A Framework and Methodology for Travel Planning under Given Condition based on Location Base Service

Review of Integrative Business & Economics Research

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ABSTRACT

Tourism is one of many activities for relaxation. It is also an effective source of revenue generation for a country. Tourism is becoming more popular at the same time travel patterns are starting to change. Many tourists prefer to plan trips by themselves and search for data, routes, and points of interest (POI) from the internet rather than engage the services of travel agencies. Therefore, this point gives rise to difficulties in operation before a trip. Many sources from research will propose various routes and attractions for tourists, which often propose travel-planning by applying data from the tourist requesting information. In this paper, we propose a novel methodology for travel planning using the nature and context of personal information to determine places of interest for tourists. A presentation is given on how to organise tourists for support of their decision-making. It also offers a way to evaluate the performance of the system to analyse and improve the effectiveness of the plan for further refinement and efficiency.

Keywords: Travel Planning; Tourism; Recommender System; Point of Interest (POI)

INTRODUCTION

The tourism industry is an element of business that can generate a lot of revenue for a country. The projected aim for tourism in Thailand for 2558 was 2.20 billion baht. However, the actual result for total tourism revenue throughout the country in 2558 was roughly 2.23 billion baht, which was higher than the target. Earnings were received by up to 29.88 million foreign tourists and 138.8 million domestic tourists. [1] The data provided above makes the point that travel trends are shifting at an increasing rate due to numerous factors such as public promotion, currency rates, festivals or events throughout the year and the changing attitudes of tourists.

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Tourism is a form of leisure activity that is gaining popularity among people around the world. Tourism can generally be divided into two forms, namely package tourism and personal tourism. Package tourists buy packages through tour travel agencies. Travel agencies and tour companies provide tourists with all necessary information points, including attractions, major restaurants and accommodations available at their destination of choice. On the other hand, personal travellers have to prepare trips by themselves such as routes, attractions, restaurants, and accommodations. Such research has become easier for personal travel planning with such applications as the touch map system and effective personal travel recommendation system. The principle of the system is based on data from users, which is used to analyse possibilities by data mining technique. This information is stored as clouds. Users can select points of interest (POI) and start planning their trip to the next stop. [2] The travel-planning system uses Google Maps, a web application that guides tourism in Taiwan. For this application, travellers must have internet access. On each trip, the plan will rely on tourism that has been previously recorded in travel guides, which can offer details for the trip. Getting the right schedule for interesting places includes comments and opinions on the various tourist attractions. [3] The travel recommendation system is based on portable devices using technology to identify the user location (location-based service such as GPS). Such research presents a step by step plan on how to plan itineraries. Portable navigation devices share travel plans with others. It also uses Google Maps to make travel plans, with the feature of displaying pictures and other visual information for visitors to see. [4] Travel Recommendation by crowdsourced data uses research to analyse tourist attractions based on number of check-ins. Then, travel planning allows users to identify interesting sights and travel time from the beginning of the trip. Moreover, the system can plan a trip for a personal traveller. The system can also plan a theme trip packet, such as for nature tourism or entertainment tourism. In addition, all usage data for tourists will be stored. The data will be used to analyse travel plans for other users. [5] Travel planning with the Cloud-Mobi Framework uses a hybrid AHP-ACO method. This research presents a framework to plan a holiday that includes a community area, business unit, and itineraries for tourists. These three factors are combined into the Cloud-Mobi Framework, where the planning stage of a tour will start from the calculation and evaluation of interesting events, including a review by statistical methods for what makes interesting sights. This information is combined with travel preparation in an Ant Colony Optimisation algorithm to find the right route. [6] In addition, the researchers also plan to propose the introduction of geographical information systems to assist in the management of tourism, such as geographical information systems for travel management. This research presents the use of geographical information systems in a conservative tour. That means information from maps, directions, and restaurants, as well as hospitals and other features in websites that bring a virtual element into the tour. The results are expressed in the form of a three-dimensional image. [7]

Several studies have presented planning for travel using powerful mapping applications with geographical information systems for routes that are accurate and easy to understand. Technology is used to identify the user's location (location-based service) and is capable of being accessed from portable devices such as smart phones and tablets. This technology is connected to the internet for enhanced performance. It

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is possible to identify the destination from a current location, as well as provide traffic information and other relevant information for tourists and stores. [8] Several studies have focused on the issue of location-based service, which can be used to enhance performance in areas such as storing the location of activities in each of the sample locations of Beijing. This information can then be used to plan a trip during the holidays. [9] Location-based service in the algorithm uses tours under the guidance of the time. This research presents a problem in bringing location-based service in that time constraints make it possible to for the system to plan only one route. In this paper, a generic algorithm has been used in the planning process in order to enhance the travel guide. The application includes data from algorithms for testing on real roads. [10]

The study found that there are various technologies and methods used for personal travel planning to assist in routes, location data and other relevant information. Such data includes the implementation of geographical information systems to help map check-in information for the sites or use data from social networks in travel planning. Therefore, this article presents research and new ways to increase the efficiency of personal travel planning. The use of personal information for data analysis, probability and statistical technique, and technology to identify the user's location (location-based service) serve as the basis to introduce the attractions that are reasonable in the time provided.

