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Tegal Tourism Object Selection Decision Support System Using Fuzzy Logic

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Abstrak

Sudah banyak instansi yang memiliki database tetapi dibiarkan tanpa pengelolaan yang baik dan bermanfaat. Misalnya di objek wisata di Kota & Kab.Tegal, Seiring pesatnya perkembangan teknologi pariwisata telah mengharuskan industri pariwisata untuk menerapkan teknologi informasi sehingga memberikan kemudahan bagi wisatawan untuk mengetahui daerah wisata sesuai dengan biaya, waktu dan jarak tempat wisata yang diinputkan. Penyediaan informasi pariwisata membantu wisatawan untuk mempertimbangkan dan mengambil keputusan untuk berwisata. Logika Fuzzy Tahani dipilih karena konsep logika Fuzzy mudah dipahami, logika Fuzzy sangat fleksibel, dan karena metode logika Fuzzy tahani merupakan bentuk model pendukung keputusan dimana alat utamanya adalah hierarki fungsional dengan kriteria masukan utama yang telah ditentukan oleh pengguna/wisatawan. Sistem ini akan diimplementasikan dengan menggunakan web programming dan database MySQL, dimana variabel yang menjadi pertimbangan adalah Jenis Wisata, Jumlah Fasilitas, Harga Tiket Wisata, Jumlah Pengunjung Wisatawan, Jarak Perjalanan dari Pusat Kota. Hasil dari penelitian ini adalah sistem pendukung keputusan pemilihan objek wisata di Tegal menggunakan Fuzzy Tahani yang dapat merekomendasikan objek wisata di Tegal yang ditentukan oleh wisatawan tergantung pada kriteria wisatawan berdasarkan firestrength dari variabel yang di pilih.

Kata Kunci— *Sistem Pendukung Keputusan, Fuzzy Tahani, Wisata, Objek Wisata di Tegal*.

Abstract

There are many agencies that have databases but are left without good and useful management. For example, in tourist attractions in Kota & Kab. Tegal, along with the rapid development of tourism technology, the tourism industry requires the tourism industry to apply information technology so as to provide convenience for tourists to find out tourist areas according to the cost, and the distance of the tourist attractions entered. The provision of tourism information helps tourists to consider and make decisions to travel. Tahani Fuzzy Logic was chosen because the concept of Fuzzy logic is easy to understand, Fuzzy Logic is very flexible, and because the Tahani logic method is a form of decision support where the main tool is functional with the main input criteria determined by the user/tourist. This system will be implemented using web programming and MySQL database, where the variables to be considered are Type of Tour, Number of Facilities, Price of Tour Tickets, Number of Tourist Visitors, Travel Distance from City Center. The results of this study are a decision support system for tourism selection in Tegal using Fuzzy Tahani which can recommend tourist attractions in Tegal which are determined by tourists depending on tourist criteria based on the firestrength of the selected variables.

Keywords— *Fuzzy Tahani, Tourism, Tourism Objects in Tegal, Decision Support System.*

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1. INTRODUCTION

The travel industry is an inseparable part of human existence, especially with regard to financial exercise which is seen as one of the companies planned in the day [1].The travel industry advancement should be constantly sought after to become a sub-area that can work on the public economy and region. The travel industry as an assistance industry is the fundamental driver the world economy so numerous nations are attempting to make the nation as an article that is wealthy in vacation spot. As an afterthought Then again, the travel industry is an extremely powerful market [2].

Tourism is an activity that cannot be separated from human life. Everyone definitely needs to travel and travel can be done both inside and outside the area where they live. Because basically the concept of tourism is human, and the geographical area is both from the area of origin and the tourist destination you want to visit, and both the industry that provides facilities and services [3].

The widespread progress and commercialization of Data Innovation and Correspondence for the movement and travel industry has required different travel and business industries to implement data innovation [4]. Along with the rapid development of technology described above, it opens the freedom to advance tourist areas which can be improved by using an online-based package system so that it can make it easier for tourists to find tourist areas in terms of cost, time and distance. vacation spot. The array of travel industry data helps travelers to consider and make choices about travel.

