International Journal of Engineering & Technology, 7 (2.9) (2018) 61-65

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

Fuzzy model tahani as a decision support system for selection computer tablet

Syafrida Hafni Sahir [1], R. Rosmawati [2], Robbi Rahim [3] *

[1] *Department of Management, Universitas Medan Area, Medan, Indonesia*
[2] *Department of Industrial Engineering, Institut Sains dan Teknologi TD. Pardede (ISTP), Medan, Indonesia*
[3] *School of Computer and Communication Engineering, Universiti Malaysia Perlis, Kubang Gajah, Malaysia*
**Corresponding author E-mail: usurobbi85@zoho.com*

Abstract

Tablet computer stores as tablet sales continue to keep pace with technology to meet the needs of consumers of tablet computer buyers, where consumers generally always have considerations or factors before taking a decision on a pur-chase, for example price, brand, screen size , memory, hard drive, or features present on the tablet computer and other factors. To be able to assist it, it needs to be sup-ported into a computerized decision support system. Decision support sys-tems in addition to providing information can also help pro-vide various alternatives that can be selected in the decision-making process. Fuzzy logic is a good way to map an input space into the output space. The research is expected to de-termine which type of tablet computer to choose based on the criteria desired by the user so that the user can easily deter-mine the option to buy a tablet computer based on features, facilities, and price, so that the brand of tablet computer can be purchased by the user.

Keywords: *Computer Table; Decision Support System; DSS; Fuzzy; Tahani.*

1. Introduction

Tablet computer is one technology that combines mobile phone and computer technology. In contrast to desktop or laptop computers have support components that are designed specifically to accommodate the ease of nature as well as smartphones that are portable [1], [2]. The main properties possessed by the components of computing tablet computer is a small size, efficient energy consumption, and efficient.

The basic concept of a fuzzy system [3]–[8] that can be used to perform calculations on an input variable based on its disguised value. In a vague set theory, it is vaguely expressed in terms of membership and degrees of truth, so that something can be said to be partially true and partly wrong at the same time [9]. The disgust from the consideration of consumer factors buyers tablet computer can be poured into a concept of fuzzy logic [10]. For example, for each price of an existing tablet computer, it can be mapped into the membership function so that a degree of membership is obtained from each of the available prices.

Based on the above explanation, it will be developed fuzzy database as a model of decision support system [11]–[13]. Most of the standard databases are clarified based on how the data is perceived by users. In fact, sometimes users need information from data that is ambiguous [14]–[20], e.g. "cheap tablet computer and has good features and facilities". If this happens, a fuzzy database can be used. So far there has been some research on fuzzy databases. One of them is the Tahani model [21]. The fuzzy Tahani model database still uses the standard relation, only this model uses fuzzy set theory to get information on its query.

2. Methodology

Decision Support System (DSS) is an interactive information system that provides information, modeling, and data manipulation [11], [22]–[26] The system is used to assist decision-making in semi-structured situations and unstructured situations, where no one knows for sure how decisions should be made.

The components of the Decision Support System are as follows:

a) Data management
   Includes databases containing relevant data for various situations and governed by software called Database Management System (DBMS)
b) Model management
   It involves financial, statistical, management science, or other qualitative models, so as to deliver to the system an analytical capability, and the management of the software required.
c) Communication
   Users can communicate and provide commands on the DSS through this subsystem. This means providing the interface.
d) Knowledge management
   This optional subsystem can support other subsystems or act as stand-alone components.
   For more details on understanding the conceptual model of DSS, consider Figure 1.

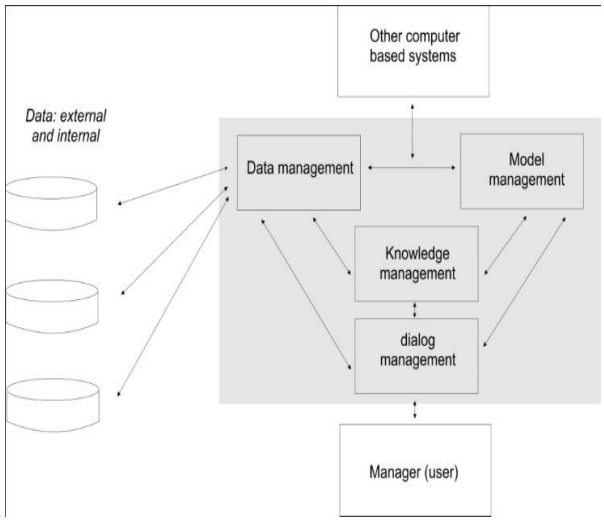

Fig. 1: Conceptual Decision Support System.

