Fault Detection, Location and Classification of Fault in Transmission Line Using Discrete Wavelength Transformation

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***ABSTRACT*: Fault detection, classification and location in transmission lines using discrete wavelength transmission is presented in this study. To improve the power quality of the transmission lines, compensation circuits are integrated. In order to increase the reliability of the system , it is of immense important to classify and locate the fault rapidly and to isolate the faulty section precisely. Detection and classification of some types of faults is based on the information covered by the wavelength analysis of power systems. Maximum norm value and energy of the signals detects the fault and detail coefficient classifies the fault into different types such as L-G ,L-L-G ,L-L-L .**

In this dissertation, wavelet transform has been used for classification and location of various types of faults with different inception angles on double circuit series compensated transmission line with different compensation levels in both the lines.

Flow chart for fault classification has been proposed. Fault location error has been tabulated for various types of faults with different distances, inception angles and different compensation levels on line1 and line2.

Fault detection techniques are discussed on the basis of feature extraction. After the overall concepts and general ideas are presented; works as well as new progress in this paper

1. INTRODUCTION

After generation of power in power system , the main purpose of the electrical transmission and distribution system is transmit electrical energy. Fault detection, location and classification of fault in transmission lines and distribution systems have been studied over the years.
In power transmission line protection , fault phase detection ,location and classification are very important problems which are need to be indicated in reliable and accurate manner for the analysis. The discrete wavelength transformation normally uses both the analysis and synthesis in pair.

Faults result in reduced efficiency of the system, reduced quality of the product, and sometimes complete breakdown of the process in transmission line. Most fault in an electrical system occur with a network of over head lines are single -phases to ground faults caused due to lighting induced transient high voltage and from falling trees . The appropriate percentages of occurrences various faults are given below.

- Single line to ground fault :70-80 %
- Line -Line to ground fault :10-17%
- Line -Line fault :08-10%
- Three phase :02-03%

The most common and also used in this paper is over- current protection is widely used. The fault location methods in which they locate fault , they can also be classified into one - terminal and two- terminal based given information from one end or both of the transmission line.

It is necessary for the faults to be detected fast and accurately .And it is also know the details about the fault that has occurred so that it can be corrected as soon as possible

When fault occur in the power system ,they provide changes in the system quantities like power factor, frequency current direction. Electrical Fault is an unwanted condition ,caused by equipment failures such as transformation and human errors and environmental conditions.

Wavelength Transformation (W.T):

W T are used in linear transformation work as Fourier transformation with one difference that it is allows time location of different frequencies, component of given signals. It will adjust their time - width to their frequency in fault detection identification of fault location it is work on time frequency wavelength. it is collect the signal from current and voltage in transmission line. so that it is useful for analyzing fault transients which contains localized high frequency component superposed on power frequency signals.

WORK ON :

- Fault detection
- Faulted Phase Selection
- Wavelength transformation
- Transmission line

Area of wavelength transformation in power systems :

- Power system transients
- condition monitoring

Discrete Wavelet Transform:

Wavelet transform are possesses feature such as a short wave, short in the sense of being little duration with finite energy which integrates to zero. The fundamental wavelength of the Discrete Wavelet Transform (DWT) evised a technique to decompose discrete time signals. In DWT, a time- scale representation of a discrete signal is obtained by using digital filtering technique. The DWT is computed by continues low pass (h) and high pass (g) filtering with discrete time-domain signal. The wavelet coefficient energy can be calculated as shown below equation (1),

$$E_w \square \sum_{N_w} [d_w(k)]^2 \qquad (1)$$

2. Types of FAULT

. The fault inception also involves in insulation failures which result SHORT CIRCUIT AND OPEN CIRCUIT of conductors. There are mainly two types of faults in the electrical power system

i. Symmetrical Faults

These are only 2-5% of system faults are symmetrical faults. These faults are easy and usually carried by per phase . These are also called as balanced faults are of two types .

a) Line to line to line to ground(L-L-L-G)
b) Line to line to line(L-L-L)

ii. Unsymmetrical Faults

These faults occur due to the causes the conductor to make contact with ground 15-20% of faults are double line to ground and causes the conductors to make contact with ground. These are mainly three types .

a) Line to ground (L-G)
b) Line to line(L-L)
c) Line to line to ground(L-L-G)

Causes of Electrical faults :

- Weather conditions
- Equipments failures
- Human errors
- Smoke of fires

Effects of electrical faults:

- Over current flow
- Loss of equipment
- Electrical fires

The fault is also take place in insulation failures and conducting path failures which gives results short circuit and open circuit of conductors .

- Open circuit faults:

These faults occur due to the failure of one or more conductors . these faults for single , two and three phases open condition. these are also called as series faults.

Short Circuit faults:

A short circuit can be defined as abnormal connection of very low impedance between two points of different potential . and it is also called as shunt faults.

