Hybrid Transmission Line Cable Fault Detection Using Iot

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Abstract- *In the urban areas, the electrical cable runs in undergrounds instead of overhead lines. It is difficult to detect the exact location of the fault for process of repairing that particular cable. The project is intended to detect the location of fault in underground cable lines from the base station to exact location in kilometers using an Arduino micro controller kit.the fault is detected using EMF sensor. Whenever a fault occurs in a cable the buzzer produce the alarm to alert and to take an immediate action by field workers.and also create the web interface for customer complaints using common registration.*

Keywords- Arduino microcontroller,EMF sensor, LCD display ,Motor driver,DC motor, Buzzer, ADC,Relay driver.

I. INTRODUCTION

The objective of this project is to determine the distance of underground cable fault from base station in kilometers using an Arduino board. Generally we use overhead lines. We can easily identify the faults but in rushed places or familiar cities we couldn't use overhead lines. So, we are moving to underground cables. Underground cables used largely in urban area instead of overhead lines. We can't easily identify the faults in the underground cables. This project deals with Arduino microcontroller, buzzer and LCD. This proposes greatly reduces the time and operates effectively. The underground cabling system is a common practice followed in many urban areas. Many time faults occur due to construction works and other reasons. At that time it is difficult to dig out cable due to not knowing the exact location of the cable fault.

1.1 Types of Cable Faults:

Following are the types of **Cable Faults** Commonly Found In the underground Cables.

- Open-Circuit Faults: Open circuit fault is a kind of fault that occurs as a result of the conductor breaking or the conductor being pulled out of its joint. In such instances, there will be no flow of current at all as the conductor is broken (conveyor of electric current).
- Short-circuit or cross fault: This kind of fault occurs when the insulation between two cables or between two multi-core cables gets damaged. In such instances, the current will not flow through the main core which is connected to load but will flow directly from one cable to another or from one core or multi-core cable to the other instead. The load will be short circuited.
- Ground or earth faults: This kind of faults occurs when the insulation of the cable gets damaged. The current flowing through the faulty cable starts flowing from the core of the cable to earth or the sheath (cable protector) of the cable. Current will not flow through the load then.

1.2 . Causes of Cable Faults

Faults in cables are mostly caused by dampness in the paper insulation of cables. As a result, it may damage the lead sheath which protecting the cable. Lead sheath can be damaged in many ways. Most of them are the chemical action of soil on the lead when buried, mechanical damage and crystallization of the lead through vibration.

1.3. Introduction To Embedded System

An Embedded System is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. An embedded system is not a computer system that is used primarily for processing, not a software system on PC or UNIX, not a traditional business or scientific application. High-end embedded & lower end embedded systems. High-end embedded system - Generally 32, 64 Bit Controllers used with OS. Examples Personal Digital Assistant and Mobile phones etc .Lower end embedded systems - Generally 8,16 Bit Controllers used with an minimal operating systems and hardware layout designed for the specific purpose. Examples Small controllers and devices in our everyday life like

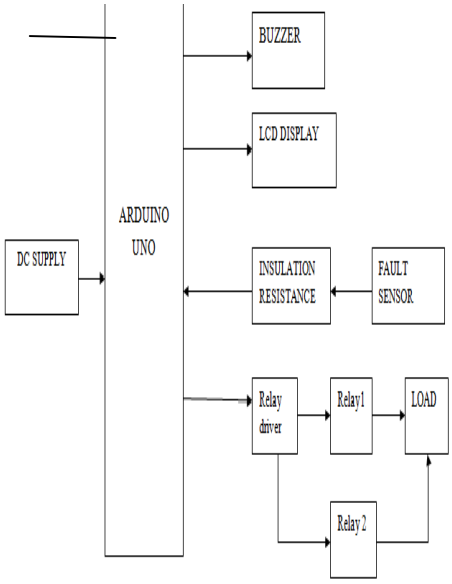
Washing Machine, Microwave Ovens, where they are embedded in.