The tourism decision support system plays an important role for tourists to monitor data on the choice of places to travel [5]. Some of the optional assistance rules include the type of travel industry you want, your spending plan, the size of the time to travel, and the distance to the ideal tourist area. The choice of an emotionally supportive network trip is made in the City/District of Tegal.

Previous research related to decision support systems has been carried out in several studies, such as the Bustomi study [6], using a Decision Support System (DSS) with the fuzzy tahani method to create a system that can help decision makers to determine the right solution for choosing tourist objects. There is also a study by Trifardi [7], who developed an android-based application with the fuzzy tahani method. This framework also has real-time information because it is directly connected to the mysql dataset. Then Hidayat's research [8] who conducted research using the web-based fuzzy Tahani method, and selected criteria through the distribution of online questionnaires.

Seeing the current reality, the author wants to develop an efficient choice of assistance that can help regions in choosing tourist destinations that have not been found in the City/Regency of Tegal. The Fuzzy Tahani strategy was chosen to develop the DSS. DSS is the basic framework of intelligent PC that upholds dynamic by applying information and shows to take care of organized and unstructured problems [9]. Analysts use the Fuzzy Tahani strategy in the choice of emotionally supportive networks because this technique can provide proposals that have rules that are close to definition.

2. METHODS

In this section, the proposed method is detailed. Including the fuzzy Tahani method and the data used in this study, namely data collection, and the system development stage.

2.1 Research Flow

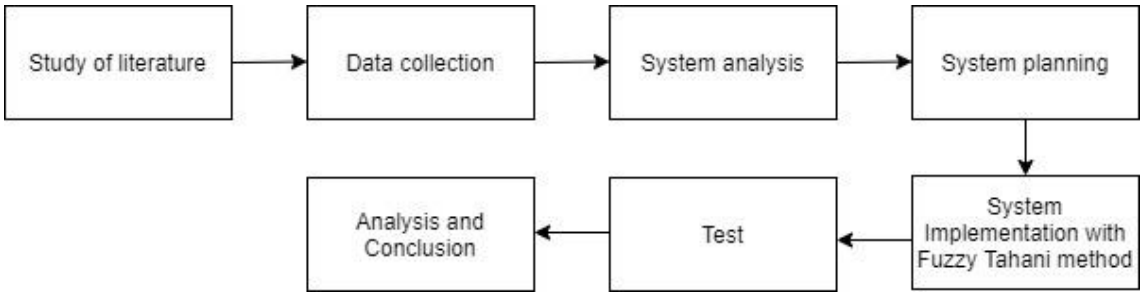

Figure 1 Research Flow

Figure 1 is a research flow consisting of literature study, data collection, system analysis, system design, for the implementation part, this system was built using a web-based Fuzzy Model Tahani database using PHP programming language and MySQL database collection, then there is testing, as well as analysis and conclusions.

2.2 Context Diagram

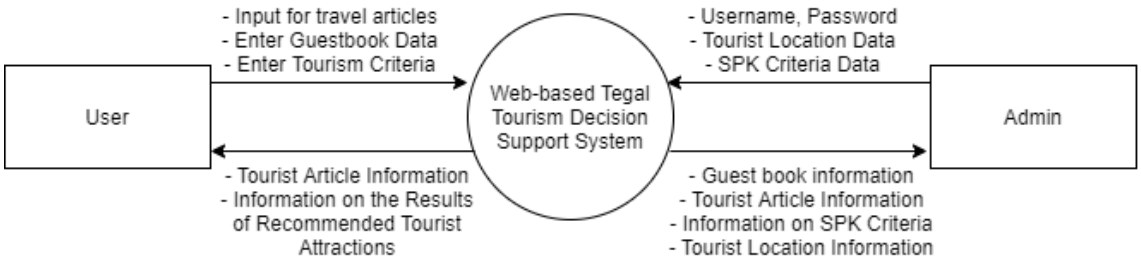

Figure 2 Context Diagram

In Figure 2 the Context Diagram is a web-based Tegal tourism decision support system design, where users can input tourism articles, and users are required to input guest book data, as well as input the desired tourism criteria. In addition, users can also get information on the results of tourist attraction recommendations and can also view detailed tourist information.

