output or analog input
RA3/AN3/VREF	bit3	TTL	Input/output or analog input or VREF
RA4/T0CKI	bit4	ST	Input/output or external clock input for Timer0 Output is open drain type
RA5/$\overline{SS}$/AN4	bit5	TTL	Input/output or slave select input for synchronous serial port or analog input

Legend: TTL = TTL input, ST = Schmitt Trigger input

PORT B Functions:

Name	Bit#	Buffer	Function
RB0/INT	bit0	TTL/ST(1)	Input/output pin or external interrupt input. Internal software programmable weak pull-up.
RB1	bit1	TTL	Input/output pin. Internal software programmable weak pull-up.
RB2	bit2	TTL	Input/output pin. Internal software programmable weak pull-up.
RB3/PGM	bit3	TTL	Input/output pin or programming pin in LVP mode. Internal software programmable weak pull-up.
RB4	bit4	TTL	Input/output pin (with interrupt on change). Internal software programmable weak pull-up.
RB5	bit5	TTL	Input/output pin (with interrupt on change). Internal software programmable weak pull-up.
RB6/PGC	bit6	TTL/ST(2)	Input/output pin (with interrupt on change) or In-Circuit Debugger pin. Internal software programmable weak pull-up. Serial programming clock.
RB7/PGD	bit7	TTL/ST(2)	Input/output pin (with interrupt on change) or In-Circuit Debugger pin. Internal software programmable weak pull-up. Serial programming data.

Legend: TTL = TTL input, ST = Schmitt Trigger input
Note 1: This buffer is a Schmitt Trigger input when configured as the external interrupt.
2: This buffer is a Schmitt Trigger input when used in serial programming mode.

PORT C Functions:

Name	Bit#	Buffer Type	Function
RC0/T1OSO/T1CKI	bit0	ST	Input/output port pin or Timer1 oscillator output/Timer1 clock input
RC1/T1OSI/CCP2	bit1	ST	Input/output port pin or Timer1 oscillator input or Capture2 input/ Compare2 output/PWM2 output
RC2/CCP1	bit2	ST	Input/output port pin or Capture1 input/Compare1 output/PWM1 output
RC3/SCK/SCL	bit3	ST	RC3 can also be the synchronous serial clock for both SPI and I^2C modes.
RC4/SDI/SDA	bit4	ST	RC4 can also be the SPI Data In (SPI mode) or data I/O (I^2C mode).
RC5/SDO	bit5	ST	Input/output port pin or Synchronous Serial Port data output
RC6/TX/CK	bit6	ST	Input/output port pin or USART Asynchronous Transmit or Synchronous Clock
RC7/RX/DT	bit7	ST	Input/output port pin or USART Asynchronous Receive or Synchronous Data

Legend: ST = Schmitt Trigger input

PORT D Functions:

Name	Bit#	Buffer Type	Function
RD0/PSP0	bit0	ST/TTL(1)	Input/output port pin or parallel slave port bit0
RD1/PSP1	bit1	ST/TTL(1)	Input/output port pin or parallel slave port bit1
RD2/PSP2	bit2	ST/TTL(1)	Input/output port pin or parallel slave port bit2
RD3/PSP3	bit3	ST/TTL(1)	Input/output port pin or parallel slave port bit3
RD4/PSP4	bit4	ST/TTL(1)	Input/output port pin or parallel slave port bit4
RD5/PSP5	bit5	ST/TTL(1)	Input/output port pin or parallel slave port bit5
RD6/PSP6	bit6	ST/TTL(1)	Input/output port pin or parallel slave port bit6
RD7/PSP7	bit7	ST/TTL(1)	Input/output port pin or parallel slave port bit7

Legend: ST = Schmitt Trigger input TTL = TTL input
Note 1: Input buffers are Schmitt Triggers when in I/O mode and TTL buffer when in Parallel Slave Port Mode.

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