Jurnal Elektronik Ilmu Komputer Udayana
Volume 8, No 3. February 2020

p-ISSN: 2301-5373
e-ISSN: 2654-5101

Tourism Recommendation System in Bali Using Topsis and Greedy Algorithm Methods

Muhammad Afif Ubaidillah [a1], Ida Bagus Gede Dwidasmara[a2]

[a]Informatics Department, Udayana University
Bali, Indonesia
[1]afifubaidillah.unud1@gmail.com
[2]dwidasmara@unud.ac.id

Abstract

Tourism is the economic mainstay of the Bali region and is an important sector in supporting the level of community welfare. The world symbol for the symbol of significance is important for Bali. Of the many tourists who come to Bali, of course not all tourists know all the information about Bali, such as in terms of tourist locations, and tourist attractions closest to other tourist attractions. Therefore, the authors support to make a recommendation system that can provide planning for the selection of tourist attractions according to the closest distance and budget of the user. This research was conducted to help tourists in planning that will be following the budget they have.

This system is designed using TOPSIS (Technique for Order Preferences with Similarities to Ideal Solutions) and the Greedy Algorithm. The TOPSIS method is SPK (Decision Making System) which will be used for the selection of tourist attractions which will help tourists to arrange holiday planning before going on a tour. While Greedy Algorithm is used to find the closest or closest distance between a tourist location and other tourist attractions, this algorithm will be able to determine which path will be taken first or is called the local optimal path, so that all paths are taken at the end of the trip and make the shortest route or referral. Global optimal so that it can also be the expected solution. From this, it can be determined the value of the shortest travel route which starts from the user's residence location to tourist attractions and other nearby tourist attractions. This study uses data obtained from DISPARDA namely tourist data and using the help of Google maps to determine the rating of each tourist site.

Research related to the selection of tourist attraction decisions based on the type of tourism, price, and facilities and the results can provide recommendations for tourist attractions that meet these criteria. Resolution of traveling salesman problem with greedy algorithm [1], Tourism selection using technique for order preference by similarity to ideal solution (TOPSIS) with visualization of object location [3], Decision support system for selection of superior waterfall tourism by using TOPSIS method in Pesawaran district [4], Decision support system for determining tourist sites with the TOPSIS method. Journal of Information Technology and Computer Science [6].

Keywords : *Tourism, Recommendation System, TOPSIS, Greedy*

1. Introduction

Bali is one of the favorite destinations for local and foreign tourists. Cultural attraction, natural beauty, and hospitality provided by the Balinese people make tourists feel at home for long in Bali. Bali is indeed a tourist place that offers the best complete package as a vacation destination, not only offering beauty, but Bali is also complete with lodging and culinary. reported by (idntimes.com, 2018), it is said that Bali is indeed the best complete tourism destination as a holiday destination. Its fantastic nature, culture, and man-made. Every time there is always a different experience offered by Bali. [5] In general, tourists prefer to travel independently because they can freely determine their own tourist destination rather than using a travel agent that requires tourists to follow the travel packages that have been provided.

However, this certainly does not always make efficient travel plans for tourists because they want to visit as many attractions as possible in a short time, eventually, they only visit a few attractions because of inefficient travel schedules. Based on the above problems as an alternative to solving this problem, namely by making a recommendation system for the selection of tourist attractions using the TOPSIS method that can help tourists to choose tourist attractions based on existing comparison criteria, and then the Greedy algorithm will work for the shortest path search. The existence of this recommendation system is expected to provide convenience and help tourists to determine their travel plans and support tourism on the island of Bali to be better.

2. Reseach Methods

Data collection in this study was obtained from literature study methods or secondary data that can be obtained from the Bali Provincial Tourism Office (DISPARDA). The data to be sought from the Bali Provincial Tourism Office are tourist attractions, addresses, price of admission (ticket), operating hours (issued). This data is useful for adding data to the bank's objectives. While for rating and distance using the help of Google maps as rating data for tourist attractions and the distance between tourist attractions. After the data is obtained it will be processed using the application that will be created with the steps taken:

1. Collect data from Bali DISPARDA and input it into the system.
2. Validate data already obtained by testing quality and validity.
3. Testing the hypothesis which will be tested later towards the proposition. Whether the proposition is accepted or rejected.

Research Design The research design used in this study is the correlational research design. According to Suryabrata (2000), correlational research design is to detect the extent to which variations on a factor are related to variations on one or more other factors based on the correlation coefficient. correlative relationships refer to the tendency that variations in one variable are followed by variations in other variables thus in a correlational design usually involves at least 2 variables. Thus if there are 2 variables studied, each is an independent variable and the dependent variable. The use of this research design is focused on digging up data then correlating with each other and then finally being able to answer the problem that is happening.

