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A Hybrid Travel Recommender System for Group Tourists

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A Hybrid Travel Recommender System for Group Tourists
(Work in Progress)

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ABSTRACT

Travel recommender systems (TRSs) are developed as information filtering tools to provide travel decision-making support. They make personalised recommendations based on the user's preferences. People tend to make group travel decisions based on trip-specific motivations. The current Group Travel Recommender Systems (GTRSs) exploit individual user's preferences and make group recommendations by aggregating profiles or aggregating recommendations. Although aggregation is a straightforward way to combine the preferences of different group members, it has been critiqued on overlooking of the group dynamics. Interaction needs among tourists' have a great influence on group travel preference. This proposed study explores a conceptual framework for a hybrid group travel recommender system based on this consideration.

Keywords: Smart Tourism, Group Travel Recommender System, Group Travel Motivation, Group Interaction Needs

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INTRODUCTION

Travel Recommender Systems (TRSs) are technical ways to filter travel information and support tourist decision-making process. They provide personalised travel recommendations to users by studying users' past preferences, and further predict their future travel preferences through analysing their travel behaviour patterns and travel interests (Logesh, Subramaniyaswamy, Vijayakumar, & Li, 2019). TRSs are the responses to the facts that tourists don't have a broad knowledge of all travel information, and excessive amount of travel information is challenging for humans to cognitively deal with (Garcia, Sebastia, & Onaindia, 2011). In addition, Information Communication Technologies (ICTs) not only make it easier to present more tourism products online directly to tourists but also enable tourists to take active role in choosing their own preferred tourism products, instead of accepting standard services. Tourists today are more experienced and demand more diversity on their trips (Garcia et al., 2011). Every tourist has different travel motivations (e.g. relaxation, experience novelty) (Crompton (1979) , individual interests (e.g. sports, art), constraints (e.g. budget, time) (Crawford, Jackson & Godbey, 1991). Tourists travel with different travel motivations each time. This leads to different travel considerations and preferences. The choice of the destination is most influenced by the travel party and his or her constraints on the destinations(Crawford, Jackson & Godbey, 1991). The interaction between/among group tourists affect the group travel preferences (Bagozzi, 2000).

In consequence, Group Travel Recommender Systems (GTRSs) emerge and are designed to fulfil the needs of supporting multi-users group travel decision-making process. Recommending for all travel parties can be difficult as each member can have different preferences. Firstly, GTRSs will acquire individual travel preferences explicitly and implicitly which have no difference with the individual user travel recommender systems (Jameson & Smyth, 2007). Secondly, based on the assumption that individual preferences are independent choice sets, Masthoff (2015) indicates that two different group recommendation techniques, recommendation aggregation and profile aggregation, can be used to generate group recommendations. Recommendation aggregation is to examine each group member's personalised recommendation and merge the results of individual recommendations and generate a single final recommendation list match for the group users. Profile aggregation creates a joint group profile of preference profile and demographic profile (Logesh et al., 2019). With the integrated individual user's likes and dislikes in preference profile and demographic constraints such as gender and age in demographic profile, GTRSs adopt group aggregation techniques such as Plural Voting and Most Pleasure. However, recent researches have argued that the aggregation method assumed the simple combination of individual preferences, and they propose an observational group recommendation approach. This approach emphases that group preferences are constructed in decision-making process by using critiquing and case-based reasoning(Nguyen & Ricci, 2017). However, this approach requires a large database to store group conversational chats, and it takes time for the system to learn and build up the interaction model for the group members by observing the group discussions.

