International Journal of Advanced Technology in Engineering and Science
Vol. No.7, Issue No. 03, March 2019
www.ijates.com
ijates
ISSN 2348 - 7550

IOT BASED UNDERGROUND CABLE FAULT DETECTOR USING HALL EFFECT SENSOR

Ms.A.Divya[1] Ms.N.Geetha[2] Ms.R.Ranjitha[3] Mr.A.Rahul[4]

[1,2,3]Department of ECE, Sengunthar Engineering College,Tiruchengode.(India)

[4]Professor, Department of ECE, Sengunthar Engineering college, Tiruchengode (India)

ABSTRACT

Present trend of laying cables for various purposes is to lay underground.Companies prefer laying the cables underground because the climatic adversities don't affect this. With advantages come challenges. There are many difficulties in laying the cables and once laid in case of any complaints, it is difficult and costly to fix it. This project is about a system that which is capable of finding where the complaint lies, so the engineer can directly get the hole dug at that point and fixes the issue. The basic principle of Electromagnetic Theory is employed to detect the discontinuity in the cable. Using a signal injector, a low frequency signal is passed through the wire and the induced magnetic field is used to detect the fault.

I. INTRODUCTION

Till the last decade the cables where made to lie overhead and currently the scenario is to lay underground cable, which is superior to the earlier method. This is because the underground cables are not affected by the adverse weather conditions. Neither the hot sunny day nor the rain is to influence it. But when the cable breaks due to some reasons it's very difficult to locate th Currently what is done is they find the at. approximate location and dig the cables out from the location and check it manually to find the exact point of discontinuity.

Currently a system 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. 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.

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.

The success of fault tracking and locating of an underground cable is mainly depends on the skill, knowledge and experience of that person. Although tracing of the cable can be an intricate job, it will very likely become

even more complex as more underground plant is installed. It is just as important to understand how the equipment works.

1.1 Types of Faults

A fault in a cable can be classified into different types such as

1.2 Open Circuit Fault

This type of fault is better than short circuit fault, because when the open circuit fault occurs, then the flow of current through an underground cable becomes zero. This fault can be occurred by disruption in conducting path. Such faults occur when one or more phase conductors break.

1.3 Short Circuit Fault

Short circuit fault can be divided into two types, namely symmetrical and unsymmetrical faults

- In symmetrical fault, three phases are short circuited in this type of fault. This type of fault is also called as three phase fault due to this reason.
- In unsymmetrical fault, the magnitude of the current is not equal and displaced by 120 degrees.

Fault location methods: Fault location method can be classified as:

1.4 Online method:

This method utilize process the sampled voltages& current to determine the fault points. Online method for underground cable is less than overhead lines.

1.5 Offline method:

In this method special instrument is used to test out service of cable in the field. There are two offline methods as following

1.6 Tracer Method:

In this method fault point is detected by walking on the cable lines. Fault point is indicated from signal or electromagnetic signal .It is used to pinpoint fault location very accurately.

Example:

- Tracing current method
- Sheath coil method.

1.7 Terminal method:

It is a technique used to detect fault location of cable from one or both ends without tracing. This method use tolocate general area of fault, to expedite tracing on buried cable.

Example:

1) Murray loop method

2) Impulse current method

II. LITERATURE SURVEY

2.1 Sectionalizing

This procedure reduces cable reliability, because it depends on physically cutting and splicing the cable. Dividing the cable into successively smaller sections and measuring both ways with an ohmmeter or high-

voltage insulation resistance (IR) tester enable to narrow down search for a fault. This laborious procedure normally involves repeated cable excavation .

2.2. Thumping

When high voltage is supplied to faulty cable, the resulted high current arc makes a noise loud enough to hear above ground. While this method eliminates the sectionalizing method's cutting and splicing, it has its own drawback. Thumping requires a current on the order of tens of thousands of amps at voltages as high as 25 kV to make an underground noise loud enough to hear above ground. The heating from this high current often causes some degradation of the cable insulation. The limit of damage can be reduced by passing minimum required power to conduct the test .

