Transmission Line Fault Detection Using Arduino With GSM

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ABSTRACT: This project deals with new method of single phase fault detection technique is used, along with automatic switching based on an Arduino display of the issue. Our detection method focuses on current that travels through cables. There will be a maximum current capacity for each cable. Current immediately increases when a short circuit fault happens. Current will be zero in an open circuit as well. Current transformers are used to measure current levels; the output current is then sent through an I to V converter unit to convert it to voltage readings. The Arduino's ADC pin receives this voltage and converts it to digital information. If any fault conditions (SC or OC) arise, the ADC pin will then take the required action. This error is shown on both an LCD and an LED display To ensure an uninterrupted power supply for end users, the municipal electrical distribution system's single phase load is switched to the other good phase using a relay driver and relay circuit. A switch for manually notifying the system of fault clearing is available. After that, just the load will be converted to regular phase. The GSM module was used to convey information to the appropriate authorities.

Keywords: Transmission line, fault detection, Microcontroller, GSM technology.

I.INTRODUCTION

In Electrical power transmission system, the majority of voltage and current signal distortions in power transmission networks are brought on by fault. An interruption in power delivery may result from faults in power transmission lines. Because the system automatically and precisely gives accurate fault location information, the amount of time needed to find a defect is significantly decreased. This will guarantee a quicker reaction time from technical staff to fix these issues, protecting transformers from harm and disasters. A smart GSM based fault detection and location system was used to adequately and accurately indicate and locate where fault had occurred. The system uses a Arduino, LCD , Sensors and a GSM modem. The system uses an impedance-based algorithm approach to calculate the fault distance from the control room after automatically detecting, analysing, and classifying problems. Finally, the control room receives the fault information. A distributed monitoring and centralised control system are designed and implemented in this project. SMS is sent to a responsible person's mobile device utilising GSM wireless technology. A desirable solution for wireless communication applications is the GSM module. The GSM network offers dependable countrywide coverage for communications. Based on the GSM standard, short messaging service (SMS) is currently the service that is most widely utilised. A unique address (SIM card number) is provided to the remote control unit by the declining cost of GSM devices like mobile phones and the GSM SMS, allowing commands to be communicated across the wireless communication network.

II. LITERATURE SURVEY

Akshit Sharma*, Ankit Nirwan*, Ajay Singh Shekhawat [1] proposed "Fault Analysis on Three Phase Transmission Lines and its Detection" Power system failure could lead to instability loss and serious damage to either the defective or nearby healthy equipment. Additionally, the stability proposal is regarded as a crucial element in the management of energy and the planning of power systems . Additionally, a high amount of current is drawn from the system during the motor starting phase, which causes a system voltage drop and disrupts the regular operation of other loads. Numerous studies have revealed that up to 90% of faults on most overhead lines are transient, ranging from 70% to 90%. When one or more circuit breakers are immediately tripped to isolate a problem, such as an insulator flashover, the fault is cleared and does not reoccur.

Sibisagar.B, Surya.V.R, VigneshVijayaraghavan, Dr.SuriyaKrishnaan [2] proposed. "Self-Regulating Line Fault Detection & Its Location In Transmission Lines " Transmission line faults are one of the main causes of power outages and damage to power transfer equipment. In rural India, restoring a line fault is projected to take seven hours, with the majority of that time spent trying to pinpoint the problem's specific position because there is no reliable way to do so. When a transmission line transmits voltage over the desired voltage, voltage below the desired voltage, or with no current flowing between any two places, one of three things can happen: a fault. Each of these line fault issues is handled separately in the proposed system. The brain is a microcontroller called Arduino UNO of this system, where it regulates how the system as a whole operates. Continuous measurements of voltage, current, and temperature are made using voltage sensors, current sensors, and temperature sensors, accordingly. The system is set up so that any deviation from the upper and lower limits of these crucial parameters will be instantly reported to the relevant electrical board, allowing for the taking of preventative measures to limit existing harm. GSM can be used to send these alarm messages. The Internet of Things can be used to find out the current status of the issue and to switch off the electricity to the affected area.