The concept of fuzzy logic was first introduced by Professor Lotfi A. Zadeh of the University of California, in June 1965[8], [27]. Fuzzy logic is a generalization of classical logic which has only two membership values between 0 and 1. In fuzzy logic, the truth value of a statement ranges from fully right up to completely wrong. With the fuzzy set theory, an object can be a member of many sets with different degrees of membership in each set. This concept is different from the classical set theory (crisp). The reasons for using fuzzy logic include:

a) The concept of fuzzy logic is easy to understand. The mathematical concept underlying fuzzy reasoning is very simple and easy to understand.
b) Fuzzy logic is very flexible.
c) Fuzzy logic has a tolerance to the data is not appropriate.
d) Fuzzy logic is capable of modeling very complex nonlinear functions.
e) Fuzzy logic can build and apply the experiences of experts directly without having to go through the training process.
f) Fuzzy logic can work with conventional control techniques.
g) Fuzzy logic is based on natural language.

Fuzzy Tahani [21] is one of the branches of fuzzy logic, which is one of the fuzzy methods using standard databases. Tahani describes a fuzzy query processing method, based on the manipulation of a language known as SQL (Structured Query Language), so the fuzzy Tahani model is aptly used in precise and accurate data retrieval process.

3. Results and discussion

The following criteria discussed in the decision support system of computer tablet selection are:

a) Price
b) Screen size
c) Memory Capacity
d) RAM

The model used in this research is fuzzy database Tahani model to present the system. The fuzzy Tahani model database still uses the standard relation, it just uses the fuzzy set to get the information from the query. The fuzzy set is a group that represents a particular condition or state in a fuzzy variable. Example: price variables, divided into 3 fuzzy sets, namely: cheap, normal, and expensive.
In calculating the value of the price will be given the degree of membership in accordance with the specified category. The categories used for the price are: cheap, normal, and expensive. The value of the Screen size will also be given according to predetermined categories to calculate the size value. The categories used for Screen size are: small, medium and wide. The value of the memory capacity is given according to a predetermined category to calculate its capacity value. The categories used for memory capacity are small, medium, and large. The category used for RAM capacity is small, medium, and large.
The value of these categories is then made in a membership function. Each fuzzy variable uses the shoulder and triangle membership functions as an approach to obtain the degree of membership of a value in a fuzzy set.
Below is the price of tablet computer prices stored in tablet computer price table with brand field, series, processor, Display, Memory, RAM, and Price.

Table.1: Prices of Tablet Computers

No	Brand	Type	Processor	Screen	Memory	RAM	Price
1	Acer	4739	DUAL CORE	10	64	2	4.199.000
2	Acer	4749Z	CD B960 2 GEN	10	64	1	3.850.000
3	Asus	A43SM034D	QUAD CORE SB	10	64	2	6.900.000
4	Asus	A44HVX185D	DUAL CORE SB	10	32	2	4.445.000
5	Samsung	C640-1021	DUAL CORE	10	32	4	4.755.000
6	Samsung	C640-1068	DUAL CORE SB	10	64	2	5.555.000
7	HP	430	DUAL CORE	10	64	2	4.150.000
8	HP	431	DUAL CORE SB	10	64	2	5.255.000
9	Samsung	CQ43-304	AMD E300	10	64	2	3.555.000
10	Samsung	CQ43-414	DUAL CORE SB	10	32	2	4.355.000
11	Sony	YB35EG	DUAL CORE	8	32	4	4.950.000
12	Sony	EG35	DUAL CORE SB	10	32	2	6.350.000
13	Lenovo	G460	DUAL CORE	10	32	2	4.200.000
14	Lenovo	G470	B815	10	32	2	3.64.000
15	Evercoss	MINI LM 1215	ATOM N570	7	16	1	2.550.000
16	Evercoss	14 INCH	ATOM N570	7	16	1	2.750.000

Based on Table 1. the price of tablet computers that have been sorted then get the Membership Function for Price variables on the set of cheap, normal and expensive. From the results of data in Table 1 can be drawn graph using the membership function shaped shoulder and triangle as shown in Figure 2:

a) Membership Function Price

Price variables are divided into 3 fuzzy hits: cheap, normal, and expensive. Cheap and expensive sets use a shoulder-shaped membership approach, whereas the normal set uses a triangular membership function approach in Figure 1.

