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DECISION SUPPORT SYSTEM FOR SELECTING TOURIST OBJECT IN SURABAYA CITY USING SIMPLE ADDITIVE WEIGHTING BASED ON ANDROID

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ABSTRACT

In this Final Project will be discussed regarding the implementation of the Attraction Decision Support System in Surabaya using Simple Additive Weighting. The problem to be taken is to get the best results from 50 attractions in the city of Surabaya based on the user's location by using an Android-based operating system, to make it easier for users to access this application. To obtain the value of distance criteria, this application uses the Haversine formula. The results of the study of the decision support system application for the selection of attractions in the city of Surabaya using the Simple Additive Weighting method is the highest value obtained from attractions based on the user's location with weights for each criterion especially the distance criteria which has a weight of 0.3.

1. INTRODUCTION

Surabaya is the second largest city in Indonesia after Jakarta, making this city the center of business, commerce, industry and education in the East Java region. In terms of tourism, Surabaya has a variety of attractions, including historical tourism that is always sought after by tourists who come.

Some of these attractions become the leading tourist attractions in the city of Surabaya. However, some people are confused in choosing tourist attractions that are in accordance with their wishes, especially tourist sites which are located close to the surroundings, especially people who come from outside the city who want to visit Surabaya will definitely experience difficulties when they first come. With current technological developments, it is actually very easy to access information through smartphones. Both written information and information in the form of images. Some people can use location-based service technology to easily find the location they want to go to.

Location based service is one of the information services using technology to find out the position of something. Location-based services that use positioning system technology, enable users to obtain location information according to their needs. LBS is included in the same technology category as the Geographic Information System (GIS). Location based service can help in the decision making process which is faced with various criteria such as the selection of tourist objects. The method used in this decision making system is the Simple Additive Weighting (SAW) method. The basic concept of the SAW method is to find a weighted sum of the performance ratings for each alternative on all attributes.

Based on the description above, this research tries to make an application with the title "Support System Decision on Selection of Attractions in the City of Surabaya Using Android-Based Simple Additive Weighting ".

2. DECISION SUPORT SYSTEM

Decision Support System (DSS) or Decision Support System (DSS) is a system that is able to provide problem-solving and communication skills for problems with semi-structured and unstructured conditions. This system is used to assist decision making in semi-structured and unstructured situations, where no one knows for sure how decisions should be made (Turban, 2001). [1]

3. FLOWCHART

The flowchart in the figure below explains the system flow that is done by the admin and user in this application.

