Fuzzy Logic Algorithm Testing For Detecting Air Flashing

Dwi Kartinah, ST., MMSI

*[*1]Department of Information System , University of Gunadarma, Depok, Indonesia*
dwi_kartina@staff.gunadarma.ac.id

Abstract
In this study, it was explained about the testing of air humidity in a room with fuzzy logic in the form of simulations using Simulink Matlab. This test is intended to determine the advantages of fuzzy logic in knowing the humidity status of indoor air, with several other superior algorithms such as artificial neural networks and genetic algorithms. . In the process of making simulations, Proportional Integrated PI is used which is integrated with algorithmic control so that it can produce a stable simulation, meaning that the resulting graphic signal is continuous (not broken). Test algorithm is seen from the optimization of process speed, torque, current, voltage and stability.
Keywords: — *fuzzy logic, genetic algorithm, artificial neural network, air humidity detection.*

I. INTRODUCTION

In 1965 from the University of California, Dr. Lotfi Zadeh introduced a system design that can solve a problem quickly and efficiently, namely fuzzy logic. Fuzzy logic in the dictionary is defined as blurred (blurred or dim), indistinct (not clear), confused (confusing), this term does not refer to a system that is not clear / fuzzy / dim, but fuzzy logic works on a system fuzzy which is built for system design with clear working methods and descriptions to assist humans in solving a problem quickly and efficiently. With fuzzy logic, it is very easy to transfer the intelligence possessed by humans into a machine or computer, so that until now its application is often used in all fields such as washing machines, cameras, microwaves, and others.

Algorithm An artificial neural network or neural network is an information system that has a working method and characteristics similar to a neural network in living things, which consists of simple processing elements called neurons (units or nodes). Each neuron is connected to other neurons by communication links called network architecture. An artificial neural network is an information processing system that has characteristics similar to biological neural networks. Artificial neural networks are inspired by the branch of biology that deals with the nervous system. The branch of science is neurobiology, the main goal of neurobiology is to explain how nerve cells can distinguish and develop their special relationships and how neural networks can recall all information.

Genetic algorithm as a branch of evolutionary algorithm is a method used to solve a value search in non-linear optimization problems (6). A genetic algorithm is represented by a sequence of steps of an artificial chromosome procedure that moves from one population to a new population using natural selection and techniques taken from genetics known as crossover and mutation. Each chromosome consists of a number of 'genes', and each gene is represented by 0 or 1 The genetic algorithm differs from the general deterministic method of convergence (6). Genetic algorithms use the mechanism of natural selection and genetics so that the terms in genetic algorithms are not much different from those in natural selection and genetics. A solution generated in the genetic algorithm is called a chromosome, while the set of chromosomes is called a population. A chromosome is formed from constituent components called genes and the value can be a numeric number, binary, symbol or character depending on the problem to be solved. These chromosomes will evolve continuously which is called generation.

The three algorithms will be tested to compare the advantages in dealing with the problem of air humidity, which are compared to the fuzzy algorithm with artificial neural networks and genetic algorithms.

II. RESEARCH METHOD

Research Methods through the stages of identify, understand, report, and analyze

2.1 Identify

This study contains the control of air humidity by comparing fuzzy logic control algorithms, artificial neural networks and genetic algorithms in the form of simulations using simulink in matlab, with the following scope:

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1. This air humidity control simulation is in the form of a humidity control simulation that is given several control algorithms to determine the advantages of optimization between the Fuzzy Logic Control algorithm, genetic algorithm and artificial neural network algorithm in visual form and the simulation results in the form of analog graphic signals.
2. This air humidity control simulation uses three input variables, namely: light, temperature and wind variables in a room as inputs, and humidity results as output variables.
3. The variables used are light, temperature, wind gusts, and humidity, where the value of each variable has a universal value of speech, namely the range of values between 0 and 1, where 0 indicates the smallest value, and 1 the largest value, for fuzzy algorithms, genetics and the neural network works between these two values.
4. The result is a graphical signal response to the scope feature in Matlab.

