Trace Tourism Experience: Tourism Hybrid Recommender System Design

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Abstract

The recommender systems (RS) are a type of information filtering that allows users to find adapted items and services according to their characteristics and preferences. In the case of tourism, RS add value to the tourist, offering alternatives, and enriching their experience in the destination. The main components of RS are the user profile, items or services information, and finally a recommendation technique to relate these two sets of information (User-Items or services). This paper presents the design and implementation of a recommendation system for tourist sites and tourist routes in the municipality of Sopó - Cundinamarca, Colombia. The obtained results show that it is possible to have a RS that supports the decision making of visitors and tourists, in addition they increase the number visits to the main tourist sites of the place.

Keywords: Recommender systems, Tourism, Sopó.

1 Introduction

Currently, with access to large loads of information of all kinds, there is a need to customize search results and help users to select items and services appropriate to their preferences and needs. The RS are born with the aim of improving the suggestions and delivering more information about the items or services offered to facilitate the user with the product selection [1].

The recommendation systems tourism area, have been popularizing and every day are more systems that suggest that places to visit. This systems are used to help tourists customize holiday plans. In many cases the RS works as an intermediary between the user and the tourism agencies [1]; tourism agencies need to promote their services and tourists users want to have unique travel experiences.

Several recommendation techniques have been proposed during the last decade, a recommendation system is software tools and techniques that provide suggestions of items to be used by a user. These suggestions are intended to support the user in decision-making processes, such as what to buy, what song to listen to, what news to read, what site to visit [2]. In addition there are many types of recommendation systems, each can be used for different approaches and in different contexts, according to the needs [3].

Burke [4] classifies the recommendation systems in: Content-Based Recommendation Systems (CRS), in these systems the recommendations are made based on a created profile, CRS use "item by item" algorithms generated by the association of correlation rules between them. This type of recommendation learns from the interests of the users and makes the recommendation process based on the characteristics present in the items. For this type of recommendation system, the attributes of the user's profile are matched with the attributes of the items to be recommended. Collaborative Filtering Recommendation Systems (CFRS), the recommendations are made based on the degree of similarity between users. These kinds of systems construct the recommendation as a statistical / probabilistic aggregation of the preferences of other users. For the realization of a good collaborative recommendation system that offers quality recommendations, it is necessary to use a good collaborative filtering algorithm. A CFRS user should rate each of the items used, indicating how much this item serves for their information needs. These scores are collected for groups of people, allowing each user to benefit from the experiences (grades) of others. History-based Recommendation Systems (HRS) these systems are
based on a user's browsing history, this history is stored in order to obtain the preferences and interests of the user and thus obtain the information needed to generate recommendations. These systems are also called systems of implicit preferences because HRS infer preferences based on user behavior and history. This allows in most cases it is not necessary to ask the user too much information about their preferences so that it can be recommended. Suggests items based on inferences about user needs and preferences. Demographic recommendation systems (DRS), which categorize users into demographic groups based on certain personal attributes whose information has previously been collected, and provide potentially interesting recommendations for any person belonging to that demographic group.

In this paper, we propose the design of a tourism recommendation system, where information technology is used to improve the tourism sector, with a collaborative and participatory character of the actors associated with its value chain, where the operation is the tourist. The interaction with the visitor and its recognition, determine the socio-economic development of the tourism products offer in the region, promoting higher levels of competitiveness that consolidate a profitable and sustainable growth and leadership of tourism activity in the territory, through TOURIST ROUTES (tourist products).

This article is organized as follows: section 2 presents the related work to tourism recommendation systems, section 3 is the proposed model of tourist route recommendation, section 4 presents the implementation of the system and finally Section 5 presents the conclusions and future work.