In spite that there are emerging GTRSs have considered the group dynamics by observing their group conversations, the attributes of group members' needs for interaction and group travel motivations have not been thoroughly investigated. Group travel motivation as a key variable for group travel has been researched in the packaged tour context. It helps understand certain groups of people's needs (e.g., senior tourists) and enhance the service providers' knowledge on providing suitable services. (Chang, 2007). But in the context of the highly personalised self-organised group travel, the group travel motivations are defined as a dynamic concept which change time to time, vary with different travel parties. Extent articles have examined on traveling with family (Wang, Yi, Wu, Pearce, & Huang, 2018), lovers (Kim & Agrusa, 2005) and friends (Song, Wang & Sparks, 2018), these articles have supported the interaction needs for travel parties with certain social relations, for example,

family-oriented group travel motivation aims at not only on children's or elder parent's needs, but also focusing on experiencing activities that can be explored together where we-memory can be created. Honeymoon travel motivation as a strong evidence of the interaction needs for travel parties, instead of individual oriented needs. For example, the wife likes art and music, and the husband likes football, but they are destination choice is not only seeking for the overlaps or consensuses of their interests, but also considering their interaction needs and enhancing the newly established marital relationship purpose. (e.g., romantic and interactive activities). To date, there is no widely agreed group travel motivation framework to explain what the group travel motivations are, how they affect group members' interaction and how do they impose on the travel destination and attraction choices.

The group travel motivation in different contexts, and how to meet their interaction needs in designing GTRSs has not been investigated yet. The interaction needs and group travel motivation have been overlooked in both group travel theories and the existing group travel recommender systems. This paper intends to develop a conceptual framework to examine how the group travel motivations would affect the group tourists' travel preferences on destination and attraction choices, and specifically under three major social relationships (i.e. families, lovers, friends) by using datamining technique on analysing tourist reviews. It also intends to find co-relations between these motivations and the type of attractions. Finally, it proposes a conceptual framework for GTRS to design a group recommender system considering group travel motivations.

LITERATURE REVIEW

Influential Factors on Travel Preferences

In literature, three groups of influential factors on individual travel preferences have been investigated. Firstly, the individual tourist related factors, the decision maker-specific factors such as age, income and travel constraints (Crawford, Jackson & Godbey, 1991), have found strong influence on individual travel preferences. Psychological variables such as personality and travel motivation have direct effect on tourists' type, for example, Gretzel, Mitsche, Hwang, and Fesenmaier (2004) integrated travel needs/motivations, travel styles, desired activities, desired destination features, personal value into 12 travel personalities. Neidhardt and Werthner (2017) propose a Seven-Factor Model by considering tourists role in the group, travel motivation and tourist travel personality, categorised group tourists into 7 types. Travel motivation is very trip-specific (Qiu, Masiero, & Li, 2018). Travel Motivation can be seen as push factors are internal forces that drive a tourist towards an action, such as human needs (e.g. relaxation, social belongingness, exploration and evaluation of self, prestige, enrichment of relationships and enabling of social interaction) (Dann, 1977). Crompton (1979) states seven social-psychological motives including escape form a perceived mundane environment, exploration and evaluation of self, relaxation, prestige, regression, enhancement of kinship relationships, and facilitation of social interaction. Besides seeking for satisfaction from social-psychological factors, tourists are also motivated by cultural motives. Tourists' culture of origins explained by socio-political differences, geographical distances, cultural values or lengths of statutory holidays (Becken & Gnoth, 2004) influence tourists' travel style preference. Most of the individual tourists related factors have been considered in the existing travel recommender systems in terms of user profiling process.

Secondly the destination-related factors have been viewed as the determinants of destination choices where two categories can be included (Laws, 1995). The primary category is related to innate features (e.g., climate, seasons, natural resources, historical architecture). The secondary category is the "given" and partly "man-made" (e.g., facilities for certain sports, shopping malls). These factors have been considered in some context-aware travel recommender systems such as crowdedness-aware, temporal aware (Sassi, Mellouli, & Yahia, 2017). There are limited articles have investigated the determining attributes to certain groups. For example for honeymoon tourists, they are not only looking for places with good scenery, good weather, historical and cultural resources, but also specifically seeking for romantic places (Kim & Agrusa, 2005).