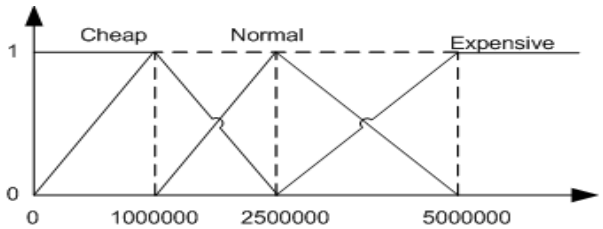

Fig.2: Membership Function on Price Variables.

Membership function on the price variable can be formulated as follows:

$$\mu_{cheap}[X] = \begin{cases} 1 & x_1 \le 1000000 \\ \frac{2500000 - x_1}{1500000} & 1000000 \le x_1 \le 2500000 \\ 0 & x_1 \ge 2500000 \end{cases}$$

$$\mu_{normal}[X_1] = \begin{cases} 0 & x_1 \le 1000000; \text{ or } x_1 \ge 5000000 \\ \frac{x_1 - 1000000}{1500000} & 1000000 \le x_1 \le 2500000 \\ \frac{5000000 - x_1}{2500000} & 2500000 \le x_1 \le 5000000 \end{cases}$$

$$\mu_{expensive}[X_1] = \begin{cases} 0 & x_1 \le 5000000 \\ \frac{x_1 - 2500000}{2500000} & 2500000 \le x_1 \le 5000000 \\ 1 & x_1 \ge 5000000 \end{cases}$$

Table 2 shows the calculation of the degree of membership of 16 tablet computer data on the price variable.

Table.2: Degree of Membership at Variable Price

No	Brand	Type	Processor	Price	Membership Degree		
					Cheap	Normal	Expensive
1	Acer	4739	DUAL CORE	4.199.000	0,000	0,32	0,680
2	Acer	4749Z	CD B960 2 GEN	3.850.000	0,000	0,900	0,000
3	Asus	A43SM034D	QUAD CORE SB	6.900.000	0,000	0,000	1,000
4	Asus	A44HVX185D	DUAL CORE SB	4.445.000	0,000	0,222	1,000
5	Samsung	C640-1021	DUAL CORE	4.755.000	0,000	0,098	1,000
6	Samsung	C640-1068	DUAL CORE SB	5.555.000	0,000	0,000	1,000
7	HP	430	DUAL CORE	4.150.000	0,000	0,340	1,000
8	HP	431	DUAL CORE SB	5.255.000	0,000	0,000	1,000
9	Samsung	CQ43-304	AMD E300	3.555.000	0,000	0,578	0,000
10	Samsung	CQ43-414	DUAL CORE SB	4.355.000	0,000	0,258	0,000
11	Sony	YB35EG	DUAL CORE	4.950.000	0,000	0,020	0,000
12	Sony	EG35	DUAL CORE SB	6.350.000	0,000	0,000	1,000
13	Lenovo	G460	DUAL CORE	4.200.000	0,000	0,32	0,000
14	Lenovo	G470	B815	3.64.000	0,000	0,600	0,000
15	Evercoss	MINI LM 1215	ATOM N570	2.550.000	0,000	0,980	0,000
16	Evercoss	14 INCH	ATOM N570	2.750.000	0,000	0,900	0,000

b) Membership Screen Function

Screen Variables are divided into 3 fuzzy ones: small, medium, and wide. Small and wide sets use a shoulder-shaped membership approach, while the set is using a triangular membership function approach in Fig. 3.

