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Transmission Line Fault Detection Using Wi-FiModule

[1]Atharva Chaudhari, [2] Sarvesh Dahiwadkar, [3]Aditya Jadhav
Tushar Pandhi
Dr .Deepak Kadam

[1]*Department of electrical Engineering of MET Institute of Engineering, BKC, Nashik,*

Abstract:
The fault occurred in transmission line is very much dangerous for the locality. The project presents design and implementation of a transmission lines monitoring and centralized control system using IOT. In this 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 faultis to be shown in display and send to webpage. A smart fault detection system was used to adequately and accurately indicate whatfault had occurred. The system uses a current transformer, a voltage transformer, arduino and a Wi-Fi module. The system automatically detects faults, analyses and classifies these faults. Finally, the fault information is transmitted to the control room.

Keyword: Automatic Fault Detection, IOT Technology, Transmission line, Fault Detection, Aurdino, Wi-Fi Module.

I. INTRODUCTION:

Power system is classified into power generation, transmission and distribution. Transmission network is one of the vital parts of power system, as it connects the supply and the demand. The loss in transmission and distribution network is very high, compared to other parts of power system. Currently, the electric power infrastructure is highly vulnerable against many forms of natural and malicious physical events, which can adversely affect the overall performance and stability of the grid. The fault in the transmission network obstructs the supply of power to the consumer. Hence the transmission network fault identification and clearance should be very fast. Additionally, there is an impending need to equip the age-old transmission line infrastructure with a high performance data communication network that supports future operational requirements like real time monitoring and control necessary for smart grid integration in power transmission systems, most of the voltage and current signal distortions are caused by faults. Faults that occur in power transmission lines can cause an interruption of power supply. The time required to locate a fault is drastically reduced, as the system automatically and accurately provides accurate fault information. This will ensure a shorter response time for technical crew to rectify these faults and thus help save transformers from damage and disasters. There are many reasons of faults in power transmission leading to power outages, if not properly managed. Notable among them includes:

- Faults at the power generation station
- Damage to power transmission lines
- Faults at the substations or parts of distribution subsystem
- Lightening

Types of transmission line faults: power system's faults are categorized as shunt faults or series faults.

- Single line-to-ground fault
- Line-to-line fault
- Line-to-ground fault

Single Line to Ground fault:

The most common type of shunt faults is Single Line-to-ground faults (SLG). This type of fault occurs when one conductor falls to the ground or gets into contacts with the neutral wire. It could also be the result of falling trees in a rainy storm. This type could be represented as shown in Fig 1 below.

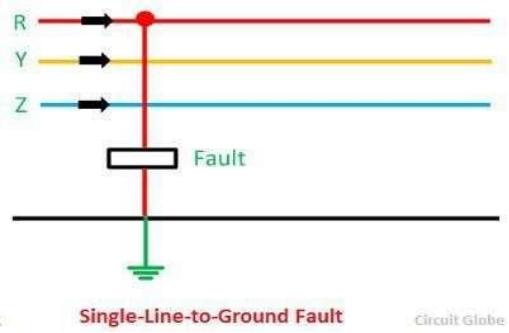

Fig 1. Single Line to Ground fault

1. Line to Line Fault:

The second most occurring type of shunt faults is the Line-to-Line fault (LL). This is said to occur when two transmission lines are short-circuited. As in the case of a large bird standing on one transmission line and touching the other, or if a tree branch happens to fall on top of two power transmission lines.

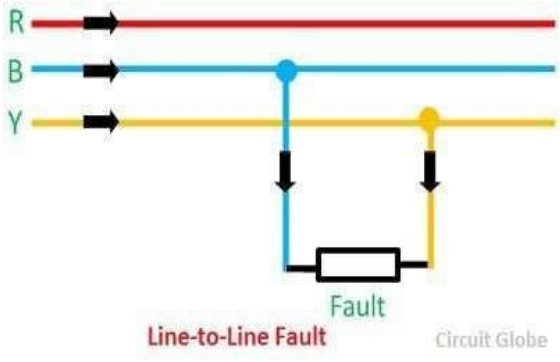

Fig 2. Line to Line Fault

2. Double Line-to-Ground Fault:

The third type of shunt fault is the Double Line-to-Ground fault (DLG) in figure below. This can be a result of a tree falling on two of the power lines, or other causes.

