Journal of Network and Computer Applications 39 (2014) 319–333

Contents lists available at ScienceDirect

Journal of Network and Computer Applications

journal homepage: www.elsevier.com/locate/jnca

Review

Mobile recommender systems in tourism

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ARTICLE INFO

Article history:
Received 8 November 2012
Received in revised form
27 February 2013
Accepted 3 April 2013
Available online 22 April 2013

Keywords:
Mobile tourism
Mobile recommender systems
Personalization
Points of interest
Pull-based
Reactive
Proactive
Location awareness
Context-awareness
Route planning
Tour planning

ABSTRACT

Recommender Systems (RSs) have been extensively utilized as a means of reducing the information overload and offering travel recommendations to tourists. The emerging mobile RSs are tailored to mobile device users and promise to substantially enrich tourist experiences, recommending rich multimedia content, context-aware services, views/ratings of peer users, etc. New developments in mobile computing, wireless networking, web technologies and social networking leverage massive opportunities to provide highly accurate and effective tourist recommendations that respect personal preferences and capture usage, personal, social and environmental contextual parameters. This article follows a systematic approach in reviewing the state-of-the-art in the field, proposing a classification of mobile tourism RSs and providing insights on their offered services. It also highlights challenges and promising research directions with respect to mobile RSs employed in tourism.

Contents

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http://dx.doi.org/10.1016/j.jnca.2013.04.006

1. Introduction

The explosive growth of online environments has made the issue of information search and selection increasingly cumbersome; users are overwhelmed by options which they may not have the time or knowledge to assess. Recommender Systems (RSs) have proven to be a valuable tool for online users to cope with the information overload. RSs use details of registered user profiles and habits of the whole user community to compare available information items against reference characteristics in order to present item recommendations (Adomavicius and Tuzhilin, 2005; Ricci et al., 2010). Typically, a RS compares a user profile to some reference attributes and seeks to predict the 'rating' or 'preference' that a user would give to an item she has not yet considered.

RSs originally found success on e-commerce web sites to present information on items and products that are likely to be of interest to the user (e.g. films, books, news, web pages, etc.). Lately, they have been increasingly employed in the field of electronic tourism (e-tourism), providing services like trip and activities advisory, lists of points of interest (POIs) that match user preferences, recommendations of tourist packages, etc. (Kabassi, 2010; Werthner and Ricci, 2004). Existing RSs in e-tourism typically emulate services offered by tourist agents where prospective tourists refer to seeking advice for tourist destinations under certain time and budget constraints (Berka and Plönig, 2004; Ricci, 2002). The user typically states her needs, interests and constraints based upon selected parameters. The system then correlates user choices with cataloged destinations annotated using the same vector of parameters.

A relatively recent development in e-tourism lies in the use of mobile devices as a primary platform for information access, giving rise to the field of mobile tourism. The unique characteristics of mobile tourism bring forward new challenges and opportunities for the evolution of innovative personalized services which have no place in the field of e-tourism. For instance, the knowledge of the exact user location develops appropriate ground for the provision of location-based services. Furthermore, user mobility allows exploiting the knowledge of user's mobility history and taking advantage of a user's social environment lying in geographical proximity.

The most prominent outcome of recent research efforts in mobile tourism has been the substantial number of mobile electronic guide systems, which have been on the spotlight over the past few years (Kenteris et al., 2011). Most of those systems go far beyond from being mobile electronic versions of printed tourist guides, as they incorporate personalization features and take full advantage of the sensing capabilities of modern mobile devices to infer user, social and environmental context in order to provide advanced context-aware services (Höpken et al., 2010).

The first systems that coupled mobile guides functionality with RS technologies appeared soon after (we use the term 'mobile tourism RSs' to refer to those systems). Mobile RSs can increase the usability of mobile tourism applications providing personalized and more focused content, hence limiting the negative effects of information overload (Ricci, 2011). In addition to offering personalized recommendations through employing sophisticated user modeling methodologies, mobile tourism RSs may also take advantage of usage and application context in providing improved, context-aware recommendations for attractions or tourist services (Adomavicius and Tuzhilin, 2011; Gavalas and Kenteris, 2011; O'Grady et al., 2007).

This article follows a systematic approach in reviewing the state-of-the-art in the field of mobile tourism RSs. It offers a detailed insight on typical recommendation tasks and the corresponding support functions commonly offered by existing mobile tourism RS prototypes, categorized in attractions recommendations, tourist services recommendations, collaboratively-generated recommendations, routes/tours and multiple-days itinerary planning. The main contribution of the article lies in the proposed classification of mobile tourism RSs, undertaken on the basis of three different aspects (their chosen architecture, the degree of user involvement in the delivery of recommendations and the criteria taken into account for deriving recommendations). Last, we highlight challenges and promising research directions with respect to mobile RSs employed in tourism.

The remainder of the article is structured as follows: Section 2 provides the required background on the recommendation techniques supported by contemporary RSs. Section 3 summarizes the main features of popular web-based e-tourism RSs. Section 4 provides a detailed view of services offered by mobile RSs in tourism, while Section 5 presents three classification viewpoints for existing mobile tourism RS prototypes. Section 6 provides insights on open issues and research opportunities in the field, while Section 7 summarizes the main issues tackled in the paper.

2. Types of recommender systems

Recommender systems are essentially information filtering systems aiming at predicting the 'rating' (i.e., the preference) that a user would give to an information item (e.g. music file, book or any other product) or social element (e.g. people or groups) she has not yet considered. RSs recommend those items predicted to better match user preferences, thereby reducing the user's cognitive and information overload. Recommendation are made either implicitly (e.g. through ordering a list of information items or displaying a 'those you bought this product, also bought that' bar) or explicitly (when the user requests a recommendation). Nowadays, RSs are classified in several types, based on their target applications, the knowledge used, the way they formulate recommendations and the algorithms they implement. Below, we describe six (6) categories of RSs (Adomavicius and Tuzhilin, 2005; Ricci et al., 2010).