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Transmission Line Fault Detection using IoT

Minal Karalkar[1], Sushrut Adlok[2], Ankit Ramteke[3], Sumit Parchake[4], Rajat Tawade[5], Sujata Manwar[6], Shubham Wankhade[7]

[1]*Assistant Professor, Department of Electrical Engineering. Priyadarshini J. L. College of Engg., Nagpur, India*
[2,3,4,5,6,7]*UG Student, Department of Electrical Engineering. Priyadarshini J. L. College of Engg., Nagpur, India*

***Abstract*: The fault occurred in transmission line is very much dangerous for the locality. In HV and EHV transmission line there are less fault occurrence but in locality the fault occurrence is more as compared to outer transmission line. In our prototype we design a model which is to be detect the fault in transmission line by comparing the voltage signal between the transmission line and a reference value, the reference value is predetermined and if the transmission line voltage is more than or less than reference value then fault is to be shown in display. The information regarding fault occurrence in particular phase is send to web page via IOT device which is NODE MCU(Esp8266) and also shown in display. The optocoupler is used to sense the voltage and send output to microcontroller IC. Here microcontroller IC ATMEGA 16 is used in this IC programming is done which compare the voltage signal and send output to IOT module and display. The power supply is provided to supply 5-volt dc power to all component this supply is separate from the supply which is used to check the fault occurrence.**

***Keywords*: Internet of things, Microcontroller IC Atmega 16, opt coupler.**

1. Introduction

It is known that when a fault occurs in overhead transmission line system then instantaneous changes in voltage and current at the point of fault generate high frequency. Electromagnetic impulses called travelling wave which propagate along the transmission line in both directions away from the fault point.
The electric power infrastructure is highly end angered against many form of natural and spiffy physical events. Which can skeptically affect the overall performance and stability of the grid. The fault impedance being low. The fault current is relatively high, during the fault. The power flow is diverted towards the fault and supply to the neighbouring zone is affected Voltage become unbalanced. It is important to detect the fault as early as possible that is why a kit is being made using microcontroller to make its process faster. The transmission line conductor resistance and inductance distributed uniformly along the length of the line. Travelling wave fault location methods are usually more suitable for application long lines. Power transmission lines employ at 50-HZ are more than 80-km long are considered to have the properties of voltage and current wave that travel on the line have the properties of voltage and current wave that travel on the line with finite speed of propagation.

Traveling wave methods for transmission line fault location have been reported since a long time. Following developments employ high speed digital recording technology by using the traveling wave transients created by the fault. Currently, the electric power infrastructure is more vulnerable against many forms of natural and malicious physical events [1], which is directly affect the stability of grid. There will be some parameter which is affected. With this, there is an approaching need to equip the age old transmission line infrastructure with a high performance data communication network, that supports future operational requirements like real in the time record and control necessary for smart grid integration [2], [3]. Due to this technique the real time monitoring is necessary.

Many electric power transmission companies have primarily depended on circuit indicators to detect the faulty sections of their transmission lines. However, there are still challenges in identifying the exact location of these faults.

Although fault indicator technology has provided a flexible means to locate permanent faults, the technical crew and patrol teams still has to physically patrol and inspect the devices for large duration to detect faulty sections of their transmission lines. Wireless sensor based monitoring of transmission lines provides a solution for several of these disquiet like real time structural awareness, faster fault localization, accurate fault diagnosis by identification and difference of electrical faults from the mechanical faults, cost reduction due to condition based maintenance rather than periodic maintenance, etc. These implementations identify stringent requirements such as fast delivery of enormous amount of highly reliable data. The success of these appeal depends on the design of cost effective and reliable network architecture with a fast response time. The network must be able to transport confidential information such as current state of the transmission line and control information to and from the transmission grid. This research provides an economical substructure to design a real time data transmission network. To observe the status of the power system in real time, sensors are put in various components in the power network.

These sensors are able to taking fine grained measurements of a variety of physical or electrical parameters and generate a lot of information. Sending this information to the control centre in a cost efficient and appropriate time is a critical challenge to be addressed in order to build an intelligent smart grid.

