SMART FAULT LOCATION FOR SMART GRID

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***Abstract*—** A smart grid is an integration of advanced sensing technologies, control methods, and integrated communications into the electricity grid Our project aims the smart fault location schemes for both transmissions and distribution systems developed taking advantage of available modern technologies used for data recording, information extraction, and integration as well as intelligent approaches to selecting fault location.

Smart grid operations require communication interface with bulk generating facilities, transmission system, substation automation, distribution automation, DMS. consumers, and the market. Metering, recording, and controlling operations come under the purview of the smart grid operations Realtime information exchange with the power market needs to be established to implement power trading and scheduling. The operators need to interact with various service providers to ensure proper functioning of the smart grid. Information exchange with the consumers prosumers is the key for the operators to implement the so called demand management system.

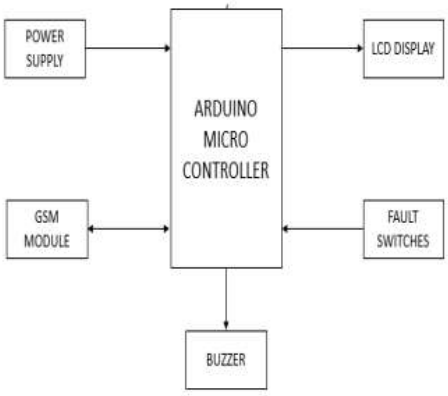
I.INTRODUCTION

Present industry is increasingly shifting towards automation. Two principle components of today's industrial automations are programmable controllers. In order to aid the tedious work and to serve the mankind, today there is a general tendency to develop an intelligent operation. Arduino uno we have used as microcontroller. It has flash type reprogrammable memory. It has some peripheral devices to play this project perform. It also provides sufficient power to inbuilt peripheral devices. We need not give individually to all devices. The peripheral devices also activates as low power operation mode. These are the advantages are appear here.

A. EXISTING SYSTEM

INTRODUCTION

The aim of this project is to determine the distance of underground cable fault from base station in kilometers and by using 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 digital converter and a microcontroller .



PROBLEMS OF EXISTING SYSTEM

- This system only detects the fault and not controlling.
- Less efficient to monitor and intimate fault in case of emergency.

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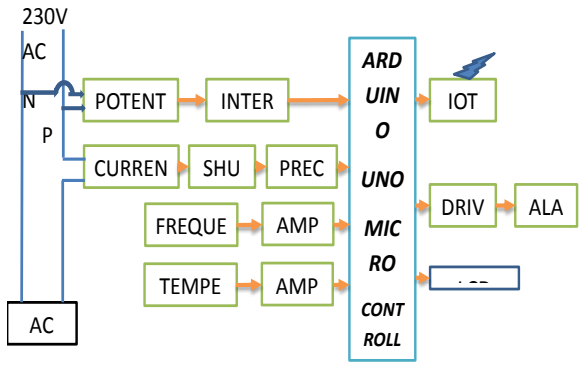
B.PROPOSED SYSTEM

The working of proposed system is based on IOT technology. Initially we are monitoring a temperature level, voltage level, current level. Frequency level of tunnel using potential transformer, current transformer, and temperature sensor. Based on Temperature sensor value the fan speed is controlled. The voltage status is monitored by potential transformer and current status is monitored by Current transformer. We are monitoring the entire chance fault like different parameters or transformer like low voltage, High voltage, and High current and high temperature, low temperature. Based on these we are monitoring a cable tunnel fault. All these values are monitored by IOT server and android app.

EXISTING SYSTEM MODEL



C.ARDUINO UNO:

Arduino/Genuino Uno is a microcontroller board based on the ATmega328P . It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

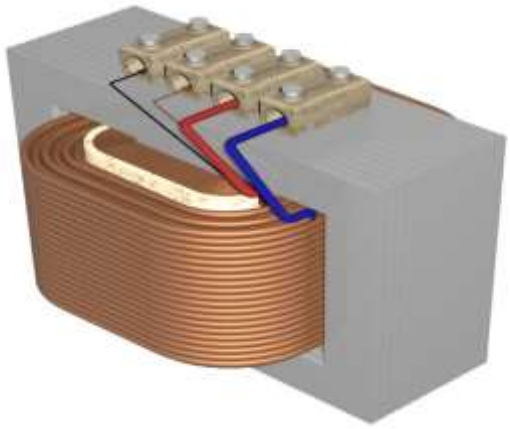
"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards

LCD DISPLAY:

A **liquid crystal display** (**LCD**) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs do not emit light directly.