2. Related work

In [5] they propose a model named RAMCAT (Mobile Augmented Reality based on the Context Applied to Tourism), which incorporates augmented reality and extends the mechanisms of recommendation taking into account the tourist's location, preferences, typology, previous visits, and contextual attributes related to the tourist at the time of use of the system (schedule, company with which to make the visit, estimated time of visit, etc.). The set of information you can show includes visits to museums, monuments, gardens, accommodations, restaurants, cultural and leisure activities. The tourist will be able to obtain detailed information of the recommended activities, as well as to request tourist routes from them.

The other hand [6], although not presenting a recommendation system, make inferences through an ontology called OntPersonal, an ontology of customization for the application ITINER, a system of tourist routes based on semantic information. The OntPersonal ontology models a set of tourism preferences and context constraints associated with the end user (tourist), which is called their profile. From a set of SWRL rules they try to infer the points of interest -obtained from an external instantiated ontology - more relevant to each profile.

RUTASIG is a tourist route planner based on intelligent systems and geographic information systems that provides the traveler with complete information about places of interest, municipalities, toll locations, among other important aspects of tourism by land in Colombia, also allows the traveler to know The best routes to reach your destination, offering different possibilities to choose an optimal route [7].

The authors [8] presents Itiner which is an application that helps the user in creating and enriching their tourism experience, that is, the application is a tourist agent and it is able to offer customized routes and adapted to the social and temporary context of the user. In particular, the application has four key points: Personalization and adaptability; Operation without internet connection or GPS; Combination of contents, both professional and amateur, and combination of contents, both tourist and commercial; Automatic import of points through OpenStreetMaps.

3. Proposed Model

The proposed model recommendation is presented in Figure 1. Where the system components are presented, among which are: the inputs (user and route information), recommendation techniques and the outputs are the recommended routes.
Each of the components of the proposed route recommendation model is presented below.

![Proposed recommendation model](image)

**Figure 1.** Proposed recommendation model.

The first component is the information. To aim to realize an RS of tourist routes first it is necessary to define the characteristics of the users that are going to be stored. It is also necessary to define some data describing the route, to identify it and to be able to recommend it.

The user profile information is composed of static data and another part is dynamic.

*Static user profile information:* it is information that is entered once and does not change over time, such as the date of birth, name, key, identification.

*Dynamic user profile information:* it is the information that will undergo modifications as a result of the interaction with the system or over time, such as interests and preferences, which may change with the passage of time.

In addition the construction of a user profile requires the previous collection of information. There are several methods to collect the data that will be processed, to constitute a new profile or to update an existing profile [9].

- **Explicit:** this is where the user manually enters their information through the filling of forms
- **Implicit:** data is extracted, created, modified and / or updated automatically, using programmed techniques such as capture of clicks, creation of cookies, storage of histories about the interaction of the user with the system, etc.

Table 1 presents the explicit data that will be requested to the user at the time of registration in the system.

**Table 1.** Tourist explicit data

<table>
<thead>
<tr>
<th>Number</th>
<th>User data</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Name</td>
<td>Tourist name</td>
</tr>
<tr>
<td>2</td>
<td>Date of birth</td>
<td>Tourist age range</td>
</tr>
<tr>
<td>3</td>
<td>email</td>
<td>Tourist e-mail</td>
</tr>
<tr>
<td>4</td>
<td>Gender</td>
<td>Tourist gender</td>
</tr>
<tr>
<td>5</td>
<td>People tourist travel with</td>
<td>Number of people with whom you travel, ages and kinship</td>
</tr>
<tr>
<td>6</td>
<td>Preferences</td>
<td>Tastes and preferences</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ecotourism, Gastronomy, Hotels, Fun, Religion, Rest, Adventure, Culture</td>
</tr>
<tr>
<td>7</td>
<td>Places / routes tourist</td>
<td>History of the routes tourist has traveled, with the rate he/she</td>
</tr>
</tbody>
</table>
As implicit data is the location of the tourist through the device GPS from which it was connected to the system.

In order to develop a tourism route recommendation system, it is necessary to identify information on the touristic routes, so that the RS can make comparisons and give recommendations. Table 2 presents the necessary information of the touristic route.