3. Result and Discussion

For its implementation, the TOPSIS Method will later be applied into the decision support system in the selection of tourist attraction locations by providing a list of output results recommended tourist attractions that have been ranked and can later be visited by potential tourists.

The search for nearby attractions is included in the Traveling Salesman Problem (TSP) because many people (tourists) do not yet know the route of the tourist attractions so spend a lot of time on the trip and tend to be ineffective. Therefore we need a solution on how to find out the shortest route to reach a destination.

The search for an efficient travel route is one of the important things that must be there because planning a travel route will provide convenience in determining the path to be taken with the shortest distance so as to shorten time, energy and costs. The following is a list of tourist attractions in Bali around Badung and Denpasar which are quite popular for tourists : [2]

Nama Tempat Wisata	Tipe	Visitor	Rating	HTM
Taman Budaya (Art Centre)	Monumen	19500	4.5	25000
Pantai Sanur	Pantai	25460	4.4	2000
Pulau Serangan	Pantai	21840	4.2	0
Museum Bali	Museum	23140	4.4	50000
Monumen Perjuangan Rakyat Bali	Monumen	24120	4.6	25000

p-ISSN: 2301-5373
e-ISSN: 2654-5101

Pantai Kuta	Pantai	48260	4.4	0
Pantai Nusa Dua	Pantai	35760	4.4	5000
Pantai Tanjung Benoa	Pantai	20560	4.4	0
Pantai Legian	Pantai	42510	4.4	0
Kawasan Luar Uluwatu	Pura	34570	4.6	30000
GWK	Monumen	54300	4.5	200000
Pantai Canggu	Pantai	19780	4.3	0
Pantai Petitenget	Pantai	30760	4.4	0
Pantai Labuhan Sait	Pantai	24250	4.4	5000
Pantai Suluban	Pantai	33750	4.5	5000
Pantai Dreamland	Pantai	27500	4.5	0
Pantai Jimbaran	Pantai	18500	4.4	0
Pantai Brawa	Pantai	36500	4.3	0
Pantai Padang – Padang	Pantai	19800	4.3	4000
Pantai Pandawa	Pantai	44200	4.5	8000

Figure 1. list of all tourist attractions

For the process to recommend the tourist attractions will go through several processes, namely choosing tourist attractions with a radius of a few km from where you live, inputting prices, the system combination process and finally the ranking using TOPSIS.

1. The user selects the nearest tourist spot

The main step taken is the user chooses the nearest tourist spot whose radius is less than a few miles from where he lives.

Decision Criteria

No.	Criteria	Distance
1.	Price	200000
2.	Distance	10km

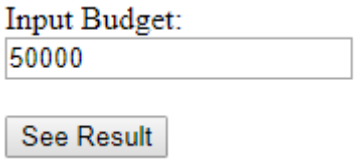
See Result

No.	Nama Tempat	Tipe	Visitor	Rating	HTM
1.	Pantai Nusa Dua	pantai	35760	4.4	5000
2.	Pantai Tanjung Benoa	pantai	20560	4.4	0
3.	GWK	Monumen	54300	4.5	200000
4.	Pantai Dreamland	pantai	27500	4.5	0
5.	Pantai Jimbaran	pantai	18500	4.4	0
6.	Pantai Pandawa	pantai	44200	4.5	8000

Figure 2. list of tourist attractions less than 10km and price 200000

2. User input their budget

The second step is the user inputting the budget they have to be able to go to the desired tourist attractions.



Kode	Nama Wisata	Type	Visitor	Rating	HTM
A1	Pantai Nusa Dua	Pantai	35760	4.4	5000
A2	Pantai Tanjung Benoa	Pantai	20560	4.4	0
A3	GWK	Monumen	54300	4.5	200000
A4	Pantai Dreamland	Pantai	27500	4.5	0
A5	Pantai Jimbaran	Pantai	18500	4.4	0
A6	Pantai Pandawa	Pantai	44200	4.5	8000

3. The system will combine every possible tourist destination obtained

In this process, the system will combine each tourist site that has been listed previously. Then the best combination will be produced with the closest distance that has been calculated using the greedy algorithm.

