International Journal of Scientific Research & Engineering Trends
Volume 5, Issue4, July-Aug-2019, ISSN (Online): 2395-566X

Distribution Transformer Condition Monitoring System Using Artificial Intelligence

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Abstract **−Distribution transformer is an important asset in distribution network. Its operation and control are important aspects which determine the reliability and quality of power supply. A remote condition monitoring system for distribution transformer is discussed here. Different parameters are acquired and processed in remote terminal unit. This communicates the data to the operator end using internet. According to parameter values, health index of a transformer is found out at the operator end interface. Analysis is based on health index. This system is different from power transformer condition monitoring systems in condition monitoring techniques used and communication. A cheaper system is designed which precisely evaluates the health status of a transformer. The test results are taken from a specially designed transformer.**

Keywords**- Distribution transformer, condition monitoring, health index, human machine interface**

I. INTRODUCTION

With the skyrocketing growth of power system networks and the increase in their complexity, many factors have become influential in electric power generation, demand or load management [1].Load Distribution Transformer in one of the critical factors for economic operation of power systems. Distribution Transformer of future loads is also important for network planning, infrastructure development and so on. However, power system load Distribution Transformer is a two dimensional concept: consumer based Distribution Transformer and utility based Distribution Transformer. Thus the significance of each forecast could be handled disjointedly.

Consumer based forecasts are used to provide some guidelines to optimize network planning and investments, better manage risk and reduce operational costs. In basic operations for a power generation plant, forecasts are needed to assist planners in making strategic decisions with regards to unit commitment, hydro-thermal co-ordination, interchange evaluation, and security assessments and so on. This type of forecast deals with the total power system loads at a given time, and is normally performed by utility companies. Nonetheless, power system load Distribution Transformer can be classified in three categories, namely short term, medium term and long term Distribution Transformer.

II. OBJECTIVE OF THE STUDY

Although the objectives of the study can be inferred from the background to the study outlined in the previous section, it can still be clearly and concisely stated that the objectives of the study are:

- To model artificial neural network which can forecast electric power supply for one day in advance (Long Term Load Distribution Transformer)?
- To train the model (using back propagation algorithm) with pre-historical load data obtained from a sample of the power company so that each input produces a desired output;
- To Test the model to get the values of future power supplies in the power system and,
- In the light of the above, make necessary recommendations and suggestions for further research. Management decision can now be automated. So, this research is aimed at suggesting a solution to the ailing power system by proposing a model which can perform 24-hours ahead load Distribution Transformer in the power system by means of artificial neural network.

III. DISTRIBUTION TRANSFORMER TECHNIQUES

The subject of load Distribution Transformer has been in existence for decades, and a number of techniques have been developed. These methods are based on either classical or modern approach. This part of the research work is necessary to establish the statistical relevance of the proposed research project, establish a generalized research question, analyze existing methods, and explore areas of possible improvements. This chapter also covers the analysis of various existing load Distribution Transformer techniques, a comparative study of reviewed papers, findings and remarks. Load Distribution Transformer has become one of the most significant aspects of electric utility planning. The economic consequences of improved load Distribution Transformer approaches have kept development of alternate, more

accurate algorithms at the forefront of electric power research [12].

1. Characteristics of a power system load

The behavior of a power system load depends on a number of factors. Thus the load does not satisfy the superposition principle i.e. the load is not necessary the sum of linear independent variables, but it is rather a nonlinear system. As commonly known, nonlinear problems are often difficult to solve and much less understood than linear problems. Hence, power system load Distribution Transformer is a great computational problem for many researchers and network planners.

IV. FACTORS AFFECTING THE LOAD

The system load, in power operation context, is the sum of consumers load at the time. A consumer load trend is as different as 'chalk and cheese' and influenced by a thousand of factors. There is no any engineering rule that guides the selecting of these factors. Thus this process is mainly based on experience gained from the correlation analysis between the load and potential influencing factors. The only existing criterion is that load Distribution Transformer in power systems can generally be divided into three different time horizons: short, medium, and long term load Distribution Transformer. However, factors affecting the load at different time horizons are not necessary the same.

V. MINIMIZATION OF MSE PARAMETER WITH ANN

Artificial neural networks have shown great strength in solving problems in image processing and image fission technique that are not governed by rules, or in which traditional techniques have failed or proved inadequate and reduction of image noise in sampled video framed image. The parallel architecture and the fault tolerant nature of the ANN is maximally utilized to address problems in variety of application areas relation to the imaging field in particular image parameter Like as MSE and PSNR.

Artificial neural networks find their application in pattern recognition and other feature extraction based recognition methods (classification, clustering, and feature selection with other fundamental image quality enhancement feature), segmentation, image compression, color representation and several other aspects of image processing. ANNs as three layers Input, Hidden and Output layer.

