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Original Article

Fault Detection and Location in Power Transmission Lines Using Labview

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***Abstract** - Energy becomes the key to running household appliances of any sort. It's a challenge and life risky profession to work with electricity. The issue in distribution lines is normally just identified and reported to controller panels, but the serviceman responsible for the fault resolution must be alerted. The current is detected correspondingly by the current transformer. In order to monitor and regulate the failure of the transmission line, the power line information is forwarded to the EB office, and the power line is trimmed using the Zigbee transceiver module. In the case of fire/spark occurrence in the transmission line, a temperature and fire sensor is employed, and sensor readings are updated additionally to the EB Office. The power-sharing is carried out from the EB station during the power deficit. Only consumers may consume limited electricity. But if the electricity use reaches that amount. The EB station then triggers the power supply entirely.*

Keywords - *EB, Transmission Line, Over Voltage.*

I. INTRODUCTION

Over the years, methods for detecting, classifying, and locating faults in transmission lines have been extensively investigated. With smart grid concepts causing academics to become increasingly concerned, the need to develop an intelligent fault monitoring and diagnostic system capable of identifying and finding various sorts of problems cannot be stressed.

The detection, categorization, and placement of defects in power systems have advanced rapidly during the last 20 years in a variety of disciplines. Signal processing methods, artificial intelligence and machine learning, the global positioning system (GPS), and communications have all advanced, allowing for more and more applications. To push existing fault avoidance systems to their limits, more researchers are needed to undertake studies with a broad breadth and depth. Two major flaws in online defect diagnostic systems are also being addressed. The difficulty in acquiring data is the first barrier. In addition to classic measurement equipment like potential transformers, current transformers, and remote terminal units, new intelligent electronic devices (IEDs) are being employed to capture information at many nodes in the grids. Self-powered sensors that aren't obtrusive are also being developed, with the potential to create sensor networks for smart grid online monitoring. Researchers can construct intelligent fault diagnostic systems by mining knowledge from data corresponding to various circumstances as more data becomes accessible. When current and voltage signals are gathered by a large number of interspersed sensors, the influence of complicated and diverse network designs may be minimized. The lack of communication and computing capabilities is the second constraint. In, the potential for GPS-based synchronized sampling and high-speed broadband communications for IEDs in power grids was discussed. The use of phasor measuring units has also gotten a lot of attention, and a quick overview can be found here. These technological advancements will provide a quick reaction to malfunctioning circumstances and appropriate operation of online monitoring systems based on sensor networks. Computers' computing power has likewise significantly grown. High-performance computing technologies, such as server clusters can finish distributed computing jobs in a relatively short amount of time, allowing for the implementation of techniques with increased calculation complexity.

We give a complete overview of defect detection, classification, and localization methods in this study. Figure 1 shows a simple system for defect detection, categorization, and localization. Current and voltage signals are sampled in the first stage, and the sampled points are sent to the feature extraction module.

The fault detector, fault classifier, and fault locator all employ characteristics extracted by this module. The fault classifier and fault locator, respectively, offer the fault type and problem location as outputs. Some of the works cover all three characteristics, while others concentrate on only one or two.

A. Feature extraction and fault detection

Although the current and voltage signals include all of the information, it is quite difficult to fit the raw signals into some sets of rules and criteria capable of intelligently comprehending the underlying messages sent by the signals. This is where feature extraction approaches come in helpful, as they actively collect essential information while reducing the influence of variation within the examined system. Researchers may obtain a greater understanding of the nature of the fault classification or localization issues after employing suitable feature extraction techniques, allowing them to address them in a more coherent and efficient manner. Furthermore, reducing the dimensionality of the data can sometimes improve the performance of certain algorithms employed in classifiers or locators, resulting in more accurate and robust findings as quickly as feasible. Methods for feature extraction are described in this section, along with thorough application examples. This section concludes with a brief introduction of defect detection methods, which are heavily reliant on the feature extraction process.

B. Hardware

The system includes DAQ measurement hardware and a computer with LABVIEW software. Sensors (ACS712, 5A, 3.2-5v, RCA switching). GSM module (along with UART converter and USB cable).Wires (RYB and Black-1.5mm diameter).Bulbs (60w and 100w) and bulb holders.

C. Data Acquisition (DAQ)

Data acquisition (DAQ) is the process of measuring an electrical or physical phenomenon such as voltage, current, temperature, pressure, or sound with a computer. A DAQ system consists of sensors, DAQ measurement hardware, and a computer.

D. LabView

In research laboratories, academia, and business, LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a popular programming environment. It is a strong and adaptable measuring and automation software solution. Its graphical programming language, G, uses a graphical block model that converts to machine code, eliminating many syntactical nuances. Unlike traditional laboratory tools, LabVIEW is software-based. LabVIEW allows users to create virtual instruments and programmers to see and alter data or control inputs. For beginners and expert programmers alike, the straightforward graphical programming language used to automate measurement and control systems is the reason why National Instruments LabVIEW is so popular. Science lab Virtual Instrumentation Engineering Work Bench is known under the moniker LabVIEW.LabVIEW is a graphical programming language that employs icons to develop programs rather than lines of text. Using LabVIEW, programs can take one hour. Users may utilize software objects to construct instruments known as virtual instruments (VIs).VIs have three major components - the front panel, the diagram of the block. Front panel is the VI and VI block diagram source code.

