UNSYMMETRICAL FAULT DETECTION OF OVERHEAD TRANSMISSION LINE BY USING HYPER LEARNING ALGORITHM

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Abstract— **Now a days, Most of the fault are occur in the power system are unsymmetrical faults are occur in overhead transmission line. The paper presents an application of hyper algorithm for fault disturbance detection and fault classification in transmission line. Hyper algorithm mostly used for optimization problems. The new method is based on the measurements and analysis of the currents, voltages. The power factor angle can be a novel criterion for faulty phase detection and classification. Many researches are even going on to enhance the techniques to solve these problems. Protection of transmission line is very important. Sudden changes in lines can cause very dangerous impact on power system. By this technique, the voltage and current are fast provided by means of MATLAB/Simulink model.**

Keywords—unsymmetrical fault, ADPBC algorithm, power factor angle detection technique.

I. INTRODUCTION

A fault in a power system can be defined as abnormal condition of the system. Under normal operating condition the equipments are operating at normal operating voltage. If any faults occur in the system means the voltage and current values are deviate from this nominal value. Generally power system fault are classified into two types. There are symmetrical fault (balanced fault) and unsymmetrical fault (unbalanced fault). Symmetrical faults are severe fault. 2-5 % of the faults are symmetrical fault. Unsymmetrical faults are common fault. But less severe than the balanced fault. Most of the faults are occur in the power systems are unsymmetrical faults. Like single line to ground fault, double line to ground fault, three phase fault and line to line fault. 65-70% of the faults are single line to ground fault. 15-20 % of the faults are double line to ground fault. 5-10 % of the faults are line to line fault. 2-5 % of the faults are three phase fault.

Granizo and Alvarez proposed a novel protection method for Ground Faults detection in cables used in Combined Overhead-Cable lines in power system. In this method, the magnitude values are less than a threshold M, faults occur on Outside cable line side. If the magnitude values are greater than a threshold M, faults occur on inside cable line side [1]. In this paper, describes detection and classification of faults using power factor angle. Here they take ieee14 bus system and to identify the fault using communication technology. The angle of voltage and current of the line terminals are measured by phasor measurent unit [2]. Wavelet transform and fuzzy logic algorithm for fault location. Wavelets are best choice to analyze transient signal. Travelling wave theory is useful for transmission line fault location and fault distance was explored [3-4]. This paper proposes a novel current travelling wave based single-ended fault location method for

locating single phase-to-ground fault of transmission line. Most of the faults are occur in the power system are single line to ground fault.In this method, to recognize the travelling waves propagating from the fault direction [5].

Subramani proposed a fault investigation method. In this paper author to compare three methods. There are impedance methods, travelling wave method, wavelet multi resolution technique. This method based on measurement and analysis of voltage and current [6]. In this paper describes, fault detection and classification using ANFIS. Adaptive neuro fuzzy interface system is a combination of fuzzy controller and neural networks. This paper integrating the capabilities of neural network and fuzzy logic system. Input data of ANFIS are derived from the values of the voltage and current. It provides a natural frame work in form of input, output pairs and information in the form of IF-THEN rules in a even fashion [7-8]. Back-propagation (BP) neural network as alternative method for fault detection, classification and isolation in transmission line. Distance protection is subdivided into different neural networks for fault detection in transmission line, fault classification and in dissimilar zones [9]**.** In this paper describes, transmission line fault location by using artificial neural algorithm[10].

II. HYPER LEARNING ALGORITHM

In the hyper architecture, the first layer and the fourth layer contain the parameters that can be modified over time. In the first layer, it contains a nonlinear of the premises parameter while the fourth layer contains linear consequent parameters. To update both of these parameters required a learning method that can train both of these parameters and to adapt to its environment. A hyper algorithm proposed by Jang will be used in this study to train of these parameters. The use of this algorithm is due to the back propagation algorithm that was used to train the parameters that exist in the adaptive networks found problematic especially in a slow convergence rate and tend to be trapped in local minima. There are two parts of a hyper learning algorithm, namely the forward path and backward path. In the course of the forward path, the parameters of the premises in the first layer must be in a steady state.