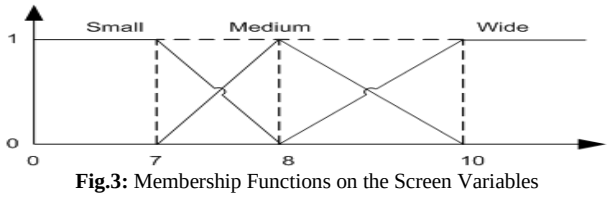

Fig.3: Membership Functions on the Screen Variables

Membership function on the variable Display can be formulated as follows:

$$\mu_{small}[X] = \begin{cases} 1 & x_1 \le 10 \\ \frac{13 - x_1}{3} & 10 \le x_1 \le 13 \\ 0 & x_1 \ge 13 \end{cases}$$

$$\mu_{medium}[X] = \begin{cases} 0 & x_1 \le 10 \text{ or } x_1 \ge 15 \\ \frac{x_1 - 13}{3} & 10 \le x_1 \le 13 \\ \frac{15 - x_1}{2} & 13 \le x_1 \le 15 \end{cases}$$

$$\mu_{wide}[X] = \begin{cases} 0 & x_1 \le 10 \\ \frac{x_1 - 13}{2} & 13 \le x_1 \le 15 \\ 1 & x_1 \ge 15 \end{cases}$$

Table 3 shows the calculation results of the degree of membership of 16 tablet computer data on the screen variables

Table.3: Degree of Membership on Screen variables

No	Brand	Type	Processor	Screen	Membership Degree		
					Small	Medium	Wide
1	Acer	4739	DUAL CORE	10	0,000	0,64	0,64
2	Acer	4749Z	CD B960 2 GEN	10	0,000	0,64	0,64
3	Asus	A43SM034D	QUAD CORE SB	10	0,000	0,64	0,64
4	Asus	A44HVX185D	DUAL CORE SB	10	0,000	0,64	0,64
5	Samsung	C640-1021	DUAL CORE	10	0,000	0,64	0,64
6	Samsung	C640-1068	DUAL CORE SB	10	0,000	0,64	0,64
7	HP	430	DUAL CORE	10	0,000	0,64	0,64
8	HP	431	DUAL CORE SB	10	0,000	0,64	0,64
9	Samsung	CQ43-304	AMD E300	10	0,000	0,64	0,64
10	Samsung	CQ43-414	DUAL CORE SB	10	0,000	0,64	0,64
11	Sony	YB35EG	DUAL CORE	8	0,000	0,533	0,000
12	Sony	EG35	DUAL CORE SB	10	0,000	0,64	0,64
13	Lenovo	G460	DUAL CORE	10	0,000	0,64	0,64
14	Lenovo	G470	B815	10	0,000	0,64	0,64
15	Evercoss	MINI LM 1215	ATOM N570	7	1,000	0,000	0,000
16	Evercoss	14 INCH	ATOM N570	7	1,000	0,000	0,000

c) Memory Membership Function

Memory variables are divided into 3 fuzzy hits: small, medium, and large. Small and large sets use a shoulder-shaped membership approach, while the set is using a triangular membership function approach in Figure 4.

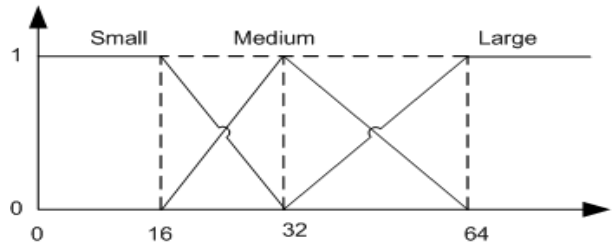

Fig.4: Membership Function on Memory Variables

Membership function on the memory variable can be formulated as follows:

$$\mu_{small}[X] = \begin{cases} 1 & x_1 \le 80 \\ \frac{80 - x_1}{170} & 80 \le x_1 \le 250 \\ 0 & x_1 \ge 80 \end{cases}$$

$$\mu_{medium}[X] = \begin{cases} 0 & x_1 \le 80 \text{ or } x_1 \ge 250 \\ \frac{x_1 - 80}{170} & 80 \le x_1 \le 250 \\ \frac{500 - x_1}{250} & 80 \le x_1 \le 250 \end{cases}$$

$$\mu_{L\,arg\,e}[X] = \begin{cases} 0 & x_1 \le 80 \\ \frac{x_1 - 500}{250} & 250 \le x_1 \le 500 \\ 1 & x_1 \ge 500 \end{cases}$$

Table 4 shows the calculation of the degree of membership of 16 tablet computer data on memory variables.

