

Testing for Recommendation Method in M-Health Sports Venue Recommendation System



Ratih Kartika Dewi, Yuita Arum Sari, Agus Wahyu Widodo, Faishal Pradipta Astungkoro, Nurul Ilmi Muhlisah Aziz

Abstract: Exercising can make the body produce more endorphins so people with regular exercise are more resistant to stress than those who have little physical activity. We can get a recommendation of the sport venue in search engine, but it can't accommodate personal preference. The mobile application for sports venue recommendations (M-health) with specific attribute weighting that can accommodate user preference for a specific attribute can be implemented with the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) algorithm. TOPSIS was chosen as a recommendation algorithm because it has a relatively low level of algorithm complexity, so it is suitable to apply in mobile devices. To test the recommendations that are processed with TOPSIS, correlation testing is done as an alternative test besides accuracy. In general, the system takes the user's location coordinates and then recommends a Futsal court based on location, price and the number of courts. First, the user is inquired to enter the weights for each criterion. Then the user gets a recommendation for a Futsal court recommendation according to the user's current location. If the user wants detailed information about the desired futsal location, the user can click on one of the futsal places and then the detail page will be appear. After seeing the details of the selected futsal place, users can view the map to go to the relevant sports venue from the user's current location. Testing the recommendation system was based on correlation testing to see the correlation between the recommendations built by the system compared to the user's preference choices. Correlation testing was carried out to see whether there was a relationship between the results of the TOPSIS recommendation and the user's preference of sport venue. The correlation between them shows a positive correlation with a value of 0.770769231.

Keywords: Mobile Recommender System, TOPSIS, M-Health, Test Of Correlation.

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I. INTRODUCTION

Exercise and sport became a trend by internet users according to [1]. Most of the internet users that are seeking information about sport and exercise are using smartphone. So, it is appropriate to develop sports venue recommendations that is applied in mobile application, by using internet and GPS of a smartphone. Sports venue recommendations in this research are based on sports venues that located in Malang which include futsal fields [2], badminton [3], tennis [4], martial arts training center [5], cycling track [6], jogging tracks [7], and the gym [8]. Each sports venue has an alternative recommendation that is different from each other, for example in the recommended badminton court the alternative is the badminton court in Malang, while for the gym recommendation, the alternative is a gym or fitness center. Data is taken from May 2018 to May 2019.

The TOPSIS algorithm was chosen as a recommendation algorithm because it can accommodate multi attribute decision making and has a relatively [9] low level of algorithm complexity, so it is suitable to apply in mobile devices. In the recommendation system, TOPSIS is a multi-attribute decision making method [10]. In addition, TOPSIS also provides recommendations based on the shortest distance from the positive ideal solution and the longest distance from the negative ideal solution to generate recommendations [11]. TOPSIS has a simple concept, easy to understand, and a simple computational process and is able to make the most ideal solution decisions [12].

Based on research [13] TOPSIS can provide recommendations that are more rational like humans, and easy to apply even in the form of spreadsheets. Also, in research [14] TOPSIS has the lowest reversal rating when compared with other methods such as ELECTRE, MEW, SAW, and four versions of AHP.

Because of its subjectivity, accuracy testing was used for sports venue recommendations to test the reliability of TOPSIS. Therefore, a correlation test is recommended to see if there is a relationship between the results of the TOPSIS recommendations and the user's preference for a sports venue. This test was carried out to measure the results of recommendations based on TOPSIS for the sports venue recommendations problem.

II. TOPSIS

The recommendation of this research use TOPSIS as a recommendation method. The outputs produced using the TOPSIS algorithm are recommendations for sports venues starting from the highly recommended to the low recommended. TOPSIS was first discovered in [15]. The computational steps are as follows [15]:

A. Create a Normalized Decision Matrix

The normalized decision matrix (r_{ij}) of the X_{ij} is shown in Equation 1. Where X_{ij} is the original decision matrix, which contains criteria and alternatives and $i, j = \{1, 2, 3, \dots, m\}$.

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}} \quad (1)$$

B. Create The Weighted Normalized Decision Matrix

The weighted normalized decision matrix with weight W are shown in Equation 2. With the problem of sports venue recommendations, weight W is given the same value ($W=1$) to equate all the weight value, so that the weight value does not affect the results of the recommendation.

$$V = \begin{bmatrix} w_1 r_{11} & \Lambda & w_n r_{1n} \\ M & O & M \\ w_1 r_{m1} & \Lambda & w_n r_{mn} \end{bmatrix} \quad (2)$$

C. Determine the Positive and Negative Ideal Solution.

The calculation of the positive ideal solution (A^+) and the negative ideal solution (A^-) are shown in Equation 3 and Equation 4, where $j = 1, 2, \dots, m$.

$$A^+ = \{(\max v_{ij} | j \in J) (\min v_{ij} | j \in J), i = 1, 2, 3, \dots, m\} = \{v_1^+, v_2^+, \dots, v_m^+\} \quad (3)$$

$$A^- = \{(\min v_{ij} | j \in J) (\max v_{ij} | j \in J), i = 1, 2, 3, \dots, m\} = \{v_1^-, v_2^-, \dots, v_m^-\} \quad (4)$$

D. The Separation Measure

The measurement of the distance from an alternative to the positive ideal solution (A^+) and the negative ideal solution (A^-) are shown in Equation 5 and Equation 6.

$$S_i^+ = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^+)^2} \quad (5)$$

$$S_i^- = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^-)^2} \quad (6)$$

E. The Distance of Alternatives to the Ideal Solution.

The relative closeness of an alternative to the positive ideal solution (A^+) and the negative ideal solution (A^-) is shown in Equation 7, .

$$C_i^+ = \frac{S_i^-}{S_i^- + S_i^+} \quad (7)$$

F. Calculate Ranking

The alternative ranking is obtained based on the order of C_i^+ . An alternative of sport venue with the largest value of C_i^+ is highly recommended.