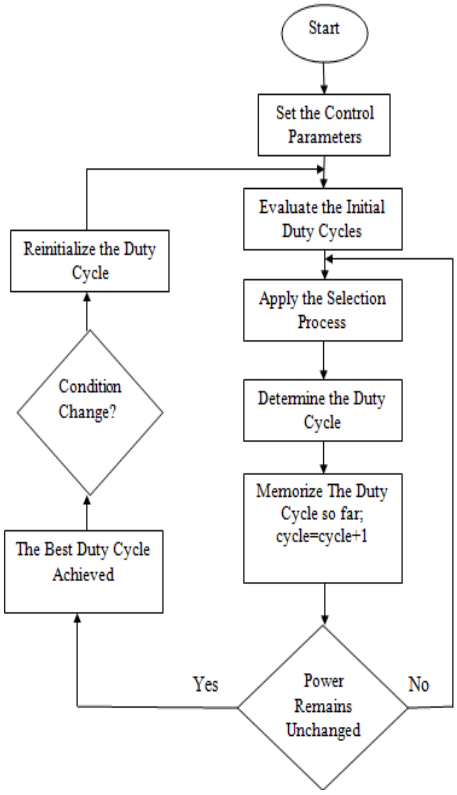

Figure 1. hyper algorithm flowchart for fault detection

A recursive least square estimator (RLSE) method was applied to repair the consequent parameter in the fourth layer. As the consequent parameters are linear, then RSLE method can be applied to accelerate the convergence rate in hyper learning process. Next, after the consequent parameters are obtained, input data is passed back to the adaptive network input, and the output generated will be compared with the actual output.

While backward path is run, the consequent parameters must be in a steady state. The error occurred during the comparison between the output generated with the actual output is propagated back to the first layer. At the same time, parameter premises in the first layer are updated using learning methods of gradient descent or back propagation.

With the use of hyper learning algorithm that combines RSLE and the gradient descent methods, it can ensure the convergence rate is faster because it can reduce the dimensional search space in the original method of back propagation.

III. FAULT DETECTION BLOCK DIAGRAM

In this paper, detecting and classifying faults on overhead the power transmission lines by using hyper learning algorithm.

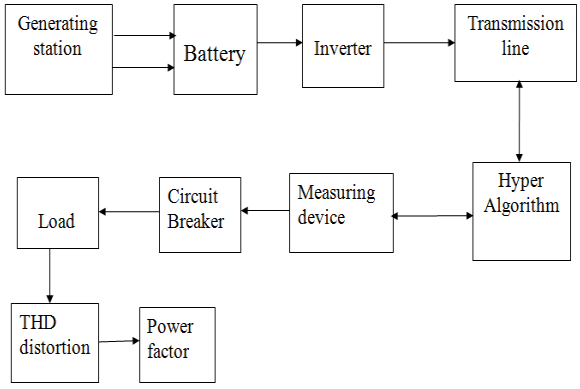

Figure 2. proposed block diagram for fault detection in overhead transmission line

For the simulation study, a fault analysis in overhead transmission line has been considered as shown in figure 2. Block diagram consists of measuring device (voltage transformer, current transformer), circuit breaker, battery, inverter and then fault block. Here we have to use three phase transmission line. A three-phase is connected to the load. Any fault takes place in the circuit means, send trip signal to the circuit breaker. In this proposed method, to indentifying a transmission fault by using hyper learning algorithm. The power factor correction is also used to find and correct the fault which is occurred in the transmission line.

IV. SIMULATION RESULTS

A. Simulink model

In this thesis describes, detecting and classifying faults on overhead the power transmission lines by using hyper learning algorithm. A three-phase model has been considered for this simulation study.

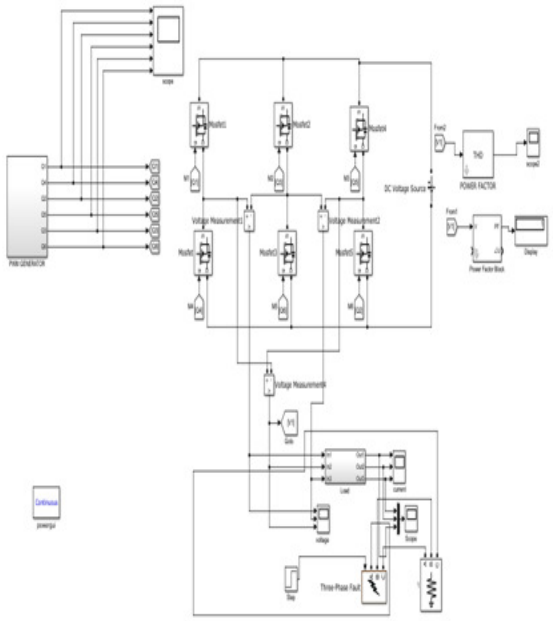

Figure 3. fault analysis in overhead transmission line

The unsymmetrical faults were discussed; single line to ground fault, double line to ground fault and three phase fault. By using this, the power factor is connected on the load side with the measured voltage values from the transmission line against single line to ground double line to ground, three phase fault. Facilitate detection, type of faults and sending tripping signals CBs**.** At the time circuit breaker get opened and to protect the load side from the fault.