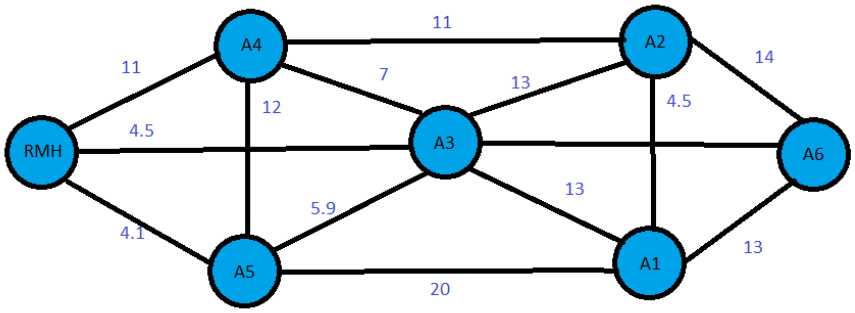


Figure 3. Distance between houses, tourist attractions and other nearby attractions

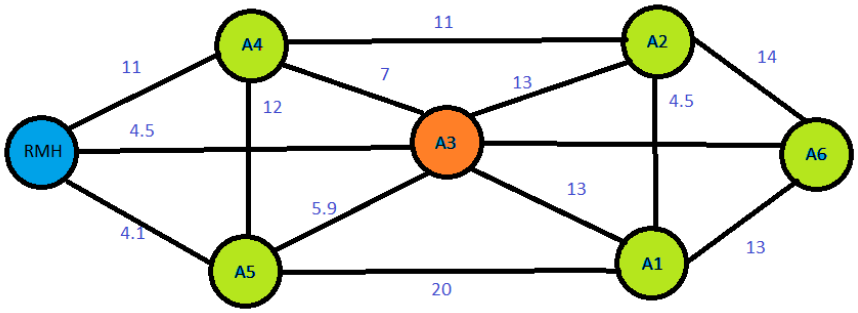


Figure 4. Route obtained from home to tourist attractions

p-ISSN: 2301-5373
e-ISSN: 2654-5101

Based on the greedy algorithm calculation, the tourist routes A5, A4, A2, A1, and A6 start from RMH to the final destination, A6. but in this case, A3 is not included in the recommendation because the budget user is less than the price of a tourist entrance ticket. Therefore, A3 will not be included in the list of recommended tourist attractions based on the user's budget.

4. Ranking using TOPSIS

After getting the best combination, the ranking process will be done using the TOPSIS method.

a. Determine criteria with certain weights

Kode	**Kriteria**	**Atribut**	**Bobot**
C1	Harga	cost	4
C2	Visitor	benefit	5
C3	Rating	cost	3
C4	Jarak	benefit	5

Table 1. criteria table

b. Determine the normalized matrix

Kode	Nama Wisata	C1	C2	C3	C4
A1	Pantai Nusa Dua	4	5	4	2
A2	Pantai Tanjung Benoa	5	3	4	2
A3	GWK	2	5	5	2
A4	Pantai Dreamland	5	4	4	2
A5	Pantai Jimbaran	5	3	4	2
A6	Pantai Pandawa	4	5	4	2

Table 2. normalization table

c. The next step is to square the values of C1, C2, C3, and C4

C1	C2	C3	C4
16	25	16	4
25	9	16	4
4	25	25	4
25	16	16	4
25	9	16	4
16	25	16	4
111	109	105	24

Table 3. squaring table

d. After getting the total, all you have to do is normalize by dividing each element of the matrix table 2
with the root *(sqrt)* of the total corresponding rows.

C1	C2	C3	C4
0.379663198	0.47891314	0.390360029	0.40824829
0.474578998	0.28734789	0.390360029	0.40824829
0.189831599	0.47891314	0.487950036	0.40824829
0.474578998	0.38313051	0.390360029	0.40824829
0.474578998	0.28734789	0.390360029	0.40824829
0.379663198	0.47891314	0.390360029	0.40824829

Table 4. matrix rooting table

e. Next is to do the weighted normalization. Weighted normalization is obtained from the matrix multiplication in table 4 (normalization) with table 1 (weighting criteria).

C1	C2	C3	C4
1.518652793	2.394565713	1.171080088	2.041241452
1.898315992	1.436739428	1.171080088	2.041241452
0.759326397	2.394565713	1.463850109	2.041241452
1.898315992	1.91565257	1.171080088	2.041241452
1.898315992	1.436739428	1.171080088	2.041241452
1.518652793	2.394565713	1.171080088	2.041241452

Figure 5. weighted ormalization table

f. Next is determining the ideal solution matrix. The ideal solution matrix is obtained based on weighted normalization and attribute criteria (cost or benefit). The positive ideal solution is to take the maximum value from weighted normalization if the benefit criterion attributes if the cost is taken the minimum value. Instead, the positive ideal solution is taken the minimum value of normalized weighted if the attribute benefit criteria, if the maximum cost is taken.