**Table 2. Information touristic routes**

<table>
<thead>
<tr>
<th>Number</th>
<th>Data name</th>
<th>Data description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Route name</td>
<td>Route identifier</td>
</tr>
<tr>
<td>2</td>
<td>Description</td>
<td>Short text describing the route</td>
</tr>
<tr>
<td>3</td>
<td>Main theme of the route</td>
<td>The main theme of the route (Religion, handicrafts, restaurants)</td>
</tr>
<tr>
<td>4</td>
<td>Time Length</td>
<td>Average time taken to travel the route</td>
</tr>
<tr>
<td>5</td>
<td>Includes</td>
<td>The route includes additional benefits</td>
</tr>
<tr>
<td>6</td>
<td>Business types</td>
<td>Value Chain</td>
</tr>
<tr>
<td>7</td>
<td>Sites</td>
<td>List of all tourist sites through which you pass during the route of the route, in addition to its geo-referencing</td>
</tr>
<tr>
<td>8</td>
<td>Ages</td>
<td>Ages of tourists targeted by the route</td>
</tr>
</tbody>
</table>

The second component is the recommendation system: In this article we propose a hybrid recommendation system to make suggestions of tourist routes, the techniques used are explained below:

1. First one, we use the Content RS, in this kind of system the recommendations are made based on the user’s profile created. The content-based filtering use “item by item” algorithms generated through the association of correlation rules among those items. In this case direct associations are made between the characteristics of the routes and the tourist profile.

2. The second one technique are History RS, attempts to suggest objects based on inferences about a user’s needs and preferences. In some sense, all recommendation techniques could be described as doing some kind of inference, and can therefore reason about the relationship between a need and a possible recommendation. History RS is based on navigation history of a user and in previous elections. We use the information of the routes that the tourist has evaluated in the past and the comments that have published of the same.

3. The last one, are Demographic RS, these systems are based on the demographic characteristics of the users to deliver the suggestion. Recommendations are made based on the characteristics of the users, such as age, sex, geographical location, profession, etc. For trace tourism, we selected the geographic location of the user, aiming to recommender nearby sites that belong to a route.

The hybrid approach seeks to combine the techniques RS in order to complete their best features and thus make better recommendations. The proposed hybrid filtering approach transparently creates and maintains user’s preferences.

Finally, the recommended routes are given and the user can know the route, see opinions of other users about the route given, start the route and has a private album for the tourist to save the photos of his trip. This album can be shared by social networks.
4. System Implementation

The system was implemented for Android, as a free application under the name Trace Tourism Experience, the system logo is presented in figure 2.

![System logo](image)

Figure 2. System logo

Among the impacts of the development of this recommendation system is the articulation of the value chain, digital dissemination of tourism products (routes), promotion of micro, small and medium-sized enterprises tourism sector, promotion of job creation of local suppliers, Knowledge of customer preferences through reports and systematization of visitor behavior, evidence of customer satisfaction level.

In Figure 3, the system registry is presented, in Figure 4 the welcome interface, Figure 5 shows the recommendations of tourist routes according to the user's preferences.

![Logging interface](image)

Figure 3. Logging interface

![Welcome interface](image)

Figure 4. Welcome interface
5. Conclusions

This paper presents the design and implementation of a tourism recommendation system, which integrates several recommendation techniques, such as content according to the preferences of tourists, according to the geo-position of the tourist and the history of routes that the tourist has liked in the past.

The system personalizes the results of the recommendations according to the user profile generating the systematization of preferences, in addition the developed interfaces are intuitive and easy to use, and the application has a management section with reports and statistics, easy integration with a CRM. The system allows sharing the experience of the journey made in the territory georeferenced through social networks, with text content and associated photo. Finally, the recommendation system adapts to the different tourism projects that the territory has, complementing them from the web interface of the platform and the APP.

As future work, it is proposed to carry out validation tests of the proposal with real users.

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