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An Analysis Of Automatic Function Smoke Detection Tools Based On Arduino Uno

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ABSTRACT
Electricity load forecasting is an estimate of the electricity load needs that will occur in the future based on existing data at present and in the past. This electricity load forecasting aims to avoid an electricity crisis which is also a crisis for electricity consumers whose average growth is increasing every year. This study discusses the implementation of the ant algorithm for electricity load forecasting with the MATLAB program. The method used is to implement data obtained from PT. PLN (Persero), Distribution and Load Regulation Center (P3B) of the North Sumatra Load Regulation Unit from February 1, 2012 to September 25, 2020. Ant algorithm using MATLAB program in this forecast is very helpful in implementing time series data so that a graphic visualization result will be obtained on the computer. Ant algorithm is a probabilistic technique adopted and inspired by the behavior of ant colonies known as ant systems.

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INTRODUCTION

In the development of today's development is inseparable from electrical technology and it is one of the supporters of technological and industrial development. So with the development of development, the need for electricity is increasing both in households, industries, public places, shopping centers, social and government every year always experience an increase in the need for electrical energy.

The characteristics of electricity demand sometimes make it difficult to meet these efforts. Forecasting the growth of electricity load and efforts to meet the daily and annual load cycles satisfactorily are two difficulties that must be overcome. The average growth of electricity consumption in Indonesia increases every year. Considering that it takes 8 to 12 years to build a power plant, system planners must look at the possibilities of the development of the electricity system in the next 10 to 20 years. This is necessary so that there is time to estimate and improve planning in a long-term perspective.

Inaccurate load planning and forecasting will cause an electricity crisis like today. The solution to this problem is to make a prediction or forecast of the electricity load in the future so that an electricity crisis does not occur. In predicting forecasting planning so that savings and regulation of electricity supply can be more optimal, an ant algorithm can be used.

In this study, an application will be designed to predict the amount of electricity load usage using the Ant Algorithm method with the MATLAB program and provide a suitable

forecast alternative to be operated at certain times according to the prediction results obtained.

Literature Review

Forecasting

The need for electricity in an area continues to increase over time in line with the increasing economic activities and welfare of the community in the area. The dynamics of electricity consumption can also be used as an indicator of the tendency of where the development of the sector or area is moving. The increasing need for electricity must of course be anticipated by providing a more adequate electricity system, both in quantity and quality in the future.

Thus, in the electricity system, good forecasting is needed to determine the need for electricity in a certain period of time, whether short-term, medium-term or long-term and the need for peak loads to reduce environmental uncertainty. This study aims to determine the need for electricity in the future, and what variables affect these needs as a whole or based on existing sectors. In forecasting electricity needs, an econometric method approach is used by grouping customers into 4 (four) sectors, namely household, public and commercial, hotel, and industrial sectors.

Forecasting is an estimate of something that will happen in the future based on data that exists at present and in the past*(historical data)*. The purpose of forecasting is to provide the basic information needed for planning, which is the act of selecting facts and trying to relate them and making and using assumptions about the future. To predict the use of electrical load requires a mathematical model called the Periodic Data / Time Series method. Load usage data is arranged based on the time sequence in one period to measure and explain various changes or developments in data. Changes that occur in a certain time series can form a trend, so that the pattern of data movement or variable values can be known and followed.

Forecasting Electricity Needs

The need for electricity in an area continues to increase over time in line with the increasing economic activities and welfare of the community in the area. The dynamics of electricity consumption can also be used as an indicator of the tendency of where the development of the sector or area is moving. The increasing need for electricity must of course be anticipated by providing a more adequate electricity system, both in quantity and quality in the future. Thus, in the electricity system, good forecasting is needed to determine the need for electricity in a certain period of time, whether it is short-term, medium-term or long-term and the need for peak loads to reduce environmental uncertainty.