2.3 Data Flow Diagram (DFD) Level 1

The level 1 data flow diagram for the system shown in Figure 2 consists of five processes, namely the administrator login process, the process of processing tourist destination data, the fuzzy value calculation process, information on finding tourist objects, and the most common process of filling out the guest book carried out by tourists or tourists. users. In the administrator login process, the information inputted by the administrator actor is in the form of username and password data that will be stored in the head element. In the process of handling tourist attraction information, the information that must be inputted by the administrator is the type of tourism, tourist facilities, tour ticket prices, number of tourist visitors, and tourist distances, which will produce system output in the form of tourist attraction information to be visited according to the inputted criteria.

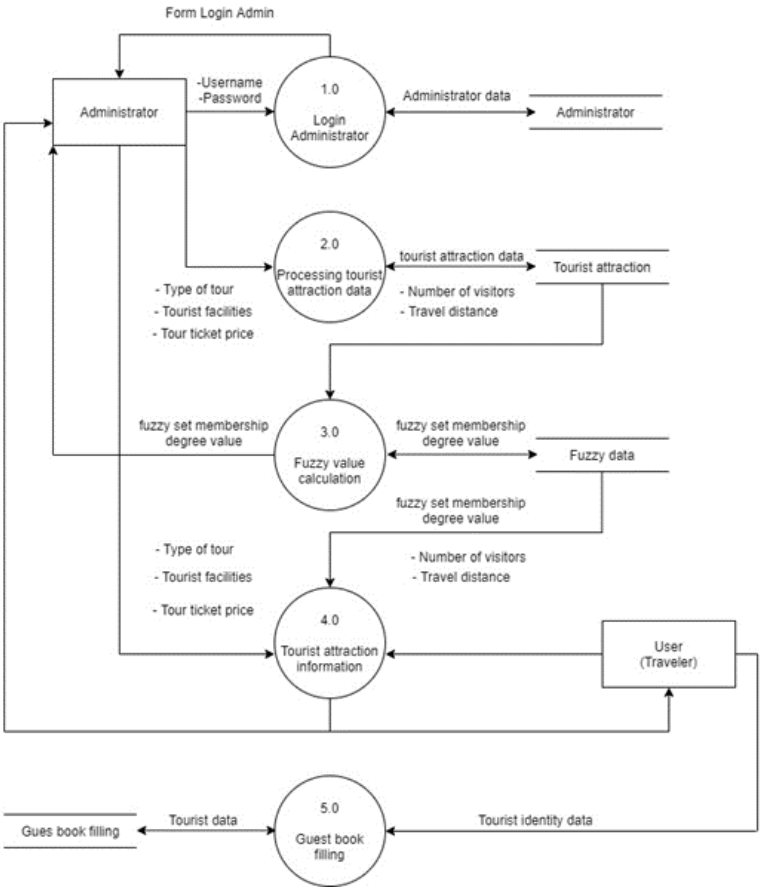

Figure 2 DFD Level 1

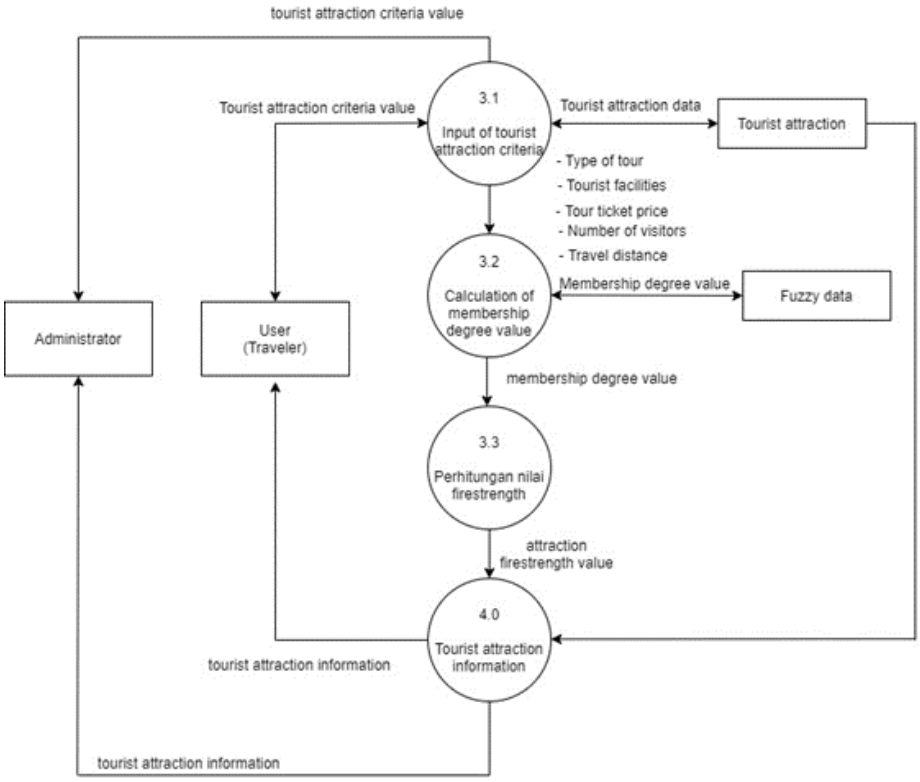

Figure 3 DFD Level 2

2.4 Data Flow Diagram (DFD) Level 2

DFD level 2 in the fuzzy value calculation process which gives the value of the degree of membership of the fuzzy set and the value of firestrength in each tourist attraction is a more detailed description of the fuzzy method process at level 1. This process consists of four processes, more specifically, processing the calculation of the degree value. membership in each tourist attraction, and displays the results of selecting a tourist attraction according to the criteria