2.3. Time-Domain Reflectometry

The Time domain reflectometer (TDR) is an electronic instrument that uses time domain reflectometry to characterize and locate faults in metallic cables. The TDR sends a low-energy signal through the cable, causing no insulation degradation. A theoretically perfect cable returns that signal in a known time and in a known profile. Impedance variations in a "real-world" cable alter both the time and profile,which the TDR screen or printout graphically represents. One weakness of TDR is that it does not pinpoint faults.

2.4. Arc Reflection Method

This method is often referred to as a high voltage radar technique that overcomes the 200 Ω limitation of low-voltage radar. In addition to the TDR, an arc reflection filter and surge generator is required. The surge generator is used to create an arc across the shunt fault which creates a momentary short circuit that the TDR can display as a downward-going reflection. The filter protects the TDR from the high voltage pulse generated by the surge generator and routes the low-voltage pulses down the cable. Arc reflection is the most accurate and easiest pre location method. The fault is displayed in relation to other cable landmarks such as splices, taps and transformers and no interpretation is required. Arc reflection makes it possible for the TDR to display "before" and "after " traces or cable signatures. The before" trace is the low-voltage radar signature that shows all cable land marks but does not show the downward reflection of a high resistance shunt fault. The "after" trace is the high-voltage signature that includes the fault location even though its resistance may be higher than 200 Ω. This trace is digitized, stored and displayed on the screen and the cursors are positioned in order to read the distance to the high resistance fault .

2.5. Blavier Test

When a ground fault occurs in a single cable and there is no other cable, then blavier test can be performed to locate the fault in a single cable. In other words, in the absence of a sound cable to locate fault in the cable, then measurement of the resistance from one side or end is called blavier test. Ground fault of a single cable can be located using Blavier's test.

Indendations:

UNDERGROUND CABLE FAULT DISTANCE LOCATOR

INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY

Authors: Dhekale P.M., Bhise S.S., Deokate N.R.

This paper proposes fault location model for underground power cable using microcontroller. The aim of this project is to determine the distance of underground cable fault from base station in kilometers. This project uses the simple concept of ohm's law.When any fault like short circuit occurs, voltage drop will vary depending on the length of fault in cable, since the current varies. A set of resistors are therefore used to represent the cable and a dc voltage is fed at one end and the fault is detected by detecting the change in voltage using a analog to voltage converter and a microcontroller is used to make the necessary calculations so that the fault distance is displayed on the LCD display.

ARDUINO BASED UNDERGROUND CABLE FAULT DETECTION

INTERNATIONAL JOURNAL FOR RESEARCH IN ENGINEERING APPLICATION & MANAGEMENT

Authors: Akash Jagtap, Jayesh Patil, Bhushan Patil.

The objective of this project is to determine the distance of the failure of the underground cable in the base station using one kilometer of Arduino board. Underground cable system is a common practice in many urban areas. Even if a failure occurs for some reason, at that time the repair process related to this particular cable is difficult because of not knowing the exact location of cable failure. The project uses the classic concept of the Ohms law, when a low voltage at the end of the power supply device is applied across a series resistor the current varies depending on the location of the Fault the cable. In the case of a short circuit (grounded line), the voltage across the series resistors changes accordingly, then input to the ADC constructs the Arduino board to develop accurate digital data for the in kilometer. The project is mounted with a resistance representing the length of the cable in KM and creating defects is executed by a set of switches in each known KM to check the accuracy of it. Failure occurs at a given distance and the respective phase is displayed on an LCD screen connected to the Arduino board.