They are used in a wide range of applications including: computer monitors, television, instrument panels, aircraft cockpit displays, signage, etc. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones. LCDs have displaced cathode ray tube(CRT) displays in most applications. They are usually more compact, lightweight, portable, less expensive, more reliable, and easier on the eyes. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they cannot suffer image burn-in.LCDs are more energy efficient and offer safer disposal than CRTs. Its low electrical power consumption enables it to be used in battery-powered electronic equipment. It is an electronically modulated optical device made up of any number of pixels filled with liquid crystals and arrayed in front of a light source (backlight) or reflector to produce images in color or monochrome. The earliest discovery leading to the development of LCD technology, the discovery of liquid crystals, dates from 1888. By 2008, worldwide sales of televisions with LCD screens had surpassed the sale of CRT units.

POTENTIAL TRANSFORMER:



Voltage transformers (VT) or potential transformers (PT) are another type of instrument transformer, used for metering and protection in high-voltage circuits. They are designed to present negligible load to the supply being measured and to have a precise voltage ratio to accurately step down high voltages so that metering and protective relay equipment can be operated at a lower potential. Typically the secondary of a voltage transformer is rated for 69 V or 120 V at rated primary voltage, to match the input ratings of protection relays.

The transformer winding high-voltage connection points are

typically labeled as H_1, H_2 (sometimes H_0 if it is internally grounded) and X_1, X2 and sometimes an X_3 tap may be present. Sometimes a second isolated winding (Y_1, Y_2, Y_3) may also be available on the same voltage transformer. The high side (primary) may be connected phase to ground or phase to phase. The low side (secondary) is usually phase to ground. The terminal identifications (H_1, X_1, Y_1, etc.) are often referred to as polarity. This applies to current transformers as well. At any instant terminals with the same suffix numeral have the same polarity and phase. Correct identification of terminals and wiring is essential for proper operation of metering and protection relays. Some meters operate directly on the secondary service voltages at or below 600 V. VTs are typically used for higher voltages (for example, 765 kV for power transmission) , or where isolation is desired between the meter and the measured circuit.

CURRENT TRANSFORMER:

Current transformers used in metering equipment for three-phase 400 ampere electricity supply

A current transformer (CT) is a measurement device designed to provide a current in its secondary coil proportional to the current flowing in its primary. Current transformers are commonly used in metering and protective relaying in the electrical power industry where they facilitate the safe measurement of large currents, often in the presence of high voltages. The current transformer safely isolates measurement and control circuitry from the high voltages typically present on the circuit being measured.

Current transformers are often constructed by passing a single primary turn (either an insulated cable or an uninsulated bus bar) through a well-insulated toroidal core wrapped with many turns of wire. The CT is typically described by its current ratio from primary to secondary. For example, a 4000:5 CT would provide an output current of 5 amperes when the primary was passing 4000 amperes. The secondary winding can be single ratio or have several tap points to provide a range of ratios. Care must be taken that the secondary winding is not disconnected from its load while current flows in the primary, as this will produce a dangerously high voltage across the open secondary and may permanently affect the accuracy of the transformer.

Specially constructed wideband CTs are also used, usually with an oscilloscope, to measure high frequency waveforms or pulsed currents within pulsed power systems. One type provides a voltage output that is proportional to the measured current; another, called a Rogowski coil, requires an external integrator in order to provide a proportional output.