From the daily mass media about PLN Optimistic to Overcome Electricity Crisis in North Sumatra. This is marked by the increasing growth in demand for electricity from the community which often causes the increasing power deficit experienced by PLN Regional North Sumatra. Based on this, PT PLN (Persero) Regional North Sumatra will continue to strive to take steps so that the electricity supply is maintained continuously.

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Ant Algorithm

The Ant Algorithm was introduced by Moyson and Manderick and was extensively developed by Marco Dorigo. The Ant Algorithm was adopted from the behavior of ant colonies known as the ant system (Dorigo, 1996). This Ant Algorithm analysis uses probabilistic techniques to solve computational problems by finding the best path through a forecast graph. Benefits of using the Ant Algorithm:

a. ease of implementation.
b. his ability to find good (acceptable) solutions quickly.
c. is a very promising computational model for practical problems that focus on finding optimal parameters.

Introduction to Matlab

MATLAB (Matrix Laboratory) is a high-performance language for technical computing that integrates computation, graphics, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in a commonly known mathematical notation. The MATLAB Desktop view is as shown in Figure 1.

a. Drawing Graphs with Plots
   MATLAB can be used to visualize the results or output, therefore you must define variables, each of which contains the value of one parameter to draw. With the plot command, a graphical display can be created. The most commonly used plot is plot (x, y). Most plots that we create assume that the x and y sources are divided into equally spaced intervals, this plot is called a linear plot. The subplot command allows you to divide the image window into subwindows that can be arranged either top and bottom, or left and right, for example: plot (x, y); and subplot (m, n, p); and To display the Helper lines on the graph, the grid command can be used in the program.
b. Data Analysis Function
   Analyzing data is an important part of evaluating test results. MATLAB provides a number of important functions that make it easier to evaluate and analyze data. These important functions are used to analyze data accurately, including:
   a. max : produces the largest value from a vector or matrix.
   b. min : produces the smallest value of a vector or matrix.
   c. Mean: produces the mean (average) value.

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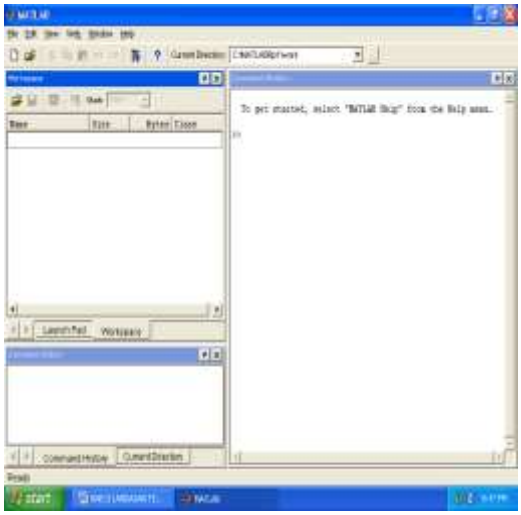
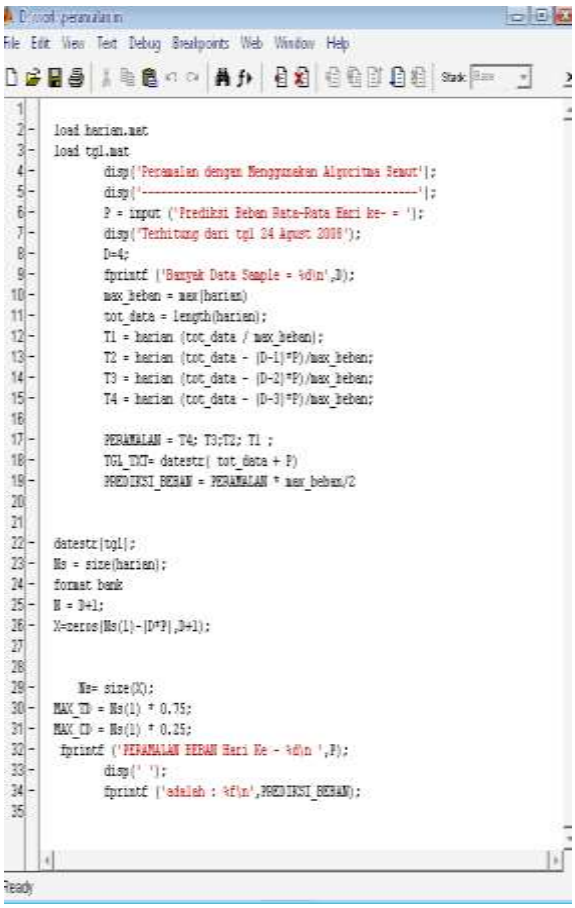