Thirdly, the travel party related factors significantly group travel preferences. The travel party related factor can be seen as interpersonal barriers (Crawford, Jackson & Godbey, 1991). According to Crawford et al, interpersonal barriers will lead to non-participation if the specific activity wouldn't meet the interaction needs or require more than one partner interaction. The relationship between individuals' characteristics, interpersonal barriers affect the joint preference for specific leisure activities or arise as the result of spousal interaction. This concept is also applicable to interpersonal relations in general such as family-child, friend relations. In GTRSs, the barriers for joint preference for some activities have been considered by creating joint group demographic profiles. However, the GTRSs have seldom considered the interaction needs among the groups.

Group Travel Interaction & Motivation

Group travel is different from the individual travel in terms of tourists' decision-choice process and associated contextual factors such as travel parties and travel motivations(Regan, Carlson & Rosenberger III, 2012). The needs for facilitation of social interaction, enhancement of human relations and group affiliation, have been emphasised in group travel (Regan et al., 2012). Group interaction can be built on the believe that "key basis for group action…is the mutual possession of a sense of 'us'" (Bagozzi, 2000). Yarnal and Kerstetter (2005) further identify that group behaviours are governed by feelings about the situation from the individuals', their interactions among each other and the personal factors that bring to the situations. Therefore, group travel preference should never be a simple combination of individual's preference (i.e., $1+1 \neq 2$). Current literature has focused on group composition analysis, group travel motivation exploration (e.g., group travel to major events), group behaviour modelling (e.g., senior tourists). Yet, there is little research focusing on examining group travel motivation and group travel behaviour pattern in a large and more general scale. This research explores tourists' interaction needs and

group travel motivations by mining travel reviews from open travel platform and analysing the hidden patterns and sentiments. It further reinforces the needs of considering the interaction needs and group travel motivation difference in group recommender system design.

Travel Recommender System

Travel recommender systems are designed to provide personalized travel recommendation based on user's preferences and interests. By studying the users' preferences, there are difference recommendation techniques have been developed over the years. Demographic-based filtering technique (Pazzani, 1999) is used to recommends items to users from similar demographics such as tourist's age, gender, education. Knowledge-based filtering technique further develops that (Pazzani, 1999) the knowledge-based recommender systems generate a recommendation by reasoning about what items meet the user's requirements and constraints. Content-based filtering (Pazzani, 1999) recommendation is made based on the tourists' profiles using features extracted from past histories. The items which will be recommended are those mostly related to the previous positively rated items. Content-based filtering would suggest destinations with the tourist's like the most but lack of diversity (Ricci, Rokach, & Shapira, 2011). Collaborative filtering target tourists are recommended destinations and attractions similar to those chosen by other tourists with similar travel preferences however it may suffer from the cold-start problem, which means a new tourist user, or a new destination needs to be rated before a recommendation can be made (Ricci, Rokach, & Shapira, 2011). There are also two approaches, memory-based and model-based filtering. In memory-based approach, tourist user's historical records to other records in the database is compared. The memory-based approach compares a user's historical records to other records in the database (Ricci, Rokach, & Shapira, 2011). The model-based approach uses statistical or learning methods, such as Bayesian network (Logesh & Subramaniyaswamy, 2019). Cold start and data-sparsity problem are the two drawbacks of this technique. The cold-start problem occurs when the system does not have enough information regarding the destination/attraction or tourist to make a prediction. Tourist user needs to provide a significant amount of information before the system can generate a destination/attraction recommendation. Therefore, hybrid recommender systems use a combination of the abovementioned methods, exploiting the advantages of one technique to compensate the shortcomings of another, thereby improving the overall performance (Logesh & Subramaniyaswamy, 2019).

