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DECISION SUPPORT SYSTEM SELECTION USED CAR USING THE FUZZY LOGIC METHOD OF TAHANI MODEL

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ABSTRACT

Yus Motor showroom does not provide a system to accommodate used car specification data based on consumer desires. The owner or sales only explains these specifications by showing used car data on a sheet of paper. One in choosing a used car will certainly result in disappointment for consumers. Therefore, we need a method capable of analyzing used car specification data based on consumer desires. One such method is the Resistant Fuzzy Model Database. This method was chosen because it has the ability to provide firmness (crisp) on faint (gray) data, namely 1-0 (fuzzy logic). That is, 1 is a true value and can be used as a basis for consideration in making decisions, while 0 is not true and absolutely not worthy of consideration in making decisions. Furthermore, the end of the process of this method is a ranking (fire strength) which shows that the highest value is the most recommended product. This study aims to help the showroom owner Yus Motor and sales decide the choice of used cars quickly and precisely based on consumer desires using the fuzzy database method Tahani model.

INTRODUCTION

One of the most popular types of vehicles is a car. Apart from the needs of daily activities and comfort from weather conditions, cars can carry a lot of passengers and are good for long trips. In addition, cars are also used for lifestyle and social status in the midst of society.

Although car vehicles are in great demand, some people find it difficult to get a new car due to economic factors, so they choose to buy a used car at a used car showroom.

CV. Yus Motor is one of the showrooms in Asahan Regency, which is located at Jl. Diponegoro, No. 177. This showroom sells various types and brands of used cars.

For consumers, getting a used car that is good and the desired specifications can be met at an affordable price is the main indicator in deciding to buy a used car. The goal, in addition to finding a car that is comfortable to use, is to ensure that the used car is not easily damaged and can be used for a long period of time.

So far, the Yus Motor showroom does not provide a system to accommodate

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used car specification data based on consumer desires. The owner or sales only explains these specifications by showing used car data on a sheet of paper. The sales system used so far is conventional, which is to offer directly to consumers, and to provide satisfaction to consumers, shop owners allow consumers to take the car home for a trial. With so many brands and types of cars being sold, relying on explanations alone and trial and error is very ineffective to decide the right choice, because the wrong chances of choosing the car you want are very large. At Yus Motor's showroom, consumers often complain about choosing the wrong car.

One in choosing a used car will certainly result in disappointment for consumers, and what is more fatal is a bad showroom image. Therefore, we need a method capable of analyzing used car specification data based on consumer desires. One such method is the Resistant Fuzzy Model Database.

Connoly and Begg explained that databases or databases are data that are gathered in a storage medium on a computer where the data is logically connected with the aim of producing certain information.[1][2]

Information systems are daily transactions within an organization that can support managerial operations well. The transaction includes strategic activities that can provide reports for certain (external) parties.[3]

The relation used by the fuzzy model Tahani in the database remains the standard relationship, but to obtain information through queries, this model uses fuzzy set theory. So, the crisp value (definite / clear existence) that is processed is initial data, and the gray data search process is called the fuzzy query process through the fuzzy database model of Tahani (Efendi & Hidayati, 2014). In this study, the end of the process is a ranking (fire strength) which shows that the highest value (1 or close to 1) is the recommended product (used car).

This study aims to help the owner of CV. Yus Motor and Sales decide the choice of used cars quickly and precisely based on consumer desires. The best used cars recommended by the system are sorted based on the highest value to the lowest value (fire strength), and the system does not recommend used cars if they have an inference value = 0.

This research is a basic research for researchers who are trying to apply knowledge about the concept of the Resisti Model Fuzzy Database method in solving the problem of making a used car selection decision. The results of this study can be used by the owner of the Yus Motor showroom.

