ISSN: 0975-833X

Available online at http://www. journalcra. com

International Journal of Current Research
Vol. 9, Issue, 12, pp.62331-62333, December, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

A HYBRID DYNAMIC RECOMMENDER SYSTEM USING SIMPLE ADDITIVE WEIGHTING METHOD FOR SERVICE SEARCH WITH COLLABORATIVE FILTERING

***Maricel A. Esclamado, Juvert C. De Los Reyes, Kendie D. Cagud, Marileth L. Piquero and Maria Theresa Tulang**

Department of Information Technology, University of Science and Technology of Southern Philippines

ARTICLE INFO

Article History:
Received 10th September, 2017
Received in revised form
07th October, 2017
Accepted 24th November, 2017
Published online 27th December, 2017

Key words:
Recommender System,
Multi-Criteria Decision Making Method,
Collaborative Filtering, Simple Additive Weighting, Web Application.

ABSTRACT

This paper describes the development of a dynamic recommender system which provides clients the recommended services based on their preferences. This system is said to be dynamic since the weight of each criterion is defined by the user. In addition, preferences of other users is also included in ranking the recommended services through the use of collaborative filtering. This provides a specific user an idea of what others preferred and may help the user in finding the best offer. In this paper, a Simple Additive Weighting (SAW) method is used to create a function to calculate the ranking score of each possible service that match the user preferences. The criteria used for the service search includes the primary factors in choosing a service such as cost, location, and rating from other clients. In addition, one of the criteria is the preferences of other users which is processed through collaborative filtering. A web application is developed to provide interface for the clients where they can search services according to their preferences. In this paper, the service search is tested on event services. Usability testing is conducted and results revealed that users strongly agree with the usefulness of the system.

Citation: Maricel A. Esclamado, Juvert C. De Los Reyes, Kendie D. Cagud, Marileth L. Piquero and Maria Theresa Tulang, 2017. "A Hybrid Dynamic Recommender System using Simple Additive Weighting Method for Service Search with Collaborative Filtering .", *International Journal of Current Research*, 9, (12), 62331-62333.

INTRODUCTION

Recommender systems provide a technology that help users in finding services online. These systems provide convenience to the user since all they have to do is just input some parameters and then get recommendations. However, some recommender systems are not dynamic that would cater the variety of users. Some users prefers one criterion over the other and some users wants to consider the preferences of others. Users tend to change preferences every now and then especially to a variety of services available. Dynamic recommender systems are classified to three categories namely content-based filtering (CBF), collaborative filtering (CF) and hybrid system. Content-based Filtering (CBF) builds a profile for a user based on the content features of the items previously rated by the user. The disadvantage of using this method is that the recommended items are similar to previous recommendations. Collaborative Filtering (CF) examines user's ratings to identify similarity between users on the basis of their past ratings, and then generates new recommendations based on like-minded users' preferences (Rana and Jain, 2015).

Corresponding author:* **Maricel A. Esclamado,
Department of Information Technology, University of Science and Technology of Southern Philippines.

In this paper, a hybrid dynamic recommender system is used to combine the advantages of other methods. This recommender system also allows users to adjust weights to parameters. Thus enhancing the flexibility of the system. Multi-criteria decision analysis methods have been utilized to different areas of application over the last several decades. In this paper, the simple additive weighting (SAW) method is used which has the ability to compensate among criteria (Velasquez and Hester, 2013), in which in this paper the weight of each criterion can be adjusted. This paper combines the different methods presented to create a hybrid dynamic recommender system suitable to the variety of users and the dynamic taste of each user.

METHODOLOGY

Calculating Ranking Score using Simple Additive Weighting (SAW) Method

Using the SAW method, the function to get the ranking score for each service is the addition of the scores for each parameter which corresponds to the criterion multiplied by its weights. In this study which specifically tested on event services, the parameters such as cost, location, and rating from other clients are considered.

$$P = ((B \times w_B) + (R \times w_R) + (L \times w_L)) \quad (1)$$

where, P = ranking score based on input parameters

B = budget parameter score
R = rating parameter score
L = location parameter score
w_B = input weight of the budget paramater
w_R = input weight of the rating paramater
w_L = input weight of the location parameter

Tables 1, 2, and 3 list the corresponding positive values for each parameter before it is used in the calculation of the ranking score

Table 1. Scores of the Budget parameter (B) with the corresponding conditions

Rating Parameter (R) Score	Conditions Let: *rating*, the rating of the package
5	4 < rating <= 5
4	3 < rating <= 4
3	2 < rating <= 3
2	1 < rating <= 2
1	0 < rating <= 1