TEMPERATURE SENSOR :

A thermistor is a type of resistor whose resistance varies with temperature. The word is a portmanteau of *thermal* and *resistor*. Thermistors are widely used as inrush current limiters, temperature sensors, self-resetting overcurrent protectors, and self-regulating heating elements. Thermistors differ from resistance temperature detectors (RTD) in that the material used in a thermistor is generally a ceramic or polymer, while RTDs use pure metals. The temperature response is also different; RTDs are useful over larger temperature ranges, while thermistors typically achieve a higher precision within a limited temperature range [usually −90 °C to 130 °C].

INTERNET OF THINGS (IOT):

The Internet of things (IoT) is the network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these things to connect, collect and exchange data.

IoT involves extending Internet connectivity beyond standard devices, such as desktops, laptops, smartphones and tablets, to any range of traditionally *dumb* or non-internet-enabled physical devices and everyday objects. Embedded with technology, these devices can communicate and interact over the Internet, and they can be remotely monitored and controlled. With the arrival

of driverless vehicles, a branch of IoT, i.e. the Internet of Vehicle starts to gain more attention.

The definition of the Internet of things has evolved due to convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems.Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), and others all contribute to enabling the Internet of things.

The concept of a network of smart devices was discussed as early as 1982, with a modified Coke machine at Carnegie Mellon University becoming the first Internet-connected appliance, able to report its inventory and whether newly loaded drinks were cold. Mark Weiser's 1991 paper on ubiquitous computing, "The Computer of the 21st Century", as well as academic venues such as UbiComp and PerCom produced the contemporary vision of IoT. In 1994, Reza Raji described the concept in *IEEE Spectrum* as "[moving] small packets of data to a large set of nodes, so as to integrate and automate everything from home appliances to entire factories". Between 1993 and 1997, several companies proposed solutions like Microsoft's at Work or Novell's NEST. The field gained momentum when Bill Joy envisioned Device to Device (D2D) communication as part of his "Six Webs" framework, presented at the World Economic Forum at Davos in 1999.

The term "Internet of things" was likely coined by Kevin Ashton of Procter & Gamble, later MIT's Auto-ID Center, in 1999, though he prefers the phrase "Internet *for* things". At that point, he viewed Radio-frequency identification (RFID) as essential to the Internet of things, which would allow computers to manage all individual things.

A research article mentioning the Internet of things was submitted to the conference for Nordic Researchers in Logistics, Norway, in June 2002, which was preceded by an article published in Finnish in January 2002.The implementation described there was developed by Kary Främling and his team at Helsinki University of Technology and more closely matches the modern one, i.e. an information system infrastructure for implementing smart, connected objects.

Defining the Internet of things as "simply the point in time when more 'things or objects' were connected to the Internet than people", Cisco Systems estimated that IoT was "born" between 2008 and 2009, with the things/people ratio growing from 0.08 in 2003 to 1.84 in 2010.

APPLICATIONS

The extensive set of applications for IoT devices is often divided into consumer, commercial, industrial, and infrastructure spaces.

WIFI

A Wi-Fi-enabled device, such as a personal computer, video game console, smartphone or digital audio player, can connect to the Internet when within range of a wireless network connected to the Internet. The coverage of one or more (interconnected)access points called hotspots comprises an area as small as a few rooms or as large as many square miles. Coverage in the larger area may depend on a group of access points with overlapping coverage. Wi-Fi technology has been used successfully in wireless mesh networks in London, UK, for

Wi-Fi provides service in private homes and offices as well as in public spaces at Wi-Fi hotspots set up either free-of-charge or commercially. Organizations and businesses, such as airports, hotels, and restaurants, often provide free-use hotspots to attract or assist clients. Enthusiasts or authorities who wish to provide services or even to promote business in selected areas sometimes provide free Wi-Fi access. As of 2008 more than 300 city-wide Wi-Fi (Muni-Fi) projects had been created. As of 2010 the Czech Republic had 1150 Wi-Fi based wireless Internet service providers.

Routers that incorporate a digital subscriber line modem or a cable modem and a Wi-Fi access point, often set up in homes and other buildings, provide Internet access and internetworking to all devices tuned into them, wirelessly or via cable. With the emergence of MiFi and WiBro (a portable Wi-Fi router) people can easily create their own

One can also connect Wi-Fi devices in ad-hoc mode for client-to-client connections without a router. Wi-Fi also connects places

normally without network access, such as kitchens and garden sheds.