METHOD

The database used in the tahani fuzzy model is still a standard database. Data is classified according to user desires. The correlation is still standard, but in this model, fuzzy set theory is used to obtain information from the query.[4]

The fuzzy stages of the tahani model, which first describe membership functions for each criterion or fuzzy variable, are curves that show the mapping of data input points into membership values (degrees of membership) that have intervals between 0

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to 1[5][6][7]. One method that can be used is the function approach. The membership function approach is triangular in shape. The second fuzzification is the conversion of member values into fuzzy values. Where the calculation of the value of the degree of membership in each fuzzy set is a formulation of each fuzzy variable. Fuzzification step is a system management database query that is created and implemented for the basis of queries on fuzzy logic systems. This means forming queries with standard relations.[4]

Operators used for basic relations in the formation of querie on fuzzy set, i.e. intersections, these operators relate to intersection operations on sets. α-predicate as a result of operations with the AND operator is obtained by taking the smallest membership value between elements in the set concerned with the following equation:

$$\mu_{A\cap B} = min\ (\mu_{A(x)}, \mu_{B(y)}) \quad \text{..... (1)}$$

Union operator, the predicate of α as a result of operations with the OR operator is obtained from the largest value of the membership value of all elements in the set related to this equation:

$$\mu_{A\cup B} = max\ (\mu_{A(x)}, \mu_{B(y)}) \quad \text{..... (2)}$$

Complementary operators. The predicate α results of the operation with the NOT operator is obtained by subtracting the membership value of the elements in the set from 1, as follows:

$$\mu\bar{A} = 1 - \mu_{A(x)} \quad \text{..... (3)}$$

After obtaining the result of the relation operation from the formation of the query, then the data resulting from the recommendation of either the AND or OR opera is the recommendation value > 0.

RESULT AND DISCUSSION

The following are the criteria (variables) used as the basis for selecting used cars using fuzzy farming models, namely:

Table 1. Criteria of selecting used cars

Variable Name	Talk Universe	Fuzzy Set
Year Out	[2005, 2020]	Long, Enough, New
Machine Condition	[0, 100]	Less, Enough, Good
Body Condition	[0, 100]	Bad, Enough, Good
Accessories	[0, 100]	Empty, Enough, Complete
Price	[50, 100]	Cheap, Medium, Expensive

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From the criteria table, a membership function for each of the existing variables can be made, namely the year out. The membership function for the year out variable consists of 3 fuzzy sets, namely Long, Enough, New.

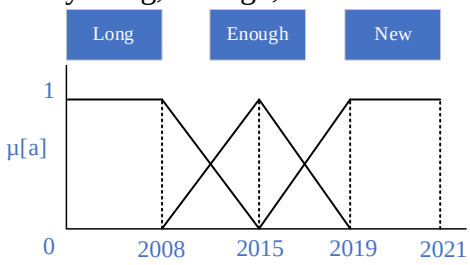

Image 1. Graph of Membership Function in Year Out

The expression for the fuzzy membership function for the year out variable is:

$$\mu \text{ Long } [a] = \begin{cases} 1; & a \le 2008 \\ \frac{2015-a}{7}; & 2008 \le a \le 2015 \\ 0; & a \ge 2015 \end{cases}$$

$$\mu \text{ Enough } [a] = \begin{cases} 0; & a \le 2008 \text{ or } a \ge 2019 \\ \frac{a-2008}{7}; & 2008 \le a \le 2015 \\ \frac{2019-a}{4}; & 2015 \le a \le 2019 \end{cases}$$

$$\mu \text{ New } [a] = \begin{cases} 0; & a \le 2015 \\ \frac{a-2015}{4}; & 2015 \le a \le 2019 \\ 1; & a \ge 2019 \end{cases}$$

Table 2 shows a table of used cars based on year out with the degree of membership in each set.

Table 2. Used Cars Are Based on Year Out

Num	Used Cars	Year Out	Membership Degrees [α]		
			Long	Enough	New
1	New Avanza 1.3E MT	2017	0	0,5	0,5
2	New Honda Mobilio S MT	2015	0	1	0
3	All New Ertiga GA MT	2018	0	0,25	0,75
4	All-New Livina E MT	2015	0	1	0
5	New Honda Jazz MT	2014	0,14	0,85	0

The membership function for machine condition variables consists of 3 fuzzy sets, namely Less, Enough, Good.