Figure 1. Matlab Desktop

m-file Script View



```
load harian.mat
load tgl.mat
        disp('Peramalan dengan Menggunakan Algoritma Semut');
        disp('-----------------------------------------');
        P = input ('Prediksi Beban Rata-Rata Hari ke- = ');
        disp('Terhitung dari tgl 24 Agust 2008');
        D=4;
        fprintf ('Banyak Data Sample = %d\n',D);
        max_beban = max(harian)
        tot_data = length(harian);
        T1 = harian (tot_data / max_beban);
        T2 = harian (tot_data - (D-1)*P)/max_beban;
        T3 = harian (tot_data - (D-2)*P)/max_beban;
        T4 = harian (tot_data - (D-3)*P)/max_beban;

        PERAMALAN = T4; T3;T2; T1 ;
        TGL_TXT= datestr( tot_data + P)
        PREDIKSI_BEBAN = PERAMALAN * max_beban/2


datestr(tgl);
Ns = size(harian);
format bank
N = D+1;
X=zeros(Ns(1)-(D*P),D+1);


    Ns= size(X);
MAX_TR = Ns(1) * 0.75;
MAX_TS = Ns(1) * 0.25;
 fprintf ('PERAMALAN BEBAN Hari Ke - %d\n ',P);
        disp(' ');
        fprintf ('adalah : %f\n',PREDIKSI_BEBAN);
```

Figure 2. m-file Script View

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METHOD

The required data collection uses the following method:

a. Literature
   Using various literature related to Forecasting with Ant Algorithms and the problems faced.
b. Observation
   Conduct observations and ask questions to sources who know about things related to the topic being discussed.
c. Internet References
   Searching for references via the internet and collecting the materials needed to compile the research report

The system development methods used include analysis of hardware and software requirements as follows;

a. Software Requirement Analysis
   Computer hardware is nothing without software and vice versa. So software and hardware support each other. Hardware only works if given instructions which are software to it.
b. Hardware Requirements Analysis
   Computers consist of hardware and software. Instructions are software given to hardware to perform a task. The hardware used by researchers here is hardware that supports software that has good graphic capabilities or displays.

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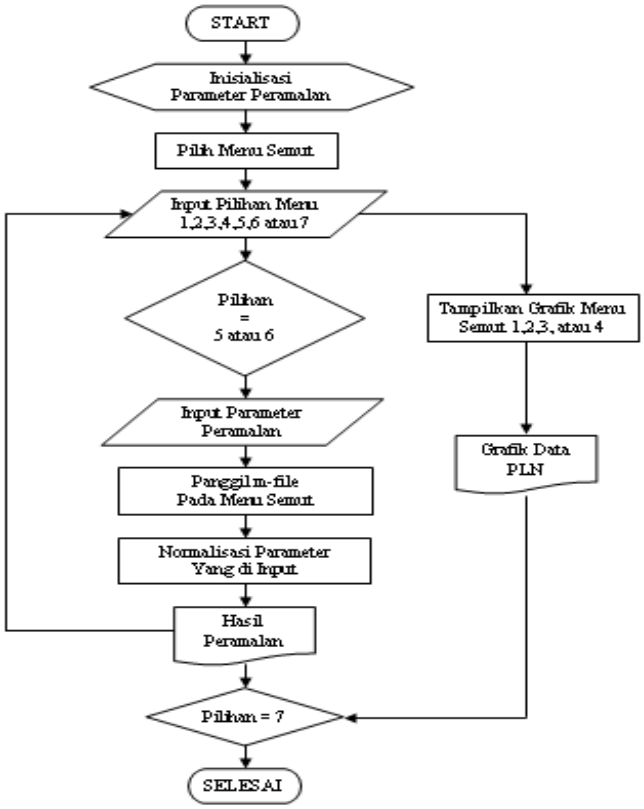