1. Systems Framework

The Travel Planning on a Smart Phone under Given Conditions System focuses on factors which affect travel planning, such as the characteristics of the individual, fundamentals of tourism, tourism data available for tourists and the psychological impact on choice of tourist destinations in coordination with current location-based applications (location-based service). Personal information is sued to determine the probability of the tourism model that meets the interests of individuals and offers attractions that meet the needs of the specific tourists. The locations for tourists who are interested can then be specified in a sequence. The system will process to plan sightseeing routes according to information provided by tourists. In the system, tourists can get information about attractions, distance, travel time, and photos without the need for additional information. This research takes place in Pak Chong District of Nakhon Ratchasima Province, with the case study extending into a wide area, as shown in the framework of Fig 1. It consists of user interface, internet network, location-based service and web service, section for analysis probability of tourism, knowledge base and section for travel planning. The details are as follows:

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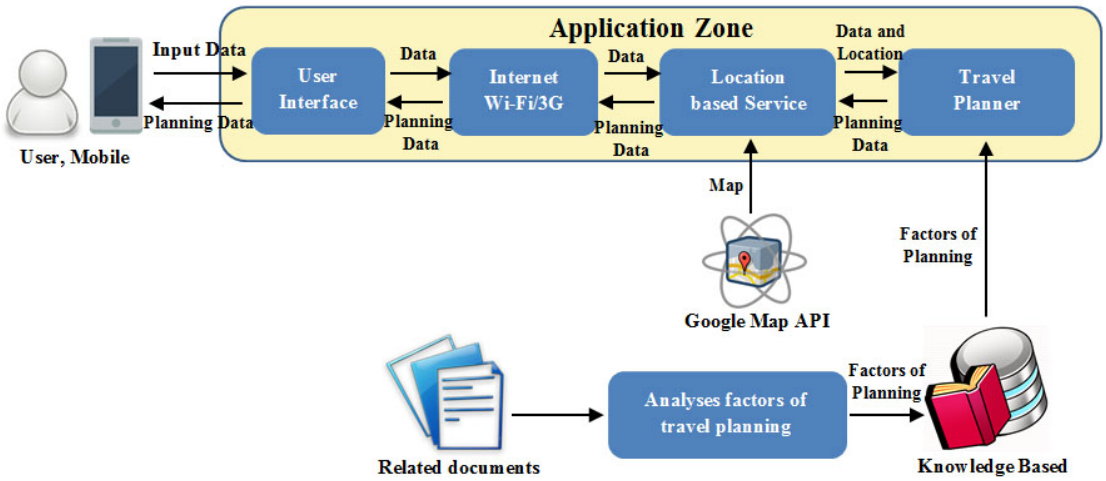

Fig 1 Framework for Travel Planning under Given Condition based on Location Based Service

Section 1: User interface. Travellers who use the Travel Planner on their smart phone under the given conditions can use their mobile devices through the user interface. These devices must be connected to the Internet. In addition, users need to import the factors affecting their travel interests, such as individual characteristics and particular interests in tourism. The information is run through the process for, with the results of the plan shown to the user from the interface.

Section 2: Internet network. (Wi-Fi / 3G) networks are employed as an intermediary in the transfer of information from the user interface to the data processing facility in the current location. The internet is an element for retrieved data to be forwarded to the planning section.

Section 3: Location-based Service and Web Service. This is used to identify the current location of users through a device such as a smart phone or tablet operating on the internet. The device sends a signal to the nearest cell tower. The current position is analysed on a Web Map Service (Map Point web service), and then the checked location is stored on the server. Correct position can then be shown on the screen. The positioning from this section will be used as a part of planning.

Section 4: Analyses for probability of travel planning. Factors for travel plans are collected from a survey of previous tourists and travel documents for information about the nature of the individual and the basic characteristics of tourists. This information can be analysed according to the process of knowledge discovery (Knowledge discovery in database or Data mining) of data or information. The process of data mining is an important process in the search for an attractive appearance for this information, such as the relationship model changes. The apparent or unusual appearance of a large amount of data is stored in the database. To provide a knowledge base that can be stored knowledge for planning the next assembly path.