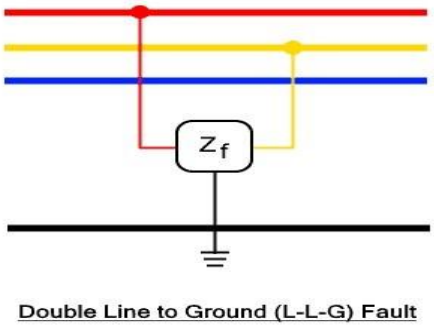

Fig 3. Line to Ground fault

LITERATURE SURVEY:

Detection of Line-to-Ground and Line-to-Line Faults Based on Fault Voltage Analysis in PV System

The voltage characteristics analysed to develop the LG and LL fault.

The simulation results verify that the proposed technique can detect and locate the LG and LL faults effectively

Automatic Fault Detection in Transmission Lines using Wi-Fi Module

- Faults over transmission line are monitored.
- IOT webpage is used for alert.
- Free IOT servers have limitation for monitoring.

II. PROPOSED SYSTEM:

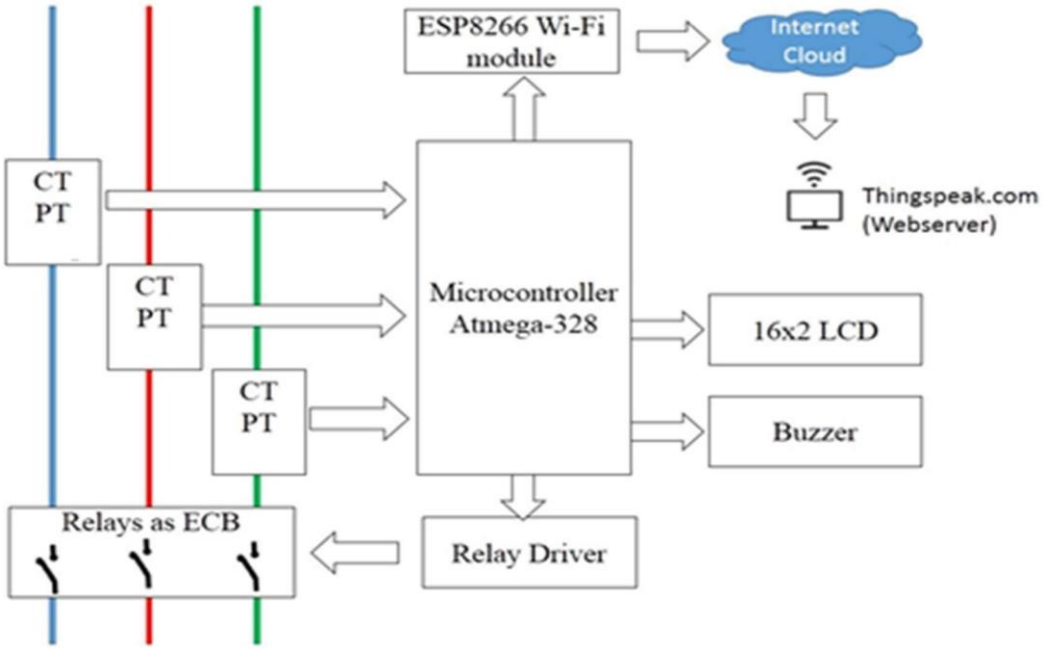

Fig 1. Proposed System block diagram.

1. ATmega328 Microcontroller:

The ATmega328 is a high-end, feature-rich microcontroller. It is a microcontroller from Atmel's mega MVR microcontroller's family. The internal circuitry of the ATmega328 has low current consumption characteristic. The hold contains 32kB of internal flash memory, 1kB of EEPROM and 2kB of SRAM.

Input Voltage: 7-12V

Input Output Pin: 20

DC Current: 40mA

Programming Software: Arduino IDE

ESP8266 Wi-Fi Module:

The ESP8266 Wi-Fi Module is a self-contained System on Chip (SOC) with an inbuilt TCP/IP protocol stack that allows any microcontroller to access your Wi-Fi connection. The ESP8266 may run a Programme or delegate all Wi-Fi networking tasks to another CPU. JHD162A LCD It's a vivid LCD display that communicates with the microcontrollerusing the I2C protocol.