Figure 3. Flow Chart

The forecasting system is built by collecting load usage data for 8 years from 01 Jan 2000 to 24 August 2008, then it will be predicted based on the rules of the ant algorithm. What will be predicted is the use of electrical load in the next few years by inputting day P. System Analysis is carried out 4 times with the same data but with different input parameters. The interface display can be seen in Figure 3.

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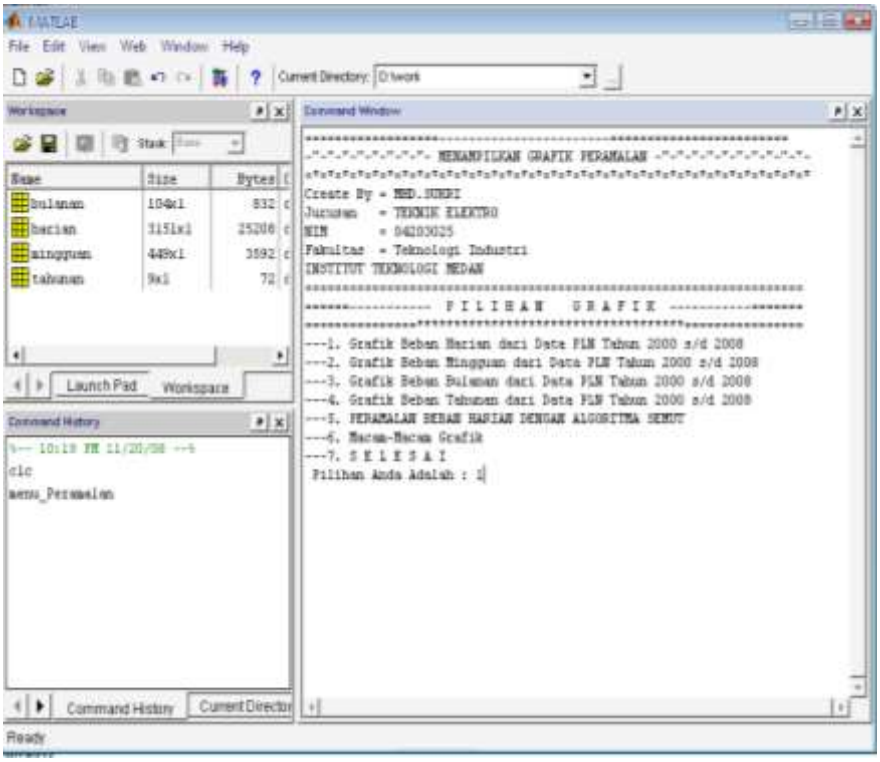

Figure 4. Interface view

RESULT SYSTEM

Implementation

System implementation is the stage where the system is ready to be operated at the actual stage, so that it will be known whether the system that has been created is truly in accordance with what was planned. In the system implementation, it will be explained how this system program works by providing a display of programmed data and graphics. Daily Load Data Graph 01 Jan 2000 to 24 August 2008, PT.PLN (Persero) P3B North Sumatra, can be seen in Figure 5