B. Result and discussion

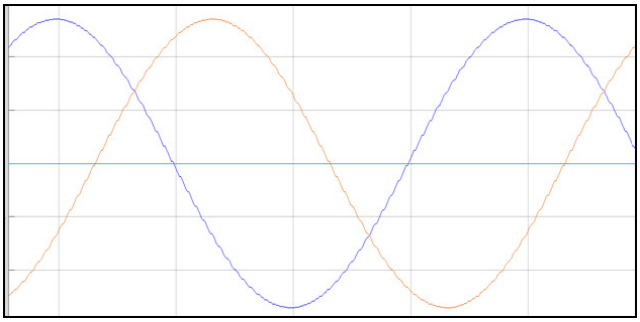

Figure 4. voltage waveform of line to ground fault (L-G) on Phase B

In the above Voltage, waveforms show the output of single line to ground fault(L-G). In this above voltage waveform, the affected phase does not exist in the simulation result and other two phases which is normally working without fault is exist in the simulation. In this waveform shows the single line to ground on phase B.

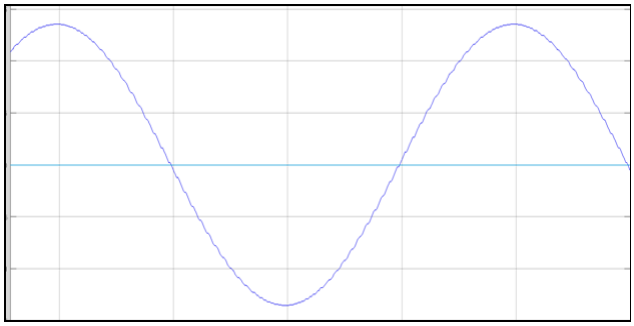

Figure 5. voltage waveform of double line to ground fault (L-L-G) on Phase B & C

In the above Voltage, waveforms show the output of double line to ground fault(L-L-G). In this above voltage waveform, the affected phase does not exist in the simulation result and other one phase which is normally working without fault is exist in the simulation. In this waveform shows the double line to ground on phase B & C.

Figure 6. voltage waveform of three phase fault

In the above Voltage, waveforms show the output of three phase fault. The three phases are affected. In this the affected phase does not exist in the simulation result. In this waveform shows the double line to ground on phase A,B & C.

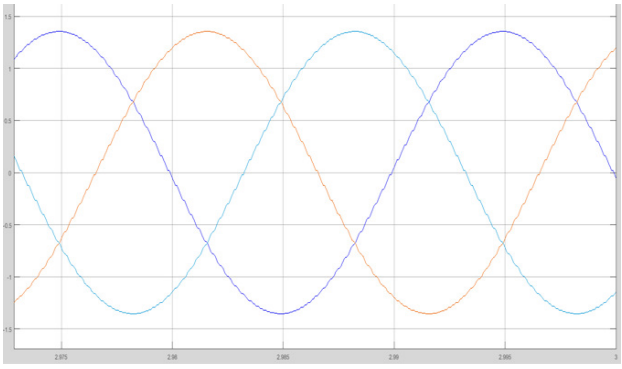

Figure 7. voltage waveform for without fault detection on PhaseA, B & C

In the above Voltage, waveforms shows the output of without fault detection in overhead transmission line. The three phases which is normally working without fault exist in the simulation.

V. CONCLUSION

This thesis has investigated the use of hyper learning algorithm as an alternative method for fault detection, classification in a overhead transmission line system. Three common faults were discussed; single line to ground fault, double line to ground fault and three phase fault. The power factor correction is also used to find and correct the fault which is occurred in the transmission line. Simulation models of the transmission line system are constructed and the generated information is then channelled using MATLAB software (version 17).

V I. REFERENCES.

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