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Overhead Transmission Line Multiple Fault Detection using IoT

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Abstract: *In the modern era transmission line is the most important part of the power system. 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 to ground fault in power system etc. This project shows the prototype of three phase fault detection system. Mainly occurred in H.V transmission line our project accurately detect of three phase fault from source system and display on blynk app by using a ESP 8266 Node MCU. In this project we use sensing device which is present on the line even though line-line, line-ground, and any unsymmetrical fault was occurred it will show on display. ESP 8266 Node MCU is a heart of our project it will detect the fault, analyses and classifies these faults. Then, the fault information is transmitted to the blynk app.*

Keywords: ESP 8266 Node MCU, Transmission line, Transformer, Internet of thing (IOT), Prototype and Blynk App.

I. INTRODUCTION

Currently, the electrical power infrastructure is more vulnerable against many form of natural and a malicious physical event, 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, which supports future operational requirements like real in the time record and control necessary for smart grid integration. 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 line. However, there are still challenges in identifying the exact location of this faults. Although fault indicator technology has provide a flexible means to locate permanent faults, the technical crew and petrol teams still has physically patrol and inspect the devices for large duration to detect faulty section of their transmission line. Wireless sensor based on monitoring of transmission lines provide a solution for several of these disquiets 5 like real time structure 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 [1].

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 from of natural and spiffy physical event. The fault impedance being low. The fault current is relatively high, during the fault. The power flow is diverted towards the fault as early as possible that is why a kit is being made using ESP 8266 Node MCU to make its process faster [1]. The faults may occur for a temporary or permanent in power system and this can disturb the supply to users. Then, it is important to detect the faults occurred so that it will prevent from any damage of equipment and continue supply the energy to consumers [2].

From the studies, 70% to 90% of faults are occurred in overhead transmission line which are transient, such as damages of insulation, swinging wires and little time contact with other objects. The other 30% to 10% faults are occurred in

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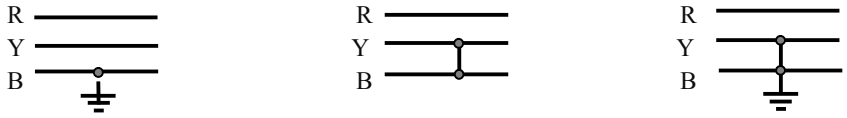
overhead line which are permanent or long duration fault. This type of fault is occurred by broken wire which result one phase to ground fault or joining the two phase together which is may occur in overhead line as well as underground cable. However, these faults must be cleared by finding them in line and repair which results permanent trip of line [3].

By using IOT system, user can take immediate action to solve the fault problems in power system after getting notification. ESP8266 Node MCU is used in this project to improve the protection system since user can detect the fault easily by getting notification from server to mobile phone. Blynk application is used as a server to monitor data about the fault occurred. To automatically reclosing the temporarily fault and trip the permanent fault in power system, programming in ESP8266 Node MCU is created for controlling it including the time taken to reclosing or trip the relay. The successful high speeds auto-reclosing on power system can be a major factor when attempting to maintain the system stability. As simplify, this project can be applied at power system including in generation, transmission or distribution system because in this system, there are many apparatuses that need to be protect and users can get the supply without having disturbance [2].

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, sensor are put in power network. These sensors are able to taking fine grained measurements of a verify of physical or electrical parameters and generate a lot of information. Sending this information to control centre is cost effective and appropriate time is a critical challenge to be addressed in order to build an intelligent smart grid.

II. TRANSMISSION LINE FAULT

Different types of faults occurred in transmission lines are single lines – to – ground fault, line –to- line fault, double line to ground fault and balance three phase fault.



L-G Fault L-L Fault L-L-G Fault

- **Single Line to Ground Fault**: The most common type of 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.
- **Line to Line Fault:** The second most occurring type of fault 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.
- **Double Line to Ground Fault**: The third type of 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.
- **Balance Three Phase Fault**: The fourth and the real type of fault is the balanced three phases, which can occur by a contact between the three power lines in many different forms.

III. LITERATURE SURVEY

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IOT based transmission line fault monitoring system is proposed. The transmission line prototype is modelled. The resistance of typical transmission line for 1 Km is about 500 ohm. Hence for modelling 1Kohm resistor is used for every 2Kms of transmission line. Fault in the transmission line is manually introduced for the purpose of demonstration. The short circuit fault at a particular distance in the transmission line is located using ohms law. The system uses Arduino to analyses distance of fault occurrence with the help of software developed. Which Works on analysing the voltage drop in the transmission line. The fault location in transmitted to the control center using Wi-Fi module.

Three Phase Transmission Line Fault Detection by using Aurdino
Krushna Nikam, Vishakha Baviskar, Prafulla Desale

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In this paper a model design to solve the problems faced by consumer by using Aurdino. We can easily detect the type fault and solve it and there distance in real time, this prototype model is very effective. It is works in less time perfect distance of fault is located. Avoid the future problem in transmission line.

Transmission Line Fault Monitoring and Identification System by Using Internet of Things.

In this paper, present an optimal formulation for a cost optimized wireless network capable of transmission of time sensitive sensor data through the transmission line network in the presence of delay and bandwidth constraints. Our analysis shows that a transmission line monitoring framework using WSN is indeed feasible using available technologies. The proposed method with formulation is generic and en-compasses variation in several factors such as asymmetric data generation at towers, wireless link reliabilities, link utilization dependent costs, non-uniform cellular coverage characteristics and requirements for cost optimized incremental deployment.

The evaluation studies show that the main bottleneck in cost minimization is wireless link bandwidth. Further, in cases of increasing flow bandwidth, the limited wireless link bandwidth leads to a feasible but expensive design due to increased dependence on cellular constraints.

