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Mobile Tourist Guide: Bridging the Gap between Recommending, Planning and User-Centered Interaction

Richard Schaller[1] and **Martin Hacker**[1]

Abstract. We present a mobile tourist guide for planning and conducting sightseeing day trips. The system combines a hybrid recommender system for sights, events and other points of interest with a tour planner for time-constrained activities taking additional constraints for public transport connections into account. A novelty of the implemented approach compared to existing solutions for tourists is that the user retains full control over the tour by being able to directly edit any detail at any time, even if there are existing constraints that hinder the direct execution of an edit operation. Moreover, recommender and planner are closely interconnected by regarding the reachability of recommended items with respect to the current selection as well as filling unavoidable gaps with fitting recommendations. The application is tailored to the city of Nuremberg, Germany, but can be extended by additional data for other destinations as well.

1 INTRODUCTION

Due to the increasing popularity of smart phones, mobile tourist guides continue to gain in importance. At the same time, there is a growing need for individual sightseeing. In view of the large number of sights and offered events the compilation of optimal personalized tours can hardly be accomplished by tourists that are typically unfamiliar with the destination.

Assistive technologies like recommender and planner can provide considerable benefits to the user by automating such complex user tasks as POI[2] selection and tour optimization. However, they introduce a variety of indirections making the relation between user profile and its effects more and more intransparent. We present a solution where the user retains full control over all details of the tour at any time – during the planning phase as well as during plan execution, as postulated in [3]. The ability to adapt the tour while conducting it is essential not only for tourists who wish to remain flexible but also for those who are affected by unexpected events like weather change, modified opening hours, cancelations or public transport delay.

The system presented in this paper is implemented as an Android app which provides personalized recommendations for sights, events and other points of interest. Users can mark the POIs of interest as obligatory or optional. Based on this selection, the planning module suggests sightseeing tours that are optimal with respect to certain criteria and can be customized by the user. For the planning as well as customization step, constraints such as opening hours and public transport connections are taken into account. Finally, the application navigates the user between the chosen POIs using a map display and textual instructions.

[1] Embedded Systems Initiative (ESI), Department of Computer Science, University of Erlangen-Nuremberg, Germany, email: richard.schaller@fau.de
[2] Point of Interest

2 RELATED WORK

In various research projects, prototypical or complete electronic tourist guides have been developed:
The P-Tour system described in [4] requires users to specify their respective interest in the available POIs. Various route alternatives are evaluated by a genetic algorithm in parallel. In [8] P-Tour was extended by including a plan monitoring component: In case a visitor runs behind schedule he is informed to hurry up. If the delay is too big, the whole route is recomputed.
The CT-Planner described in [2] uses a content-based recommender to calculate scores for all POIs. To obtain a user profile, the user can specify his interests directly or indirectly via choosing between different routes. The latter are generated by using the recommender with a slightly modified user profile. In case the user decides for one of these alternatives the user profile is updated accordingly.
The system developed in [1] is based on an Iterative Local Search algorithm. For customizing the generated route various operations such as adding, removing or moving a POI are provided. These operations will shift POIs beyond the specified end time if needed. As far as we know the visit durations are not adjusted.
In [9] an overview of plan-based electronic tourist guides is given.

3 SYSTEM DESCRIPTION

3.1 System Architecture

The system consists of an Android app containing several tightly coupled modules and providing the main functionality. An additional server component is currently only used for sightseeing data updates and collaborative filtering.

3.2 Data

Currently our system supports around 100 POIs in and around Nuremberg. For each of them, the data contains the following meta information: title, description, location, address, picture, opening hours and URLs linking to further information. Every POI is assigned to at least one of 14 categories such as Castles, Churches or Parks. Moreover, the system carries information about all subway and tram connections in Nuremberg and some selected bus tours.

3.3 User Settings

Upon the application startup, the user is asked to specify his interest in the individual categories using a slider interface. The resulting user profile is later used to generate recommendations. Furthermore, the user has to choose a date for the day trip. Sights that cannot be visited on the specified day will be hidden until the user changes the date.

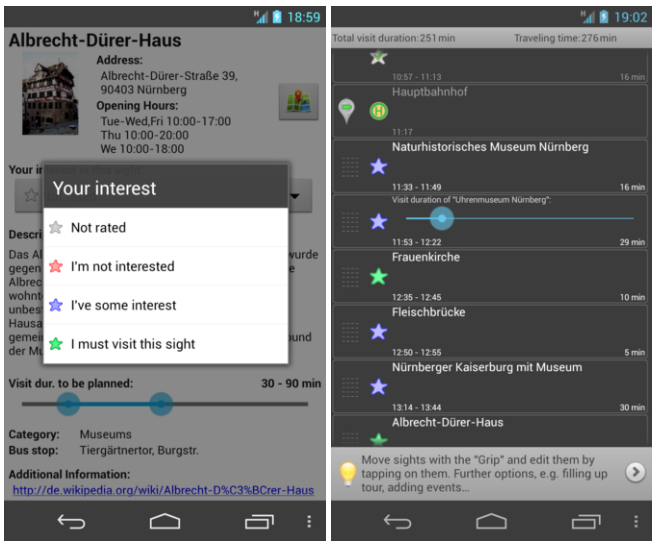

Figure 1. POI details screen with activated interest selection (left); Route editing screen with the visit duration change slider being activated (right)

