Hardware Modeling of Fault Detection System for Three Phase Transmission Line

Suneel Kumar[1], Himanshu Singh[2], Gaurav Raj[3], Aman Verma[4], Anoma Vandana Kanchan[5], Priyanshi[6]

[1]Assistant Professor, EE Department, Rajkiya Engineering College, Bijnor, UP, India
[2,3,4,5,6] UG Student, EE Department, Rajkiya Engineering College, Bijnor, UP, India

ABSTRACT- In electricity journey the generation of transmission, distribution, utilization of electrical power is called electrical technology. In power generation transmission and distribution many components are involved. So there are many types of electrical faults or faults like in transmission lines occurs in transmission system like line to line faults and line toground fault in power system etc. In this paper, a prototype is presented for fault detection in three phase system. Mainly occurred in high voltage transmission lines, the present work accurately detectsthe distance of three phase fault from source system and displays it on control panel by using Arduino mega. In this work sensing device is used which is installed on the line even though L-L, L-G and any unsymmetrical fault occurs it will be shown on the display. Arduino is a heart of the present work. It detects the fault,analyses and classifies these faults and then, determines the fault distance.

***Keywords*- Transmission Line, Faults, Protection, Distance, Arduino**

I..INTRODUCTION

The protection of electricity system transmission lines significantly impacts any country's economic importance. It also has an immediate impact on people's lives and has an indirect impact on the progress of any nation. An unwanted fault in the transmission line or power system, there can be happened a huge damaged. Which basically impacts normal living. In the three-phase transmission line, there are different kinds of protection systems are applied. Generally, ground faults are more common on overhead transmission lines than phase faults, and the amplitude of ground-fault current varies from phase fault current, separate protection mechanisms are required.
The following factors determine the decision of a specificprotection scheme:

1. The scheme's economic justification to secure 100 percent supply continuity.

2. Between the receive side and the receiving end of the system,the numbers of switching stations are in series.

3. If the neutral is connected or protected is an issue in system earth-fault. The project is designed for the automatic identifying

mechanism when temporary faults and permanent faults occur. The faults that occur in the transmission line can be under voltage, overvoltage, and overcurrent, temporary and permanent faults. A small part falls in the line which can cause a temporary fault. Permanent faults are those which will not clear on tripping. An example of a permanent fault on an overhead line is a broken wire causing a phase to open, or a broken pole causing a phase too short together. On transmission, circuits can be a major factor in bringing strong stability. The automatic protective measure may affect the functioning of the circuit into a defect that has not been resolvedfor those problems that are permanent, which may have a negative impact on system stability. There are some features that are added to the work:

- It can sense the fault current or high voltage.
- If the fault is isolated, the fault current is also isolated.
- Indication of the fault and which location it occurred that is d displayed in the LCD.
- The relay is added to the transmission line which continuously changes the direction.

For controlling and monitoring purposes, Arduino Uno, Relay, switch, resistor, potentiometer, and LCD are used.

II..LITERATURE REVIEW

Sibisagar. B et al. proposed that 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 canhappen: 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 [1].

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 [1].

Power system failure could lead to instability loss and serious damage to either the defective or nearby healthy equipment. Additionally, the stability proposalis regarded as a crucial element in the management of energy and the planning of power systems. Additionally, a highamount of current is drawn from the system during the motor starting phase, which causes a system voltage drop and disruptsthe 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 asan insulator flashover, the fault is cleared and does not reoccur [2].

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 ofthe system fails at any point, a fault is simply described as a collection of unfavorable 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, analyzing, and classifying problems. The control room receives the fault information [3].

The paper aims to design a protection system for three phase system with data acquisition system that says this method is very handy to detect the fault on transmission lines. This system will reduce the human efforts off closing the circuit breaker. This pater shows the in such many solve the problems faced in transmission line and consumers but using the method, we can easily detect the fault and resolve it and problem solved in real line very useful for the future [4].

In this paper a model is designed to solve the problems faced by consumers by using Arduino. Type of fault can easily be detected and solved and its distance in real time can be measured, this prototype modelis very effective. It works in less time and perfect distance of faultis located.

III. PROPOSED DIAGRAM

The proposed diagram of the model consists of various components for implementing the fault detection system. The proposed diagram and components are shown in Fig 1 & 2.