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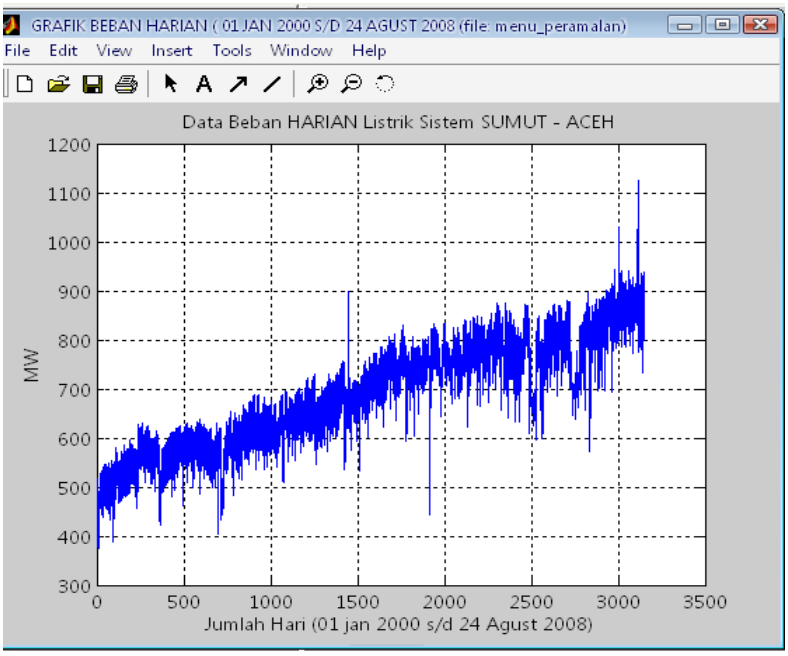

Figure 5. Daily load data graph

Weekly Load Data Graph, 01 Jan 2000 to 24 August 2008, PT.PLN (Persero) P3B North Sumatra can be seen in Figure 5.

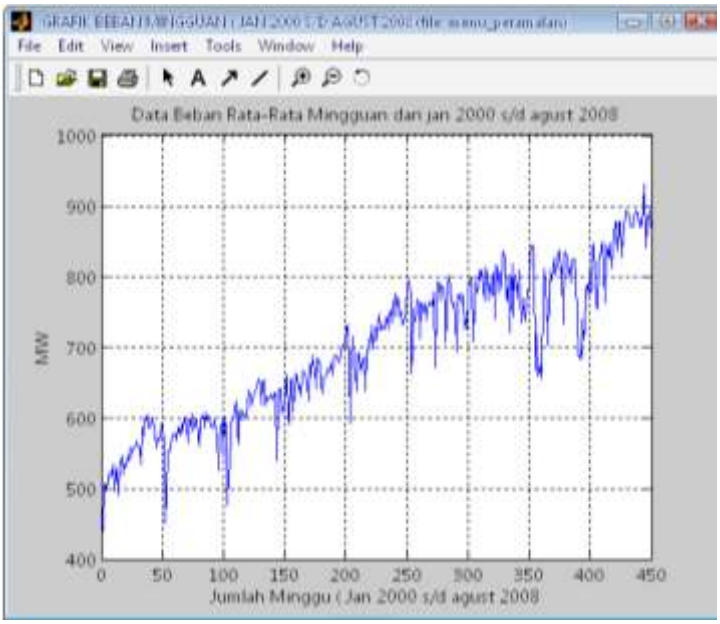

Figure 6. Weekly load data graph

Monthly Load Data Graph, 01 Jan 2000 to 24 August 2008, PT.PLN (Persero) P3B North Sumatra, can be seen in Figure 7.