in the tourist attraction search data. The four processes are the result of processing the data contained in the entities in the tourist attraction DSS database, namely the tourist attraction entities and fuzzy data entities. Figure 3 illustrates the level 2 DFD in terms of the quality of the fuzzy value calculation.

2.5 Fuzzy tahani

Fuzzy logic is a generalization of classical logic in which there are only two membership values: 0 and 1. The truth value of a proposition in fuzzy logic might range from entirely true to absolutely untrue. With set fuzzytheory, an object can belong to several sets, each with varying degrees of membership. This concept is distinct from the traditional set (crisp). To decide whether or not an object is a member of a set, classical set theory uses two-valued logic [10].

Fuzzy variables, fuzzy variables for tourist menus include:

a) Tourist attractions that have not been exposed
b) Facilities
c) Price Range
d) Number of Visitors
e) Location Distance

a) Tourist destinations that are less well-known

The existence of a tourism decision support system website that uses fuzzy logic makes it easier for tourists to choose tourism objects that have not previously been exposed, and it can improve tourist interest in visiting areas.

b) Many Tourist Facilities

In Figure 4, the tourist facility criteria are separated into three fuzzy sets: Few, Enough, and Many.

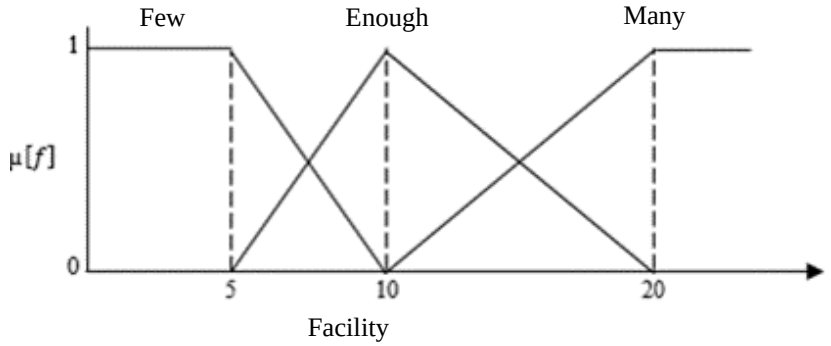

Figure 4 Facility Membership Function Graph

The membership function in the facility criteria can be formulated as follows:

$$\mu\text{Facility}_{\text{few}}\ [f] = \begin{cases} 1 & \rightarrow \ f \leq 5 \\ \dfrac{10-f}{5} & \rightarrow 5 \leq f \leq 10 \\ 0 & \rightarrow \ f \geq 10 \end{cases}$$

$$\mu\text{Facility}_{\text{enough}}\ [f] = \begin{cases} 0 & \rightarrow \ f \leq 5 \\ \dfrac{f-5}{5} & \rightarrow 5 \leq f \leq 10 \\ \dfrac{20-f}{10} & \rightarrow 10 \leq f \leq 20 \end{cases}$$

$$\mu\text{Facility}_{\text{many}}\ [f] = \begin{cases} 0 & \rightarrow \ f \leq 20 \\ \dfrac{f-10}{10} & \rightarrow 10 \leq f \leq 20 \\ 1 & \rightarrow \ f \geq 20 \end{cases}$$

Function of Membership

c) Ticket Prices for Attractions

The pricing range of entry tickets for tourism objects that have been set in tourist attractions in the Tegal and Kab. Tegal is shown in Figure 5. The criteria for tourism pricing are split into three broad groups: cheap, medium, and expensive.

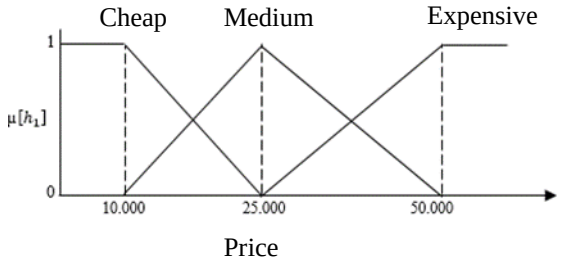

Figure 5 Graph of the Price Membership Function

The shoulder-shaped membership function method is used in the cheap and costly sets, whereas the triangle approach is used in the medium set. On the Tourism Price Criteria, the membership function may be expressed as follows:

$$\mu\text{Price}_{\text{cheap}}\ [h] = \begin{cases} 1 & \rightarrow \ h_1 \leq 10.000 \\ \dfrac{25000-h_1}{15.000} & \rightarrow 10.000 \leq h_1 \leq 25.000 \\ 0 & \rightarrow \ h_1 \geq 25.000 \end{cases}$$

$$\mu\text{Price}_{\text{medium}}\ [h] = \begin{cases} 0 & \rightarrow h_1 \geq 50.000 \ or \ h \leq 10.000 \\ \dfrac{h-10.000}{15.000} & \rightarrow \ 10.000 \leq h \leq 25.000 \\ \dfrac{50.000-h}{25.000} & \rightarrow \ 25.000 \leq h \leq 50.000 \end{cases}$$

$$\mu\text{Price}_{\text{expensive}}\ [h] = \begin{cases} 0 & \rightarrow \ h \leq 25.000 \\ \dfrac{h-25.000}{25.000} & \rightarrow 25.000 \leq h_1 \leq 50.000 \\ 1 & \rightarrow \ h \geq 50.000 \end{cases}$$

d) Tourist Visitor Numbers

The criteria for the quantity of tourists discovered in tourist attractions are classified into three fuzzy sets in Figure 6, namely Quiet, Ordinary, and Crowded. The Crowded set uses a triangular method, whereas the Lonely and Crowded sets use a shoulder-shaped membership function.

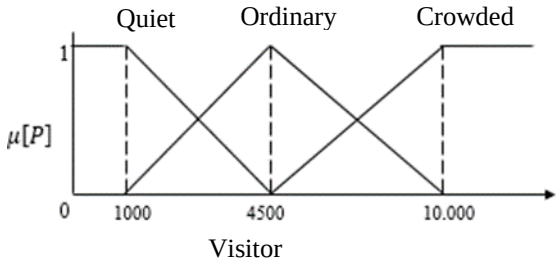

Figure 6 Graph of the Visitor Membership Function

On the Visitor criteria, the Membership function can be expressed as follows:

$$\mu\text{Visitor}_{quiet}\ [P] = \begin{cases} 1 & \rightarrow\ P \leq 1000 \\ \dfrac{4500 - P}{3500} & \rightarrow 1000 \leq P \leq 4500 \\ 0 & \rightarrow\ P \geq 4500 \end{cases}$$

