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Recommendation system for popular tourist attractions in Taiwan using Delphi panel and repertory grid techniques

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HIGHLIGHTS

- An online recommendation system is designed and tested.
- A construct elicitation mechanism using Delphi panel method is proposed.
- The matrix construction mechanism uses repertory grid technique.
- Matching recommendations with preference achieves 60.4–79.3%.
- Reductions in data-sparsity effect and dimensionality were observed.

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ABSTRACT

Problems exist in current on-line information systems available to tourists in that they are often of a general nature not offering a personalized service. To overcome this, in the context of the leading 100 Taiwanese attractions, a system is proposed comprising: (a) a construct elicitation mechanism using the Delphi panel method; (b) a matrix construction mechanism using the repertory grids, expert knowledge, and user preference; and (c) a recommendation mechanism using two similarity methods to provide recommendations. A study was consequently undertaken, and the main findings included: (1) the mean levels of precision in matching attractions with preferences were 60.4–79.3%, exceeding levels previously reported and so suggesting that the expected outcome of combining the Delphi panel method and repertory grid technique was achieved and (2) after decreasing the number of constructs, reductions in data-sparsity effect and dimensionality were also observed.

1. Introduction

According to the 2008 report of the World Tour Organization, tourism is the primary source of foreign exchange earnings and economic development in numerous countries. The Taiwanese Executive Yuan listed tourism as one of the six key emerging industries, promoting the Project Vanguard for Excellent in Tourism to transform Taiwan into an “East Asia tourism gateway” and the “major international travel destination” (Taiwanese Executive Yuan, 2009). Tourism accounted for approximately 4% of the 2010 GDP in Taiwan, the same percentage as the oil industry, indicating the economic importance of the tourism industry in Taiwan. In the past decade, the Taiwanese government has actively promoted developing tourism, signing a cross-strait travel agreement for residents of Mainland China in 2008. According to statistical data from the Tourism Bureau, Taiwan has experienced substantial growth in its tourism industry. In 2011, Taiwan attracted 6.09 million international tourists (Fig. 1; a growth of 9.34% compared with 2010) and approximately 152,268,000 domestic tourists (Fig. 1; a growth of 22.86% compared with 2010). Total tourism revenues attained a high of NT$ 636.3 billion, representing an increase of 23.79% compared with the previous year (Fig. 2). Thus, the tourism industry has exhibited vigorous growth in Taiwan (Taiwanese Tourism Bureau, 2012).

Backpacking is a popular form of travel favored by travelers, and 88% of domestic tourists in Taiwan typically chose backpacking travel (Taiwanese Tourism Bureau, 2010). However, within the traveling and tourism industries in Taiwan, most travel websites

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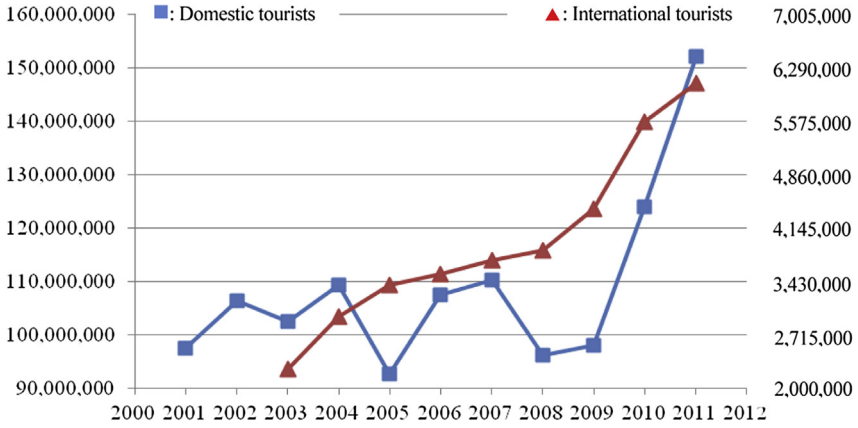

Fig. 1. Numbers of domestic tourists and international tourists for 2001–2011.

