



# Automatic Fault Detection of Transmission Lines Using IoT

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## ABSTRACT

*A smart GSM based fault detection system was used to adequately and accurately indicate fault had occurred. This will ensure a shorter response time for technical crew to rectify these faults and thus, help save transformers from damage and disasters. The system uses a current sensor, Arduino, current detector, voltage sensing circuit (for overload cases), and a GSM modem. Finally, the faulty information is transmitted to the control room. In conclusion, the time required to locate a fault is drastically reduced, as the system automatically and accurately provides accurate fault location information. By using this project, we can detect the faults of three phase transmission lines one can monitor the Temperature, Voltage, Current by means of GSM modem by sending message.*

**Keywords:** ARDUINO UNO, GSM, LCD, Voltage Sensor, Current Sensor, Relay, Transformer, Buzzer.

## INTRODUCTION

Transmission network is considered to be one of the vital parts of power system. The loss in transmission and distribution network is considered to be very high, compared to other parts of power system. The electric power infrastructure is highly vulnerable against many forms of natural and malicious physical events. Many electric power transmission companies have primarily relied on circuit indicators to detect faulty sections of their transmission lines. Wireless sensor-based monitoring of transmission lines provides a solution for several of these concerns like real time structural awareness, faster fault localization, accurate fault diagnosis by identification and differentiation of electrical faults from the mechanical faults, cost

reduction due to condition based maintenance rather than periodic maintenance, etc. These applications specify stringent requirements such as fast delivery of enormous amount of highly reliable data. The success of these applications depends on the design of cost effective and reliable network architecture with a fast response time. The network must be able to transport sensitive data such as current state of the transmission line and control information to and from the transmission grid. This project provides a cost optimized framework to design a real time data transmission network. To monitor the status of the power system in real time, sensors are put in various components in the power network.

An embedded system is one kind of a computer system mainly designed to perform several tasks like to access, process, and store and also control the data in various electronics-based systems. Embedded systems are a combination of hardware and software where software is usually known as firmware that is embedded into the hardware. One of its most important characteristics of these systems is, it gives the o/p within the time limits. Embedded systems support to make the work more perfect and convenient. So, we frequently use embedded systems in simple and complex devices too. The applications of embedded systems mainly involve in our real life for several devices like microwave, calculators, TV remote control, home security and neighborhood traffic control systems, etc.

## LITERATURE SURVEY

In Rubini.R, *et al* [1] proposed a system has an alerting, recording and reporting system for over speed violation management. The Zigbee transmitter sends the speed limit of the particular lane entered by the vehicle and also gives alerts like "road works", "steep slopes", "school zone" in the form of acoustical messages and also in LCD. The receiver unit placed in the vehicle receives the messages and sends to the microcontroller. When speed of the vehicle nears the speed limit it displays the warning and if exceeds the limit, the microcontroller records the violated speed and time. The LCD displays the lane speed limit and shows the number of times, speed was violated. A GSM module sends message to the nearest traffic personnel immediately after a violation occurs. An authenticated device is also provided, which can be operated only by the traffic police in which he can retrieve the data stored at any time. Increase in the count of violation increases the penalty amount which can be collected in toll gates located nearby.

In S.P. Bunker, *et al* [2] described a real-time online safety prototype that controls the vehicle speed under driver fatigue. The purpose of such a model is to advance a system to detect fatigue symptoms in drivers and control the speed of vehicle to avoid accidents. The main components of the system consist of number of real time sensors like gas, eye blink, alcohol, fuel, impact sensors and a software interface with GPS and Google Maps APIs for location.

In G.Sathya, *et al* [3] achieved with the help of "AARS using GPRS 3G TECHNOLOGY". Through this, we can provide a smooth flow for the ambulance by controlling the traffic light according to the ambulance location to reach the hospital. The location of the ambulance can be easily identified with the help of the GPS unit installed in it. A controller in the traffic junction can automatically control the traffic flow and thus reduces the time delay taken by ambulance to the hospitals. The traffic junction band the ambulance will have GPRS 3G modem to communicate between them. The chances of misusing the ambulance can overcome with the help of an RFID tag given to the doctor's in the respective hospitals so that the security can be attained.. This scheme is helpful for the Traffic police to control the traffic thereby helping the patients who are facing emergency.