II. RELATED WORKS

Programs uploaded in Arduino kit to detect faults from the underground cables.when the fault occur in the underground cable,we can find out the faults using the fault detecting sensor (EMF sensor) connected to the Arduino kit. LCD display which displays the faults in Kilometre.cable has many types. Every cable has different resistance depends upon the material used.the value of the ressistance is depends upon the lenth of the cable.The resistance is the leading role in the project.if any deviation in the resistance value then,the voltage will get changed that particular point is called as the FAULT point .we are finding out those faults with the help of Arduino microcontroller.the fault point represents the standard distance from the base station and it will be displayed in the display unit.

III. SYSTEM ARCHITECTURE AND SYSTEM COMPONENTS

system architecture



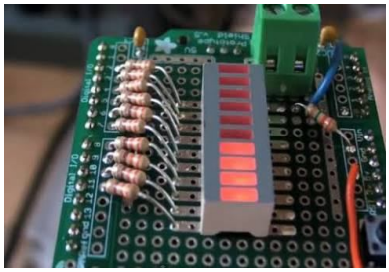
System components:

3.1 Arduino uno:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header, and a reset button. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. Arduino uno microcontroller can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The microcontroller is programmed using the Arduino programming language (based on Wiring) and the Arduino development environment (based on Processing).This pin outputs a regulated 5V from the regulator on the board. This pin can be supplied with power either from the barrel adaptor, the USB connector, or the Vin pin of the board. You can supply voltage via the 5V pin, however this bypasses the regulator, and can damage your board. Maximum current draw is 0.8A.

3.2 Emf sensor

The emf is sensorconnected to the Arduino microcontroller kit,which can detect the occurrences of the fault in the under ground cable.



3.3 Liquid crystal display

A liquid crystal display or LCD draws its definition from its name itself. LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs .Liquid crystal displays are super-thin technology display screen that are generally used in laptop computer screen, TVs, cell phones and portable video games.

LCD's technologies allow displays to be much thinner when compared to cathode ray tube (CRT) technology. Here we use this LCD display for displaying the comments from the user.

3.4 Motor Driver (L293D)

Microcontroller has very low current output it cannot drive current consuming sources, suchlike motor hence motor driver circuit requires. We can implement this circuit using transistor or related driver IC. Notification LED can directly drive with current limiting resistor through microcontroller. Motors can be connected with motor driver IC output it can be submersible pump or basic movements motor.

3.5 DC Motor:

It is an electric motor that converts electrical energy into mechanical energy and it is called a DC Motor. Because it works on direct current. 12V DC power supply is required for the DC Motor for its operation. In this project DC Motor is used to operate wheels of the vehicle.

3.6 Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

3.7 Analog to Digital Converter

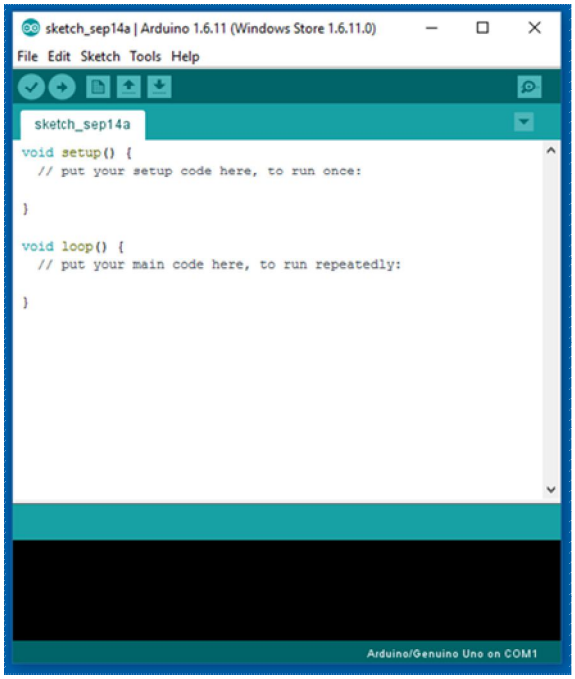
An analog-to-digital converter (ADC) is a system that converts an analog signal, such as a sound picked up by a microphone or light entering a digital camera, into a digital signal. An ADC may also provide an isolated measurement such as an electronic device that converts an input analog voltage or current to a digital number proportional to the magnitude of the voltage or current. Typically the digital output is a two's complement binary number that is proportional to the input, but there are other possibilities. There are several ADC architectures. Due to the complexity and the need for precisely matched components, all but the most specialized ADCs are implemented as integrated circuits (ICs).