Artificial neural networks are computational models inspired by biological neural networks, and are used to approximate functions that are generally unknown. Particularly, they are inspired by the behavior of neurons and the electrical signals they convey between input (such as from the eyes or nerve endings in the hand), processing, and output from the brain (such as reacting to light, touch, or heat). The way neurons semantically communicate is an area of ongoing research. Most artificial neural networks bear only some resemblance to their more complex biological counterparts, but are very effective at their intended tasks (e.g. classification or segmentation). Some ANNs are adaptive systems and are used for example to model populations and environments, which constantly change.

Neural networks can be hardware- (neurons are represented by physical components) or software-based (computer models), and can use a variety of topologies and learning algorithms. Classification of image segments into a given number of classes using segments features is done by using a Kohonen competitive neural network. Kohonen networks are feed forward networks that use an unsupervised training algorithm, and through a process called self-organization, configure the output units into a spatial map.

V. RESULT AND SIMULATION

MATLAB software will be used for the implementation. MATLAB works faster in calculation while working with video or image.

1.Why Matlab?

Matlab is intended primarily for Mathematical Computing. Matlab contains a huge collection of predefined algorithm which is used for image processing. An algorithm can be tested immediately without recompiling it again. Matlab provides interactive environments which help you to work innovatively with your data and helps to keep track of the files and variable etc.

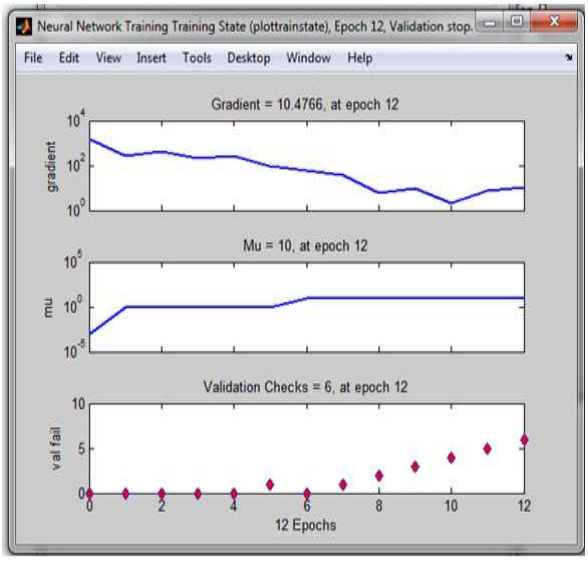

Fig.1NN Validation State.

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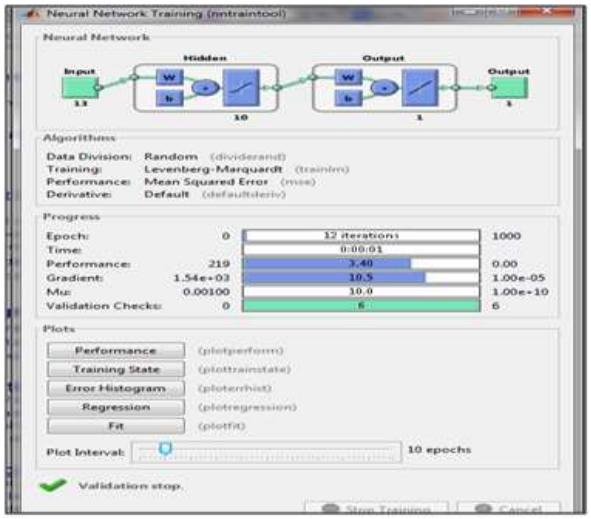

Fig.2 NN Training State.

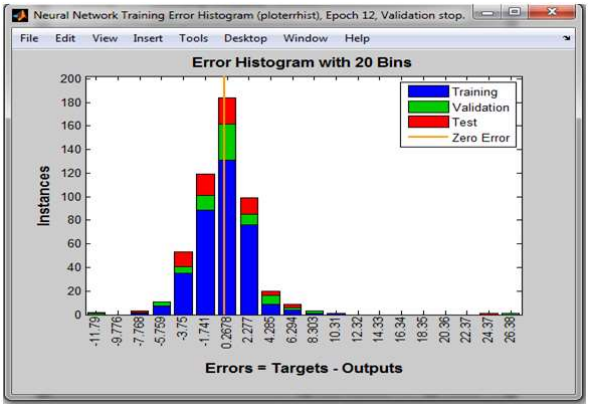

Fig.3 Error of histogram.

MSE Analysis represents histogram for multiple layer option. The irregular result provide to neural network. So 0.2678 Error histogram with 20 bins is the highest value of this graph represent.

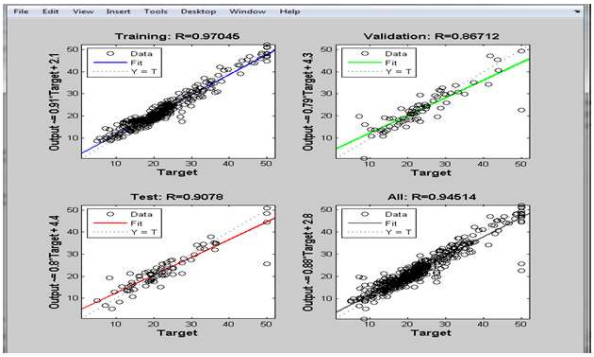

Fig.4 output Error.