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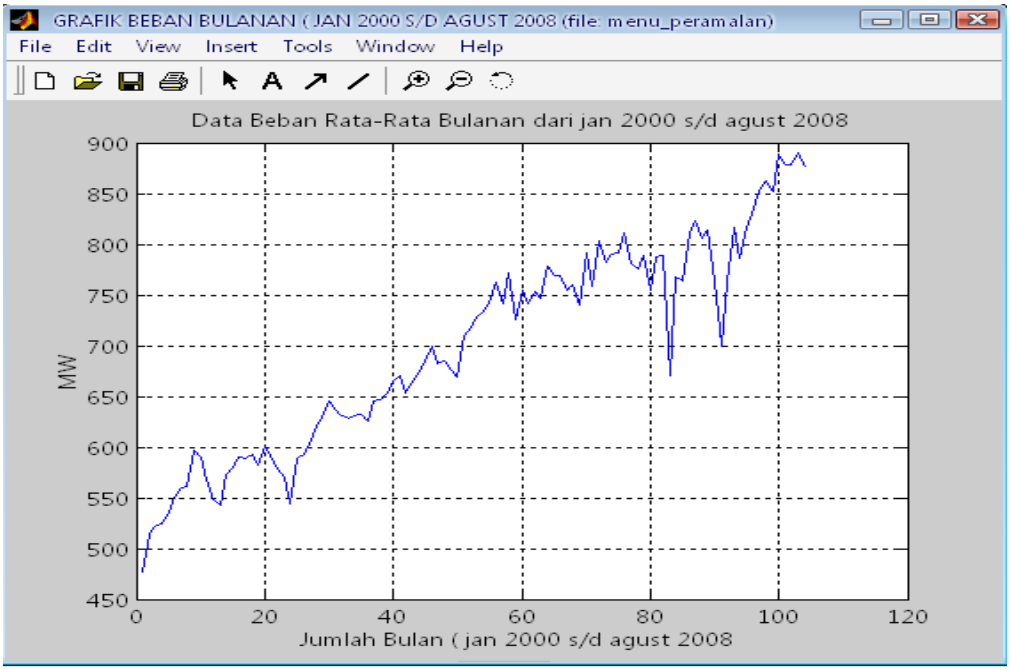

Figure 7 Monthly load data graph

The annual load data graph can be seen in Figure 8.

Figure 8. Annual load data graph

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Electrical Load Forecasting Graph (4, 6, 150) DSIGMF Input Parameters