In S.P. Bhumkar *et al* [4] described a real-time online safety prototype that controls the vehicle speed under driver fatigue. The purpose of such a model is to advance a system to detect fatigue symptoms in drivers and control the speed of vehicle to avoid accidents. The main components of the system consist of number of real time sensors like gas, eye blink, alcohol, fuel, impact sensors and a software interface with GPS and Google Maps APIs for location.

In Jyotika Kapur *et al* [5] dealing with India there has been an increase of 17.4% in the total number of road accidents during the period of 2011-2012. This percentage has raised eyebrows and caught the attention of many to curb the growing rate. It is found that 80% of the times it is the fault of the driver. This can be avoided if we could device a mechanism which could alert the driver about the coming jeopardy. This can be achieved by monitoring the distance between two cars using Bluetooth. If the distance decreases than the one specified, the driver would be signaled and according to the signal, necessary actions will be taken by the mini gadget present in the car. This paper proposes that with the help of Bluetooth technology, we can keep track of the speed of the car and take appropriate actions to avoid accidents.

## EXISTING SYSTEM

In existing system using nodes they are detecting the faults for that we do not know what fault it is, whether it is short circuit or wire cut or over load. To overcome that



problem, we proposed a new system which is less cost and less complexity with good accurate result.

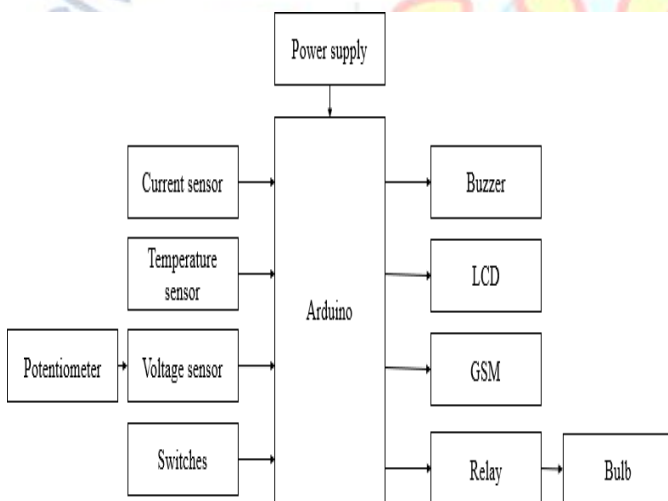
Drawbacks:

- No accuracy.
- We couldn't know what type of fault occurred.
- High cost.

## PROPOSED SYSTEM

Here we proposed a system uses an Arduino, current detector, voltage sensing circuit (for over load cases), and a GSM modem. The system automatically detects faults, analyses and classifies these faults and then. Finally, the fault information is transmitted to the control room. In conclusion, the time required to locate a fault is drastically reduced. And here LCD is used to see which type of fault it is. By temperature sensor we can monitor the temperature of the distribution transmission lines

## BLOCK DIAGRAM



## HARDWARE COMPONENTS ARDUINO UNO

The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market. The Arduino is open-source, which means hardware is reasonably priced and development software is free. This guide is for students in ME 2011, or students anywhere who are confronting the Arduino for the first time. For advanced Arduino users, prowl the web; there are lots of resources.



## VOLTAGE SENSOR

voltage sensor is a sensor used to calculate and monitor the amount of voltage in an object. Voltage sensor can determine the AC 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.



## CURRENT SENSOR

Current flowing through a conductor causes a voltage drop. The relation between current and voltage is given by ohm's law. In electronic devices, an increase in amount of current above its requirement leads to overload and can damage the device. Measurement of current is necessary for the proper working of devices.



## RELAY

A relay is a electromagnetic switch that is used to turn on and turn off a circuit by a lower power signal, or where several circuits must be controlled by one signal. Most of the high end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts.



### 16X2 LCD

An LCD is an electronic display module that uses liquid crystal to produce a visible image. The 16\*2 LCD display is a very basic module commonly used in DIYs and circuits. In this LCD each character is displayed in a 5x7 pixel matrix.