III. METHODOLOGY

The research methodology in this study can be shown in Figure 1. First, we determine the criteria and applying TOPSIS algorithm as in chapter 2. Then, recommendation results generated as in chapter 4.

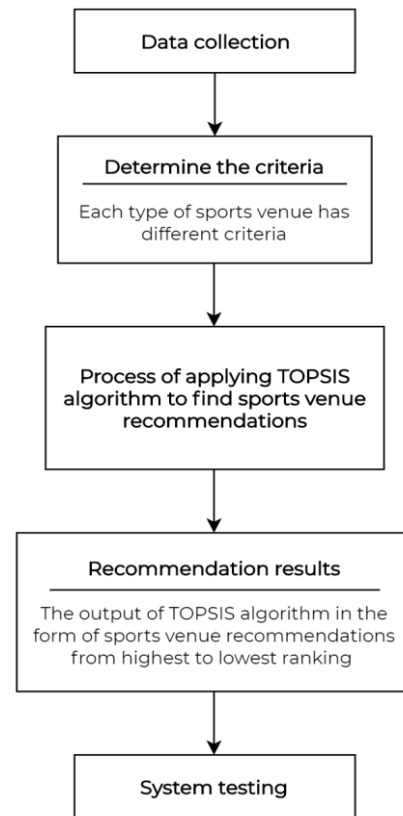


Fig. 1 Research Methodology

Data acquired from sports venue data in Malang. Each type of sports venue has different criteria for each recommendation system. The recommendations system using the management model in the form of an algorithm-based model such as TOPSIS. The output by using TOPSIS is a recommendation for a sports venue starting from the first ranking or the highest-ranking (the most recommended) to the lowest ranking. The final step is to test the system with a correlation test to see whether there is a relationship between the results of the TOPSIS recommendations and the user's choice of a sports venue. Test of correlation in decision support system has been conducted in [16] in case of recipe recommendation system.

IV. RESULTS AND DISCUSSION

In general, the system takes the user's location coordinates and then recommends a futsal court based on location, price and the number of courts. Recommended sports venues that are used as samples are futsal field recommendations.

Fig. 2 is the main page of the application. On this page the user is inquired to enter the weights for each criterion. Then the user gets a recommendation for a futsal court recommendation according to the user's current location as in Fig. 3. If the user wants detailed information about the desired futsal location, the user can click on one of the futsal places and then the detail page will be appear.



Fig. 2 Main Page

After seeing the details of the selected futsal place, users can view the map to go to the relevant sports venue from the user's current location. This feature utilizes Google Maps to provide travel routes from current location to the recommended sports venue.

Testing the recommendation system was based on correlation testing to see the correlation between the recommendations built by the system compared to the user's preference choices.



Fig. 3 Recommendation Page

Table I shows the results of futsal field ranking recommendations in the form of ranking built with TOPSIS, compared to the user's choice ranking.

As shown in Table 1, calculating the correlation between TOPSIS ranking and the ranking of user choices shows a correlation value of 0.770769231. This means that the two have a positive relationship and the value is close to 1.

Table I: Ranking of TOPSIS Recommendation and User Recommendation

Futsal Field/Court	TOPSIS Ranking	User's Choices Ranking
Ch**pions Futsal	6	1
H* Futsal	25	25
Ch**pion Futsal Tidar	5	4
Ch**pion Futsal Araya	13	8
K**k Off Futsal	18	18
C*esar Futsal	7	15
R*I Soccer Zone Futsal	8	19
V**a Futsal	3	5
J**k's Futsal	9	9
Es*ulso Futsal	17	17
B**u Futsal	22	22
B**na Futsal	11	11
Wi**ya Putra Futsal	20	20
Top T** Futsal	23	23
Fut**1 88	21	21
Ang**sa Futsal	16	16
Ch**pion Futsal Tlogomas	2	13
Olj**ico Futsal	14	14
Ch**pion Futsal Suhat	4	3
O**isnade Futsal	15	7
A*M Futsal	19	6
Ni**Mirah Futsal	12	12
Ni**las Futsal 1	24	24
Z**a SM Futsal	1	2
The S**rpion Futsal	10	10
CORRELATION	0.770769231	

V. CONCLUSION

A mobile application to recommends a sports venue is needed to support the user's health. TOPSIS algorithm was chosen as the algorithm to make recommendations. For testing the result of recommendations processed with TOPSIS, correlation testing is performed to see whether there is a relationship between the results of TOPSIS recommendations and the user's choice of the sports venue. The correlation between the two shows a positive correlation with the value of 0.770769231.

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