UNDERGROUND CABLE LINE FAULT DETECTION

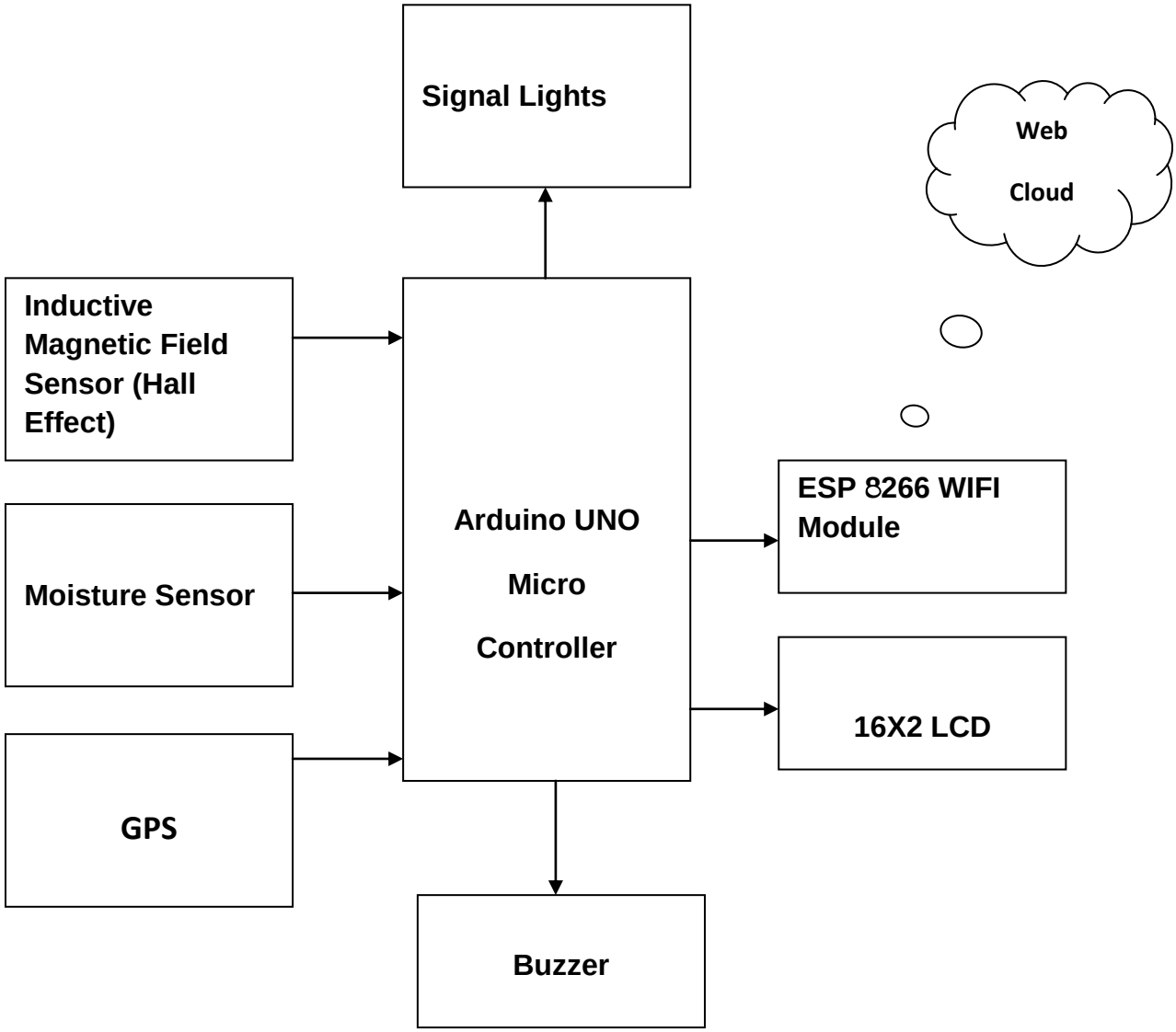
International Research Journal of Engineering and Technology