### BUZZER

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzer and beeper include alarm devices, timers and confirmation of user input such as a mouse click or keystroke. Buzzer is an integrated structure of transducers, DC power supply, widely used in computers, printers, copiers, alarms, electronic toys, automotive electronic equipment, telephone, timers and other electronic products for sound devices.

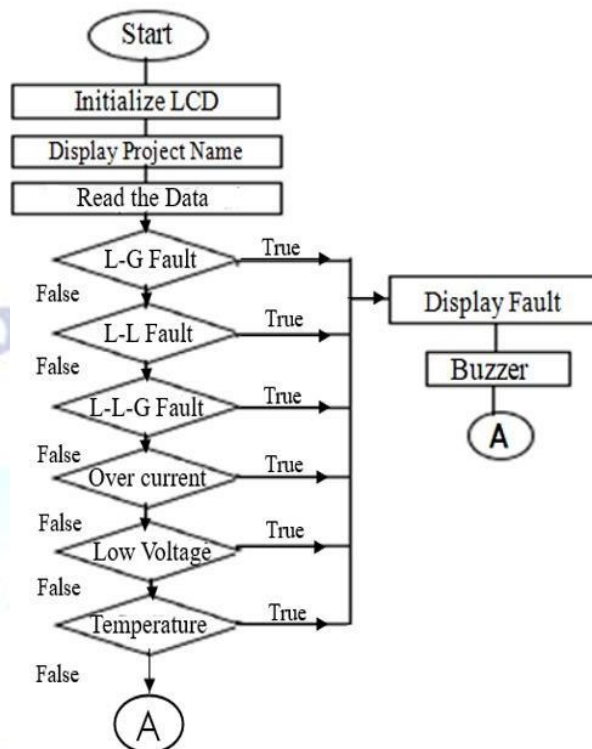


### GSM MODULE

A GSM modem is a device which can be either a mobile phone or a modem device which can be used to make a computer or any other processor to communicate over a network. A GSM modem requires a SIM card to be operated and operates over a network operator. It can be connected to a computer through serial, USB or Bluetooth connection.



### FLOW CHART



### IMPLEMENTATION OF WORK

This prototype is used to detect the fault, which has occurred in transmission line.

- By using ATMEG328p microcontroller, Push Switches, Indicating LEDs, LCD; this prototype is assembled with a set of resistors, cables, by using set of switches made to creation of fault in prototype.
  - A 230V AC supply is fed through a Step-down transformer which gives 12 V AC output which is to AC-DC Power Modulator, where it converts AC voltage into DC voltage using a Full Wave Rectifier circuit. 7809 voltage regulator is used to regulate voltage output voltage to 9V as micro controller needs 9V power supply.
  - Through micro controller, there is only one 5V power output pin and single ground. The main challenge is that the prototype needs to power various components i.e., LCD, Arduino Board, buzzer, and . To solve this issue, a Power Extension PCB has been introduced in module. It provides multiple power pins which can be used for many components. In short Power extension PCB works as Power extension board which provides multiple outputs using single supply.
- When any fault is occurred i.e, over current, over voltage, low voltage, temperature increase. A Bulb is provided in



the circuit which turn off when any fault occurs and send the data to the Mobile.

The push buttons shows/ simulates the faults in the system. Various buttons are allotted for various purposes and each button is responsible for different used to show phase to L-L fault, L-G fault and L-L-G fault.

Assuming these names for push buttons and their faults shown: -

1. DPDT switch 1 – sw1 for L-L fault
2. DPDT switch 2 – sw2 for L-G fault
3. DPDT switch 3– sw3 for L-L-G fault

## RESULT

This The analysis of fault detection and location system of transmission line. Whether it is any type of fault that can be detected and located. When fault occurs on the transmission line the signal is send to the control room or mobile phone through a GSM modem. The message Receive on the mobile which is symmetrical or unsymmetrical like L-G, L-L, L-L-G. The single that appears on the control room or mobile phone is that L\*G or any type of fault occurred on transmission line.

## CONCLUSION

Here, in this project we have designed a GSM based transmission line monitoring and indication system that sends information of the same to control room via SMS. The implemented system design mainly concentrates on the distribution system. The project has continuous monitoring system integrating the GSM communication technology and the microcontroller technology. It also represents the hardware architecture and the software flow.

## Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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