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Developing a Personal Recommender System for Homestay Services using TOPSIS Method

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Abstract
Homestay Perlis recommender system is a web-based application system developed for users to find the best homestay services in Perlis. This system functions as: i) recommending the best homestay in Perlis and ii) receive review of homestays from the users. User requirements were identified through a survey. A set of questionnaire was distributed, and several criteria to select a homestay were identified. The collected data from experienced users were used to calculate the result using TOPSIS method. From the requirements, an application of a recommender system was designed and developed. The advantage of this system is the recommendations for the homestay are based on the criteria that meet users' priority. Besides that, the system able to help users to make a right decision in order to choose a homestay that meets their preferences and requirements. The usability test and the user acceptance test were conducted in the study. Results from usability test that focuses on the system's design, navigation, content, understanding and interactivity show that the recommender system is easy to navigate, fast loading and easy to understand. The user acceptance test measures the aspects of developing a website which are reactions to the website, interface design, navigation and the content for developing a website, which indicates high mean values showing that the recommender system is accepted by the users. Generally, the objectives of this research are successfully achieved.

Keywords: *homestay services, recommender system, tourism, user satisfaction, web-based system*

Introduction

Accommodation is a vital aspect of the tourism product towards the tourists. The style, degree and landscape of accommodation define the capacity and worth of tourism that is potential at any destination. Tourist accommodation typically refers to traditional hotels of several categories, while alternative accommodation refers to establishments such as Guest houses, Service apartments and Commercial homes that provide paid to the tourists on short-term basis (Gunasekaran.N & Anandkumarb, 2012). Homestay is one of the alternative accommodations that are provided for the tourists with an authentic and local touch.

Due to the issue, the study focuses on the method of selecting the best homestay services based on fuzzy logic approach. A recommender system will be developed by using the method in order to help users to choose a homestay based on their preferences. Users will choose their favourites based on the criteria provided; therefore, the system will generate a result and suggest the best homestay service that meets their need. This recommender system will become a new medium to

recommend and provide the information to people who want to make a decision on selecting the best homestay services.

TOPSIS Method

i. Introduction

Multi Criteria Decision Making (MCDM) model based on fuzzy set theory refers to making decisions in the presence of multiple, usually conflicting, criteria. This relates to the selection of homestay that satisfies all the required criteria. There are several methods in MCDM, however, Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) method has been chosen in this study. The principle of the TOPSIS method is that the chosen alternatives should have the shortest distance from the ideal solution to the negative ideal solution.

ii. TOPSIS

TOPSIS method was first developed by Hwang and Yoon is one of the methods used to solve MCDM. The most crucial principle in TOPSIS is that the chosen alternatives should have the longest distance from the negative ideal solution and the shortest distance from the positive-ideal solution (Hwang and Yoon, 1981). This method is selected because it has simple process and also easy to program. Apart from that, the method is easy to understand and have the capability to remain the same quantity of the steps although there is problem about the size. However, TOPSIS method has its disadvantages. The Euclidean distance does not look at connection of attributes besides it is hard to weight and retain stability of judgement (Velasques& Hester, 2013).

In addition, in traditional TOPSIS, the rating and weight of the criteria are known precisely. However, there are many real situations involved crisp data, which are inadequate to represent the real life situation due to vagueness of human judgements and cannot be estimated with precise numeric values (Hwang and Yoon, 1981). In order to resolve the vagueness that often arising in information from human judgements, fuzzy set theory has been integrated in many MCDM methods including TOPSIS.

According to Ahi, Aryanezhad, Ashtiani and Makui (2009), TOPSIS method consists of a few steps that are explained in the Research Method. In fuzzy TOPSIS, all the ratings and weights are defined by means of linguistic variables. A linguistic variable is defined as variable which values are sentences in a natural or artificial language (Zadeh, 1973) and linguistically, useful and beneficial (Zimmermann, 1991) in dealing with the situation due to the concept of linguistic variable that is very difficult to be explained as a pre-set amount of terms.

Research Method

There are four phases involved in the study; i) Planning, ii) Design, iii) Implementation, and iv) Testing.

i. Phase 1: Planning

The area of the study has been defined during the feasibility study. In this study, web-based application was chosen as a recommender system for selecting the homestay services in Perlis. Besides, the study aims to identify the best homestay service using a web-based recommender based on MCDM approach using TOPSIS method.The web-based recommender became

assistance that recommends homestay based on users' preferences. Hence, the time taken for the users to select the best homestay service can be reduced.

Apart from that, all the information that related with this study was gathered and few journals and articles were reviewed together with the theoretical study on fuzzy logic, homestay services, MCDM and TOPSIS method. The deliverable in this phase is the literature review.

Other study that was conducted in this phase is finding the homestays that were included in this study. Homestays that available in Perlis according to the official directory of Ministry-registered homestays are Homestay Kampung Ujung Bukit, Homestay PayaGuring and Homestay Felda Mata Ayer. The criteria that influenced the selection of the homestays also were studied by distributing a set of questionnaire to 30 respondents. They were asked to select 7 criteria from 15 in the list of the questionnaire to find the most preferred criteria when choosing a homestay. The outcome from this activity is the 7 most chosen criteria by the respondents which are; price, safety, location, facility, comfortable, Internet service, and cleanliness.

