Personalized Sightseeing Tours Support Using Mobile Devices

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Abstract. In this paper, we present PSiS (Personalized Sightseeing Tours Recommendation System) Mobile. PSiS Mobile is our proposal to a mobile recommendation and planning support system, which is designed to provide effective support during the tourist visit with context-aware information and recommendations about places of interest (POI), exploiting tourist preferences and context.

Keywords: Mobile Recommendation System, Sight Information Provider, Context-Aware, Client-Server Application.

1 Introduction

It is well known that the task of planning where to go and what to do, in the limited amount of time available, are common problems encountered by tourists when visiting a city for the first time.

In effect, cities are large information spaces, and in order to navigate these spaces visitors often require numerous guide books and maps that provide large amounts of information. Although the amount of information allows tourists to select more appropriate points of interest, it also turns the process so complex that the tourist might not be able to assimilate all this information adequately.

Mobile devices applications can be used to provide an effective support to tourists in tour planning process. Mobile terminals are embedded systems with very limited capabilities (limited display size, resolution, power consumption, processing capabilities, low memory and networking capacity) compared to a traditional computer. These limitations need to be considered because of possible technical, ergonomic or economic implications for the mobile user. So, mobile client-server applications performance is a crucial aspect that depends on many factors, such as bandwidth, connectivity, positioning capability and support for the paradigms of interaction, the user interface and security issues.

3 PSiS Mobile

PSiS (Personalized Sightseeing Tours Recommendation System) [1] is a tour planning support, it aims to define and adapt a visit plan combining, in a tour, the most adequate tourism products, namely interesting places to visit, attractions, restaurants and accommodations, according to the tourists specific profile (which includes interests, personal values, wishes, constraints and disabilities) and available transportation system between different locations. To ensure a good visit plan, working schedules as well as transportation schedules are considered.

The system gathers knowledge about the tourist's profiles, creating groups and stereotypes with specific interests and features, allowing characteristic inheritance. Tourists travel history is stored, which leads to accumulated knowledge about personal profiles. This knowledge, together with tourist stereotypes offers a mean of learning about general and specific interests of tourists. Also, it is possible for the tourist, to provide feedback on accomplished tours.

Currently, PSiS only interacts with tourists through a web application accessible only from a browser, but it's indispensable to have a tool to assist tourists "on the field". Thus, we are studying and developing a mobile tool to be integrated in the PSiS project, called PSiS Mobile. This tool also takes into account the tourist current context and nearby sights context.

In a preliminary phase, PSIS Mobile will be limited to data from the city of Porto, Portugal. But it will be designed so that no data or user restrictions are imposed. It is composed by two pieces, the server-side and the mobile client. All the main information like user profiles, history and similarity values, is compiled on the server. In other words, all the recommendation aspects are on the server, since it classifies sights with a rate to that specific user. There is a complete database with all information about points of interest in a certain city/region, and a complete portfolio of users as well as their visit history.

The mobile client is a very important piece in all system, because it interacts with the user. With a PDA, the user can see his generated route and provide information about his context with this the system can offer a more effective recommendation about places to visit and can do the re-planning of the original visit, in real time. The system interacts with the user providing information about nearby sights to see, these points of interest are recommended according to user profile and context; Shows trip planning for current day, that can be re-arranged according to current context, for example, if tourist is behind schedule a planning algorithm is executed to do a re-plan; Shows favorite sights stored on the system.

With PDA we know user's current context, i.e. its location, day/time information and traveling speed. And with this information we can get even more information, for example, we can know what is the weather forecast for that location at that moment, to refine the recommendation (to not suggest outdoor spaces to visit). With traveling speed, planning can be made more effective, taking that speed and calculate the time that takes to get from one to another point of interest. Besides the already mentioned information, on or behind schedule.

Our mobile application will manage some basic recommendation routines only. What we mean with this is that it will not classify (or rate) points of interest, but only

show the results to the user. For example, if a user likes Chinese food, certainly a Chinese restaurant has a higher classification value according to the user preferences (might not happen if classification is given using collaborative filtering, since the restaurant might have a negative classification by similar users).