Table 2. Scores of the Rate parameter (R) with the corresponding conditions

Budget Parameter (B) Score	Conditions Let: X_b, the amount of budget inputted by the user and *Price,* the amount of price of a certain package
5	X_b > Price
4	X_b = Price
3	X_b < Price < (X_b + 10% X_b)
2	X_b < Price < (X_b + 20% X_b)
1	(X_b + 20% X_b) < Price

Table 3. Scores of the Location parameter (L) with the corresponding conditions

Location Parameter (L) Score	Conditions Let: *distance*, the distance of the nearest venue of the event the service can offer
5	distance < 1 km
4	1km <= distance < 5km
3	5km <= distance < 10km
2	10km <= distance < 20km
1	distance >=20km

Collaborative Filtering

To enhance the ranking of the recommended services, data of preferences from many users that match the category of the service the client is searching is included to give the client an option of getting suggestions from other users based on the ratings given by the group of users.

$$Ranking\ Score = P + (CF \times w_{cf}) \quad (2)$$

where, P = ranking score based on input parameters

CF = score from collaborative filtering which is the average of all the ratings given by the group of users

w_{cf} = input weight for the collaborative filtering

Considering equations 1 and 2, the sum of the weights (w_B, w_R, w_L, *and* w_{cf}) should be equal to 1.

Development of the Web Application

A web application is developed to provide an interface to the user where they can input parameters and set weights. Figure 1 shows the system architecture that shows how the data flows in the system.

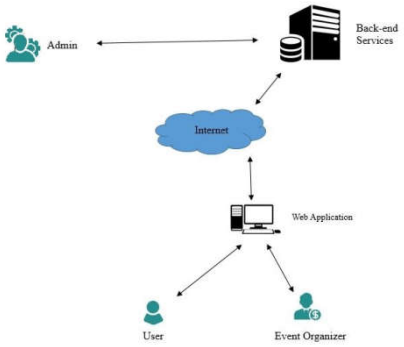

Figure 1. System Architecture

RESULTS AND DISCUSSION

Web Application

A.1 Interface for the Service Provider

The web application provides the service provider specifically the event organizer an interface to input the services they offered to the system as shown in figure 2. The data is then stored in a server which is managed by the admin

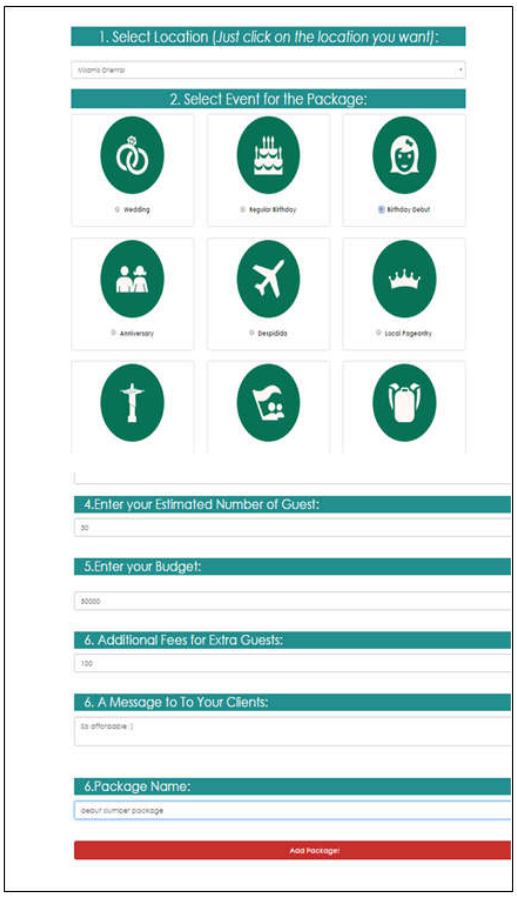

Figure 2. Interface for Service Provider

A.2 Interface for the Client Searching for Recommended Services

The web application provides the user an interface to input values to parameters and set weights as shown in Figure 3. Figure 4 shows a sample of search results.