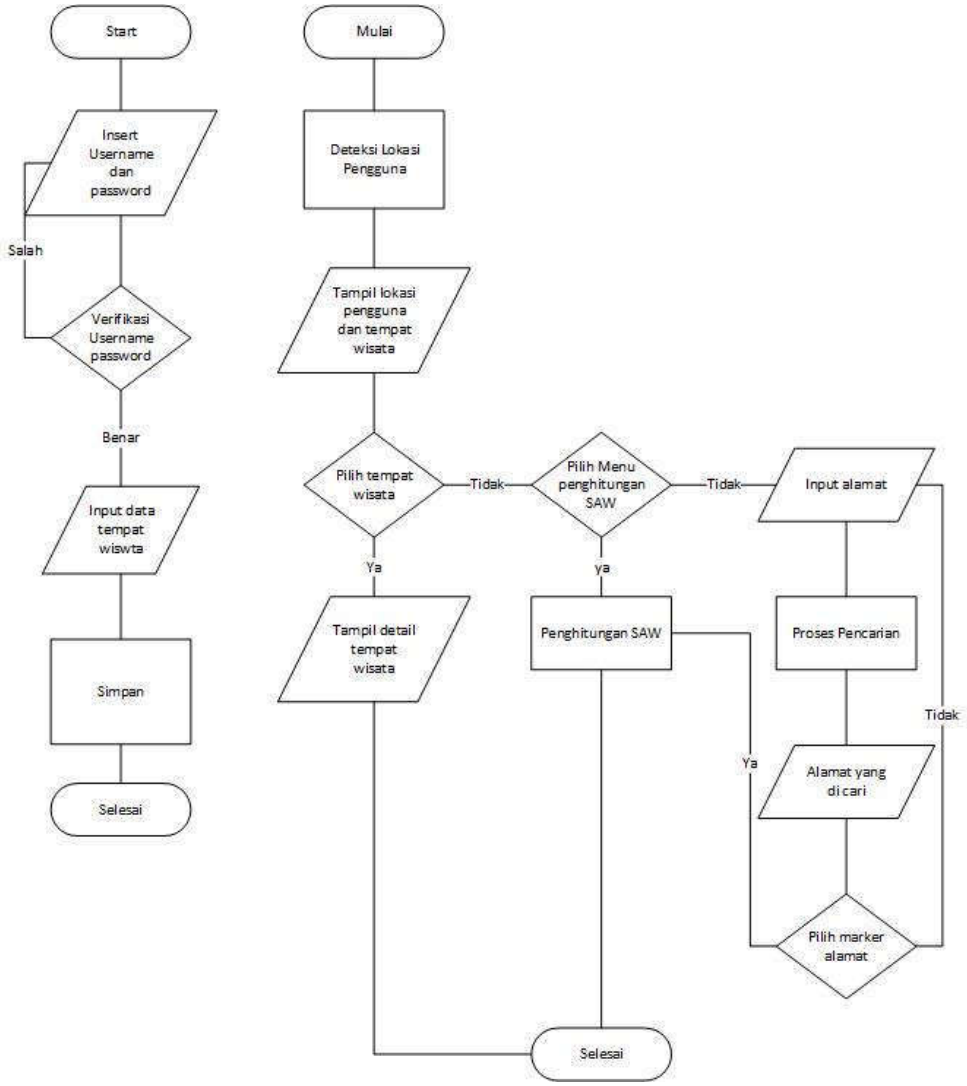

Figure 1. flowchart admin and user

4. CALCULATION OF THE SAW METHOD

According to Kusumadewi (2007), the SAW method is often also known as the weighted sum method. [2].

4.1 Criteria Weighting

Weight assessment data structure for each criterion, including:

a. Benefit Clock
Weighting for working hour criteria.

Table 1. Weighting of operating hours criteria Table

Operasional Clock (hours)	Weight
6 – 15 jam	1
X > 15 jam	2

b. Ticket Cost
Weighting for Ticket Price criteria.

Table 2. Weighting table ticket price criteria

Ticket Cost	Weight
X < 60000	3

60000 – 100000	2
X > 100000	1

c. Facility
Weighting for Facility criteria.

Tabel 3. Facility criteria weighting table

Facility	Weight
X <= 5	1
6 – 10	2
X > 10	3

d. Address
Weighting for Address criteria.

Table 4. Address criteria weighting table

Address	Weight
Near the highway	2
Residential area	1

The criteria for selecting tourist attractions to get the best choice of tourist attractions are as follows:

a. Operasional Clock = 0.15
b. Ticket Cost = 0.25 (cost)
c. Facility = 0.2 (benefit)
d. Distance = 0.3 (cost)
e. Address = 0.1 (cost)

4.2 Distance Calculation

Before calculating the SAW method, the distance calculation between the user's GPS location and the tourist attractions is calculated first using the Haversine formula. For example the user's GPS location is at Bhayangkara University in Surabaya, then:

User Location : Bhayangkara University Surabaya
Latitude : -7.3213517
Longitude : 112.7321167
Location of tourist attractions : Surabaya Zoo
Latitude : -7.297014
Longitude : 112.738738

$$x = (\text{rad } Long_2 - \text{rad } Long_1) * \text{Cos } ((\text{rad } Lat_1 + \text{rad } Lat_2)/2)$$
$$y = (\text{rad } Lat_2 - \text{rad } Lat_1) \quad (3)$$
$$\text{Jarak} = \sqrt{(x * x + y * y)} * R$$