Table.4: The Degree of Membership in the Memory Variable

No	Brand	Type	Processor	Memory	Membership Degree		
					Small	Medium	Large
1	Acer	4739	DUAL CORE	64	0,000	0,000	1,000
2	Acer	4749Z	CD B960 2 GEN	64	0,000	0,000	1,000
3	Asus	A43SM034D	QUAD CORE SB	64	0,000	0,000	1,000
4	Asus	A44HVX185D	DUAL CORE SB	32	0,000	0,720	0,280
5	Samsung	C640-1021	DUAL CORE	32	0,000	0,720	0,280
6	Samsung	C640-1068	DUAL CORE SB	64	0,000	0,000	1,000
7	HP	430	DUAL CORE	64	0,000	0,000	1,000
8	HP	431	DUAL CORE SB	64	0,000	0,000	1,000
9	Samsung	CQ43-304	AMD E300	64	0,000	0,000	1,000
10	Samsung	CQ43-414	DUAL CORE SB	32	0,000	0,720	0,280
11	Sony	YB35EG	DUAL CORE	32	0,000	0,720	0,280
12	Sony	EG35	DUAL CORE SB	32	0,000	0,720	0,280
13	Lenovo	G460	DUAL CORE	32	0,000	0,720	0,280
14	Lenovo	G470	B815	32	0,000	0,720	0,280
15	Evercoss	MINI LM 1215	ATOM N570	16	0,000	1,000	0,000
16	Evercoss	14 INCH	ATOM N570	16	0,000	1,000	0,000

d) Membership function of RAM capacity

The RAM variable is divided into 3 fuzzy hits: small, medium, and large. Small and large sets use a shoulder-shaped membership approach, while the set is using a triangular membership function approach in Figure 5.

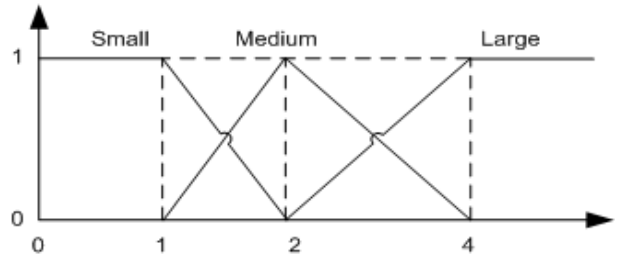

Fig.5: Membership Function on Variable RAM Capacity

Membership function on variable RAM capacity can be formulated as follows:

$$\mu_{small}[X] = \begin{cases} 1 & x_1 \le 1 \\ \frac{1 - x_1}{1} & 1 \le x_1 \le 2 \\ 0 & x_1 \ge 2 \end{cases}$$

$$\mu_{medium}[X] = \begin{cases} 0 & x_1 \le 1 \text{ or } x_1 \ge 2 \\ \frac{x_1 - 1}{1} & 1 \le x_1 \le 2 \\ \frac{4 - x_1}{2} & 2 \le x_1 \le 4 \end{cases}$$

$$\mu_{l\,arg\,e}[X] = \begin{cases} 0 & x_1 \le 1 \\ \frac{x_1 - 4}{2} & 2 \le x_1 \le 4 \\ 1 & x_1 \ge 4 \end{cases}$$

Table 5 shows the calculation of membership degrees of 16 tablet computer data on variable RAM capacity