Positive => (max | benefit), (min | cost)

Negative => (min | benefit), (max | cost)

The results can be seen in the following table:

#	C1(Cost)	C2(Benefit)	C3(Benefit)	C4(Cost)
Positive	0.759326397	2.394565713	1.463850109	2.041241452
Negatve	1.898315992	1.436739428	1.171080088	2.041241452

Figure 6. ideal solution matrix table

g. The next step is to look for totals and rankings. To find the totals and ranks, we must find the distance of the ideal and negative solutions obtained from table 5 (weighted normalization) and table 6 (ideal solution table). The trick is to squeeze the difference between each element of the normalized weighted matrix with an ideal solution matrix, then add up each alternative, after that it is rooted.

POSITIF	NEGATIF	PREFENSI
7.19266938	6.964693512	0.491948505

p-ISSN: 2301-5373
e-ISSN: 2654-5101

6.73435119	6.695048626	0.498536697
7.10494063	6.73435119	0.486610968
7.017874929	6.914139677	0.496277091
6.73435119	6.695048626	0.498536697
7.19266938	3.684880798	0.338760175

Figure 7. ideal solution distances and preferences table

Preference is obtained from dividing the negative ideal divided by the sum of the positive and negative ideal.

h. The last is to look for the final score by adding a preference result with a total weight of C1, C2, C3, and C4 from each tourist destination. the result is as below

PREFENSI	BOBOT	FINAL SCORE
0.491948505	15	15.49194851
0.498536697	14	14.4985367
0.486610968	14	14.48661097
0.496277091	15	15.49627709
0.498536697	14	14.4985367
0.338760175	15	15.33876017

Figure 8. the final score by weighting

i. Final results ranking with TOPSIS

Ranking	Nama Tempat Wisata	Visitor	Rating	HTM	Final Score
1	Pantai Dreamland	27500	4.5	0	15.49627709
2	Pantai Nusa Dua	35760	4.4	5000	15.49194851
3	Pantai Pandawa	44200	4.5	8000	15.33876017
4	Pantai Tanjung Benoa	18500	4.4	0	14.4985367
5	Pantai Jimbaran	20560	4.4	0	14.4985367
6	GWK	54300	4.5	200000	14.48661097

Figure 9. final table ranking results with TOPSIS

The TOPSIS method successfully ranked different values in 6 locations. There are two locations that still have the same value, namely 14.4985367 at rank 4 and 5. This happens because the requested value is really the same on all criteria. but for ranking 4 and 5 can be seen from the distance of the previous tour with a distance of tours 4 and 5.

4. Conclusion

The study was conducted using 20 tourist destinations and 4 criteria. Criteria weights are obtained by processing the results of input values by the user based on user fees. Price and distance criteria are cost criteria while visitors and ratings are benefits. TOPSIS ranks based on the final score obtained by calculating the distance from the positive and negative ideal

solutions. The ranking results are given by TOPSIS basically succeeded in ranking them with different values.

The TOPSIS method succeeds in providing recommendations on tourist attractions with the closest distance and user-defined costs. TOPSIS provides recommendations by ranking all tourist attractions. TOPSIS ranking is based on the final score obtained by calculating the distance from the positive and negative ideal solutions.

Future studies are expected to be integrated with Google Maps, so they can provide better recommendations by showing tourist locations. In addition to tourist sites that have the same value, ratings can be given according to user proximity. not only that, the recommendation method is expected to use another method and better than this method.

References

[1] Andi Lukman, STIMED Nusa Palapa, AR Rubinah, and AMIK Rizky. Penyelesaian travelling salesman problem dengan algoritma greedy, 2011.
[2] Dinas Pariwisata Provinsi Bali. 2019. *Buku Direktori 2019.* https://disparda.baliprov.go.id/buku-direktori-2019/. 2019.
[3] Dwi Ely Kurniawan. Pemilihan wisata menggunakan technique for order preference by similarity to ideal solution (topsis) dengan visualisasi lokasi objek. KLIK KUMPULAN JURNAL ILMU KOMPUTER, 5(1):75–86, 2018.
[4] Eka Aprilia and Sri Ipnuwati. Sistem pendukung keputusan pemilihan wisata air terjun unggulan dengan menggunakan metode topsis di kabupaten pesawaran. PROCIDING KMSI, 6(1):53–61, 2018.
[5] IDN Times and Riyan Sumarno. 15 destinasi wisata keren di bali yang harus dan wajib dikunjungi, 2019.
[6] Putri Alit Widyastuti Santiary, Putu Indah Ciptayani, Ni Gusti Ayu Putu Harry Saptarini, and I Ketut Swardika. Sistem pendukung keputusan penentuan lokasi wisata dengan metode topsis. Jurnal Teknologi Informasi dan Ilmu Komputer, 5(5):621–628, 2018.