Authors: Ansa Sebastian, Anu Jacob, Angel Wilson, Ann Rija Paul J

This underground cable line fault detection system is helpful for find out faults and its location in very easy manner .Underground cables have been widely used with the development of power system grid .Underground cables are prone to a wide variety of faults due to underground conditions, wear and tear, rodents .Detecting fault source is difficult because entire line is to be dug in order to check fault at cableline. The repairmen know exactly which part has fault and only that area is to be dug to detect the fault source. Thus it saves a lot of time, money and allows to service underground cablelines faster. We use IOT technology that allows the authorities to monitor and check faults over internet. The system detects fault with the help of potential divider network laid across the cable. When a fault gets created in a cableline, a specific voltage gets generated as per the resistors network combination. This voltage is sensed by the microcontroller and is updated to the user. The information conveyed to the user is the distance to which that voltage corresponds to. The microcontroller detects the fault cableline data and displays this data over LCD display, it transfers this data over internet to display ThingSpeak to develop the online system that links with the system to display the cable faults online.

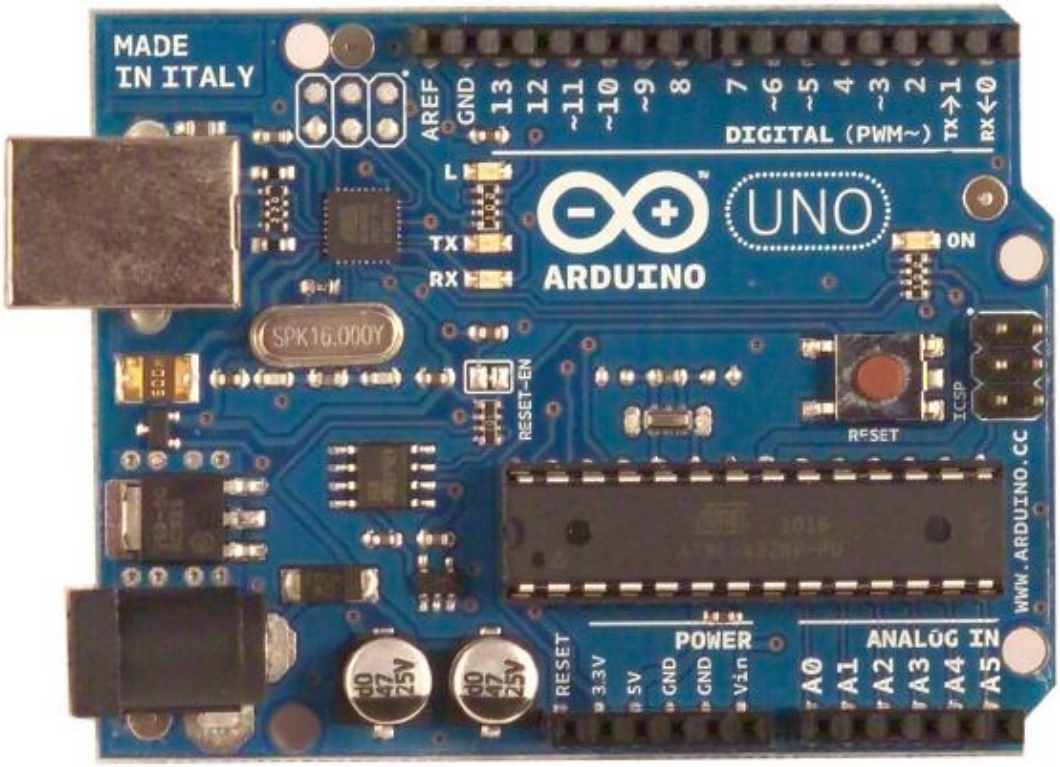
Figures And Tabulation:

III. BLOCK DIAGRAM:

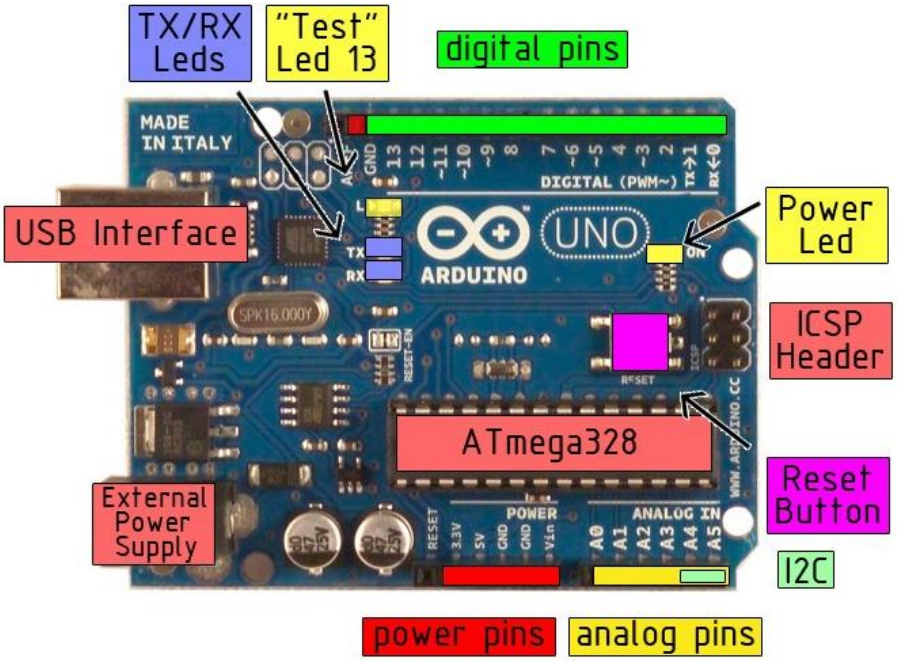


IV.HARDWARE DESCRIPTION:

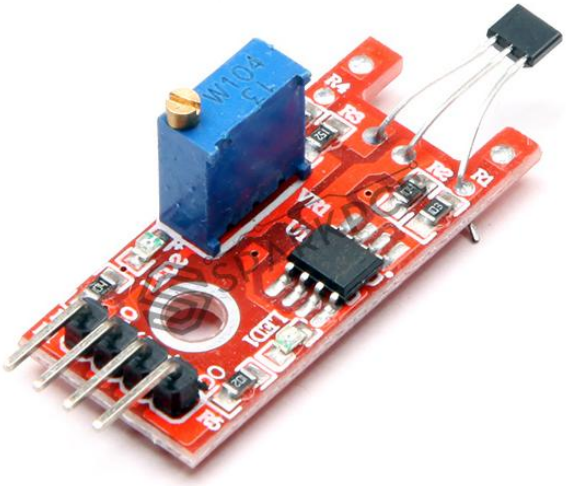
4.1 ARDUINO UNO



4.2 Arduino Uno board Description:



4.3 HALL EFFECT SENSOR



4.4 ESP8266 NODEMCU WIFI DEVKIT

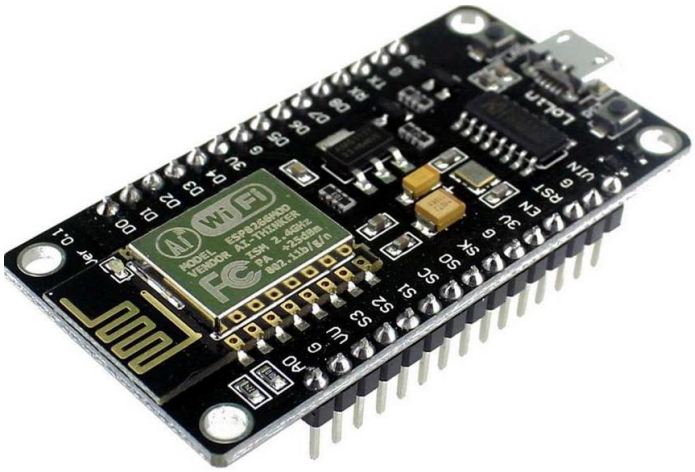


TABLE:

FAILURE STATUS OF POWER CABLE:

Division	2013	2014	2015	2016	2017
Gradual failure	33	38	39	46	27
Production Defect	6	3	3	2	1
Total	39	41	42	48	28

V. FUTURE SCOPE AND CONCLUSION

This project described the IoT Technology Based Underground Cable Fault Distance Detection System Using Arduino UNO Microcontroller in software and hardware simulation form and results were successful. A full fledged prototype model had been implemented as proof of concept to realize and understand the real time scenarios in underground cable system. Through this prototype simulation model the proposed architecture had been demonstrated.