Our mobile client will show the points of interest, for that user and for a specific category, ordered by classification (downward; higher classification appears first). After visiting some points of interest, the user can provide feedback about the visited place.

When the user is going to see a point of interest, the application will show detailed information about it. With this, the tourist knows more about what he is going to see, for example, the history of a museum.

We also want to implement Augmented Reality in our system, meaning that the user will have the options of pointing the PDA to the point of interest direction and access to its detailed information. These details will include information like pictures of the point of interest in other seasons of the year (i.e., covered in snow). This application will offer built-in social networking too, so the user can share his pictures with the community in a matter of seconds. Despite all the features to be implemented in our application, we want a smooth and easy to understand interface to the user. To facilitate navigation throughout the application it is essential that the number of clicks between various features is kept at the minimum.

To conclude, we want to make a real application that really helps people on seeing what they expect to see, or going where they like. It is important to develop an optimized communication mechanism to ensure that a tourist does not waste too much time just to gather the necessary information.

In our case scenario we have Microsoft server side technology, and all the recommendation system is working under .NET framework. The database, that is present in the same physical server, is implemented on SQL Server 2008.

At user side, we have a PDA running the Android OS. The problem is that Android uses Java technology. So, there are two different modules, implemented with different technologies that need to communicate. Another issue is the low RAM memory capacity: only 288MB for the whole system, so we need to be very careful with the mobile application development.

Since we have two different technologies communicating with each other, and the base system is already implemented, we must create a middleware that bridges communications between these two technologies. This means that the mobile middleware will play a crucial role on the system.

Some of the important features of the middleware include security, data synchronization, device management, and the necessary support for multiple devices. Because this will be an occasionally connected application (Smart client), a temporary database is used on the mobile device to permit access to parts of the data without constant traffic consumption over the network, and to allow the application to work without internet connection (with multiple limitations, like no access to new points of interest and recommendations).

First of all, after requesting a recommendation for a trip, all the necessary data is transferred from the server and stored on the mobile device. We find this to be necessary, because of the low Internet speed rates on mobile phones and its possible unavailability. When we say necessary data, we mean, the information of all the

nearby points of interest that will be on the planning schedule, and other points of interest nearby the first ones. This approach is useful if the tourist wants to re-plan the schedule in real time.

All the collected data, photos, user context and others will be stored on the device, to then be sent to the server.

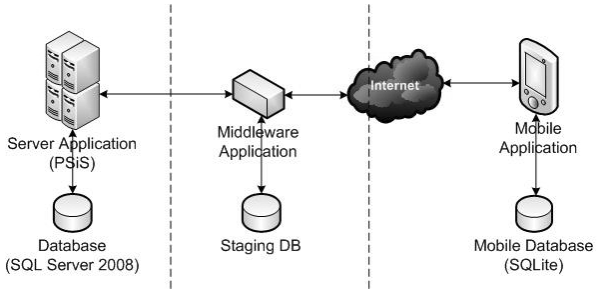

Figure 1 - Mobile Architecture Overview

This architecture from Figure 1 can be summarized saying that:

- The existent system will does not need to be changed;
- The middleware application is a component that will reside on the server side and will be developed on .NET Framework, with directives to permit the communication between the existing system and the mobile application;
- The mobile application runs on Android devices and is used to capture/send data from/to the field. The application also has a synchronization component to synchronize the handheld data with the server database;
- Internet connection is used to retrieve/update itinerary information, sites information and personal preferences. Data is uploaded and downloaded automatically without user intervention.

4 Conclusion

We have introduced the main concerns present in the development of a mobile application in a client-server environment. Although mobile devices have many constraints, with PSiS Mobile we pretend to provide a good user experience, giving tourists a fast and user friendly tool including context-aware adaption, a route planning system, augmented reality and built-in social networking features, to provide the user with important and significant details about what he is seeing or is about to see.

References

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