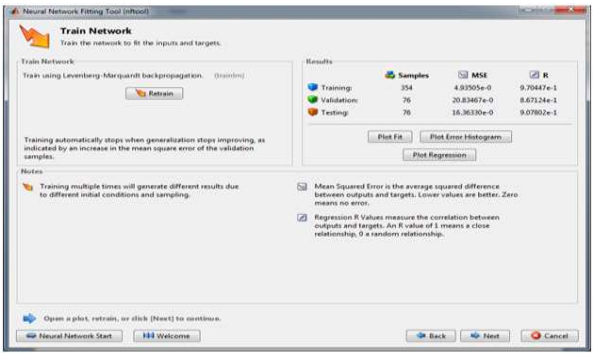

Fig.5 Import data.

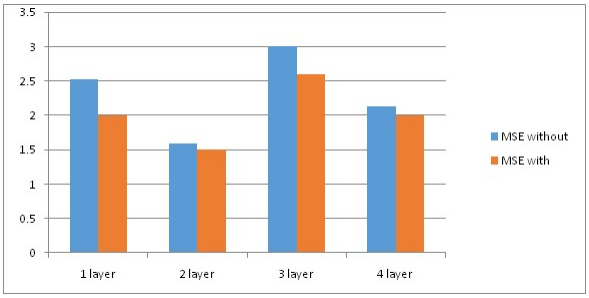

Fig.6 MSE Layer of Analysis Neural Network.

Layers	MSE Analysis Without Neural Network	MSE Analysis With Neural Network
1 Layer	2.53x10	2.00x10
2 Layer	1.59x10	1.5091x10
3 Layer	3.01x10	2.59x10
4 Layer	2.13x10	2.00x10

The previous chapter introduces the proposed methodology. This chapter describes the related future work and schedule plan of excursion.

VII. CONCLUTION AND REFERENCE

The main objective of this research project is to provide power system planners with an accurate and reliable short-term load Distribution Transformer (STDT) system which may assist to economically optimize power system operations. In the deregulated electricity market, the key power system operational activities such as priced-based unit commitment (PBUC), energy interchange, and adequate power reserves rely heavily on a Distribution Transformer result with reasonable accuracy. Equally, LTDT is also essential, especially for large power users (LPUs), to duly manage their notified maximum demands (NMD) and perhaps even better their expansion plans. These requirements are the main impetus of this work.

This thesis is sequentially arranged, commencing with the general introduction of STDT, literature review, some basic requirements of a convenient MSE system, a detailed introduction of the selected technique Improved GA, data collection, and processing, development of models, and finally the obtained application results for the CPUT, Bellville campus reticulation network. In this work, a number of GA -based models for STDT have been developed and studied. The development of these models was based on two different neural networks (Feed forward and Elman Recurrent) and trained using real life data as a case study. Table 5.1 presents a complete schedule of network parameters of the developed models.

REFERENCES

[1]. Haneen Al-Wazan(2005)"Load Distribution Transformer In: Applied Mathematics for Restructured Electric Power Systems", Optimization, Control, and Computational Intelligence, Springer.
[2]. SimanekaAmakali, and A. AL-Rumaih (2005), "Electric Load Distribution Transformer using Genetic BasedAlgorithm, Optimal Filter Estimator and least error squares Technique", PWASET, pp. 138 -142
[3]. Sharif (2006),"Hybrid ellipsoidal fuzzy systems in Distribution Transformer regional electricity loads"Energy Conversion and Management, Volume 47, Issues 15-16, September 2006, Pages 2283-2289
[4]. Chen evaluated and Swift L (1993),"Time Series Distribution Transformer , Simulation, Application", Ellis Horwood, New York.
[5]. Adepoju and E.D. Farmer (1985),"Comparative models for electrical load Distribution Transformer ", John Wiley and Sons, New York. pp.232
[6]. Satish and Galiana, F.D (1987), "Short-Term Load Distribution Transformer ", Proceedings of the IEEE, Vol.75, No.12, pp. 1558-1572.
[7]. Rashid and YazdanShirvany (2007) "Artificial Neural network Approach for Short-termload Distribution Transformer forIllam Region", Volume1 Number 2, WASET ORG
[8]. Al-Saba and J.H. Taylor (2000) "Short-term Load Distribution Transformer by Feed Forward NeuralNetworks", Proc. IEEE ASME First Internal Energy Conference (IEC), Al Ain, United Arab Emirate, http://www.ee.unb.ca
[9]. Ganzalez and J. H. Park (1992) "Short-Term Load Distribution Transformer Using an Artificial Neural Network" IEEE Trans. Power Systems, vol. 7, no. 1