IV. Proposed Methodology

In this paper to attain our concept, need to use ESP 8266 Node MCU, voltage sensor, Optocoupler, temperature & Humidity sensor, LED Indicator. We show a prototype model of 3ph fault detection of overhead transmission line, we give 3-phase supply to the transmission line. An optocoupler is used for isolation purpose of digital circuit. So we make the fault line by using switches. The main component of our project is ESP 8266 Node MCU. The 5V DC supply is requiring for controlling board. This is provided with the help of Transformer and Rectifier Circuit combination. Output switches is given to analog pin of ESP 8266 Node MCU and LED indicator is also connected to digital output pin of ESP 8266 Node MCU. So when fault is occurs it Indicates on LED Indicator and at a same time ESP 8266 Node MCU give output to relay and it disconnect load from supply and also ESP 8266 Node MCU send the notification blynk app with the help of internet of thing (IOT). This all thing happens as soon as fault is occurred in line due to proper program insert in ESP 8266 Node MCU.

V. Proposed Block Diagram

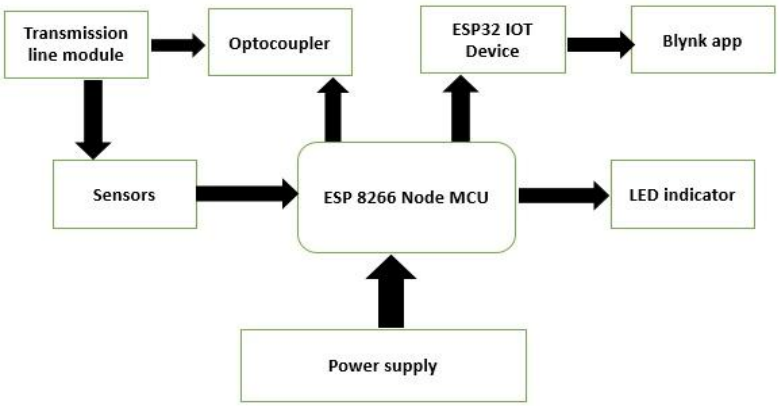

Figure: Block Diagram

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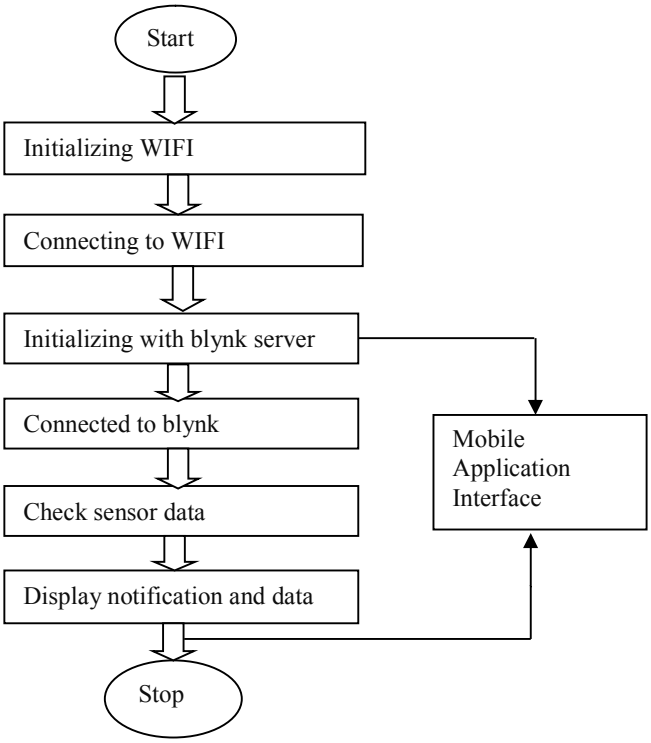
VI. PROPOSED ALGORITHM



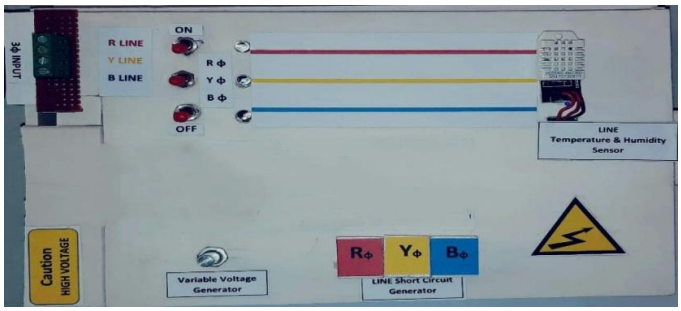
VII. ADVANTAGES

1. It improves the system performance.
2. It reduces the operating expense and the time to locate the fault in field.
3. Work on real time response.
4. Coverage area in large compared to existing system.
5. Devices enable by wireless communication
6. Economically reliable and low cost.
7. Devices and sensors communicate wirelessly.
8. Less number of men required for time to time Observation.

VIII. APPLICATION

1. Used in industrial fault detection system.
2. Used in transmission line fault detection system.
3. It can used in mine.

IX. RESULT AND DISCUSSION



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Working model of proposed system

The proposed system identifies the fault and displays the fault on the LED and sends the data within fraction of seconds through IoT to the web page. This helps the operators to clear the fault precisely and restore the power system back into service. The data 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 analysed.

X. Conclusion

In this model we will try to solve the problem faced by consumers & utility by using ESP8266 Node MCU. We can easily detect the type fault and solve it in real time, this prototype model is very effective. It is works in less time & fault is located accurately. The reliability of existing system is very poor. This method is more reliable to locating and finding the type of fault in three phase overhead lines. Avoid the future problem in transmission line.

IX. Acknowledgment

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