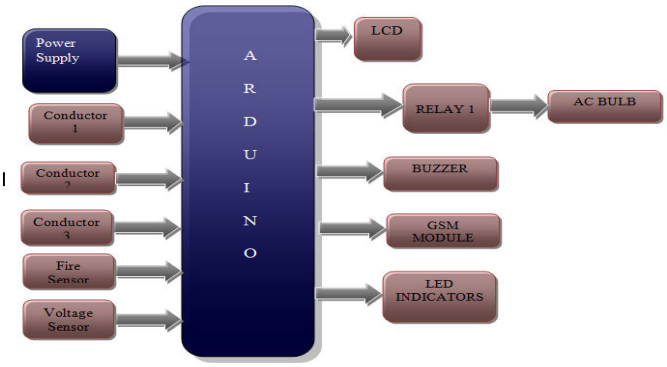
Prof. Vikramsingh R. Parihar1* , Shivani Jijankar2 , Anand Dhore3 , Arti Sanganwar4 , Kapil Chalkhure5., [3] proposed "Automatic Fault Detection in Transmission Lines using GSM Technology" There are numerous distinct elements that make up the electric power system. One of these is the transmission system, in which power is delivered to consumers via transmission lines from generating plants and substations. When the insulation of the system fails at any point, a fault is simply described as a collection of unfavourable but unavoidable happenings that might momentarily upset the stable condition of the power system. The fault was properly and precisely indicated and located using a smart GSM-based fault detection The system uses an impedance-based

algorithm approach to calculate the fault distance from the control room after automatically detecting, analysing, and classifying problems. The control room receives the fault information

Sharmili W. Drugkar1 Krishna R. Maske2 Bhagyashree Gadekar3 [4] Proposed "TRANSMISSION LINE FAULT DETECTION USING GSM TECHNOLOGY" The distribution system and transmission system faults are sufficiently and precisely identified in this article using a smart GSM-based fault detection system. A variety of safety devices, a voltage and current sense section, a microcontroller section, an LED display section, and a GSM (global system for mobile communication) module are all included in the proposed system. This method will assist the local electrical board and service personnel in quickly identifying any faults and preventing transformer damage. A variety of devices are employed in this system, including a GSM modem, RS-232 cable, microcontroller, potential transformer, and current transformer. This system uses a micro-controller to automatically identify, evaluate, and classify faults. This system also gives the information about which type of fault occurred in transmission line such as L-L (line to line), L-G (line to ground), L-L-G (double line to ground) fault, L-L-L & L-LL-G (symmetrical fault). And this information is send to the service provider company via SMS using GSM.

S.Chellam*,P.Latha1, K.M.Nivetha2 M.Swathi3 [5]proposed "Fault Detection using GSM Technology in Overhead Distribution Lines" The identification and mitigation of the single line fault in the overhead distribution line are given in this work. Due to the GSM technology being used, distribution lines are being measured, protected, and controlled against various fault conditions. It is tracked how voltage and current change as a result of open and short circuit faults. Thermistor is used to measure the line temperature. The notification will be conveyed by GSM if there is any change in the temperature. Using a sag detector, the sag in the distribution line is also found and monitored. Here, the message is sent and the defect is using a GSM modem.

III PROPOSED METHODOLOGY



A. POWER SUPPLY

All digital circuits require regulated power supply. In this article we are going to learn how to get a regulated positive supply from the mains supply.

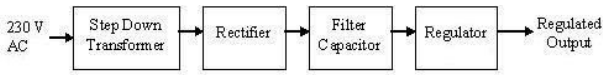


Figure 1:- power supply

B..ARDUINO

A maker of single-board microcontrollers and microcontroller kits for creating digital gadgets and interactive objects that can sense and be controlled both physically and digitally, Arduino is an open-source hardware and software firm, project, and user community. Due to its products' GNU Lesser General Public License (LGPL) or GNU General Public License (GPL) licencing, anyone is allowed to produce Arduino boards and distribute software. Commercially, Arduino boards can be purchased as constructed or as DIY kits. Different types of microprocessors and controllers are used in Arduino board designs. A variety of expansion boards, breadboards (shields), and other circuits can be interfaced with the boards' sets of digital and analogue input/output (I/O) pins. The boards provide serial communications interfaces that can be used to load software from personal computers, including on some models, Universal Serial Bus (USB). Typically, a dialect of elements from the programming languages C and C++ are used to programme microcontrollers. The Arduino project offers an integrated development environment (IDE) based on the Processing language project in addition to using conventional compiler toolchains.

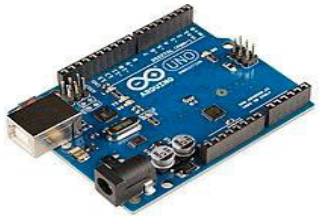


Figure 2:Arduino

C.GSM MODEM

GSM, which stands for Global System for Mobile communications, reigns (important) as the world's most widely used cell phone technology. Cell phones use a cell phone service carrier's GSM network by searching for cell phone towers in the nearby area. Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot. The digital system has the ability to carry 64 kbps to 120 Mbps of data rates.

