Design of a Tourism Recommendation System Based on User's Profile

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Abstract. Recommender systems have emerged as a powerful tool in addressing the issue of information overload, they allow to filter and select relevant content that fit users' preferences and needs. In this paper we describe the general architecture of a recommender system which uses users' profiles to provide personalized and tailored journey to visitors of the Darâa-Tafilalet region. User profile contains various attributes that characterize the user and reflect his behavior. It helps to recommend the best offers for users and therefore to improve touristic experiences in the region Draâ-Tafilalet.

Keywords: Recommendation · Personalization · User profile · Tourism

1 Introduction

Nowadays, many people rely on online travel websites when planning a touristic trip or looking for information about travel destinations. Yet, because of the huge range of information afforded by the World Wide Web, they are always faced with multiple choices and alternatives. So, choosing the most suitable and adequate offer from the myriad options has become a hard and a complex task.

Recommender systems (RS) are considered as the effective tool to address these concerns by assisting the travelers to make the optimal decision. The use of RS could help tourists to search, compare and choose the more interesting products and services that fit their preference and need.

In order to provide users with personalized recommendation, the recommender system must select the more relevant offers that matches with their preferences and needs, in other words, the offers that best match their profile. Therefore, the user profile is an important component in the recommender system, and plays a key role in its effectiveness.

The rest of this paper is structured as follows: Sect. 2 gives a brief overview of the user profiling process and some existing travel recommender systems, according with their approaches, Sect. 3 shows a general overview of our proposal. And Sect. 4 end up with some conclusions and future works.

2   Background and Related Work

2.1   User Profiling

User profiles are a representation of various attributes that characterize a user and reflect his preferences, needs, behaviors and interest [1]. These profiles are one of the basic components in every recommender system, in order to provide users with highly relevant contents that fit their interests and needs.

The process of building user profile is called user profiling, it generally consists of two main phases (Fig. 1) [2]. The former concerns the collect of relevant information about individual users. The second phase focuses on user profile construction from the data collected using intelligent techniques, such as statistical keyword analysis; social filtering algorithms; or machine learning techniques [3]. The information in the user profile are then exploited in order to provide relevant contents to the users based on their preferences and needs.
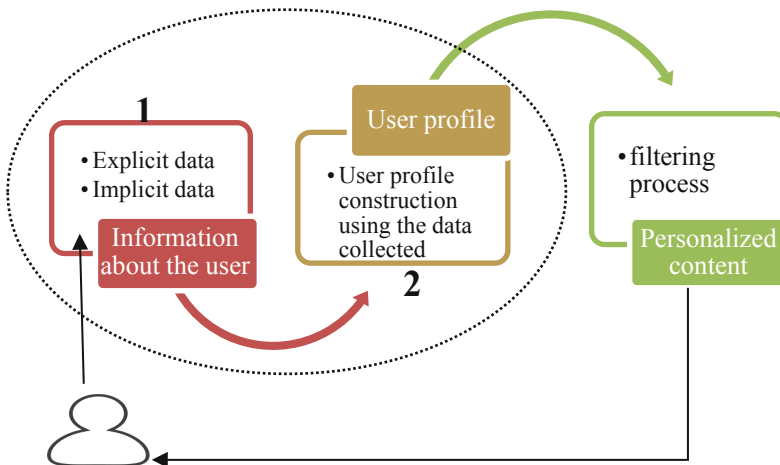
Fig. 1. User profiling phases

In the literature, information about users can be gathered in two ways: explicitly or implicitly [1, 2]:

- Explicit user information collection relies on the information directly provided by the user for example via online registration forms or surveys. Despite it is the easiest way of obtaining information about users, this approach has several downsides: it cost the user's time and effort and require user's reliability because if the user give fraudulent or wrong information the profile then constructed will not accurately reflect the user. Furthermore, the explicit profiles have a static nature and require the user's intervention to be updated
- Implicit user information, on the other hand, is collected through tracking the user's interactions with the system. The user profiles issued from this method are called implicit or dynamic user profiles. The main advantage of this method is that the data is collected automatically without any intervention from the user, but the accuracy of the profile relies on the amount of data generated through user-system interaction [4].

As mentioned above, both of implicit and explicit information have strengths and weaknesses. Our approach consists to integrate the two methods to overcome their limitations.

2.2 Travel Recommender Systems

As mentioned in [5] travel recommender systems (TRS) aim to provide users with tourism and leisure resources or attractions that match their needs and preferences such as destinations, whole tourist packs, or places to visit in a specific geographic area.

For instance, SigTur/E-Destination [6] is a Web-based TRS that provides recommendation on touristic activities in the region of Tarragona taking into account the user profile, as well as a map-based interface with the localization of the proposed activities. The recommender integrates several types of data (demographic data, composition of the travel group, geographical aspects, main travel motivations explicitly provided by the user and implicit feedback deduced from the interaction of the user with the system), it also combines many recommendation techniques, such as content-based, collaborative and demographic filtering techniques and ontology-based approaches. Tourist preferences on several kinds of tourist activities are stored in an ontology with a degree of interest in each concept. The interest degree is firstly initialized through the information explicitly provided by the user via a questionnaire when entering the system and then updated when the user performs actions on the recommended activities (e.g., requesting more detailed information of an event or removing it from the travel planner).

SPETA [7] is a TRS that recommends tourism services, such as attractions or restaurants, to tourists who are visiting a city they are unfamiliar with. The SPETA system is based on a hybrid filtering approach divided into four steps: first, contextual information such as the location, the time or the weather are taken into account to make a preliminary set of services. Second, knowledge-based filtering technique are used to obtain a more concise set of services by computing the semantic similarity between the user preferences and the touristic services with a feature-based similarity

algorithm, values under a defined threshold are discarded. In this step both services and user preference are presented in ontology. Third, collaborative based filtering techniques are used to filter the most suitable services from the remaining options based on user preferences. Finally Support Vector Machines is used to calculate the distance between the user preferences and the touristic services to make the final decision. Unlike the second step, in this step, user preferences and touristic services are presented as a rating vector.