Table.5: The Degree of Membership in the RAM Variable

No	Brand	Type	Processor	RAM	Membership Degree		
					Small	Medium	Large
1	Acer	4739	DUAL CORE	2	0,000	1,000	0,000
2	Acer	4749Z	CD B960 2 GEN	1	1,000	0,000	0,000
3	Asus	A43SM034D	QUAD CORE SB	2	0,000	1,000	1,000
4	Asus	A44HVX185D	DUAL CORE SB	2	0,000	1,000	1,000
5	Samsung	C640-1021	DUAL CORE	4	0,000	0,000	1,000
6	Samsung	C640-1068	DUAL CORE SB	2	0,000	1,000	1,000
7	HP	430	DUAL CORE	2	0,000	1,000	1,000
8	HP	431	DUAL CORE SB	2	0,000	1,000	1,000
9	Samsung	CQ43-304	AMD E300	2	0,000	1,000	0,000
10	Samsung	CQ43-414	DUAL CORE SB	2	0,000	1,000	0,000
11	Sony	YB35EG	DUAL CORE	4	0,000	0,000	0,000
12	Sony	EG35	DUAL CORE SB	2	0,000	1,000	1,000
13	Lenovo	G460	DUAL CORE	2	0,000	1,000	0,000
14	Lenovo	G470	B815	2	0,000	1,000	0,000
15	Evercoss	MINI LM 1215	ATOM N570	1	1,000	0,000	0,000
16	Evercoss	14 INCH	ATOM N570	1	1,000	0,000	0,000

From explanation and calculation of weight of Tahani model shown in table 2, table 3, table 4 and table 5, then can be test of tablet computer selection based on user selected criterion, where selection criteria consist of based on selling price, memory capacity, capacity, RAM and Screen size. For example the user wants to find a tablet computer that the selling price is, Wide Screen Size, Medium Memory and high RAM, then searched using fuzzy model Tahani then search results to the database using Tahani model query command looks like in table 6.

Table.6: Results Query Model Tahani

No	Brand	Type	Processor	Screen	Memory	RAM	Price
1	Samsung	C640-1021	DUAL CORE	14	32	4	4.755.000

4. Conclusion

Based on the results of research conducted using fuzzy model Tahani for some criteria such as price, size, memory capacity, RAM in determining the selection of tablet computers is done by first determining the membership function and perform fuzzy operations as a whole, the use of Tahani model as decision support is very appropriate because the user get the recommended type of tablet computer before making a sale and purchase transaction.

References

[1] Computer Hope, "Computer vs. Smartphone," *computerhope*, 2017. .

[2] C. Anglano, "Forensic analysis of WhatsApp Messenger on Android smartphones," *Digit. Investig.* vol. 11, no. 3, pp. 1–13, 2014.

[3] P. harliana and R. Rahim, "Comparative Analysis of Membership Function on Mamdani Fuzzy Inference System for Decision Making," *J. Phys. Conf. Ser.*, vol. 930, no. 1, p. 012029, Dec. 2017.

[4] M. Mesran, M. Syahrizal, S. Suginam, N. Kurniasih, and A. D. Gs, "Expert System for Disease Risk Based on Lifestyle with Fuzzy Mamdani," *Int. J. Eng. Technol.*, vol. 7, no. 2.3, pp. 88–91, 2018.

[5] A. Indahingwati, M. Barid, N. Wajdi, D. E. Susilo, N. Kurniasih, and R. Rahim, "Comparison Analysis of TOPSIS and Fuzzy Logic Methods On Fertilizer Selection," *Int. J. Eng. Technol.*, vol. 7, no. 2.3, pp. 109–114, 2018.

[6] N. H. Phuong and V. Kreinovich, "Fuzzy logic and its applications in medicine," *Int. J. Med. Inform.*, vol. 62, no. 2–3, pp. 165–173, 2001.

[7] T. Simanihuruk et al., "Hesitant Fuzzy Linguistic Term Sets with Fuzzy Grid Partition in Determining the Best Lecturer," *Int. J. Eng. Technol.*, vol. 7, no. 2.3, pp. 59–62, Mar. 2018.

[8] T. Listyorini and R. Rahim, "A prototype fire detection implemented using the Internet of Things and fuzzy logic," *World Trans. Eng. Technol. Educ.*, vol. 16, no. 1, pp. 42–46, 2018.

[9] A. S. Ahmar et al., "Modeling Data Containing Outliers using ARIMA Additive Outlier (ARIMA-AO)," *J. Phys. Conf. Ser.*, vol. 954, no. 1, 2018.