R = radius bumi= 6371 km 1° = 0.0174532925 radian

Latitude 1 = -7.3213517* 0.0174532925 = -0.1277817 radian
Longitude 1 = 112.7321167* 0.0174532925 = 1.96754661 radian
Latitude 2 = -7.297014* 0.0174532925 = -0.12735692 radian
Longitude 2 = 112.738738 * 0.0174532925 = 1.96766217 radian

x = (1.96766217 - 1.96754661) * Cos ((-0.1277817 + -0.12735692)/2)
= (0.00011556) * (0.99187407)
= 0.000114621

y = (-0.12735692 – (-0.1277817))
= 0.00042478

Jarak = $\sqrt{(0.000114621 * 0.000114621 + 0.00042478 * 0.00042478)} * R$
= $\sqrt{1.93576E-07}$ * 6371 km
= 0.000439973 * 6371 km
= 2.8030664 km

4.3 Match Rating

Below is a matching rating table for each alternative on each criterion.

Table 5. Match Rating

Tourist attraction	Operational hour	Ticket price	Amenities	Distan	Address
Surabaya ZOO	1	3	1	2.80	2
Suroboyo Carnival	1	2	1	2.68	2
De MATA Trick Eye Museum	1	2	1	3.02	2
Mayangkara Park	2	3	1	1.64	2
Bungkul Park	2	3	2	3.43	2
Royal Plaza	1	3	3	1.39	2

4.4 Normalization

The SAW method requires the decision matrix normalization process (X) to a scale that can be compared with all available alternative ratings

$$r_{ij} \begin{cases} \dfrac{x_{ij}}{Max_i x_{ij}} & \text{jika j adalah atribut keuntungan (benefit)} \\ \dfrac{Min_i x_{ij}}{x_{ij}} & \text{jika j adalah atribut biaya (cost)} \end{cases} \quad (4)$$

Keterangan:

r_{ij} = Rating kinerja ternormalisasi

Max_{ij} = Nilai maksimum (terbesar) dari setiap baris dan kolom

Min_{ij} = Nilai minimum (terkecil) dari setiap baris dan kolom

X_{ij} = Baris dan kolom dari matriks dengan r_{ij} adalah rating kinerja ternormalisasi dari alternatif Ai pada atribut Cj; i = 1, 2, ..., n.

4.5 Reference Value Each Alternative

The final result is obtained from the sum of the multiplication of matrix normalization with criteria weights so that the biggest value is chosen as the best alternative.

Table 6. Application Test Results with SAW Calculation

No.	Tourist Attraction	C1	C2	C3	C4	C5	Result
1.	Ciputra Waterpark	1	1	1	11.64	1	0.493
2.	Ciputra World	1	3	2	3.47	2	0.354
3.	City Of Tomorrow	1	3	2	2.70	2	0.362
4.	De Javasche Bank Museum	1	3	1	9.66	2	0.277
5.	De MATA Trick Eye Museum	1	3	1	3.02	2	0.291
6.	Delta Plaza	1	3	2	6.54	2	0.345
7.	Food Junction Grand Pakuwon	1	3	2	11.03	1	0.393
8.	Galaxy Mall	1	3	1	7.52	2	0.344
9.	Grand City	1	3	2	6.92	2	0.345
10.	House Of Sampoerna	1	3	1	10.03	1	0.326
11.	Bamboo Forest	2	3	1	8.32	1	0.402
12.	ITC	1	3	2	9.07	2	0.343
13.	Seed Garden 2 Wonorejo	1	3	2	6.50	2	0.345
14.	Surabaya ZOO	1	3	1	2.80	2	0.294

