Towards Chatbots as Recommendation Interfaces

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Abstract. Providing tourists with the information they need in a timely and understandable manner is a key objective for promoting cultural heritage. Currently, tourists often spend only a few days in a city or in an entire region, so they need recommendations for optimizing the visit. In this paper, we introduce the objectives of the *Tourisitific* project, in which we aim to create a recommender system for travel information, supporting a lightweight access through chatbots. In this way, we will support travellers during their visits without burdening them with the installation of dedicated apps. In addition, we will help small and micro touristic operators in building their presence on the web with a familiar and easy to manage interface.

1 Introduction

Providing tourists with the information they need in a timely and understandable manner is a key objective for promoting cultural heritage. Currently, tourists often spend only a few days in a city or on an entire region, so they need recommendations for optimizing the visit. For building such recommender systems, we need data for describing points of interest, accommodations, etc.

In particular contexts, e.g., in Sardinia or other southern regions in Italy, most operators have small activities, such as a tavern or a bed and breakfast and the organization team includes only two or three people. Such dimensions do not guarantee resources and knowledge for working adequately on the web and ensure the social network presence. According to a recent study on trip activity planning [10], two thirds of travellers in USA uses the Internet as the main resource. A large majority considers the web essential for planning a vacation, including paths, point of interest (POI), transportation, information on events, etc.

Nowadays, we have many online services, which allow people to organize parts of their journey such as e.g., the overnight stay with Booking.com or Expedia. They usually offer a vertical and centralised approach focusing on a single service, thus requiring operators to insert and manage the information in the system in

a dedicated fashion. For small operators, this requires a good amount of effort, and sometimes this puts them outside the market.

In this paper, we introduce the *Touristific* (Semantic Search and User-Friendly Interfaces for e-Tourism) project, which aims at solving this problem by combining the power of recommender systems with conversational interfaces. It aims at creating a chat-based client for inserting and requesting information into an integrated system for planning travels. We discuss the main ideas behind the project, its workplan and the advancements in the interaction with a recommender system it will explore.

2 Related work

Relevant research for this project is related to the different travelling or geographic ontologies [4, 3, 6]. They have been used in isolation, without integrating them into a single source. For tourist information, a recent attempt to collect homogeneous data is Wikivoyage (`http://www.wikivoyage.org/`), which accepts only text organised in a language-dependent way.

In recent years, different ontology alignment and more general semantic matching techniques have been discussed in the literature. The more relevant for our work are recent studies in RDF property matching [8, 7]. Specific search interfaces for tourism related data have been analysed in [5, 1].

Besides the semantic data analysis, the project will leverage on context-aware recommender systems that provide services according to e.g., the current user's position, time, proximity, etc. In [3], the authors describe a touristic guide that recommends travel services (e.g., restaurants, hotels and transportation) according to the context. In [9], Bayesian networks are exploited for recommending restaurants. They calculate the estimated appreciation weighting the conditional probability related to the different restaurant characterizing attributes. A collaborative filtering approach for recommending activities and places while visiting a city is described in [2, 11].

3 Overview of the Touristific project

The *Touristific* project has two main practical objectives. On the one hand, it aims at providing a unified platform for tourists that proposes personalised paths while maintaining a simple interface. On the other hand, it will support small and micro touristic operators in building a good presence on the web, providing at least the most useful for the recommender system.

We plan to use an innovative interaction approach for this problem, which is based on chatbots for the most used messenger applications (e.g., Whatsapp and Telegram). Since it is reasonable assuming that all operators are familiar with such applications, this could be a good metaphor for guiding them in creating the contents. In addition, we aim at exploiting the same interface also for providing recommendations. This will avoid installing specific client applications in tourists' mobiles, which may difficult to find. We will also integrate proximity

interactions based on Bluetooth beacons for simplifying the access to information on the go, according to the tourist position with respect to the different point of interest (POI).

The recommendation of personalised visit packages needs to face three main challenges. The first is data integration, since we do not have a specific standard. Our solutions is to apply semantic-web technologies for this purpose, such as automatic ontology building and semantic annotation. The second challenge is the personalisation itself: we need to build a system able to respond in real-time to the constraints that user may express through the chat application, while considering activities and places that match their preferences. Finally the third challenge is designing a usable and effective interaction, balancing the need of information for having better recommendation with a reasonable interaction that would not overwhelm the user.