[10] D. Abdullah, Tulus, S. Suwilo, S. Effendi, and Hartono, "DEA Optimization with Neural Network in Benchmarking Process," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 288, no. 1, p. 012041, Jan. 2018.

[11] D. Siregar, D. Arisandi, A. Usman, D. Irwan, and R. Rahim, "Research of Simple Multi-Attribute Rating Technique for Decision Support," *J. Phys. Conf. Ser.*, vol. 930, no. 1, p. 012015, Dec. 2017.

[12] R. Risawandi and R. Rahim, "Study of the Simple Multi-Attribute Rating Technique For Decision Support," *Int. J. Sci. Res. Sci. Technol.*, vol. 2, no. 6, pp. 491–494, 2016.

[13] S. Syamsudin and R. Rahim, "Study Approach Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS)," *Int. J. Recent Trends Eng. Res.*, vol. 3, no. 3, pp. 268–285, Apr. 2017.

[14] R. Rahim et al., "Combination Base64 Algorithm and EOF Technique for Steganography," *J. Phys. Conf. Ser.*, vol. 1007, no. 1, p. 012003, Apr. 2018.

[15] R. Rahim, M. Dahria, M. Syahril, and B. Anwar, "Combination of the Blowfish and Lempel-Ziv-Welch algorithms for text compression," *World Trans. Eng. Technol. Educ.*, vol. 15, no. 3, pp. 292–297, 2017.

[16] R. Rahim, I. Zulkarnain, and H. Jaya, "A review: search visualization with Knuth Morris Pratt algorithm," in *IOP Conference Series: Materials Science and Engineering*, 2017, vol. 237, no. 1, p. 012026.

[17] R. Rahim, A. S. Ahmar, A. P. Ardyanti, and D. Nofriansyah, "Visual Approach of Searching Process using Boyer-Moore Algorithm," *J. Phys. Conf. Ser.*, vol. 930, no. 1, p. 012001, Dec. 2017.

[18] R. Ratnadewi, E. M. Sartika, R. Rahim, B. Anwar, M. Syahril, and H. Winata, "Crossing Rivers Problem Solution with Breadth-First Search Approach," in *IOP Conference Series: Materials Science and Engineering*, 2018, vol. 288, no. 1.

[19] R. Rahim et al., "Block Architecture Problem with Depth First Search Solution and Its Application," *J. Phys. Conf. Ser.*, vol. 954, no. 1, p. 012006, 2018.

[20] R. Rahim, H. Nurdiyanto, A. S. Ahmar, D. Abdullah, D. Hartama, and D. Napitupulu, "Keylogger Application to Monitoring Users Activity with Exact String Matching Algorithm," *J. Phys. Conf. Ser.*, vol. 954, no. 1, 2018.

[21] V. Tahani, "A fuzzy model of document retrieval systems," *Inf. Process. Manga.* vol. 12, no. 3, pp. 177–187, 1976.

[22] A. Aljuaidi, "Decision support system analysis with the graph model on non-cooperative generic water resource conflicts," *Int. J. Eng. Technol.*, vol. 6, no. 4, p. 145, Oct. 2017.

[23] N. Nurmalini and R. Rahim, "Study Approach of Simple Additive Weighting For Decision Support System," *Int. J. Sci. Res. Sci. Technol.*, vol. 3, no. 3, pp. 541–544, 2017.

[24] A. S. Ahmar, "A Comparison of α-Sutte Indicator and ARIMA Methods in Renewable Energy Forecasting in Indonesia," *Int. J. Eng. Technol.*, vol. 7, no. 1.6, pp. 9–11, 2018.

[25] A. Rahman and A. S. Ahmar, "Forecasting of primary energy consumption data in the United States: A comparison between ARIMA and Holter-Winters models," in *AIP Conference Proceedings*, 2017, vol. 1885.

[26] A. S. Ahmar, A. Rahman, A. N. M. Arifin, and A. A. Ahmar, "Predicting movement of stock of 'Y' using sutte indicator," *Cogent Econ. Financ.* vol. 5, no. 1, 2017.

[27] P. Singhala, D. N. Shah, and B. Patel, "Temperature Control using Fuzzy Logic," *Int. J. Instrum. Control Syst.*, vol. 4, no. 1, pp. 1–10, 2014.