Network design is a significant aspect of sensor based transmission line monitoring due to the large scale, vast land, uncommon topology, and critical timing requirements. Mechanical faults, low cost due to condition based maintenance rather than periodic maintenance, etc. The use of sensor networks has been prefer for several applications like mechanical state processing and dynamic transmission line rating applications [4]-[6]. To observe the status of the power system in actual time, sensors are put in various components in the power network [7].

2. Block diagram

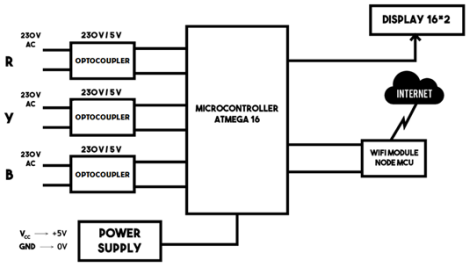

Fig. 1. Block diagram

3. Circuit diagram

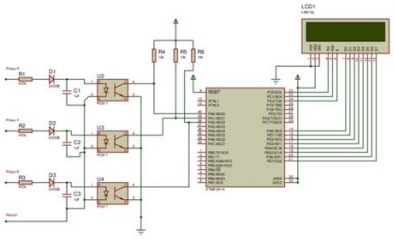

Fig. 2. Circuit diagram

4. Component list

- Switches
- Microcontroller ATmega 16
- LCD Display (16*2)
- Wi -Fi Module Node MCU
- Optocoupler
- Resistors
- Diode

5. Working and operation

- Our prototype is used to detect the fault, which has occurred in transmission line.
- By using ATMEGA16 microcontroller, optocoupler, LCD. A prototype is assemble with a set of resistor, cable length in km, by using set of switches made to creation of fault in prototype.
- A 230v ac supply is fed to the terminal, let us consider the terminals (R,Y,B)we took supply and fed to the terminal there one resistor connected with diode, resistor rating is 470k ohm and diode IN4007 which rectify the voltage signal and gives variable DC as a output.
- A capacitor which is connected in parallel which is used to keep out all unwanted signal as well as gives constant DC supply.
- The DC supply is then gives to optocoupler and input Side of optocoupler the DC supply is present that glows the LCD.
- Inside the optocoupler one LED and transistor are present. The transistor is NPN transistor, the base terminal is sense the radiation of LED and the current flow inside the transistor from collector to emitter.
- The emitter terminal is connected to ground and the collector terminal is connected to IC ATMEGA 16.
- The program is done in IC ATMEGA16 which compare the voltage level and gives the output on LCD and Wi-Fi module result shown on PC and screen.

6. Internet of things (IOT)

The internet of things or IOT, is a system which is connected between the devices, analog, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to sending data over a network without requiring human-to-human or human-to-computer interaction. The Internet Of Things is simply defines “A network of Internet connected object able to collect and transfer data ”. IOT is the concept of connecting any device with an ON and OFF switch to the internet and then give a appropriate output.

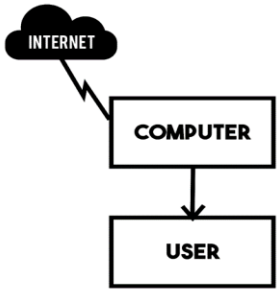

Fig. 3. Internet things

7. Result

The three terminal is connected to the switch when one switch is one and remaining two switches are closed then the output shown is display is terminal Y and B has been faulted (Supposed terminal is R,Y,B and terminal R is connected to supply i.e. switch is ON and other switch which is connected between terminal Y and B is OFF hence its shows the fault.)

A. Applications

- Used in transmission line
- Used in distribution line

- Used in villages

B. Future scope

- Underground Line fault Detection
- Data Logging

C. Advantages

- Work in real time response inter
- Coverage area in large compared to existing system
- cost efficient
- Devices enable by wireless communication
- Number of components are used
- Economically reliable and low cost

8. Conclusion

The model design in such a way to solve the problems faced by consumer. By using such method, we can easily detect the fault and resolve it. It is highly reliable and locate the fault in three phase transmission line and also supposed to data storage. It works on real time so we maintain all data sheet and avoid the future problem in transmission line.

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