Section 5: Knowledge base. Data obtained from the analysis of factors is stored, including the nature of the individual travel plans and the nature of the tourist attractions. This is a rule and relationship related problems. The information in this

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knowledge base will be drawn to take part in the trip planning. The knowledge base is a repository for the tourism planning system on smartphone under given conditions.

Section 6: The planned trip. This is another important part of the system in planning the trip to get the information that is required from the user. The current location is obtained from a location-based service and the factors affecting tourism are used to process the travel of tourists. Visitors are required to have their own identifying information such as individual characteristics, attractions, distance and time. The system will show the attractions of interest that meet the user's selections on the screen. The user can select to view information about the different places before deciding on a location they will visit. The system also shows the distance from the current point to the target user's desired destination. All of this goes into the algorithm to find the path (Path Algorithm) or optimal travel routes based on user-defined data. The results of the trip will be displayed on a map.

Proposed Travel Planner Method

The Framework concept development shows that the planned trip is an important part of the system. Under the plan, it will include analyses of probability for trip planning, tourist attraction suggestions and recommendations for travel planning under the time conditions. The details are as follows:

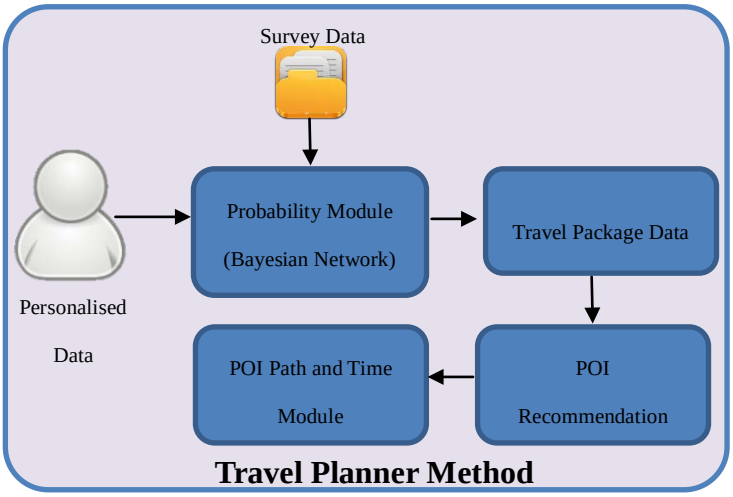

Figure 2 Travel Planner Method

Section 1. Probability Module by Bayesian Network

This section presents the analysis of personal characteristics for tourism. Data for the tourism model was collected by questionnaires from the sample group. Subsequently, all data from samples was analysed by probability formats and analysis of factors for tourism such as incentive of tourism, attraction category, activity, location, facilities and budget. However, some factors may affect other factors, causing patterns or relations of data. The researchers used a probability theory by Bayesian Network, which is one of the Bayesian learning methods. This is a technique using the theory of probability based on Bayes 'rule (Bayes' Theorem) to find the most accurate assumptions using previous knowledge, including probability of assumptions, and new data. For example, probability is observed for each

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assumption to find the best hypothesis. The principles of Bayesian learning are calculated for the probability of each hypothesis. However, Bayesian learning can learn more because new samples were used to modify the distribution which affects increase or reduction of the probability. That causes change of learning. This method model is being adapted to the new sample. The prediction of new samples in the target class uses the most probability of all hypotheses. [11] To calculate the probability of assuming by using Equation 1.

$$P(h|D1, D2 \dots Dn) = \frac{P(D1|h) \times P(D2|h) \times \dots \times P(Dn|h) \times P(h)}{P(D1,D2,D3 \dots Dn)} \quad (1)$$

Where h is the hypothesis to be tested
D is the evidence associated with h
P(h|D) is the posterior probability of h condition on D

Section 2. POI Recommendation Module

This section relates to the displayed attraction that matches a person's characteristics. When analysing the probability of a person based on Bayes 'rule, the system uses a Travel Package Data that matches the personal characteristics and location-based service to analyse the current location of the user. It then shows the location according to the inside radius. Tourists can choose locations according to their interests. The plan may be changed when a user changes location. The Analytical Hierarchy Process (AHP) is used to prioritise various places accordingly.

Section 3. POI Path and Time Module

This section imports the results from the POI Recommendation Module and the nearest journey procedure based on Shortened Path Analysis. The system will show places that have been prioritised. The user can specify time spent in each location and then send the information for preparation of an itinerary.

