Application of Fuzzy Logic Algorithm for Hybrid Car Usage Time

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ABSTRACT
Electricity generating systems in motorized vehicles use motor rotation with gasoline or diesel fuel to supply voltage to electronic devices and batteries as a backup power source.A good battery performance, will support the device that is supported while the amount of energy that can be stored by the battery is limited, the battery will experience a charge and discharge cycle. Therefore, there must be continuous battery charging needed so that the battery erformance can reach the maximum.One solution to developing the hybrid method in charging batteries is to utilize two sources of electricity, namely charging from the vehicle engine and wind power plants that are obtained when the vehicle is running. The method used is the fuzzy logic method by assessing the input and output system from the observations. In this research will be carried out the design of hybrid power plants for the use of load with time simulation to supply the load in order to obtain accurate battery usage time modeling so as to make the battery not quickly damaged. The results of the hybrid generator design on four-wheeled motor vehicles can maintain the source of electricity in the battery and use fuel efficiently.

Keywords
Battery, hybrid power plant, discharging

1. INTRODUCTION
Understanding hybrid car technology is a car that combines engines using fuel oil and engines with motor drives using battery power [6]. There are several objectives of Hybrid car technology, such as fuel-efficient cars, increased car power and additional power for the addition of devices that use electrical power in cars, such as audio [6]. There are currently two types of Hybrid cars, Hybrid standard and full Hybrid[6].

The high price of fuel oil has made car manufacturers compete to make fuel efficient cars. Of course, a fuel efficient car then reduces vehicle performance will not be liked by most consumers. Therefore, car manufacturers make Hybrid car technology or called the Hybrida car. Wind energy is energy that is wasted when the car is running, if the wind energy is used as additional energy to supply to the battery it will further stimulate the use of car fuel. in this study will be designed hybrid power plant control by combining the energy generated from engine speed and wind energy to supply batteries.

2. METHODOLOGY
2.1. Stages - Stages of Research
The research stages that will be carried out include data collection, hardware design and software design, system testing using matlab software simulation based on fuzzy logic

[1][4][7]. In full, the stages of this research are described as a whole in the research flow chart shown in Fig. 1 along with indicators of achievement success.[2][9]

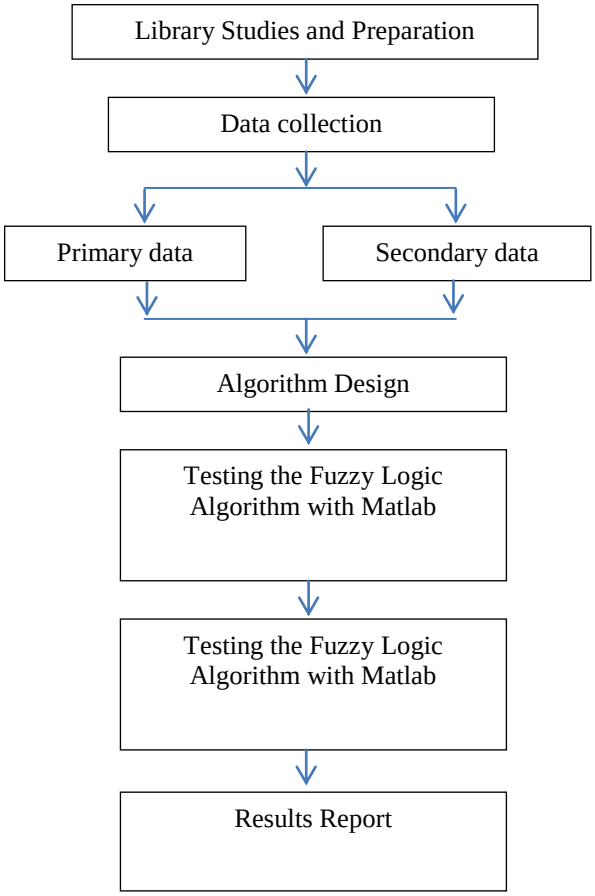

Fig 1: Research Flow Chart

2.2 Performance Indicators
Table 1. Table Indicators of achievement of research results

Stages	Details of activities	Research Activities	Achievement Idicator
Literature	Study	Library search	From the

review.	library of the system that will be made.	about the system to be created	results search obtained data reference as reference to research.
Design and manufacture	Software Design.	Designing an interface device for the Fuzzi Logic Algorithm.	Generate circuit schemes and diagrams for software design
Testing	Testing the system with a simulation program Laboratory testing of application systems	Test the system with a simulation program Conduct laboratory tests to obtain data in accordance with system applications.	Generate simulation system test results Obtain data that matches the system application

3. RESULTS AND DISCUSSION

3.1. Fuzzy Logic Testing

After the programming is complete, it is tested to find out whether the program was made successful or not.[1][3][9] This test uses MATLAB simulation with Fuzzy Logic[2][10]. From the test it was found that the program managed to run well with the program [12][15]flow as shown in the following Fig.2:

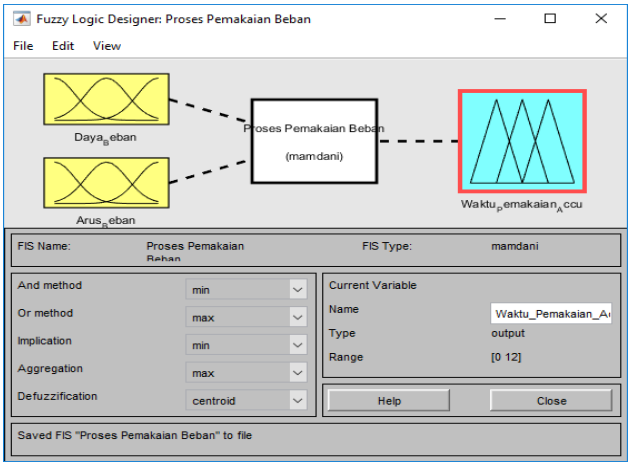

Fig 2: Input design and system output

The system is designed with two inputs and one output[12][13]. The input made in five parts in the membership function for input usage is load;
- Very less
- Somewhat less
- Medium
- A bit big
- Hugh

The load usage input is shown in the membership design function Fig. 3.[15][17]

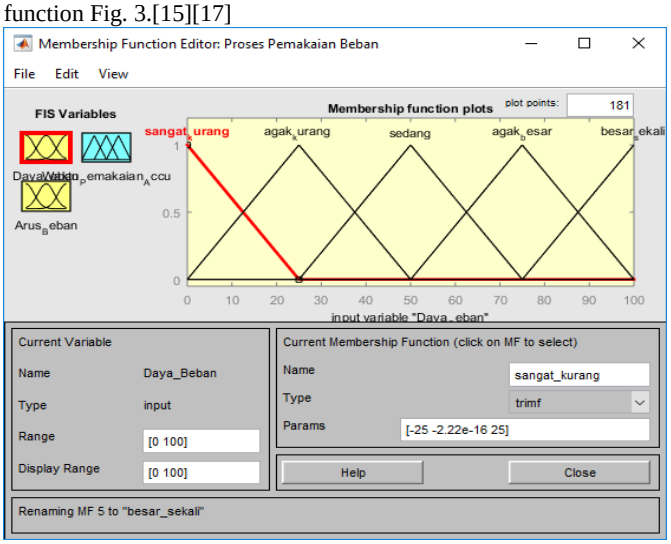

Fig 3: Membership design is the power consumption input function

For membership functions for input Load current is the same as the membership load usage function of fig.4 [14] [6]

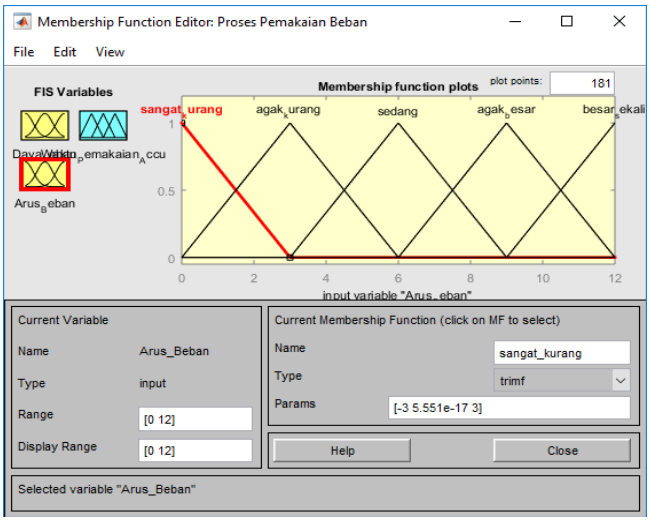

Fig 4: Membership design input function Load current

[14][16][17]For membership functions for Output battery usage time is;
- Very slow
- Slow
- Hurry up
- A little fast
- Very fast [1][17]

The chat area input shown in the membership design function Fig.5.

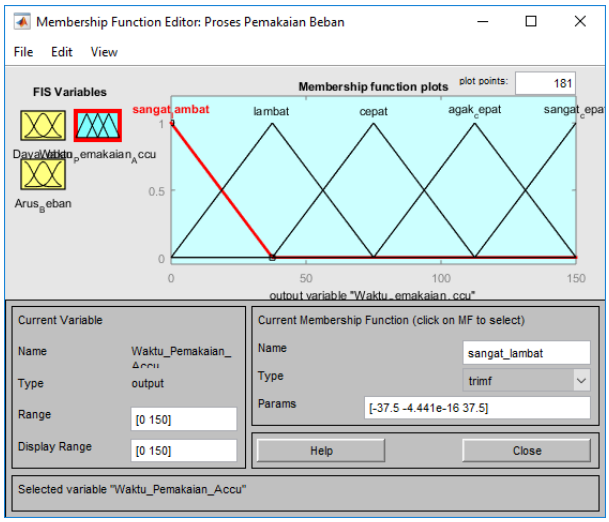

Fig 5: Membership design Output function of battery usage time

After the design of each part of the input and output, the next step is to make a rule for each condition that will occur [2][5]. Fig.6.