Utravel [8] is a context-aware TRS, which recommends locations (shops, pubs, museums, etc.) based on the user interests, with respect to his current location. The mobile recommender provides user with a map on which is indicated his current position, and a set of surrounding locations with cultural or commercial relevance, according to his preferences and to his current context. User profiles are represented as a weighted vector, and are built taking into account the individual behavior of the user as well as the behavior of other similar users.

3   Proposition

In this section we introduce the architecture of our proposed system. The principal goal of this system is to provide recommendations to users about journey, in the region of Daraâ-Tafilalt, Morocco, based on user profiles.

The proposed architectural framework described in (Fig. 2) distinguishes between: the domain model, the user model and the adaptation model.
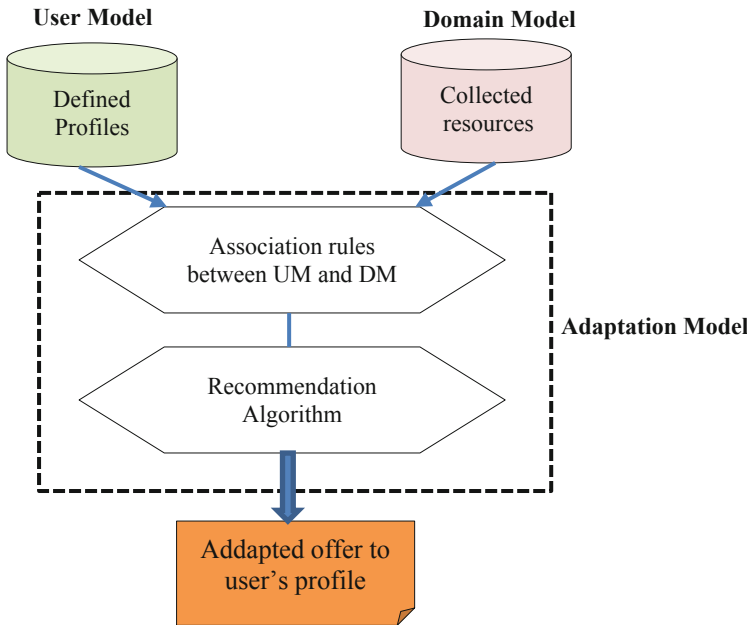
Fig. 2. Architecture of our recommender and adaptive system

3.1 Domain Model

This component defines and represents all the tourism knowledge about tourism resources in the Draâ-Tafilalet region. This region offers varied tourism potentialities with diverse geographical, cultural and natural components [9]. For the first step, we analyse the touristic area and extract various sites and touristic objects of the region (Museums, Libraries, tourist and historical sites, hotels, … etc.) through surveys and collaborations with authorities in charge of the tourism sector (example: Ministry of Tourism [9], Tourism Observatory [10], Moroccan National Tourist Office [11], …), as well as the collection of the information available on the Web and social networks. Therefore, tourism offers will be sorted by classes (for instance: Cultural tourism, medical tourism, business tourism, natural tourism, sports tourism) and subclasses (for example, the Cultural Tourism can be subdivided into two sub-groups, sites (Museums, Historic Sites, Archeological sites, Art galleries/crafts stores) and events (Special events, Festivals, Culturally oriented concerts) visitors [12].

3.2 User Model

This component is essential in order to discern user interests and needs and thus provide personalized and tailored offer according those preferences. In our system, the user profile is composed of two distinct parts. The first one represents the demographic and the personal characteristics of the user such as age, gender, country … on other word the characteristics that are independent of the domain, this part is called in the literature the static part. The second part is dynamic, it represents the goals and the preferences of the user directly related to the domain.

In our approach, we will also consider seven stereotypes considered as some of the most common tourist, who visit the region Daraâ-Tafilalet during the whole year: Young Tourists, Adventurers, Comfort Lovers, Senior Tourists, Business Tourists, Cultural Tourists and Internal Tourists. Stereotypes are useful when just little information about the user is available (demographic information), they allow to place the user in a predefined group that has well known preferences.

3.3 Adaptation Model

This model contains the set of adaptation rules that make up the connection between the Domain model and the User Model. The objective is to recommend the appropriate offers according the user profile.

There are several recommendation approaches, such as the content-based approach, the collaborative screening approach, the social approach, and the demographic approach. They generally suffer from a set of problems that reduce their performance for a subset of users. To overcome these problems, hybridization of these approaches is necessary. Our challenge is to study these hybridization techniques and choose the appropriate one [13].

The second challenge is to provide the most adapted presentation of the recommended touristic offers to the tourists according to their user profile, especially the demographic factors (age, language, gender…) by using Associations rules component [14]. Certain number of rules will be studied such as for example: if a user is male, from France and has between 21–35 years then the most presentation recommended will be a French sequence video lasting 2.8 min.

4   Conclusion and Future Work

In this paper, we propose to develop a tourism recommender system that is capable to generate personalized touristic offers using a user profile. The proposed recommendation process has three layers including: Domain model, user model and the adaptation model.

As our future work, we plan to enrich and improve the user/domain model representation by taking advantage from ontologies and semantic technologies. Keeping a maximum of information about the features of touristic items and user characteristics would help to establish a greater degree of accuracy and thus to make an accurate recommendation. We have also to study the different recommendation approaches used in order to decide on a suitable technique.

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