REVIEW ON ULTRAFAST TRANSMISSION LINE FAULT DETECTION USING ARTIFICIAL INTELLIGENCE

Ms. Kandekar Pooja B.
Department of Electrical Engineering
Matoshri College of Engineering & Research Centre, Nashik (India)
Kandekarpooja59@gmail.com

Prof.Ms.Desai Poonam A.
Department of Electrical Engineering
Matoshri College of Engineering & Research Centre, Nashik (India)
ms.poonamdesai.@rediffmail.com

Abstract- **This paper deals with ultrafast transmission line fault detection using artificial intelligence. Reliability of electricity is very important in day to day life. To achieve reliability and efficiency of electrical power network proper protecting zones and operation of that protection system is too much important. Various protection systems for transmission lines are developed according to operating phenomenon such as relay protection, distance protection, ANN, FFT and so on. Only up to 85% of the line can protect by the distance relay instantaneously. This requires the use of a communication link between the relays at the two ends of the line to achieve fast tripping from both ends. Multiresolution analysis (MRA) is a signal processing tool that has been introduced to solve some of the problems inherent in Fourier transform analysis methods. The DWT based ANN method has been shown that only currents alone can be used for transient analysis of the fault and only two modes are required for differentiation. Neural networks have attracted the attention of scientists and technologists from a different number of disciplines. While neural networks for function approximation seem useful for the purpose of mathematical network modeling, we may need a more convincing argument for how networks of this type may be used in practical applications.**

Key Words- Artificial Neural network (ANN), FFT, DWT, MRA.

I. INTRODUCTION

Transmission lines are a important part of the electrical transmission distribution system, as they provide the path to transfer power from generation to load. Transmission lines works at voltage levels from 69kV to 765kV, and are ideally properly interconnected for reliable and efficient operation. Factors such as unbalance market condition, economic aspects, right of-way clearance and environmental requirements have pushed utilities to handle transmission lines near to their operating limits. Any fault, if not sensed and isolated fastly will cascade into a system wide disturbance causing more outages for a properly interconnected system operating very near to its limits.

Transmission protection systems are designed to detect the location of faults and isolate only the faulted part from healthier one . The main challenge to the transmission line protection lies in reliably sensing and isolating faults adjusting the security of the system.

For many centuries, one of the target of humankind has been try to develop machines. One can envisioned these machines as doing all functions and tedious tasks so that we might enjoy a more comfortable life. The era of machine designing began with the inventing of simple machines such as lever, wheel and pulley. Many similar congenial inventions followed thereafter. Recently engineers and scientists are trying to make intelligent devices. Artificial neural systems are present-day examples of such machines that have highly able to further improve the comfort of our life. Artificial neural network (ANN) has been equipped with distinction of parallel processing, nonlinear mapping, attached memory, and offline and online learning techniques. The wide uses of ANN with its winning outcomes make it an proper diagnostic mean in electric energy systems.

Their most basic characteristic is their configuration. Only few of the networks provide quick responses. Other networks need time to give output and are characterized by their real-time behavior, which we often refer to as dynamics. Neural networks also differ from each other in their learning modes. There are a variety of learning rules that establish when and how the connecting weights change. Finally, networks exhibit different speeds and efficiency of learning. DWT coefficients have been extracted from the current signals under normal condition as well as abnormal or fault condition. During fault, it has been found that DWT coefficients are of higher values resulting in more values of AbA compared to that under normal condition. At normal condition, the values of AbA for phase A, phase B and phase C current are 0.0028681, 0.005676 and 0.0033315 respectively and these values are very less. If AbA value is more than 0.08 for either of the three fault currents, a fault occurs.

I LITRATURE SURVEY

Line Current Differential: Communications is an important piece of a line differential relay, as the currents from one line terminal must be sent to relays at other terminals to perform the differential calculation. This necessitates the use of a digital communications channel, which is widely a multiplexed channel where channel switching may carried out.

Distance**:** Distance relays applied at dual-breaker line terminals are vulnerable to mis-operation on outside faults. During a close in reverse external fault, the voltage is dropped to a very low limit, and the security of the relay is maintained by directional monitoring. If one of the line CTs saturates, the current measured by the relay may increase in magnitude, and be in the opposite direction of the actual fault current, leading to an mis operation of the forward distance element for an outside faults.