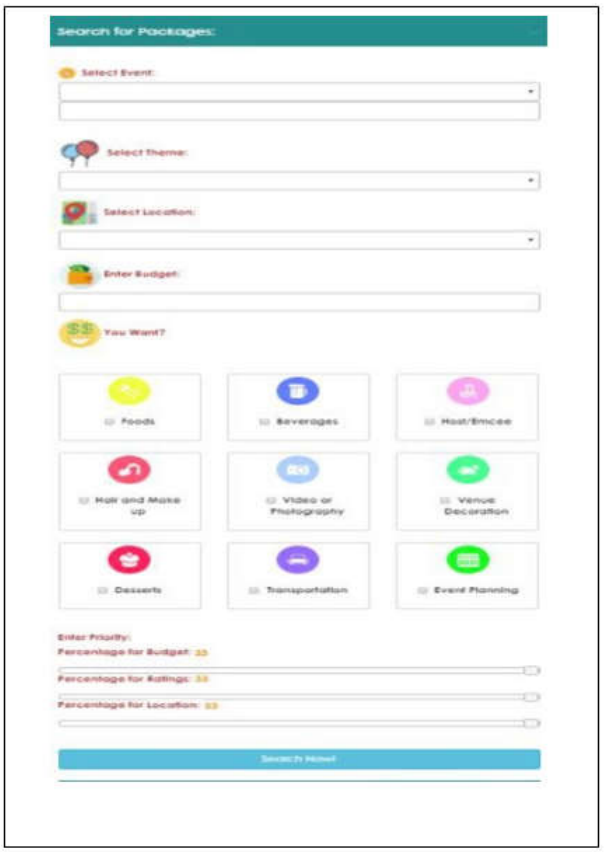

Figure 3. Interface for Client to input parameters and to set weights

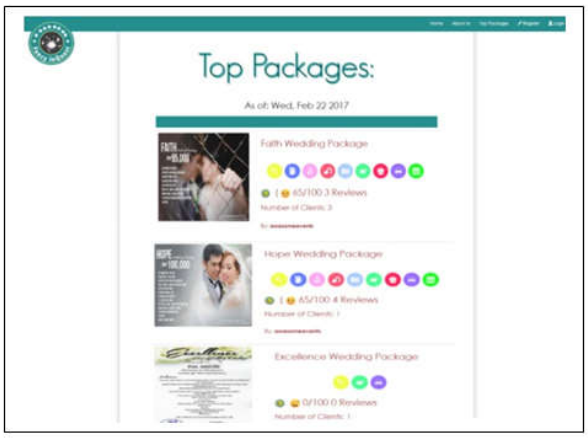

Figure 4. sample search results

Evaluation Results

A survey is conducted regarding on the usability of the system. There are ten (10) questions in a survey with four (4) choices: strongly disagree, disagree, agree and strongly agree. Table 4 list the questions used in the survey. Figure 5 shows the results of the survey. Based on the results, majority of the correspondents agree on the usability of the system.

Table 4. List of Questions on the survey questionnaire

N	Questions
1	I think that I would like to use this system.
2	I found the system complicated.
3	It was easy to learn to use this system.
4	I think that I would need the support of a technical person to be able to use this system.
5	I found the various functions in this system were well integrated.
6	I thought there was too much inconsistency in this system.
7	I would imagine that most people would learn to use this system very quickly.
8	I found this system very awkward to use.
9	I found the system very difficult to use.
10	Overall, I am satisfied with how easy it is to use this system.

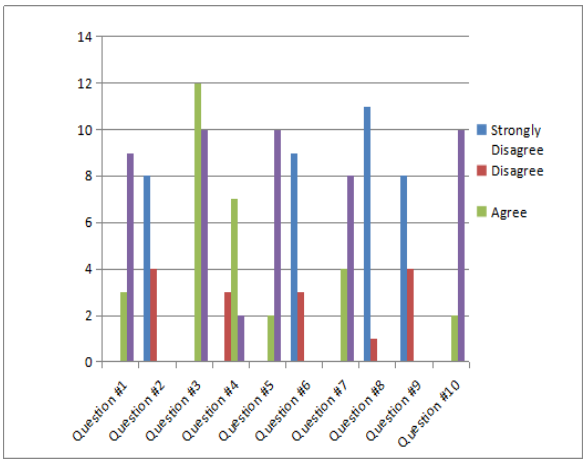

Figure 5. Results of the Survey on Usability

Conclusion

The researchers concluded that the development of the dynamic recommender system has helped in terms of finding services according to client's preferences which provides more flexible options to users and also suggest options to users based on the preferences of others. Specifically, implementing this to event services provides a convenient way for clients to search services and provides event organizers and service providers a way they can market their services.

Acknowledgment

The researchers were grateful to the correspondents and service providers/event organizers who provided the researchers the necessary data.

REFERENCES

Rana, C. and Jain, S.K. 2015. "A Study of the Dynamic Features of Recommender Systems", *Artificial Intelligence Review*, vol. 43, No. 1, pp. 141-153.

Velasquez, M. and Hester, P.T. 2013. "An Analysis of Multi-Criteria Decision Making Methods", *International Journal of Operations Research*, vol. 10, No. 2, pp. 56-66.

Ding, Y., Li, X. and Orlowska, M. 2006. "Recency-based Collaborative Filtering", Proceedings of the 17th Australian Database Conference, vol. 49, pp. 99-107.

Burke, R. 2010. "Evaluating the dynamic properties of recommendation algorithms", 4th ACM conference on recommender systems, p. 225-228.

Ricci, F., Rokach, L., Shapira, B. 2010. "Introduction to Recommender Systems Handbook", Recommender Systems Handbook, pp. 1-35.

****