4. Evaluation

The evaluation of travel planning systems on smartphone under given conditions focuses on the correction and satisfaction of recommendations based on personal characteristics. The details are as follows:

4.1 The evaluation of accuracy is an algorithm for forecasting data. Imported data into the data-mining process is processed to classify information according to the Bayesian Network and test data with 10 fold Cross Validation method. This is how the researchers identified which could be used to assess the error. [12] The process divides the number of test data inputs into 10 series, which then select the data set to be used in 9 training sets and one data set for the test (Test Set). It then loops to change data sets, both for training set and tested to complete 10 laps of testing. Measurement accuracy is the average of accuracy for the test of 10 series, with three additional values in the evaluation including accuracy, precision and recall. Also measured is the percentage of correct predictions by root mean squared error (RMSE) and mean absolute error (MAE).

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	Data retrieve(+)	Data not retrieve(-)
Relevant data(+)	TP	FP
Irrelevant data(-)	FN	TN

Table 1.Four types of information related to predictive information

Table 1 shows a predictive model in four different types, including: 1) Relevant data and Data retrieved, 2) Relevant data and Data not retrieved, 3) Irrelevant data and Data retrieved, and 4) Irrelevant data and Data not retrieved. It will be validated by three standard values including accuracy, precision and recall. This calculation method is based on Equations 2, 3 and 4, respectively.

$$Accuracy = \frac{(TP+TN)}{(TP+FP+TN+FN)} \times 100\% \quad (2)$$

$$Precision = \frac{TP}{(TP+FN)} \times 100\% \quad (3)$$

$$Recall = \frac{TP}{(TP+FP)} \times 100\% \quad (4)$$

In addition, there are 2 error tests comprised of root mean squared error (RMSE) and the mean absolute error (MAE).The root mean squared error is a variable that represents average discrepancy value of data to forecast data collected in the trial, which should be a value close to zero if the forecast of travel information is accurate, as shown in Equation 5. Mean absolute error is a variable that represents average deviation, regardless of the positive or negative direction between the value of the forecast data and data in the test series. If mean absolute error (MAE) value is close to zero, then the accuracy of the forecast is higher as well, as shown in Equation 6.

$$RMSE = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(Q_i - T_i)^2} \quad (5)$$

Qi = The value of information obtained from the prediction, Ti = The value of the test series, i = Data and n = All data

$$MAE = \frac{1}{n}\sum_{i=1}^{n}|Q_i - T_i| \quad (6)$$

Qi = The value of information obtained from the prediction, Ti = The value of the test series, i = Data and n = All data

4.2 User satisfaction in the system

In testing to evaluate the satisfaction of users, questionnaires were used to measure the level of satisfaction in the interaction capabilities of the system. The questionnaires were comprised of closed-ended questions. The classification criteria

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for the satisfaction rating system tested whether respondents had access to the following five aspects.

1. The ability to learn measures the ability of a system to allows users to learn quickly, such as users understanding the working parts of the system without the need for expert assistance. The system works honestly, without complexity.

2. Effectiveness measures the ability of a system to allow users to use it properly for achievement of goals and tasks. The system can predict travel plans based on individual preferences. The system displays attractions that match the user's interests. The system can determine the shortest route to the users.

3. Efficiency of Use measures the ability of a system in terms of speed and support of users as well as sensitivity to changes within the system, such as the system shortening time to make better decisions in a quick process.

4. Flexibility measures the ability of a system to allow users to select various effects. Users can make appropriate adjustments to meet their own needs and choose to view results in multiple formats upon request.

5. Satisfaction of users measures the ability of the system to make users more comfortable using it and satisfied with the results it provides. For example, the system can be linked to related information and is stated correctly. Systems language is conveyed clearly and the system uses colour to display elements in a simple and clean layout with appropriate pictures and buttons.

7.CONCLUSIONS

In this paper, we propose a framework and methodology for travel planning, which is a part of the Travel Planning on a Smart Phone under Given Conditions System Development. In the proposed travel planning, we propose a travel-planning method that consists of forecast models for tourism using the probabilistic Bayesian process. The attractions are shown according to personal characteristic with location-based service beginning nearby. The principle of Analytical Hierarchy Process (AHP) is used to rank the attractions to visit. The final part is the shortest route possible by shortened path analysis. The system shows attractions that have been ranked according to particular interests. Users can specify the desired time spent in each location then send the information to the routing element concerning the nearest location. Subsequently, a performance measurement system with a measurement standard includes three values: 1) Accuracy 2) Precision and 3) Recall and test error of forecast by root mean square error (RMSE) and the mean absolute error (MAE). There is also a measurement for the user satisfaction aspect, which includes five distinct factors: the ability to learn, effectiveness, efficiency of use, flexibility and satisfaction of users. In future work, researchers should collect master data for processing through the analysis method mentioned above, with subsequent development of an application session. Testing should be conducted for a real attraction, with the results analysed for improved efficiency of the system.

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