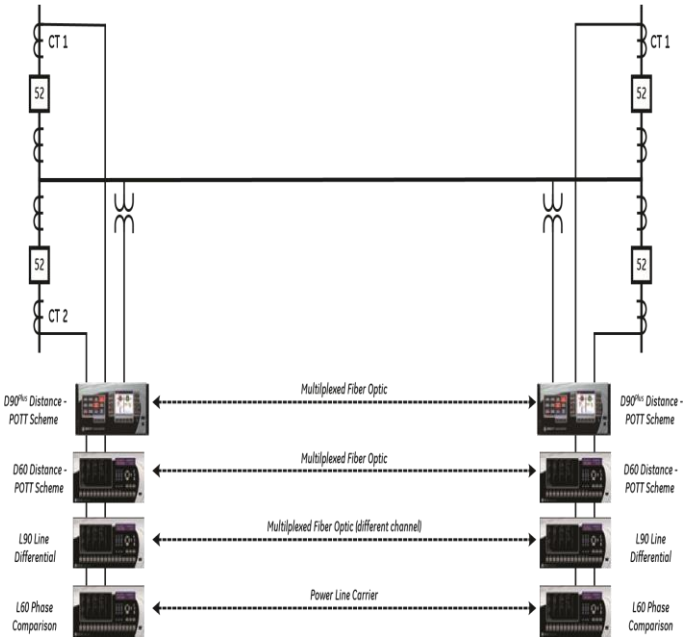

Fig..1 Relay protection scheme for transmission line.

There is no fault-free system and it is neither practical nor economical to build a fault-free system. the various cases of abnormal condition such as natural events, physical accidents, equipment failure, and mis operation generate faults in the power system network. the type and frequency of faults are amplification of current flow, increasing heat produced in the conductor damages. the actual magnitude of fault depends on resistance to flow and varied impedance between the fault and the sources of electricity supply. Total impedance comprises of fault resistance, resistance and reactance of line conductors, impedance of transformer, reactance of the circuit, and impedance of generating station. the conventional distance relay settings are based on a predetermined network configuration with worst fault conditions.

The year 1943 is often considered the initial year in the development of artificial neural systems. McCulloch and Pitts (1943) outlined the first formal model of an elementary computing neuron. The model included all necessary elements to perform logic functions, and thus it could function as an arithmetic logic computing element. The implementation of its compact electronic model, however, was not technologically feasible during the era of bulky vacuum tubes. The formal neuron model was not widely adopted for the vacuum tube computing hardware description, and the model never became technically significant. However, the McCulloch and Pitts neuron model laid the groundwork for future developments.

Donald Hebb (1949) first proposed a learning scheme for updating neuron's connections that we now refer to as the **Hebbian learning rule. He** stated that the information can be stored in connections, and postulated the learning method that had a profound impact on future developments in this field. Hebb's learning rule made primary contributions to neural networks theory.

III Artificial Neural Network

Artificial neural network (ANN) is made up of many computational processing elements called neurons or nodes. These nodes operate in parallel and are connected together in topologies that are loosely modeled after biological neural systems.The training of ANN is done in order to get exact output to a specific input. ANN has capability to produce similar outputs when input fed data is common, but it does not show an identical patterns. A most used model for ANN is the multilayered model. The perceptron model with multilayers neurons ability to deal with non-linear and complex problems layer. Back propagation feed forward networks are used to process the organised input data obtained from discrete wavelet transform.5 inputs and 1 output neuron were established for guiding ANN thereby designing discrete wavelet transform based ANN fault detector.

ATP/MATLAB is used to test ANN, there were 4 inputs and 1 output neuron selected from 11 fault data. There are 12 neurons chosen for hidden layer. Hidden layer is then activated using hyperbolic tangent function.

The apparent impedance observed by relay gets reduced as distance decreases in distance relay protection scheme. And if the ratio of apparent impedance and positive sequence impedence is less than 1, then the fault is detected. Long and medium type transmission line has given such type of protection scheme.