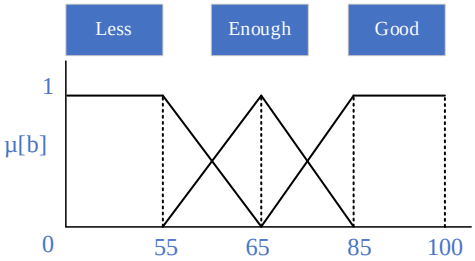

Image 2. Graph of Membership Function in Machine Condition

The expression for the fuzzy membership function for the machine condition variable is:

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$$\mu \text{ Low } [b] = \begin{cases} 1; & b \le 55 \\ \frac{65-b}{10}; & 55 \le b \le 65 \\ 0; & b \ge 65 \end{cases}$$

$$\mu \text{ Enough } [b] = \begin{cases} 0; & b \le 55 \text{ or } b \ge 85 \\ \frac{b-55}{10}; & 55 \le b \le 65 \\ \frac{85-b}{20}; & 65 \le b \le 85 \end{cases}$$

$$\mu \text{ Good } [b] = \begin{cases} 0; & b \le 65 \\ \frac{b-65}{20}; & 65 \le b \le 85 \\ 1; & b \ge 85 \end{cases}$$

Table 3 shows a table of used cars based on machine condition with the degree of membership in each set.

Tabel 3. Used Cars Are Based on Machine Condition

Num	Used Cars	Machine Condition	Membership Degrees [α]		
			Less	Enough	Good
1	New Avanza 1.3E MT	79	0	0,285	0,715
2	New Honda Mobilio S MT	85	0	0	1
3	All New Ertiga GA MT	60	0,433	0,567	0
4	All-New Livina E MT	85	0	0	1
5	New Honda Jazz MT	70	0	0,749	0,251

The membership function for machine condition variables consists of 3 fuzzy sets, namely Bad, Enough, Good.

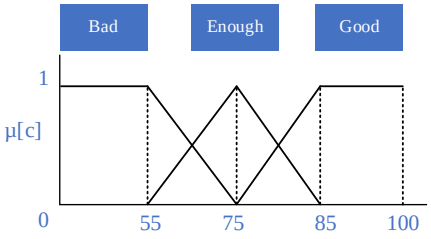

Image 3. Graph of Membership Function in Body Condition

The expression for the fuzzy membership function for the body condition variable is:

$$\mu \text{ Bad } [c] = \begin{cases} 1; & c \le 55 \\ \frac{75-c}{20}; & 55 \le c \le 75 \\ 0; & c \ge 75 \end{cases}$$

$$\mu \text{ Enough } [c] = \begin{cases} 0; & c \le 55 \text{ or } c \ge 85 \\ \frac{c-55}{20}; & 55 \le c \le 75 \\ \frac{85-c}{10}; & 75 \le b \le 85 \end{cases}$$

$$\mu \text{ Good } [c] = \begin{cases} 0; & c \le 75 \\ \frac{c-75}{10}; & 75 \le c \le 85 \\ 1; & c \ge 85 \end{cases}$$

Table 4 shows a table of used cars based on body condition with the degree of membership in each set.

Tabel 4. Used Cars Are Based on Body Condition

Num	Used Cars	Body Condition	Membership Degrees [α]		
			Bad	Enough	Good
1	New Avanza 1.3E MT	80	0	0,422	0,578
2	New Honda Mobilio S MT	70	0,25	0,75	0
3	All New Ertiga GA MT	88	0	0	1
4	All-New Livina E MT	84	0	0,1	0,9
5	New Honda Jazz MT	70	0,26	0,74	0

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The membership function for accessories variables consists of 3 fuzzy sets, namely Empty, Enough, Complete.

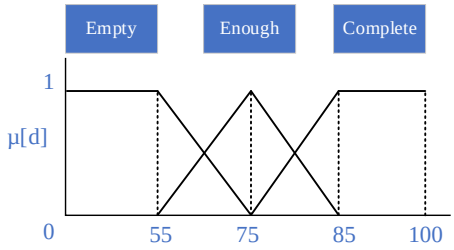

Image 4. Graph of Membership Function in Accessories

The expression for the fuzzy membership function for the accessories variable is:

$$\mu \text{ Empty } [d] = \begin{cases} 1; & d \le 55 \\ \frac{75-d}{20}; & 55 \le d \le 75 \\ 0; & d \ge 75 \end{cases}$$

$$\mu \text{ Enough } [d] = \begin{cases} 0; & d \le 55 \text{ or } d \ge 85 \\ \frac{d-55}{20}; & 55 \le d \le 75 \\ \frac{85-d}{10}; & 75 \le d \le 85 \end{cases}$$

$$\mu \text{ Complete } [d] = \begin{cases} 0; & d \le 75 \\ \frac{d-75}{10}; & 75 \le d \le 85 \\ 1; & d \ge 85 \end{cases}$$

Table 4 shows a table of used cars based on accessories with the degree of membership in each set.