- Power Supply: +3.3V
- Current Consumption:100mA
- Range: 10m & 100m with antenna
- Works on serial communication protocol
- Programmed using AT- Commands
-

2. **Relay:**

Relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit.

Relays were used extensively in telephone exchanges and early computers to perform logical operations. A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated Operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays". Magnetic latching relays require one pulse of coil power to move their contacts in one direction, and another, redirected pulse to move them back. Repeated pulses from the same input have no effect. Magnetic latching relays are useful in applications where interrupted power should not be able to transition the contacts. When the coil is energized with direct current, a diode is often placed across the coil to dissipate the energy from the collapsing magnetic field at deactivation, which would otherwise generate a voltage spike dangerous to semiconductor circuit components.

Such diodes were not widely used before the application of transistors as relay drivers, but soon became ubiquitous as early germanium transistors were easily destroyed bythis surge. Some automotive relays include a diode inside the relay case. If the relay is driving a large, or especially a reactive load, there may be a similar problem of surge currents around the relay output contacts. In this case a snubber circuit (a capacitor and resistor in series) across the contacts may absorb the surge. Suitably rated capacitors and the associated resistor are sold asa single packaged component for this commonplace use.

- Can switch AC/DC
- Operating voltage: 5v
- Operating current: 100mAmp
- Switching supply capacity:
- 12V DC, 30A
- 250V AC, 10A
- Operating temperature: 0-70 Degree Celsius

III. CIRCUIT DIAGRAM:

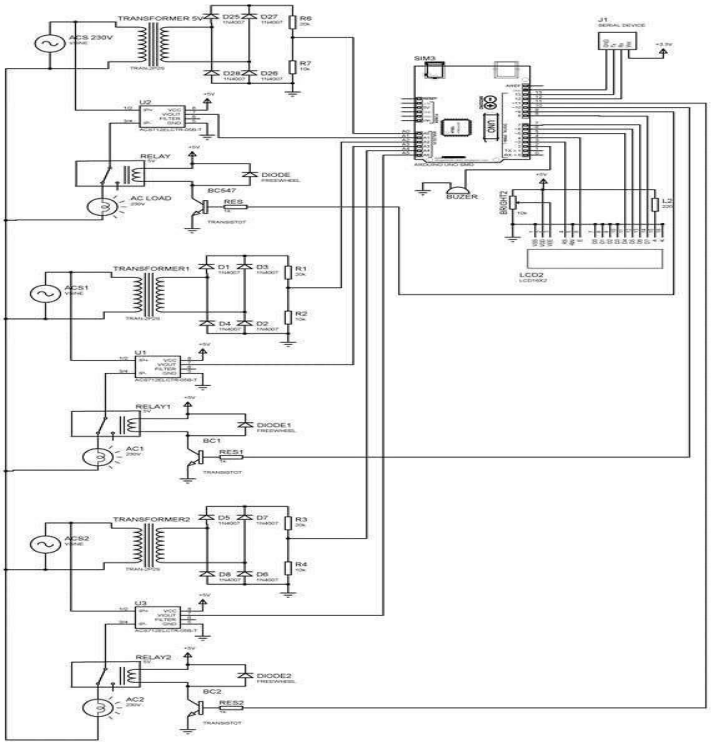

Fig 2. Proposed System Circuit Diagram

IV. RESULT:

The proposed system identifies the fault and displays the fault on the LCD screen and sends the data within fraction of seconds through IoT to the web page. This helps the operators to locate the fault precisely and send the service man to clear the fault and restore the power system back into service. The data for every phase can also be recorded for every second and can be used for data sampling, behaviours of the transmission network for various load flow studies can be analyzed.

V. CONCLUSION:

The model is designed to solve the problems faced by power system. By using such a method, we can easily detect the faultand resolve it. It is highly reliable and locates the fault in three phase transmission line. It allows to record all the real time data sheets up to date.

VI. ACKNOWLEDGEMENT:

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