provide only static travel information such as sightseeing attractions, hotel booking, transportation, and itineraries. For travel suggestions, only group package itineraries, designated routes, and simple searches for traveling products are available. Consumers must self-search relevant information from a large amount of tourism data, making it difficult to obtain information specific to their preferences and needs. Information overload causes consumers to become stressed, decreases consumer satisfaction levels, and causes physiological discomfort (Lewis, 1996). Therefore, assisting consumers to acquire their preferred tourist information is crucial, rendering personalized travel recommendation systems critical (Kenteris, Gavalas, & Mpitziopoulos, 2010; Yang, Cheng, & Dia, 2008; Zheng, 2009); discussions of such systems are only beginning in Taiwan.

Recommendation systems can ameliorate information overload and complexity when users search for information on the Internet, making inferences regarding user' preferences to offer personalized recommendations (Adomavicius & Tuzhilin, 2005; Ardissono, Goy, Petrone, Segnan, & Torasso, 2003; Ricci, 2010; Wolfson, Xu, & Yin, 2004; Zheng, 2009). Two primary methods that have been proposed for systems in the tourism domain: content-based and collaborative filtering (Burke, 2007; Goy, Ardissono, & Petrone, 2007; Kabassi, 2010). Content-based recommendation systems are used to recommend items similar to items that consumers wanted in the past; however, this method is problematic because it only recommends items closely related to those the user liked in the past. In other words, no potential items are recommended (Degemmis, Lops, & Semeraro, 2007; Lops, de Gemmis, & Semeraro, 2010; Pazzani & Billsus, 2007; Yang et al., 2008). Collaborative recommendation systems are used to aggregate data regarding user preferences and make recommendations to other users based the past behaviors of similar users, but this method yields a new item problem, where new item cannot be easily recommended to other users because the new items have no ratings (CACM, 1992; Degemmis et al., 2007).

To address these problems, researchers have proposed knowledge-based recommendation systems (Burke, 2000). Rather than requiring a large amount of statistical data (item rating from users), such methods require only sufficient knowledge to judge items similar to each other. For example, Hsu, Hwang, and Chang (2010) developed a recommendation system by using the knowledge of domain experts to describe the relations among items and features, and user-filled scores regarding preferences for recommendations. However, the knowledge-based recommendation system exhibited the following problems: (a) cold-start: a new item is not immediately recommended and may not be recommended; and (b) no explicit mechanism exists to identify the constructs used to describe user preferences and item features.

In the present study, the newly-elected top 100 popular tourist attractions in Taiwan (Taiwanese Popular Tourist Destinations, 2011) were used as the research target and a novel online recommendation system was proposed to overcome the problems of knowledge-based methods, providing personalized tourist information to users. Briefly, four distinctive functions were established

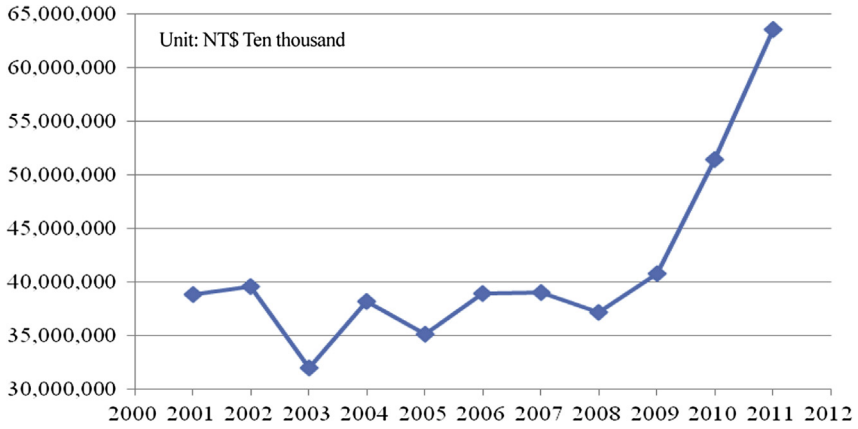

Fig. 2. Amount of tourism revenues for 2001–2011.