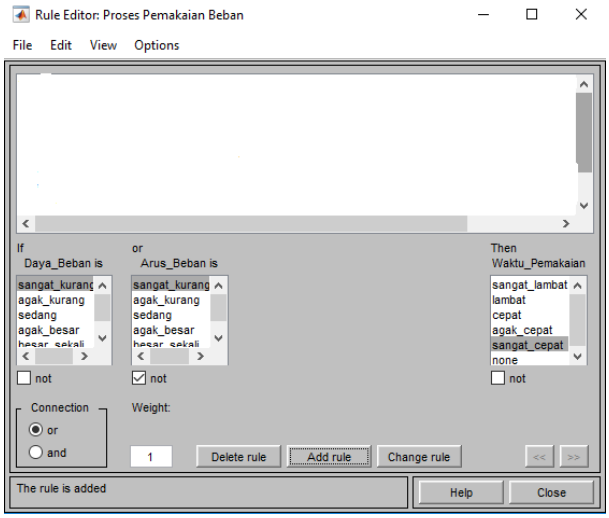

Fig 6: Rule placement for each load usage condition

From each of the five input and output conditions, each of the possibilities that occur will be described[3][4]. From the design of loading conditions to output the battery usage time is obtained by 12 possibilities using a cryptic logic algorithm[11][14]. The process of filling every possible rule is when the rule is activated, there will be three menus of two input parameters and one output parameter. [1][4] The rule filling is inputted with 12 possibilities with input load and current generated. View rule displays the input and output values resulting from the fuzzy logic process shown in Fig.8. with load data = 50 watts, current = 6 amperes and 7 hours battery usage time.

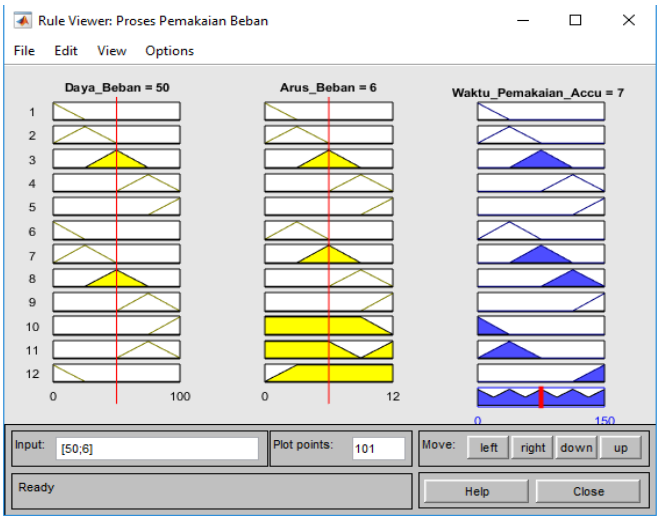

Fig 8: Rule filling

3.2. Test results with calculations

Obtained from the draft there are five testing scenarios;
1. For a 50 watt load that will be supplied with a 12v / 50Ah battery then:

- I = p / (V) = (50 watts) / (12V) = 4,167 Ampere
- Charging time:
  50Ah / 4,167 A = 11.99 Hours
- Battery deficiency of 20% (2,398 hours)
  Then: 11.99 - 2,398 = 9,592 hours
- Usage time: 9 hours, 35 minutes, 31.2 seconds

For Fuzzy logic testing at 50 Ampere power obtained battery usage time of 7 hours there is a difference of 2 hours from the calculation[7][8][16].

The calculation table with different load power is shown in Table 2.

Table 2. Table Test results with battery usage calculations

No	Power Load (watts)	Current (Ampere)	Battery usage time (hours)
1	5	0,416	123:47:38,4
2	10	0,833	57:37:33,6
3	20	1,666	27:36:50,4
4	30	2,5	17:36:2,7
5	40	3,333	12:36:12,6
6	50	4,167	9:35:31,2
7	60	5	7:36:7,2
8	70	5,83	6:10:26,4
9	80	6,667	5:6:3,6
10	90	7,5	4:16:8,4
11	100	8,3	3:36:7,2

4. CONCLUSIONS

Based on the results of the research that has been done, the following points can be concluded:

The fuzzy method provides the right results in the simulation that has been done, with a membership function that describes the conditions of input and output. Forming the output value in the Fuzzy method can be formed based on the work description of the system that results in battery usage time. From the results of the application with the Fuzzy algorithm where the load value = 50 watts, the current generated is 6 Ampere, this input results in battery usage time = 7 hours

5. ACKNOWLEDGMENTS

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