Group travel recommender systems have two major approaches, one is social choice theory based recommendation (Masthoff, 2015) and the other one is group dynamics and group decision-making theories based recommendation. Social Choice Theory (Arrow, Sen, & Suzumura, 2010), as the supporting theory of GTRSs, explained the aggregation which aggregated multiple factors so as to discriminate between multiple alternatives. Based on this theory, Masthoff (2015) suggests that GTRSs adopt group aggregation techniques including three major categories 1) majority-based strategies which use the most popular items (e.g., Plural Voting: most liked items); 2) consensus-based strategies that consider the preferences of all group members (e.g., Average: averages individual ratings); and 3) borderline strategies that only consider a subset (e.g., Most Pleasure: takes the maximum of individual ratings) to make a combined group recommendation. Additionally, aggregation strategies have been modified by giving different weight to different users considering their constraints and influence among the group (Berkovsky, Freyne, & Coombe, 2009). For instance, higher weight is given to children or people with disabilities because of their limited physical status, people who are experts or have higher social impacts as they probably will influence the whole group decision. This weight aggregation technique in a way has taken the group composition and group roles into consideration.

From the aggregation approach, most of the studies have been focused on POIs recommendation by focusing on how "fair" it will be by aggregating individual group user's preference into group preference while adopting different techniques; and also focus on how to improve the personalisation level of extracting individual user profile. Hybrid approach with a combination of content-based filtering, collaborative filtering and knowledge based filtering has been used to aggregate individual recommendation list into group list (Pessemier, Dhondt, & Martens, 2017). Social pertinent trust walker algorithm and social network collaborative filtering has also been used to better create the group profile (Ravi & Vairavasundaram, 2016).

However, researches have shown that an absolute best aggregation strategy does not exist. Moreover, most of the GTRSs completely neglected the specific aspects of a group such as group related dynamics, group composition, concentrate on solely on individual preferences of group members. Based on these considerations, group dynamic based GTRSs have been developed. Group dynamics and group decision-making theories-based recommender systems do consider more the joint decisions, specification of roles such as the leader role in university student travel group when comes to the decision making. The core of these models stays the same, as they are all the combination of individual travel preference but overlooked the group dynamic. Nguyen and Ricci (2017) pointed out by using conservational methods, adopting case reasoning and critiquing can better capture the group decision-making process.

As the current GTRSs have overlooked the significance of group travel motivations in the real group travel preferences and their needs for interactions, this study aims to propose a novel group travel recommender system model which will focus on specific groups by their social relationship connection (i.e. family with children, lovers and friends). Different social relationship brings great difference on travel preference as when travelling different significant others, the travel motivations vary. Furthermore, travel with family are divided into two subgroups, family with children, and travel with parents. The interaction in these groups can be varied different especially within family travel group and lovers' group. However, there is not enough literature to support how the differences are in the context of tourism destination and itinerary choices. This paper

intends to investigate how the influences are in terms of destination attraction choices will be needed within these identified groups.

PROPOSED APPROACH

At the beginning of the research, unstructured interviews will take place with interviewees who have self-organised group travel experience which provides in depth knowledge for understanding the interaction needs. By interviewing, an initial model of group interaction needs and group travel motivation framework will be built up.

Followed with text mining which aims at analysing the textual contexts for unveiling the hidden patterns and interpreted into actionable information (Fan, Wallace, Rich, & Zhang, 2006). The research aims to extract tourist online reviews with different groups (e.g., family, lover, and friend) for different types of attractions by dividing them into positive or negative opinions. By only collecting group travel reviews, the corpus cleaning of irrelevant articles and adverbs and lexicon based stemming process will be conducted. Text analysis based on words' frequency, topic-based modelling for sentiment classification will be adopted.

CONCLUSION

This research explores the group interaction needs and group travel motivations among group tourists in social relationships. By conducting qualitative interviews and travel online review text mining, the group tourists' preferences can be more clearly identified. It can further validate that group travel motivations are very trip-specific, situational and varying with different travel party (parties). These dynamic and varying group travel motivations have significance influence on the group tourists' preferences. In addition, this paper provides a solid conceptual foundation for design group travel recommender systems with the consideration of group interaction needs and group travel motivations.

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