There are various cell sizes in a GSM system such as macro, micro, pico, and umbrella cells. Each cell varies as per the implementation domain. There are five different cell sizes in a GSM network macro, micro, pico, and umbrella cells. The coverage area of each cell varies according to the implementation environment. A GSM MODEM can perform the following operations:

1. Receive, send or delete SMS messages in a SIM.
2. Read, add, search phonebook entries of the SIM.
3. Make, Receive, or reject a voice call.

Figure 3: GSM MODE

D.LCD DISPLAY

A flat, thin electronic visual display called a liquid crystal display makes use of the liquid crystal's ability to modulate light. LCDs are frequently used in displays for computers, televisions, aircraft, instrument panels, signage, etc..

Figure 4: LCD Display

E.TRANSMISSION LINES

A transmission line is used for the transmission of electrical power from generating substation to the various distribution units. It transmits the wave of voltage and current from one end to another. The transmission line is made up of a conductor having a uniform cross-section along the line. Air act as an insulating or dielectric medium between the conductors

Figure 5: Transmission lines

F.RELAY

A switch that is controlled by electricity is a relay. It is made up of a set of working contact terminals and a set of input terminals for one or more control signals. Any number of contacts in various contact forms, such as create contacts, break contacts, or combinations of these, may be present on the switch. Relays are employed when multiple circuits need to be controlled by a single signal or when a circuit has to be controlled by a separate, low-power signal. In order to refresh the signal coming in from one circuit by transmitting it on another circuit, relays were originally utilised in long-distance telegraph circuits. To carry out logical processes, relays were widely utilised in early computers and telephone exchanges. Other operating principles have been developed, such as solid static relays, which use semiconductor features for control without relying on moving elements, in contrast to the typical form of a relay, which uses an electromagnet to close or open the contacts. Electrical circuits are protected from overload or defects by relays with calibrated operating characteristics and occasionally several operating coils; in contemporary electric power systems, digital instruments still carry out similar activities and are referred to as protecting relays. Latching relays only need one control power pulse to permanently operate the switch. Repetition of the same type of pulse has no impact, but applying another pulse to a different set of control terminals or applying a pulse with the opposite polarity resets the switch. When power interruptions shouldn't influence the circuits that the relay is controlling, magnetic latching relays can be advantageous.

Figure 6: Relay

G. FIRE SENSOR

A flame-sensor is one kind of detector which is mainly designed for detecting as well as responding to the occurrence of a fire or flame. The flame detection response can depend on its fitting. It includes an alarm system, a natural gas line, propane & a fire suppression system. The response of these sensors is faster as well as more accurate compare with a heat/smoke detector because of its mechanism while detecting the flame. Sensor/detector can be built with an electronic circuit using a receiver like electromagnetic radiation. This sensor uses the infrared flame flash method, which allows the sensor to work through a coating of oil, dust, water vapour, otherwise ice

Figure 6: Fire Sensor

H. VOLTAGE SENSOR

A voltage sensor is a sensor used to calculate and monitor the amount of voltage in an object. Voltage sensors can determine the AC voltage or DC voltage level. The input of this sensor is the voltage, whereas the output is the switches, analog voltage signal, a current signal, or an audible signal. A potentiometer (colloquially known as a "pot") is a three-terminal resistor with a sliding contact that forms an adjustable voltage divider. It is a measuring device which measures the voltage or current at the output by comparing it with the known input voltage. Varying the input voltage is a difficult process and requires advanced equipments. In the potentiometer the input is fixed at some maximum and minimum value

Figure 7: Voltage Sensor

I..LED

LED is a semiconductor that illuminates when an electrical charge passes through it. LEDs are commonly green, amber, or red, but they can be an assortment of other colors as they've become popular with case lighting. Below are examples of how an LED could be used with a computer. Indicator lights are used to make the operating status (on, off, fault) of the device on which they are installed visible from the outside by means of a small light.

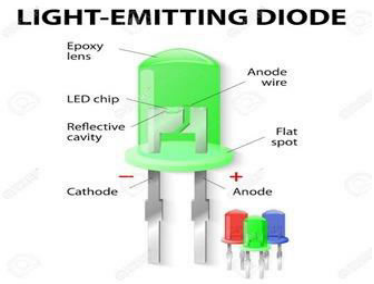


Figure 8: LED

H..BUZZER

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren**.** It includes two pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal.