IV .SOFTWARE DESCRIPTION

4.1.Arduino IDE

IDE is an integrated development environment based on programming language named as Processing, it also support C and C++. It basically is a cross-platform application written in ASP.Net. IDE is basically for software programming of any hardware board or IC.This code editor have following features: Syntax highlighting, brace matching, automatic indentation, one-click mechanism for loading and compiling of the programs on the Arduino board. In IDE program written is known as Sketch. C/C++ sketch consist of two functions which are compiled and amalgamate with a program stubmain().

- setup(): this function runs at the beginning or start of the program and even initialize the settings.
- Loop(): this function is called repeatedly until the board power is cut-off.



V.MODULES

5.1. Fault sensing module

Underground fault detection deals with finding the exact fault location from the base station .Cables have some resistance. We are mainly focusing that resistance. Resistance can vary with respect to the length of the cable. If the length of the cable increases, the value of the resistance will also increase. If deviation occurs in the resistance value, we call that as fault point and that point can be identified with the help of arduino technology and IR Transmitter and Receiver. That fault point represents the standard of distance (kilometre) from the base station.

5.2. Alarm and Display module

Display unit is connected to the Arduino kit which is used to display where the fault occurs. Once faults occur in the cable, the display unit displays the exact fault location. Here we use the display unit as LCD.Buzzer system is used to create an alerting signal. Buzzer systems create an alerting sound signal, once the fault occurs in the underground cable.

5.3 .Web Interface Modules:

This module contains following details:

- Public Register
- Public Login
- Admin Login

5.3.1. Public Register:

This module prompts the user to give his various information for registration.

- Name
- Address
- Mobile Number
- Email id

5.3.2. Public Login & Complaint module

In this module, public will logon by using user name and password. And He/she can also give complaints to higher authority about cable fault and its details like where the fault occurs.

5. 3.4.Admin Login & Action module

In this module administrator collects all the complaints after successful login and Fault location details sends to the workers. Then that workers get into the action and its going to easily rectified.

VI. SYSTEM TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub assemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that theSoftware system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

6.1.Unit testing

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application .it is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

6.2.Integration testing

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components

6.3. Functional test

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

Functional testing is centered on the following items:

Valid Input : identified classes of valid input must be accepted.
Invalid Input : identified classes of invalid input must be rejected.
Functio : identified functions must be exercised.
Output : identified classes of application outputs must be exercised.
Systems/Procedures: interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields, predefined processes, and successive processes must be considered for testing. Before functional testing is complete, additional tests are identified and the effective value of current tests is determined.

6.4.System Test

System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process descriptions and flows, emphasizing pre-driven process links and integration points.

6.5. White Box Testing

White Box Testing is a testing in which in which the software tester has knowledge of the inner workings, structure and language of the software, or at least its purpose. It is purpose. It is used to test areas that cannot be reached from a black box level.

6.6 .Black Box Testing

Black Box Testing is testing the software without any knowledge of the inner workings, structure or language of the module being tested. Black box tests, as most other kinds of tests, must be written from a definitive source document, such as specification or requirements document, such as specification or requirements document. It is a testing in which the software under test is treated, as a black box .you cannot “see” into it. The test provides inputs and responds to outputs without considering how the software works.

6.7. Unit Testing:

Unit testing is usually conducted as part of a combined code and unit test phase of the software lifecycle, although it is not uncommon for coding and unit testing to be conducted as two distinct phases.

6.8. Integration Testing

Software integration testing is the incremental integration testing of two or more integrated software components on a single platform to produce failures caused by interface defects.The task of the integration test is to check that components or software applications, e.g. components in a software system or – one step up – software applications at the company level – interact without error.

6.9.Acceptance Testing

User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements.

VII.CONCLUSION

This project is intended to detect the exact location of circuit fault in the underground cables from the feeder end in km by using an Arduino microcontroller. The Arduino microcontroller works based on the output of the cable resistance.

Relay helps to separate the faulty line from healthy line. Underground cables offer an affordable and justifiable solution for critical parts and in some cases the entire length of overhead high voltage power lines. With appropriate

technology used in appropriate places, the environmental impact of underground cables can be minimized.

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