Figure 1 display the overall phases with activities and outcomes of the study and the descriptions of each phase are described in the following sub-sections.

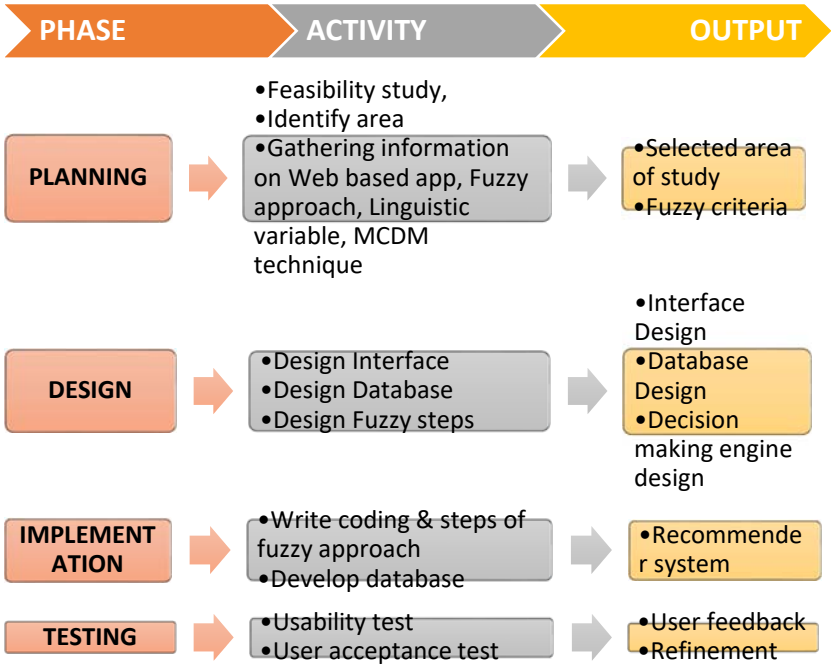


Figure 1: Method of Study

ii. Phase 2: Design

The activities that involved in this phase were designing the interface and the contents of the website. Besides that, designing a database and the steps in the TOPSIS method were included in this phase. The interface of a website played an important role to attract the users to return back once they had visit the website. Hence, the interfaces of the website have been designed by using

Axure RP Pro 7.0. The second activity involved was designing a database. phpMyAdmin has been used as a tool to design the database in order to come out with the database design structure.
Next activity is designing the recommender system using TOPSIS method. There are few steps involved (Ahi, Aryanezhad, Ashtiani and Makui, 2009) which are:

Step 1: Calculate normalized decision matrix.
Step 2: Calculate weighted normalized decision matrix.
Step 3: Define positive ideal solution and negative ideal solution.
Step 4: Compute the distances of each of the alternatives from positive ideal solution and negative ideal solution using equations.
Step 5: Calculate the relative closeness to the ideal solution.
Step 6: Rank order of priority.

iii. Phase 3: Implementation
In this phase, Adobe Dreamweaver is used to write the coding using PHP language, phpMyAdminfor the database which provides the recommender system.

iv. Phase 4: Testing
There were two testing that were conducted in this phase, which are usability test and user acceptance test. In the usability test, the user was assigned to complete the tasks given. During the test, the user was observed and the feedbacks on functionality are taken for refinement. User acceptance was carried out to investigate the user feedbacks toward the system. A set of questionnaire has been distributed to the users and they were asked whether the system able to meet their expectation. The result from the questionnaire has been documented as a research finding.

Findings and Analysis
i. Usability Testing
Usability testing is one of the techniques to ensure that the users that are using the system are able to carry out the assigned tasks effectively, efficiently and satisfactorily (Gaffney, 1999). Each of the respondents is given their time to provide feedbacks on the tested system. For this study, there is 10 respondents from various backgrounds were chosen to perform the tasks.

a) Website of Homestay Perlis Users
The respondents need to complete all of the ten tasks provided. They were interacted with the system based on the design, navigation, content, understanding and interactivity and give their comments and suggestions during the testing for improvement purposes.

Based on the observation, all of the tasks that were assigned to the respondents were successfully accomplished. They could understand the instructions stated in the website without any guideline given from the researcher. However, there were some parts of the website that need to be improved in order to make the website more user-friendly. The details of the refinements are explained in the next sub-section.

b) Refinement of the Website

Based on the observation and feedback from the respondents, the recommender system were refined to ensure that the website met the users' need satisfied them. The refinement details were explained in following Table 1 and Table 2.