ALARM:

An **alarm** gives an audible or visual warning about a problem or condition.

Buzzer:

A **buzzer** or **beeper** is a signalling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise).

Often these units were anchored to a wall or ceiling and used the ceiling or wall as a sounding board. Another implementation with some AC-connected devices was to implement a circuit to make the AC current into a noise loud enough to drive a loudspeaker and hook this circuit up to a cheap 8-ohm speaker. Nowadays, it is more popular to use a ceramic-based piezoelectric sounder like a Sonalert which makes a high-pitched tone. Usually these were hooked up to "driver" circuits which varied the pitch of the sound or pulsed the sound on and off.

D.SOFTWARE REQUIREMENTS

1. ARDUINO IDE

Arduino is both an open-source software library and an open-source breakout board for the popular AVR micro-controllers. The Arduino IDE (Integrated Development Environment) is the program used to write code and comes in the form of a downloadable file on the Arduino website. The Arduino board is the physical board that stores and performs the code uploaded to it. Both the software package and the board are referred to as "Arduino" figure is shown in 4.1. Arduino is open-source hardware. The hardware reference designs are distributed under a Creative Commons Attribution Share-Alike 2.5 license and are available on the Arduino website. Layout and production files for some versions of the hardware are also available. Figure 4.1 Arduino IDE 49 Although the hardware and software designs are freely available under copyleft licenses, the developers have requested the name Arduino to be exclusive to the official product and not be used for derived works without permission. The official policy document on the use of the Arduino name emphasizes that the project is open to incorporating work by others into the official product.[25] Several Arduino-compatible products commercially released have avoided the project name by using various names ending in -duino. An early Arduino board with an RS-232 serial interface (upper left) and an Atmel ATmega8 microcontroller chip (black, lower right); the 14 digital I/O pins are at the top, the 6 analog input pins at the lower right, and the power connector at the lower left. The boards use single or double-row pins or female headers that facilitate connections for programming and incorporation into other circuits. These may connect with add-on modules termed shields. Multiple and possibly stacked shields may be individually addressable via an I2C serial bus. Most boards include a 5 V linear regulator and a 16. MHz crystal oscillator or ceramic resonator. Some designs, such as the Lilypad, run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions.

2.ANDROID STUDIO

Android Studio is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems. It is a replacement for the Eclipse Android Development Tools (E-ADT) as the primary IDE for native Android application development. Android Studio was announced on May 16, 2013, at the Google I/O conference. It was in early access preview stage starting from version 0.1 in May 2013, then entered beta stage starting from version 0.8 which was released in June 2014. The first stable build was released in December 2014, starting from version 50 1.0. At the end of 2015, Google dropped support for Eclipse ADT, making Android Studio the only officially supported IDE for Android development. The following features are provided in the current stable version, ¬ Gradle-based build support ¬ Android-specific refactoring and quick fixes ¬ Lint tools to catch performance, usability, version compatibility and other problems. ¬ ProGuard integration and app-signing capabilities ¬ Template-based wizards to create common Android designs and components.

E. CONCLUSION & FUTURE SCOPE

1 CONCLUSION

In recent years, the computing power of cloud services has revolutionized the solution of complex and nonlinear data problems. Therefore, this paper introduced an Iota based under cable fault detection, assessment, and forecasting system that utilizes IOT based system monitor the cable tunnel all parameters enhance transmission line safety through early warnings. The system was installed in an operating transmission line and chance power failure. The transmission linebased temperature value of tunnel.

2 FUTURE SCOPE

To accommodate a wide variety of generations centralized and distributed intermittent and dispatchable. ¬ To communicate with energy management system in smart buildings to enable customers to manage their energy use and reduce their energy cost. ¬ To provide improved power quality to the users. ¬ To provide real-time information, lower operation cost and electricity available to everyone. ¬ To use information technology for monitoring and control to optimize its capital and operational cost. ¬ To predict and instantly respond to system problems to avoid power outages and power quality problems. To make the nation's energy independent.

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