The work can be extended for open circuit fault, short circuit Line to Line Fault (LL) and double Line to Ground Fault (LLG). The open circuitfault can be detected using a capacitor in ac circuit which measures the change in impedance and calculate the distance of fault

REFERENCE

[1] Xiaoning Kang; Xiuda Ma; Shuai Jiang; Xiaoyun Qu, Chao Zhang; Xiaoning Kang; Xiuda Ma; Shuai Jiang; Xiaoyun Qu 2016 IEEE PES Asia-Pacific Power and Energy Engineering Conference (APPEEC)

[2] Gilbert Cheung, Yuan Tian, Tobias Neier, Technics of Locating Underground Cable Faults inside conduits, International Conference onCondition Monitoring and Diagnosis IEEE (CMD 2016)

[3] Nikhil Kumar Sain, Rajesh Kajla, and Mr.Vikas Kumar, Underground Cable Fault Distance Conveyed Over GSM, International Organization of Scientific Research Journal of Electrical and Electronics Engineering, Volume 11, Issue 2, Mar-April 2016.

[4] C.Bharatiraja, S.Jeevananthan, J.L. Munda, A TimingCorrection Algorihm based extended SVM for three level Neutral point clamped MLI in Over Modulation Zone IEEE Journal of Emerging and Selected topics in Power Electronics.

[5] Manar Jaradat, Moath Jarrah, Abdel Kader Bousselham, Yaser Jararweh, Mahmoud Al-Ayyoub The Internet of Energy: Smart Sensor Networks and Big Data Management for Smart Grid, Procedia Computer Science Elsevier, July 2015.

[6] Dhivya Dharani. A and Sowmya. T, Development of a Prototype of Underground Cable Fault Detector, International Journal Electrical, Electronics, and Computer Systems, Volume-2, 2014.

[7] Md. Fakhrul Islam, Amanullah M T O, Salahuddin. A. Azad, Locating Underground Cable Faults: A Review and Guideline for New Development, 2013 IEEE Conference

[8] M.Fonseca_Badillo, L. Negrete_Navarrete, A. Gonzalez_parada, A. Castaneda_Miranda, Simulation and analysis of underground power cablesfaults, 2012 Elsevier Procedia Engineering

[9] Abishek Pandey, Nicolas H. Younan Underground cablefault detection and identification using Fourier analysis, 2010 IEEE Conference.

[10] Tobias Neier, Cable fault location practical experience, HV Technologies, version-1, June 2006.

[11] M.S. Choi, D.S. Lee, and X. Yang, A Line to Ground Fault Location Algorithm for Underground Cable System, Korean Institute of Electrical Engineers International Transactions on Power Engineering, pp. 267 – 273, Jun 2005.

[12] K.K. Kuan, Prof. K. Warwick, Real-time expert system for fault location on high voltage underground distribution cables, IEEE Proceedings-C, Volume. 139, No. 3, MAY 1992.

[13] Ashlesha A. Patil and Dr. S. R. Suralkar. Review on-IOT Based Smart Healthcare System. International Journal of Advanced Research in Engineering and Technology, 8(3), 2017, pp 37–42

[14] Snehal R. Shinde, A. H. Karode and Dr. S. R. Suralkar, Review onIOT Based Environment Monitoring System, International Journal of Electronics and Communication Engineering and Technology, 8(2), 2017, pp. 103–108

[15] Viswanath Naik.S1 , S.Pushpa Bai1 , Rajesh.P , Mallikarjuna Naik.B, IOT Based Green House Monitoring System, International Journal of Electronics and Communication Engineering & Technology (IJECET), Volume 6, Issue 6, June (2015), pp. 45-47 .