15.	Lenmarc Mall	1	3	2	6.88	2	0.345
16.	Mangrove	1	3	1	10.00	1	0.326
17.	Cancer Museum	1	3	1	6.22	2	0.279
18.	Submarine Museum	1	3	1	6.53	2	0.278
19.	Health Museum	1	3	1	9.01	2	0.277
20.	Nahdatul Ulama Museum	1	3	2	2.09	2	0.375
21.	The November 10 Struggle Museum	1	3	1	8.46	2	0.277
22.	Surabaya Museum	1	3	1	7.26	2	0.278
23.	TNI AL – Loka Jala Crana Museum	1	3	1	10.57	1	0.326
24.	Yos Sudarso Museum	1	3	1	10.97	1	0.326
25.	Ria Kenjeran Beach	1	3	1	11.18	2	0.276
26.	Pakuwon Trade Center	1	3	3	7.19	2	0.411
27.	Royal Plaza	1	3	3	1.39	2	0.484
28.	Suroboyo Carnival	1	2	1	2.68	2	0.337
29.	Apsari Park	2	3	1	6.53	2	0.353
30.	Bungkul Park	2	3	2	3.43	2	0.429
31.	Ekspresi Park	1	3	1	7.24	2	0.278
32.	Flora Park	1	3	2	4.38	2	0.349
33.	Harmoni Keputih Park	1	3	1	8.30	2	0.327
34.	Inspirasi Park	2	3	1	2.19	1	0.430
35.	Jangkar Park	2	3	1	2.18	1	0.431
36.	Keputran Park	2	3	1	5.50	2	0.355
37.	Korea Park	2	3	1	4.25	2	0.358
38.	Lansia Park	2	3	1	5.93	2	0.354
39.	M Duryat Park	2	3	1	5.92	1	0.404
40.	Mayangkara Park	2	3	1	1.64	2	0.404
41.	Monumen Ronggolawe Park	2	3	1	2.41	2	0.375
42.	Mundu Park	2	3	1	8.14	2	0.352
43.	Paliatif Park	2	3	1	7.70	1	0.402
44.	Pelangi Park	1	3	1	0.70	2	0.575
45.	Prestasi Park	1	3	1	6.76	2	0.278
46.	Remaja Surabaya Park	1	3	1	8.0	2	0.277
47.	Sulawesi Park	2	3	1	5.19	2	0.355
48.	Teratai Park	2	3	1	7.81	1	0.402
49.	Transmart	1	3	2	4.35	2	0.349

Based on the test results table above, it can be seen that the distance criteria is very influential on the final results of each alternative with weights for each criterion obtained from the test data in table 7.

Table 7. Table of test data to determine the criteria weights

	C1	C2	C3	C4	C5	
A	2	3	1	3	1	
B	1	3	2	3	1	
C	1	2	3	3	1	
D	3	2	2	2	1	
E	1	2	2	4	1	
F	2	3	2	2	1	
G	2	2	2	3	1	
H	1	2	3	3	1	
I	1	3	2	3	1	
J	1	3	1	4	1	
Total	15	25	20	30	10	100

Jam Operasional (C1)	= 15/100 =0.15
Harga Tiket (C2)	= 25/100 = 0.25
Fasilitas (C3)	= 20/100 = 0.2
Jarak (C4)	= 30/100 = 0.3
Alamat (C5)	= 10/100 = 0.1

Below this is the SAW calculation page display in the application.

Image 2. SAW Page Counter

6. CONCLUSION

From the description in the previous chapters a conclusion can be drawn as follows:

1. This application uses the Simple Additive Weighting method to get the best tourist attraction by giving weights to each criterion especially the distance criteria which has a weight of 0.3, so we get the highest value as the best alternative.
2. The application is able to provide tourist destination solutions for users according to the user's location.

To determine the distance criteria, this application uses the Haversine formula by calculating the longitude and latitude of the user's location and tourist attractions, so that the distance of the tourist attractions from the user's location can be know.

REFERENCES

[1] M. P. K. (SPK). (2013). [Online]. A. [Accessed: 08 J. 2017] Riadi, "Sistem Pendukung Keputusan (SPK)," *www.kajianpustaka.com*, 2013. .

[2] B. H. Afif Amrullah, Elya S. A., "Berprestasi Pada Sistem Informasi Akademik," no. 2007, pp. 1–7, 2015.

[3] F. Lahman, "Aplikasi LBS (Located Based Service) Perguruan Tinggi di Surabaya Menggunakan Metode Haversine," *Skripsi. Surabaya Univ. Bhayangkara Surabaya*, 2015.

[4] A. A. Putra, "(Metode) Simple Additive Weighting SAW", *wordpress*, 2014. .