Figure 9: Buzzer

IV. FINAL HARDWARE

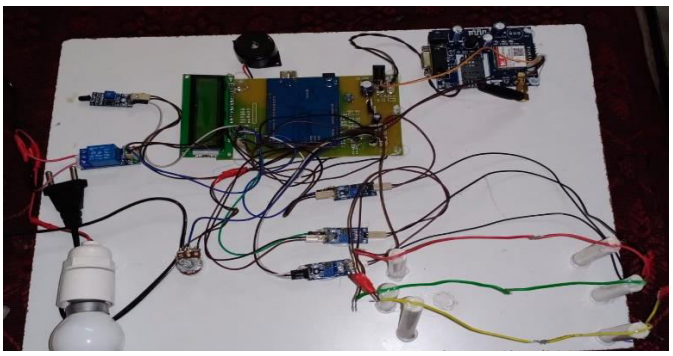


Figure 10 : HARDWARE KIT

Heart of the project is the microcontroller ATMEGA 328P. In general the normal distribution phase voltage is 220 V, in this project we used a step down transformer 220/12 V for converting the phase voltage from 220 V to 12 V. Then, a bridge rectifier has been used for converting the 12 V ac to 12 V dc; after that, applied voltage divider converts the 12 V to 5 V because the microcontroller works at maximum 5 V. By this process the three distribution phase is connected into three microcontroller pins. At cases, when the distribution side is in load shedding protection of transformer must be ensured, which is why the microcontroller power is given from an external power source (5 V battery) backup and also the GSM module power is given from external power source(4V battery). GSM module communicates with atmeg32 through UART. RXD of GSM module is connected with TXD of atmega32 and TXD of GSM module is connected to RXD of atmega32. As viewed from figure, the system was found to be balanced three phase system. In figure, the corresponding representation appears in the LCD display with the phase voltages in all the phases to be around 200 V to 240V. The view from Android Phone is also shown in figure. Authority get information with respective of time

Figure 11: Output through LCD and LED

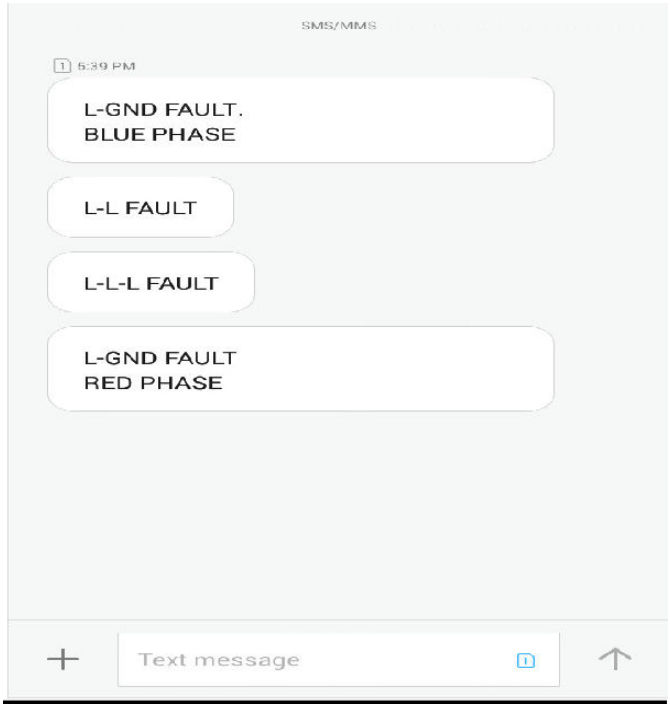


Figure 12 : Output through SMS from GSM

V.CONCLUSION

In this project, we've created a GSM-based system for monitoring and indicating transmission lines, which provides information about the system to the control centre via SMS. The distribution system is the main focus of the actualized system design. It offers a means of spotting errors like energy theft and energy wasting. Various system parameters are continuously monitored by the system. Additionally, it aids in timely defect detection, preventing unauthorised use of electricity. Through a hyper terminal, automatic monitoring, analysis, and recording are performed on the PC screen. The project has a continuous monitoring system that combines microcontroller and GSM communication technology. Additionally, it depicts the software flow and hardware architecture. The system's implementation will save a significant quantity of electricity, making electricity available to more consumers in a country with a huge population, like India.

VI.ACKNOWLEDGEMENT

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In this project , Transmission line fault is detected with short period of time through GSM technology.

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