3.1 Semantic data integration

The project aims at developing techniques for aggregating and integrating heterogeneous information, taking it from sources that are neither synchronised nor structured. We rely on semantic annotations for solving differences among the open data repositories, which consists of inserting tags assigning a specific meaning to a particular piece of information, which are independent from the specific data syntax or transferring protocol.

The goal is having a common ontology with an automatic process, simplifying the inclusion of further sources and minimizing human interventions: even using RDF triples for representing knowledge, without a constant update the information becomes obsolete soon. Adaptive techniques applied to both structured and unstructured sources will provide such data automatically, without the need of expensive human data entry or cleaning.

The result will be a homogeneous view of data and its structure, which will be both inspected for providing the personalised packages.

3.2 Automatic recommendation of personalised packages

With the information coming from the different integrated sources, we will define and fine tune a set of recommendation algorithms that will take into account the user's profile and context-dependent attributes: position, social network connections, weather conditions, the date and time of the visit. On the one hand, we want to maximise the user's satisfaction; on the other hand we want to optimise the visit order in the point of interest.

In the process of generating personalised packages, the context puts a set of constraints. For instance, it must consider the working hours in a specific POI, the number of people that is able to accommodate simultaneously, etc. In addition, users may express constrains through their preferences (e.g., arts, cuisine, music etc.) both as a single or in a group with other people they are travelling with.

The recommendation algorithm should include means for weighting all these constraints in creating a package, and estimating the degree of interest for the user and the group for each item included. It is also important to represent why a specific POI has been recommended, in order to explain it to the user and allow him/her to modify his/her system internal representation in case the result is not satisfactory for them.

3.3 User Interface

In order to guarantee the effectiveness of the approach, the recommendation and the semantic analysis must be supported by a friendly user interface for both inserting and consuming the personalised packages. We aim at exploiting a chatbot for both purposes.

For creating the annotated information, the dedicated chatbot will reply to questions on how to insert specific pieces of information inside the system. For instance, the user may ask the bot how to insert the description of a B&B room and the bot will reply with a short description of the content needed (e.g., a name for the room, a short description and some photos). In addition, it will support the user in inserting contents through a guided dialogue, with a sequence of bot initiated questions that the operator will answer through a mobile phone.

In our example, the description of the B&B room will be requested by the bot asking "Please, send me some text describing the room". The operator will write a short text or, in case s/he would need help in identifying how to write such text, s/he may ask a concrete example to the bot. After that, it will ask multimedia content for better advertising the room, asking e.g., "Send me some pictures or a small video now". The operator will provide them through further messages. Finally, the bot will ask information for completing the content with semantic annotations. The request will minimise the number of questions while will try to maximise the usefulness of the annotation for the recommendation task.

In order to have a working interface, the bot must support the operator in building a mental model corresponding to the information needed by the system for supporting the potential customers, and the process of creating the package. Through the answers of the bot, the operator will learn to associate the possible recommendation outcome to parameters that are understandable for him e.g., associating the user groups identified by the recommendation algorithm to specific needs in the offered service. At the same time, s/he should be able to foresee the effect of a change in the service characteristics in the groups s/he will receive.

A symmetric interface will support tourists during their visit. It will provide recommendations both on-demand but also in a proactive way. The bot will reply to questions in natural language, such as e.g., "Where should we go for dinner tonight?".

In addition, the bot will exploit contextual information sensed through the mobile device for sending specific suggestions during the visit, in order to both recall the recommendations included in the personalised package, but also for

reacting in real time to different types of changes in the plan. Some of them may be related to last-moment decision of the user e.g., she was going to a restaurant but in the middle of the road she decides to stop in a museum she noticed while walking. The system may update the recommendations in order to find another place suitable for eating.

Moreover, the bot should react to context changes such as the weather (a sudden shower may require to go inside a museum rather than going for a walk) or proximity information. For instance, approaching a specific beacon the user manifests an implicit interest for the particular object, so the system may use such information for further recommendations. The bot may ask questions for reinforce the inference.

4 Conclusion and future work

In this paper, we discussed the main goals of the *Touristific* project, highlighting the strict correlation between the semantic web technologies, recommendation techniques and user interface design that would be needed for supporting real-time context-aware recommendations. In particular, we discussed the main ideas that will guide the user interface design and the communication with the underlying recommender system.

In future work, we will start a proper requirement elicitation work and we start creating the first version of the demonstrator.

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