3.4 POI Selection and Break Scheduling

On the next screen, the user can browse through the catalog of all POIs that are available on the given day and select individual items that should be considered for the tour. There are four ways how the catalog can be accessed, each of them represented by a separate tab:

- The *recommendation tab* offers a list of personalized recommendations generated by the recommender module which implements a hybrid recommender system approach. It combines content-based algorithms, collaborative filtering and a temporal contiguity recommender designed to suggest POIs nearby the already selected items. The detailed algorithm is described in [7].
- The *by Category* tab enables users to browse POIs based on the assigned categories. When choosing one of them from a drop-down menu, users are provided with a list of the corresponding POIs.
- The *Search* tab gives users access to a search-as-you-type interface supporting a full-text fuzzy search. More detailed descriptions of the used search algorithms can be found in [6, 5].
- The *Map tab* enables the user to access POIs by location. As all selected items are highlighted on the map in color, the user gains an impression of the spatial relation between POIs and might consider groups of nearby POIs in order to reduce transportation cost.

The presented POI lists in each tab show both the name and nearest bus stop for each entry. Users can tap POIs to get further details and rate POIs for possible tour inclusion by choosing between three options (see Figure 1:Left). For route planning purposes the user may specify a minimum and maximum visit duration via sliders. The details page also contains a collaborative "Users who selected this POI were also interested in that"-feature.

The last tab provides an overview of the selected items. The user can add breaks if he wishes a certain time interval to be blocked, e.g. for lunch.

3.5 Route Planning

Before suggesting a route the system asks the user to schedule the beginning and the end of the tour. A destination to be reached at the end of the route can optionally be specified. The system then calculates three route alternatives taking into account time and location for start and end, transfer time, opening hours and the min/max values for the visit duration. The optimization criterion is to visit as many selected POIs a possible. The used algorithm is based on the Iterative Local Search approach to the Orienteering Problem as described in [10]. The route alternatives differ as follows: One contains only the selected items, one is filled up with additional POIs provided by the recommender system and one is filled up with best-fitting POIs.

3.6 Tour Adaptation and Re-Planning

In case the user is not satisfied with the generated route or wants to modify the route during sightseeing, e.g. due to an overcrowded sight, he can switch to the route editing screen. It supports the following editing operations: removing a POI, inserting a POI at a specific position/at its best position, moving a POI, changing a POI's visit duration and filling up a route with additional POIs. The different editing operations either consume time or leave spare time after they were performed. For the former we want to provide as much flexibility as possible which means that we reduce the time spent on other POIs. For the latter we want the extra time to be distributed "fairly" between available POIs, i.e. the time is equally distributed among all POIs. In order to allow for such flexibility we first collapse all visit durations in a route to make room for further modifications, then perform the operation and finally expand the visit durations.

4 CONCLUSION

We presented a mature electronic tourist guide incorporating various AI technologies: It features a hybrid recommender, an advanced search engine, a sophisticated route planner and smart route editing. We demonstrate how these components can be put together into an assistance system, run self-contained on a mobile device and be accessed by users on devices with small screen real estate.

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REFERENCES

[1] Ander Garcia, Olatz Arbelaitz, Maria Teresa Linaza, Pieter Vansteenwegen, and Wouter Souffriau, 'Personalized tourist route generation', in *Current Trends in Web Engineering*, 486–497, Springer, (2010).
[2] Yohei Kurata, 'CT-Planner2: More flexible and interactive assistance for day tour planning.', in *Proc. of ENTER*, pp. 25–37, (2011).
[3] Bernd Ludwig, Martin Hacker, Richard Schaller, Bjoern Zenker, Alexei V. Ivanov, and Giuseppe Riccardi, 'Tell me your needs: assistance for public transport users', in *Proc. of EICS*, pp. 157–160, (2011).
[4] Atsushi Maruyama, Naoki Shibata, Yoshihiro Murata, Keiichi Yasumoto, and Minoru Ito, 'P-Tour: A personal navigation system for tourism', in *Proc. of 11th World Congress on ITS*, pp. 18–21, (2004).
[5] Richard Schaller, Morgan Harvey, and David Elsweiler, 'Improving search experience on distributed leisure events', in *EuroHCIR*, (2012).
[6] Richard Schaller, Morgan Harvey, and David Elsweiler, 'Out and about on museums night: Investigating mobile search behaviour for leisure events', in *Proc. of the ECIR Workshop Searching4Fun*, (2012).
[7] Richard Schaller, Morgan Harvey, and David Elsweiler, 'RecSys for distributed events: Investigating the influence of recommendations on visitor plans', in *Proc. of SIGIR*, (2013).
[8] T Shiraishi, M Nagata N Shibata, M Nagata, N Shibata, Y Murata, K Yasumoto, and M Ito, 'A personal navigation system with a schedule planning facility based on multi-objective criteria', in *Proc. of 2nd Intl. Conf. on Mobile Computing and Ubiquitous Networking*, (2005).
[9] Wouter Souffriau and Pieter Vansteenwegen, 'Tourist trip planning functionalities: state–of–the–art and future', in *Current Trends in Web Engineering*, 474–485, Springer, (2010).
[10] Pieter Vansteenwegen, 'Planning in tourism and public transportation', *4OR*, **7**(3), 293–296, (2009).