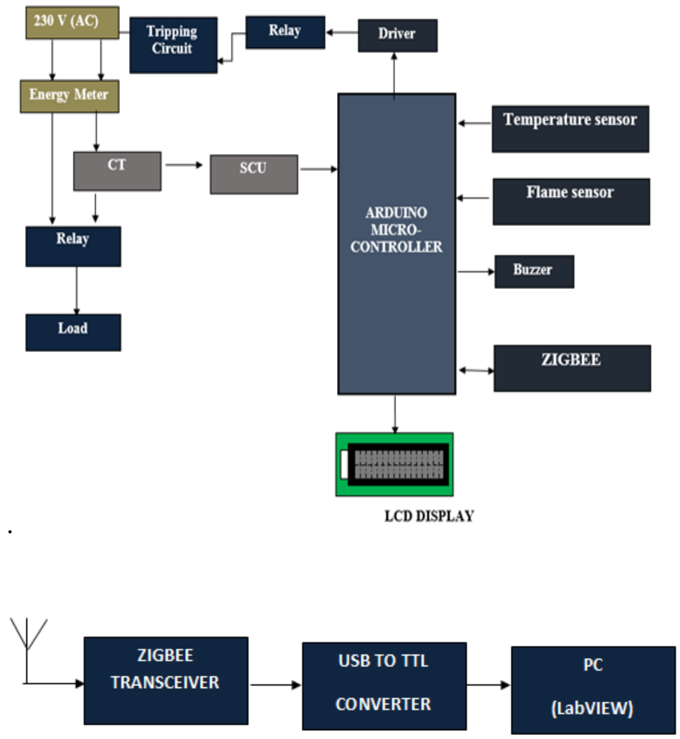

Fig. 1 General block diagram of the proposed system

The data is initially loaded into LabVIEW's front panel using the mouse or keyboard. Case 1: A well-balanced situationRelays with three phases (R, Y, and B) are enabled.SPST and Relay P are turned off. The three-phase system is powered by 60 watts. load(bulb).

The balanced LED indication on the front panel will light up. Figure 1 depicts this. Case 2: The Overload Situation (unbalanced)The relays (R, Y, and B) and the SPST switch are both turned on. Relay P has been turned off. In these circumstances, current flows in phase R.After that, R trips should be relayed. In phase R, we see zero current in the front panel. Figure 2 shows how an overloaded LED shines. Case 3: Theft of Power

E. Fault Location

Extraction of features and identification of flaws Although the current and voltage signals include all of the information, it is quite difficult to fit the raw signals into some sets of rules and criteria capable of intelligently comprehending the underlying messages sent by the signals. This is where feature extraction approaches come in helpful, as they actively collect essential information while reducing the influence of variation within the examined system.

Researchers may obtain a greater understanding of the nature of the fault classification or localization issues after employing suitable feature extraction techniques, allowing them to address them in a more coherent and efficient manner. Furthermore, reducing the dimensionality of the data can sometimes improve the performance of certain algorithms employed in classifiers or locators, resulting in more accurate and robust findings as quickly as feasible. Methods for feature extraction are described in this section, along with thorough application examples. This section concludes with a brief introduction of defect detection methods, which are heavily reliant on the feature extraction process. Specifically focus on wide-area fault location algorithms, series-compensated transmission line fault location algorithms, hybrid transmission line fault location algorithms, and artificial intelligence-based fault location algorithms.

II. RESULT AND DISCUSSION

This discusses the results of the suggested work. Our project's hardware configuration successfully connects to all sensor readings such as current, temperature, and fire. LabVIEW design is developed, and the notion of power-sharing is handled through LabVIEW software.

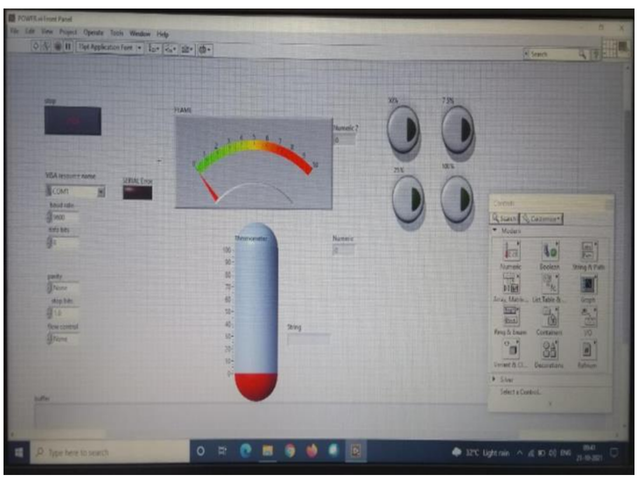

Fig. 2 Hardware Setup

The LabVIEW design that has been created for our project is above the image. We can monitor the temperature value and flame sensor value in the above-mentioned LabVIEW design. Through this EB station, if there is a fire in the transmission line is easily accessible. We may also transfer the current consumption % from the LabVIEW to the consumption area. Based on the current percentage data obtained, the consumer can utilize electricity.

The LabVIEW design shown above was created just for our purpose. We can monitor the temperature and flame sensor values in the LabVIEW design above. This allows the EB station to quickly determine whether or not there is a fire in the transmission line. We may also communicate the current consumption % to the customer area from LabVIEW. The electricity can be used by the consumer based on the current percentage statistics.

III. CONCLUSION

Finding a defect in a power transmission line is a difficult and dangerous task in the power system. Many studies have been conducted on defect detection. However, this is one of the most straightforward methods. This idea is effective in analyzing asymmetrical faults in power lines. In a Wireless Sensor Network (WNS), a current sensor connected to an Arduino translates the analog current value into digital form, which is then sent to the main primary node via Zigbee transceiver. With the aid of Zigbee technology, parameters calculated in an Arduino ATmega328 UNO communicate data to a control panel or substation, allowing for quick action. We've accomplished our goal.

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