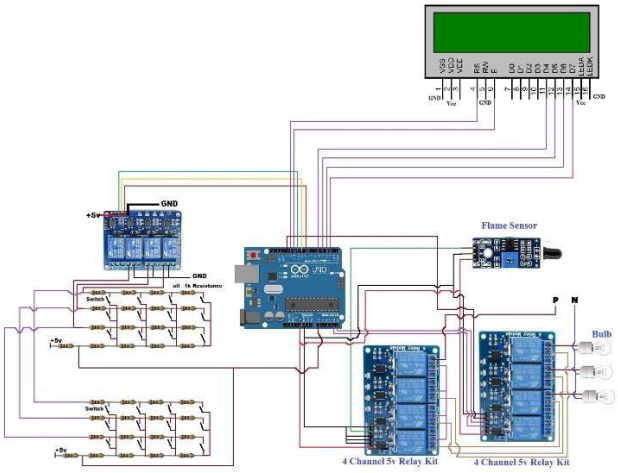


Fig 1: Proposed Diagram

Table 1: List of Components

SR NO.	COMPONENTS NAME	RATING	QUANTITY
1	Arduino UNO	5V	1
2	Power Adapter	5V	1
3	Resistor	1k OHM	34
4	LED (Red,Yellow,Blue)	0.04A	3
5	Flame Sensor	760nm-1100nm	1
6	LCD Display (16cm*2cm)	1mA	1
7	PCB (Printed Circuit Board)	-	2
8	4 Channel Relay Kit	5V	3
9	Preset	10k	1
10	Push Buttons	-	24

IV. IMPLEMENTATION

- Connect the power supply (AC or DC) of the transmissionline to the relay module.
- Connect the relay module to the Arduino Uno using digitalinput/output pins.
- Connect the LCD to the Arduino Uno using the

appropriatepins.

- Connect the resistors in a voltage divider configuration tomeasure the voltage of each phase.
- Set up the Arduino IDE:
- Download and install the Arduino IDE software from theofficial Arduino website.
- Connect the Arduino Uno to your computer via USB.Upload the code to the Arduino:
- Connect the Arduino Uno to your computer via USB.Select the correct board and port in the Arduino IDE.
- Click on the "Upload" button to compile and upload the codeto the Arduino Uno.
- Test the system:
- Connect the system to the three-phase transmission line. Power on the Arduino Uno and observe the LCD display. Verify if the system correctly detects the presence or absenceof each phase. [5]
- Observe the relay module switching on or off based on thephase status.

V. RESULT

The result is obtained by Creating Fault across Slide Switch.Slide Switch Numbering is shown in Table 2.

Table 2: Slide Switch Numbering

Sr no.	Slide Switch number	Output
1	4	R↓ Y↓ B↓ 4KM 4KM NF
2	7	R↓ Y↓ B↓ 3KM NF 3KM
3	9	R↓ Y↓ B↓ NF 1KM 1KM
4	12	R↓ Y↓ B↓ NF 4KM 4KM

Fault is detected and removed early by knowing the exact location of the fault. By designing the programmable software which is installed in the Arduino UNO. It showsthe output on the LCD display including the location of the fault. Fault type is line to line (Fig 2). The arrangements of the component is as shown in the Fig 3.

Fig 2: Fault type and distance detection

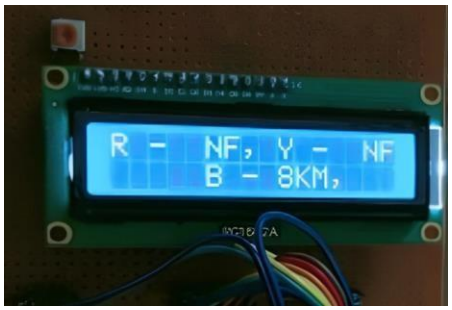
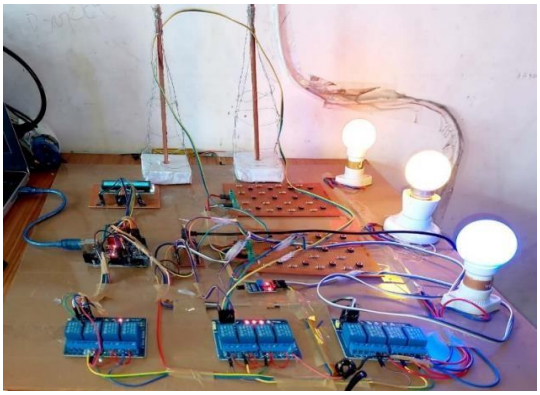


Fig 3: Working Model



VI. CONCLUSION

In now days there is the huge demand of the electricity becauseof all the industrial or any other work is depends on electricity.Due to this sometime overloading is occurred which affect the conductor of transmission line and electrical equipment life. Because of this situation and natural calamity fault is occurred.It should be detected early and rectify earlier to provide electricity to the consumer without any longer period interruption of power supply. Using this programmable devicefault location can be detected instantly so that fault can be removed in short time period and continue the power supply byremoving fault in short time period. The work detects the location of fault and type of fault quickly with less human efforts and thus improves system performance.

VII. FUTURE SCOPE

The future implications of the project are very great considering the amount of time and resources it saves. The project undertaken can be used as a reference or as a base for realizing a protection scheme to be implemented in other transmission lines of higher levels. It can have a global positioning system (GPS) connected so data can be sent to accurate location for fault occurrence in transmission line. A better and appropriate programming for finding distance can also be formulated.

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