2.2   Understand

The procedure of this research is:
1. Simulating humidity control applied by using Fuzzy Logic Control, genetic algorithms and artificial neural network algorithms to control humidity according to input tolerances.
2. The results of the optimization of the three algorithms are intended to make the air in the room optimal, namely the humidity value produced in accordance with the rules of room health standards.
3. Analyzing the response of the speed optimization response in the form of a graphic signal.

2.3   Report

Evaluation of the analysis results obtained as follows:
1. Air humidity generated from Fuzzy Logic Control, genetic algorithms and artificial neural network algorithms is determined by the input, where the inputs applied are light, temperature and blowing variables. In simulink matlab output in the form of humidity produces a graph, where the graph starts from the minimum input value, up to the maximum input value level.
2. Responses at the resulting speed are optimal, because the rise time or the increase in the graph in the form of a ladder does not have a fixed or variable value, the more rise time appears, the more the rise time increases every second, this indicates that every the rise time also increases the input value received in the form of light, temperature and gust variables.
3. The value of the universe of speech, which is a value that is between 0 and 1 can provide a response at a more optimal speed, because it does not focus on a point number,

2.4   Analyze

Fuzzy logic is often the best choice, because of its advantages in bridging machine language and human language, but fuzzy logic is not a perfect concept that can be used to solve all problems. There are times when fuzzy logic cannot be applied, if there is a simpler method, such as by using evolutionary theory which has a better decision-making function than fuzzy logic which relies on data precision.
On the other hand, many control systems already work well without fuzzy logic, this method is very dependen on analyzing the needs of a user, if you use this method often, you will say that fuzzy logic is a solid and efficient method for solving mapping problems that prioritizes precision.
For artificial neural network algorithms, it is very superior in the following ways:
•   Classification: selects an input data into certain predefined categories
•   Association: describes an object as a whole only with parts of other objects
•   Self organizing: the ability to process input data without having to have a target
•   Optimization: finding the best answer so as to minimize the cost function
•   As for the genetic algorithm, the genetic algorithm has several advantages over conventional computational methods, including:
•   The nature that supports parallel computing where the search power is as large as the population.
•   Its nature does not require basic knowledge of the object being calculated.
•   Its flexible nature, so that changes in input or the entry of disturbances to the on-line system at the time of calculation can be anticipated immediately