$$\mu\text{Visitor}_{ordinary}\ [P] = \begin{cases} 0 & \rightarrow P \leq 1000 \text{ or } P \geq 10000 \\ \dfrac{P - 1.000}{3500} & \rightarrow\ 1000 \leq P \leq 4500 \\ \dfrac{10.000 - P}{5500} & \rightarrow\ 4500 \leq P \leq 10000 \end{cases}$$

$$\mu\text{Visitor}_{crowded}\ [P] = \begin{cases} 0 & \rightarrow\ P \leq 4500 \\ \dfrac{P - 4500}{5500} & \rightarrow 4500 \leq P \leq 10000 \\ 1 & \rightarrow\ P \geq 10000 \end{cases}$$

e) Distance to Attractions for Tourists

The distance between the application user and the tourist attraction that will be obtained based on the distance information on google maps is shown in Figure 7, and the Distance Criteria are divided into three fuzzy sets, namely Near, Medium, and Far. A shoulder-shaped membership function is used in the Near and Far sets, while a triangle method is used in the Medium set.

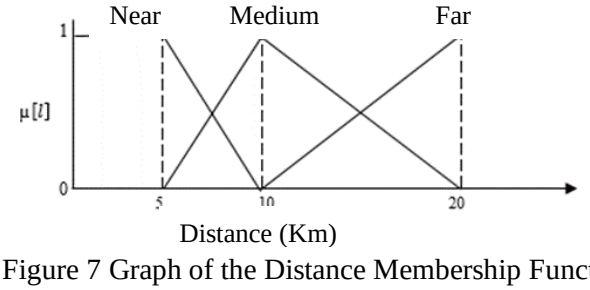

Figure 7 Graph of the Distance Membership Function.

The membership function of the criteria for the distance to the location of a tourist attraction can be formulated as follows:

$$\mu\text{Location}_{near} \quad [l] = \begin{cases} 1 & \rightarrow \quad l \leq 5 \\ \dfrac{10-l}{5} & \rightarrow 5 \leq l \leq 10 \\ 0 & \rightarrow \quad l \geq 10 \end{cases}$$

$$\mu\text{Location}_{medium} \quad [l] = \begin{cases} 0 & \rightarrow \quad l \leq 5 \\ \dfrac{l-5}{5} & \rightarrow 5 \leq l \leq 10 \\ \dfrac{20-l}{10} & \rightarrow 10 \leq l \leq 20 \end{cases}$$

$$\mu\text{Location}_{far} \quad [h_2] = \begin{cases} 0 & \rightarrow \quad l \leq 20 \\ \dfrac{l-10}{10} & \rightarrow 10 \leq l \leq 20 \\ 1 & \rightarrow \quad l \geq 20 \end{cases}$$

2.5 DSS Flowchart

Figure 8 is a flowchart of a decision support system for selecting tourist objects in Tegal using the Fuzzy Tahani method.