Tabel 5. Used Cars Are Based on Accessories

Num	Used Cars	Accessories	Membership Degrees [α]		
			Empty	Enough	Complete
1	New Avanza 1.3E MT	80	0	0,5	0,5
2	New Honda Mobilio S MT	70	0,225	0,775	0
3	All New Ertiga GA MT	90	0	0	1
4	All-New Livina E MT	65	0,46	0,54	0
5	New Honda Jazz MT	74	0,04	0,96	0

The membership function for the price variable consists of 3 fuzzy sets, namely Cheap, Medium, Expensive.

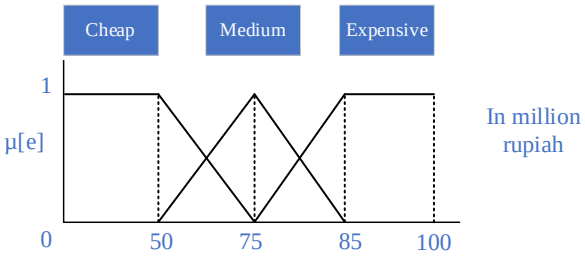

Image 4. Graph of Membership Function in Price

The expression for the fuzzy membership function for the price variable is:

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$$\mu \text{ cheap } [e] = \begin{cases} 1; & e \le 50 \\ \frac{75-e}{20}; & 50 \le e \le 75 \\ 0; & e \ge 75 \end{cases}$$

$$\mu \text{ Middle } [e] = \begin{cases} 0; & e \le 50 \text{ or } e \ge 85 \\ \frac{e-50}{20}; & 50 \le e \le 75 \\ \frac{85-e}{10}; & 75 \le e \le 85 \end{cases}$$

$$\mu \text{ Expensive } [e] = \begin{cases} 0; & e \le 75 \\ \frac{e-75}{10}; & 75 \le e \le 85 \\ 1; & e \ge 85 \end{cases}$$

Table 6 shows a table of used cars based on price with the degree of membership in each set.

Tabel 6. Used Cars Are Based on Price

Num	Used Cars	Price	Membership Degrees [α]		
			Ceaph	Medium	Expensive
1	New Avanza 1.3E MT	65.000.000	0,25	0,5	0
2	New Honda Mobilio S MT	80.000.000	0	0,5	0,5
3	All New Ertiga GA MT	48.000.000	1	0,1	0
4	All-New Livina E MT	90.000.000	0	0	1
5	New Honda Jazz MT	90.000.000	0	0	1

From the results of the above calculations, it is determined that the year out variable with the priority of the New fuzzy set, the condition of the machine with the priority of the fuzzy set is Good, the condition of the body with the priority of the fuzzy set Good, the accessories with the priority of the Complete fuzzy set, and the price with the priority of the Cheap fuzzy set which is executed using the Structure Query. Language (SQL). The SQL that is formed is as follows:

Select nm_mobil, tk, km, kb, ase, hrg, (tk + km + kb + ase + hrg)/5 as recommendation From tbl_usedcar Where yo = ”New” and mc=”Good” and bc=”Good” and acc=”Complete” and pri=”Cheap”. The following are the results of the search for the desired data:

Table 7. Result

Num	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**
1	New Avanza 1.3E MT	0,5	0,715	0,578	0,5	0	0,46
2	New Honda Mobilio S MT	0	1	0	0	0,5	0,3
3	All New Ertiga GA MT	0,75	0	1	1	0	0,55
4	All-New Livina E MT	0	1	0,9	0	1	0,58
5	New Honda Jazz MT	0	0,251	0	0	1	0,25

Table Captions :
P1: Cars Name, P2: Year Out, P3: Machine Condition, P4: Body Condition, P5: Accessories, P6: Prioce, P7: Recommendation

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CONCLUSION

From the results of the research conducted, it can be concluded that the fuzzy logic of the durable model can be applied to the selection of used cars by using the value of the assessment criteria as fuzzy input data. With sustainable fuzzy logic, the used car selection process can produce accurate information that can be used by the owner of the yus motor showroom as a means of assisting in making used car sales decisions.

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