III.   RESULT AND DISCUSSION
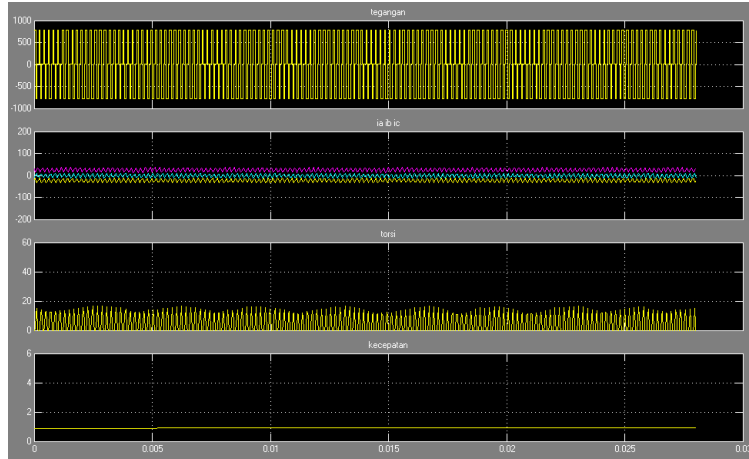
3.1   Fuzzy logic result

Figure 1 Representation Simulation fuzzy logic

Figure 1 describe the signal result of simulation using fuzzy logic algorithm
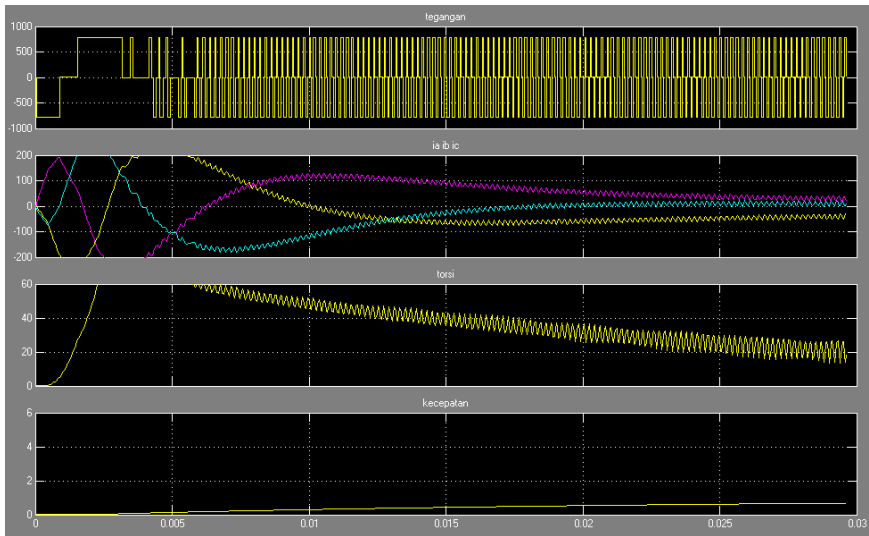
3.2   Neural Network result

Figure 2 Representation Simulation Neural Network

Figure 2 describe the signal result of simulation using Neural Network algorithm
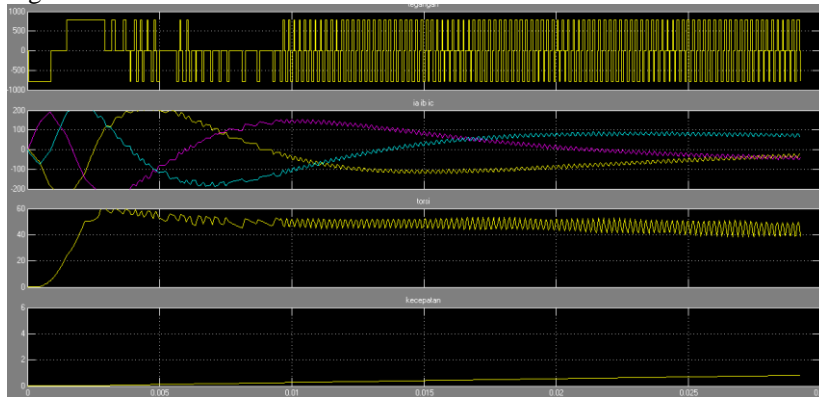
3.3   Genetic Algorithm Result

Figure 3 Representation Simulation Genetic Algorithm

Figure 3 describe the signal result of simulation using Genetic algorithm the results of the comparison test of the 3 algorithms can be seen in table 1

Table 1 Result of Comparison

Algorithm	Time (second)	Torque (nm)	Current (ampere)	Voltage (volt)	Stable
Fuzzy Logic	0.05	10	5 A	1000	stable
Neural Network	0.03	20	5A	1000	Non Stable
Genetic algorithm	0.05	40	1A	1000	Non stable

IV. CONCLUSION

The conclusion of this research is
1. For the speed of producing superior artificial neural network algorithms by getting the smallest optimal speed value of 0.03 s
2. For torque, the genetic algorithm is superior by having a large torque value of 40 nm
3. For the current genetic algorithm is superior by getting the smallest current in optimization, namely 1 A
4. Voltage equal to 1000 . simulation
5. Stable in the sense that the resulting signal is stable (does not produce a signal that has a large range. Fuzzy logic algorithm has stability compared to other algorithms

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