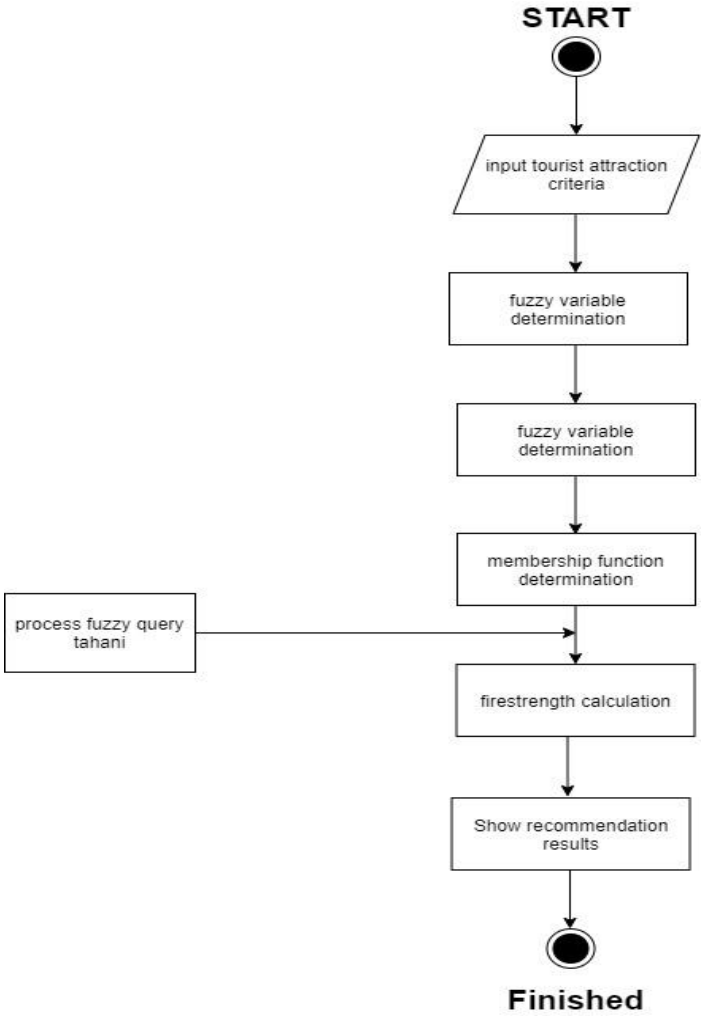

Figure 8 DSS Flowchart

3. RESULTS AND DISCUSSION

3.1 Data collection results

Data of tourists entering tourist attractions in the City & Regency of Tegal in 2016 can be seen in table 1, there are 30 data taken from research data sources obtained indirectly through intermediary media, data obtained from author data in ready-to-use form, namely information and citations, either from the internet or literature.

Table 1 Tourist Data

Tourist attraction	Facility	Price (Rp)	Visitors (±)	Distance (Km)
Desa Wisata Guci	16	7000	66.558	28
Pantai Alam Indah	7	5000	31.336	18
Pantai Purwahamba Indah	15	3500	29.257	25
Waduk Cacaban	6	4000	3.833	22
Wisata Kesehatan Jamu Kalibakung	6	5000	710	14

3.2 Fuzzification Results

In Table 2 Fuzzy Criteria is a non-fuzzy Tourism Type variable, so it is only used to classify the output of tourist attraction recommendations that have gone through the fuzzification process

Table 2 Fuzzy Criteria

Ticket	Visitors	Facility	Distance	Type
Expensive	Crowded	Lots	Far	Natural
Currently	Average	A little	Currently	Social & Cultural
Inexpensive	Quiet	Average	Close	Histor & Religion
				Education
				Nautical

The Fuzzy Tahani method is used to process initial data, namely tourism criteria data to obtain tourism search prediction decisions that suit the user. After all stages are carried out with the fuzzy tahani method, later it will be known which types of tours are more suitable for tourists to visit in accordance with the criteria entered by tourists.

3.3 Tourist Object Selection Decision Support System Form

In Figure 9 the Tourist Object Selection Decision Support System Form is a tourist attraction selection page form based on criteria that have been determined by tourists or users.

Figure 9 Tourist Object Selection Decision Support System Form

The inputted criteria are linguistic values based on the fuzzy set of a fuzzy variable. And the system produces output of tourist attraction information which is a suggested list of names of attractions to be visited based on the criteria values that have been entered by tourists or users. You can also view the details or detailed information of a tourist attraction by clicking on the detailed text located on the right of the list of tourist attraction names based on tourist attraction data selected by tourists.

4. CONCLUSION

Based on the research that has been carried out, it can be obtained several conclusions made by researchers, namely the decision support system that has been made can be used appropriately to determine tourist attraction visits in the City/Regency of Tegal in accordance with predetermined value standards, the system is also made depending on the needs of users/tourists with specified criteria, namely types, facilities, ticket prices, number of tourist visitors, distance from the city center, the Fuzzy Hold method has been actively applied to the search system to make it easier for users/tourists when they want to search for tours according to their needs. the desired criteria, the final result of this system is as a tourist recommendation in accordance with the criteria that have been entered by the user/tourist.

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