International Journal Of Engineering Research And Development
e- ISSN: 2278-067X, p-ISSN: 2278-800X, www.ijerd.com
Volume 14, Issue 9 (September Ver. II 2018), PP.58-60

Short Term Load forecasting of a Power System Using Plant Growth Algorithm

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ABSTRACT:*In power system energy management system Load forecasting is the major part of the system. The exact load forecasting helps the electric utility to make unit commitment decisions, reduce spinning reserve capacity and schedule device maintenance plan properly. Apart from its plays a key role in reducing the generation cost, it is also essential to the reliability of power systems. In current scenario Load forecasting plays an important role in power system planning, operation and control. But for the proper Planning and precise operational applications of load forecasting requires a certain 'lead time' which is calledas forecasting intervals. On the basis of lead time, load forecasting types fall into four different categories: very short-term forecasts, short-term forecasts, medium-term forecasts and long-term forecasts. In the present paper STLF model is developed and executed using Matlab 8.6 with a new optimization algorithm called Plant Growth Algorithm for the AndhraPradesh Grid. By using the five year load pattern of Andhra Pradesh Grid from the year 2007 to 2011 the forthcoming year's load pattern will be forecasted by using (PGOA) Plant Growth Optimization Algorithm.*

INDEXTERMS*: PGOA, STLF, Load Forecasting.*

Date of Submission: 18-12-2018 Date of acceptance: 31-12-2018

I. INTRODUCTION

Load forecasting is the process used to predict the future demand from the past load data and environment data.Till now numerous models have been adapted to predict the electrical demand more precisely.There are three different types of Load forecasting:

A. Long-term electric load forecasting (LTLF): is helpful for the power utility to plan the forthcoming projects, altering the existing project in order to increase power generation, hiring of man power for smooth operation.The time period for long time demand prediction is more than 10 years.

B. Medium-term load forecasting (MTLF): is helpful in making necessary arrangement of fuel reserves and planning equipment as well as plant maintenance. The time range for medium term load forecasting is 3 to 5 years.

C. Short-term load forecasting (STLF): is helpful in providing essential data for the daily operation and energy scheduling. The time range is from hour to a month.

In current deregulated power scenario forecasting of electrical power gained much more attention. In the power bid market the precise forecasting helps in buying the ample amount of power at a minimal cost. The inaccurate predicted data leads to wrong biding of price for the required power which leads to increase in electricity pricing.Hence in this paper, the important focus is narrow down the difference between the predicted data and actual data therefore prediction accuracy increases which lead to most accurate electricity price biding.

II. ELECTRICALLOAD FORECASTING

2.1 LoadCharacteristics:

In load forecasting problem the aim is to predict the load, hence it is very important to know the load behavior. It is known that electrical load is the dynamic one which changes with respect to time and also influenced by external factors like time, seasonal changes and currency value etc.

2.2 Necessities of the Load Forecasting Process

- Precise
- Fast Convergence
- Simple GUI

- Self erroneous value detection
- Continuous Data Access

III. PLANTGROWTH OPTIMISATIONALGORITHM

An effective algorithm is presented to simulate plant growth realistic in this paper, taking into account branching, phototropism, leaf growth and spatial occupancy. The major focus of the model is to select the activated points by equate the concentration of their morphogen to augment the L system.

ThePGOA takes the growth area of artificial plant as solution space, the best node of the plant considered as the best solution to the problem. The PGOA searches the optimal node in the solution search space based on two criteria.

1. Generating new nodes by branching to search the solution space in order to find the best solution.
2. Growing leaves around the branch points to find the precise solution in the local solution space.

0. Start
1. Initialize
Set NG=0 {NG is the generations counter}
Set NC=0 {NC is the convergence counter}
Set NM=0 {NM is the Mature points counter}
Set the upper limit of the branch points N and initialize other parameters.
Select N_0 branch points at random and perform leaf growth.
2. Assign Morphogen
Calculate the eligibility of the leaf point.
Assign the concentrationlevel of the morphogen of each branch point by Eq.1.
3. Branching
Select two critical values between 0 and 1 randomly and dispose by Eq.3.
Produce new points by branching in four modes.
4. Selection Mechanism
Perform leaf growth in all of the points.
Pick out the mature branch points, the number of which is k ($0 \le k \le N$), by the maturity mechanism.
Set NM = NM + k
Generate new point in the amidstof the crowded area and choose the best point in order to substitute the crowded points.
Eliminate the lower competition ability branch points and select N branch points for next generation.
5. Competition
Compare the current points with the mature points and get the best fitness value f_{max}
6. Check the Termination Criteria
If ($NG<NG_{max}$&&$NC<NC_{max}$&&$NM<NM_{max}$)
Go to step2
else
Exit
7. Stop

One execution of the procedure from step2 through step6 is called a generation or a cycle.

IV. RESULT ANALYSIS

A Matlabcode was developed to perform the load forecasting for the Andhra Pradesh Grid using Plant Growth Optimisation Algorithm. Using the actual data for the years 2007 - 11 the load demand for the years 2012 - 2016 is forecasted.

YEAR	ACTUAL	FORECASTED
2007	8157	8984
2008	8482	9498
2009	9309	10023
2010	9683	10559
2011	10453	11106

Table.4.1Predicted Load (in MW) with actual load for the years (2007 - 11)

YEAR	MONTH	PSO	DE	PGOA
2012	DEC	11980	11771	11665
2013	DEC	12913	12281	12235
2014	DEC	13550	12968	12816
2015	DEC	14360	13850	13408

2016	DEC	15175	14890	14012

Table.4.2 Predicted load (in MW) for the December month from (2012 – 16) using PSO, DE and PGOA

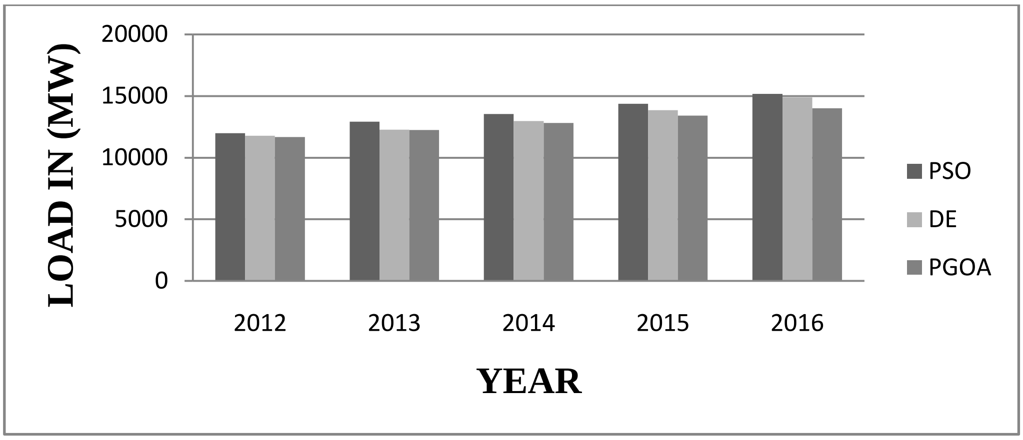

Fig. 4.1 Comparison of Forecasted load in (MW) for the year (2012 – 16) using PSO, DE and PGOA

V. CONCLUSION

The main objective of this work is to implement the Plant Growth Optimization Algorithm in order to predict the future load for planning and hassle free operation of power system. Also by using the PGOA we narrowed the difference between the predicted data and actual data which increases the computational efficiency of developed load forecasting model when compared to existing models with minimal time and better convergence.

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