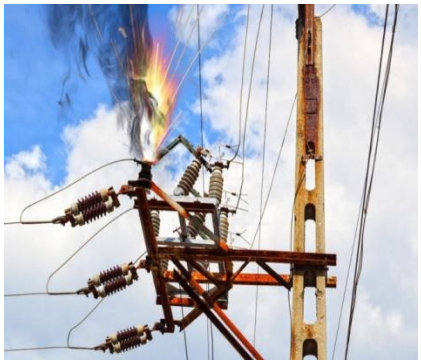

Fig. 1. Electrical faults in power systems

3. Performance comparison of different types of FAULTS:

There are two methods are mentioned by their application in this field of work . That are working to implemented in paper.

- Signal analysis techniques wavelength transformation
- Artificial intelligence neural network

4. Applications of FAULT:

a. Fault detection are reduced the faulty condition in transmission .
b. Fault detection are increased the stability of power system .
c. fault detection are increased the speed of operation of power system.
d. fault detection are improve the economical factor of power system.
e. fault detection are increased the Reliability of power system.

5. Fault Detection Using Discrete Wavelet Transform (DWT) :

Discrete Wavelet Transform is found to be useful to analyzing the transient phenomenon of associated with faults on the transmission lines. In this paper, DWT is used for fault detection purpose due to following reasons. It provides a fast, reliable, accurate fault analysis and it also easier to implement and it provides less computation time and resources required compared to the continuous wavelet transform.

5.1 Feature Extraction of Line Signals Using DWT:

The three phase current signal of transmission line are taken as input and decomposed using discrete wavelet transform to obtain feature extraction

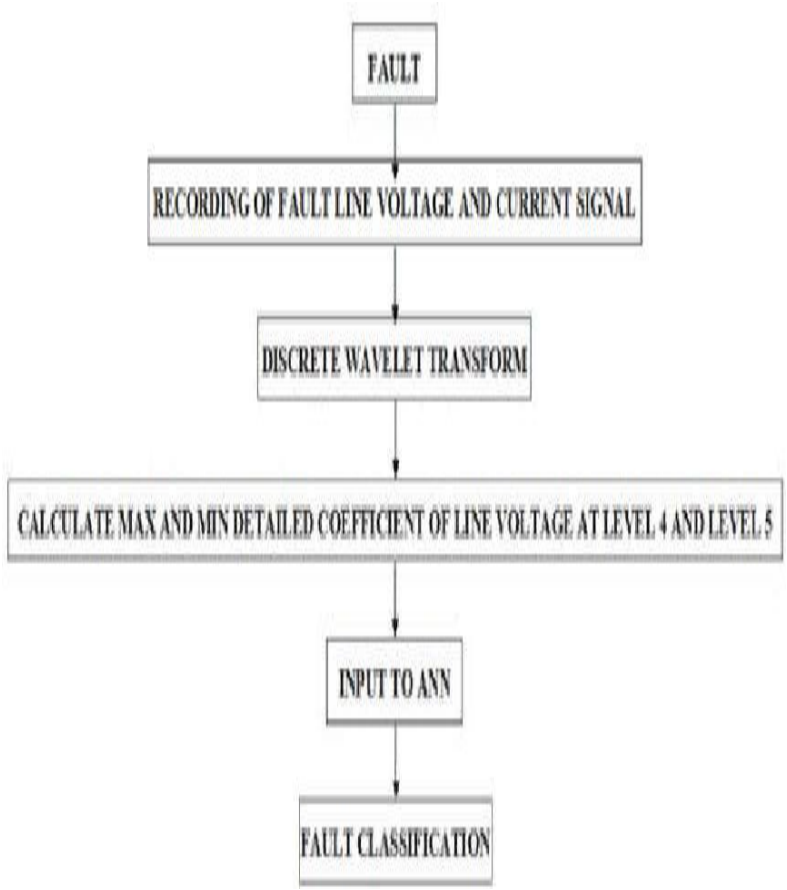

Fig. 1: Flow chart of the proposed approach for fault detection and classification

6 . **Description of Proposed Transmission Line Fault**, **Analysis Method:**

The proposed algorithm is applied in two main steps. First step is fault detection and the last step is fault classification.
A flow chart of the proposed algorithm is shown in Fig . 1. The fault detection process is done using DWT and fault classification process is done using another reconstructed wavelength transformation to find out the location of fault occur in transmission line .

6.1 Fault Classification Simulation Results and Discussions:

With the help of fault detection process, absence and presence of faults are known. The discrimination of fault is not possible just with the help of DWT transformed signal.
In this proposed system, Another Wavelength are used to determination of fault location in transmission line by introduce the same frequency of wavelength to located the position of fault in transmission line. The feature obtained by processing DWT are provided as an input to for the location of fault in transmission by another W.T signal are used to find the location of fault. The feature obtained by processing DWT are provided as an input to located fault position . The features used for fault classification are maximum and, minimum detail coefficient of three phase current signal of d4 and d5.

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CONCLUSION

The proposed paper uses an DWT- WT techniques for fault detection classification and location . The three phase current signal of transmission line are decomposed up to fifth detail level using DWT to obtain feature extraction. The feature extracted by processing the discrete wavelet transform are maximum and minimum detail coefficient value of d4 and d5, which are used for fault detection and classification.

The proper selection of db6 as mother wavelet has played a significant role of extracting the useful information for fault detection and classification. The proposed paper provides approximately 90 .60 percent accurate classification. The proposed scheme is easily comprehensible, determinist and feasible for aquatically.

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