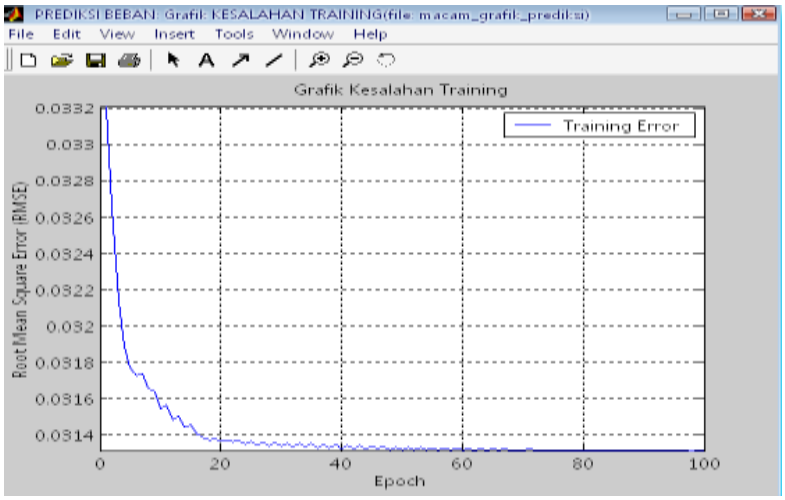

Figure 9. RMSE of Training Error with DSIGMF Input Parameters

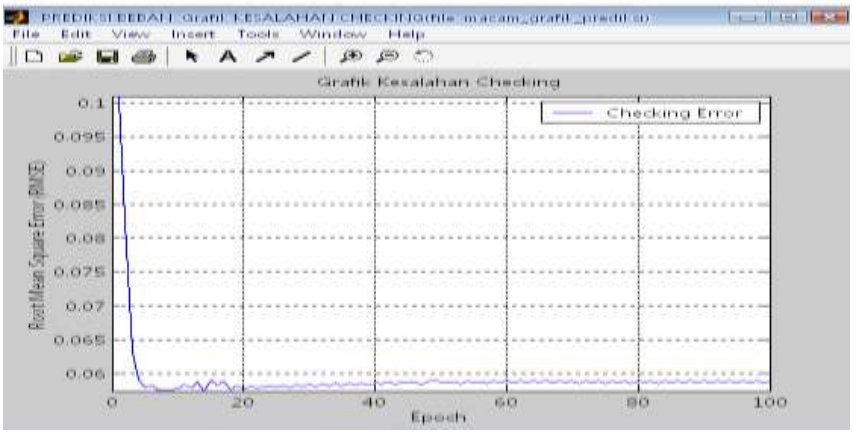

Figure 10. RMSE Error Checking with DSIGMF Input Parameters

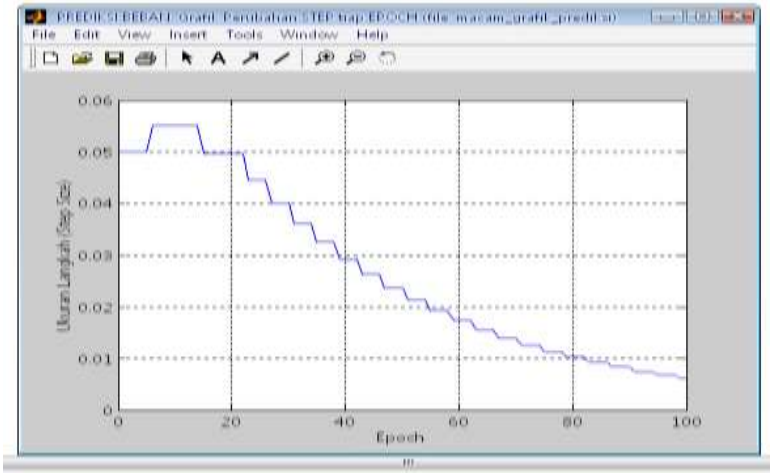

Figure 11. Step Size with DSIGMF Input Parameters

INFOKUM
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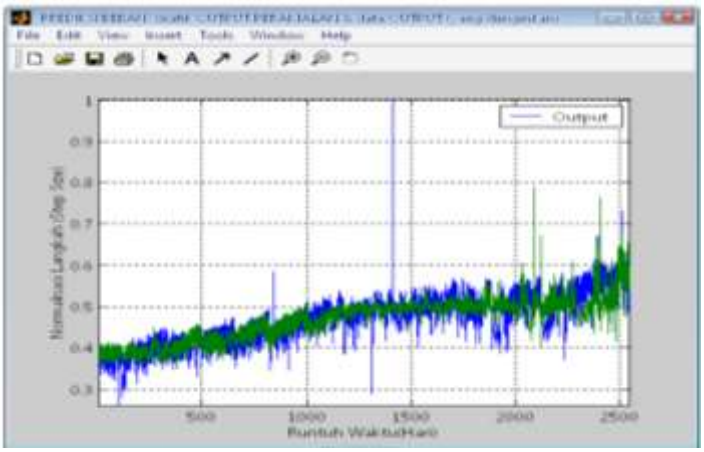

Figure 12. RMSE of Training Error with GAUSSMF Input Parameters

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CONCLUSION

The electricity load forecast for the next 150 days, calculated from the last date of data, namely August 24, 2008, is 515 MW falling on January 13, 2009. The Ant Algorithm can be used to predict electrical load usage using a mathematical model called Time Series Data. In forecasting the electrical load, the value of P (Predicted day P to a predetermined time) is large, so the error in the prediction results obtained is greater. In the initialization of the input parameters used, namely: DSIGMF, GAUSSMF, and GAUSS2MF, from the Training Error RMSE Graph, the smallest error is the DSIGMF parameter. From the comparison of the 3 (three) input parameters, namely DSIGMF, GAUSSMF, and GAUSS2MF, the smallest RMSE Error Checking Graph is DSIGMF.

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