Adaptive type relaying is approached for most of the applications. ANN has wonderful feature of learning which make it unique and advantageous to extend its use for adaptive type of protection schemes even. Adeline model of neural network have been applied by khaparde for long length transmission line. MLP have also being used to avoid any disoperation of relay along with adaptive protection scheme based on ANN

IV Discrete Wavelet Transform:

Selection of hidden layers depend on the wavelet transforms , possesses statistical features such as a little wave, kurtosis, signal wave skewness. The advantages of the Discrete Wavelet transform is high degree of robustness, ability to learn Transform (DWT) . The features of DWT are, time-domain representation unlike Fourier transforms , self-arranged Maps and Counter technique etc. The signal needed to be analyzed. Among the various networks, the DWT is computed by successive propagation neural network is a kind of neural network having low pass (h) and high pass (g) filtering of discrete signlas which is widely applied today owing to its effectiveness time-domain signal. This is called as MALLAT algorithm. To solve almost all types of problems. In first decomposition level, signal is decomposed into D1 algorithms such as Levenberg-Marquardt [20], Quasi- and A1, with the frequency band of D1 and A1 is f /2–f /4, Newton and conjugate gradients algorithms, gradient 0 – f /4. In the second decomposition, again the low pass descent have been used to optimize the learning rules in filter, A1 is splitted into D2 and A2 with the frequency BPN. Combination like WT & ANN is most commonly band of D2 is f /4 – f /8 and A2 is 0 – f /8. used for fault detection and classification purpose. The wavelet coefficient energy can be calculated as According to [21], DWT based approach for fault shown below equation (1), detection not only detects the fault accurately and quickly, it also reduces the volume of input data of the ANN without (1) loss of information. This dramatically reduces the training time and increases the overall performance. The MATLAB / SIMULINK is used to generate the fault. Tool boxes contains Wavelet Transform [22], Neural Networks toolbox [23], Fuzzy interference system and Simulink.

Fault Detection Using DWT: Discrete Wavelet Transform helps in programming, analyzing transient phenomenon program modules into simpler statistical features such as skewness, kurtosis, mean of signal, standard deviation etc. Such features correspond to the faults type occuring on the transmission lines. The focus of this paper is to develop a review over the fault locators. In this paper, DWT is used as fault detection technique for real-time fault detection, classification due to following reasons. It provides a fast, discrete wavelet transform and artificial neural network. Reliable, accurate fault analysis and it also easier The fault condition are simulated in MATLAB (8.2) on the implementation provides less computation time and 220kV transmission line..

V CONCLUSION

The paper presented a survey on new ANN-based approach to real-time fault classification in power transmission systems which can be used in

digital power system protection. It uses calculated spectral energy as inputs, also known as vector features. A wavelet transform based fault location method Uses the traveling wave theory of transmission lines. The proposed fault location method is independent of the fault impedance. The method can be used both with single ended and synchronized two ended recording of fault transients. The fault location estimation error is related to the sampling time used in recording the fault transient. DWT method of fault detection bags certain unique advantages Unlike the basis functions used in Fourier analysis, the wavelets are not only localized in frequency but also in time. This localization allows the detection of the time of occurrence of abrupt disturbances, such as fault transients.

VI REFERENCES

1] *Ultrafast Transmission Line Fault Detection Using a DWT Based ANN Ahmad AbdullahMember,IEEE.*

2] *2017 International Conference on circuits Power and Computing Technologies [ICCPCT]* ***Detection And Location of Fault in a Micro grid Using Wavelet Transform***
.

3] *2016 International Conference on Intelligent Control Power and Instrumentation (ICICPI)* ***DWT and BPNN Based Fault Detection, Classification and Estimation of Location of HVAC Transmission Line.***

4] ***Fault Location Estimation on Transmission Lines Using Wavelet Transform and Artificial Neural Network*** *Las Vegas Nevada, USA, June 26-29, 2006.*

5] ***Faults Detection in Power Systems Using Artificial Neural Network*** *Eisa Bashier M Tayeb School of Electrical and Nuclear Engineering, College of Engineering Sudan University of Science &Technology; Khartoum – SUDAN.*

6] **High-speed fault detection and classification with neural nets** M. Kezunović [a], Igor Rikalo [a], D.J. Šobajić b aDepartment of Electrical Engineering, Texas A&M University, College Station, TX 77843-3128, USA Electric Power Research Institute, 3412 Hillview Avenue, Palo Alto, CA 94304-1395, USA Received 7 February 1995.

7] ***Transmission Line Fault Detection and Classification UsingDiscrete Wavelet Transform and Artificial Neural Network*** *M. Gowrishankar, 1 2P. Nagaveni and 3P. Balakrishnan.*

8] ***A Novel Fault Classification Technique for High Speed Protective Relaying of Transmission Lines.***