Table 1: Change the Feedback Response of the Result for Homestay Review

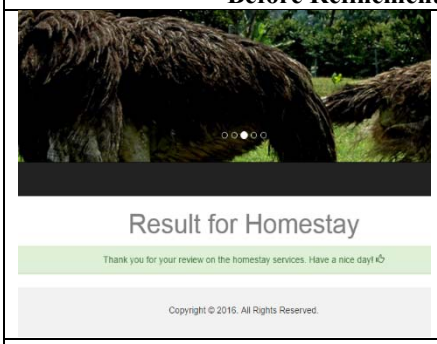
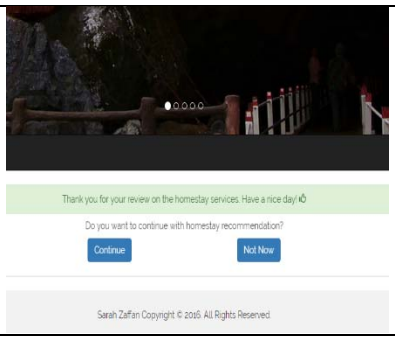
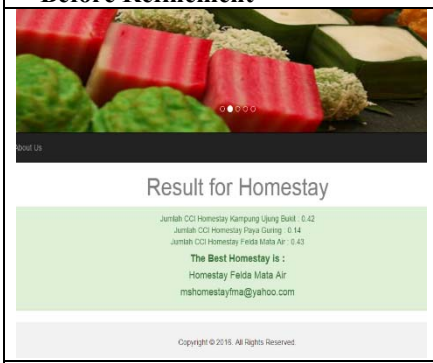
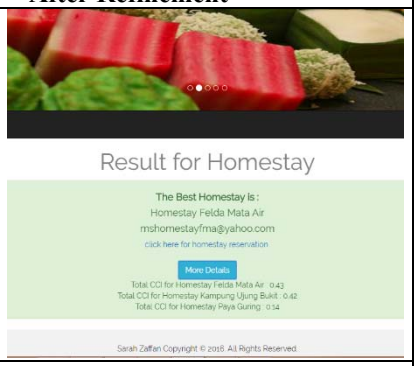
Before Refinement	**After Refinement**
	
The feedback response was quite simple. Besides, the users felt that it was quite difficult to proceed with the Homestay Recommendation since they need to return back to the Main Page and made the choice all over again.	The continue button was added to ease the users to proceed with the Homestay Recommendation. Besides, if they choose to not continue, they will simply returned back to the Main Page.

Table 2: Change the Pattern of the Result for Homestay Recommendation

Before Refinement	**After Refinement**
	
The result not only displays the best recommended homestay but also displays the result of the other homestays with their total Cci. The interface looked quite cluttered at the first impression. Besides, the homestays were not ranked according to their total Cci.	The result was decided to only display the best recommended homestay. However, if the users want to view the details of the result, they can simply hit the More Details button. The new interface of this page is more organized compared to the previous version.

From the analysis, it can be concluded that the users of the website of Homestay Perlis could complete the tasks given successfully. The recommender system is easy to navigate, fast loading and easy to understand.

ii. User Acceptance Test

After the refinement of the website is done, a user acceptance test was conducted in order to find out the user acceptance. The users were given a questionnaire and were asked to answer all questions based on their observation and perception on the recommender system. There are 15 questions were asked which considered all the aspects of creating a website such as the interface design, navigation, content and the users' reaction towards the system.

a) Descriptive Statistic

Statistical analysis, which is a descriptive statistic, is used in this study to describe and summarize the data that were collected from the test. The result of the acceptance test is shown in Figure 2 that detailed out the mean value for each of the questions.

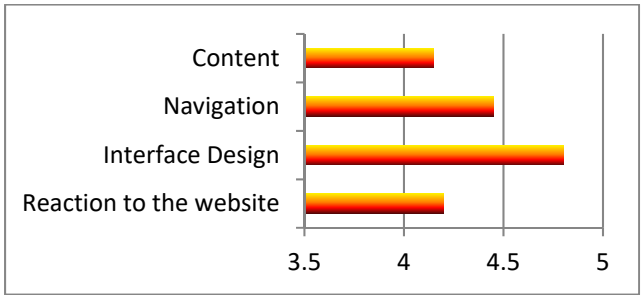


Figure2: Mean value for each aspect

All the mentioned aspects (reactions to the website, interface design, navigation and the content for developing a website) were measured using 5 Likert scale and the mean value for the entire questions are positive within a range between 3.70 and 5.From the result, it can be concluded that the recommender system is accepted by the users.

Conclusion and Recommendations

The web-based application, which is a website of Homestay Perlis, is a recommender system, which helps users to find the best homestay service in town. The study was developed by using Fuzzy Logic approach for TOPSIS method. The recommender system has been successfully developed and had received many positive responses from the users during the usability and user acceptance test. Apart from that, this system also gives a lot of benefits to tourism agencies as it able to suggest the best homestay besides promoting the culture, and the interesting places in Perlis. The result of the best recommended homestay is based on the review made by the users who experienced living in those homestays. Therefore, the result is always updated from time to time as the review continuously made by the users.

There are few recommendations suggested for the future work of the Homestay Perlis in order to improve its quality and features. For the future enhancement, the system is recommended to collaborate with the official website of those homestays so that the users will be able to make

reservation directly from the website of Homestay Perlis. Besides that, more number of homestays can be added to the recommender system so that the users have more choices in selecting the best homestay service in Perlis. By enhancing the website of Homestay Perlis, all those recommendations may help this recommender system to be more useful in assisting the users in decision making.

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