5.2 HappyParking

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There are estimations that indicate that about half of the vehicles on the move are searching for parking and that more than 40% of the total fuel consumption is spent while looking for an available parking space. This also contributes to significant urban traffic congestion. So, it would be interesting to have software tools that can help drivers to park easily.

For the application challenge, our group proposed a *HappyParking* application, which would offer some interesting benefits:

- It ackowledges the importance of considering parking in the context of a displacement between a source location and a target location. This implies that the final target location has to be considered when deciding an appropriate parking space. Moreover, the application can be integrated into existing GPS-based navigation applications.
- It considers multimodality, that is, that parking a car could be just a leg within a longer trip using different modes of transportation.
- It exploits real-time constraints (e.g., time-based parking restrictions).
- It can accommodate a variety of methods to capture information about available parking spaces (e.g., magnetic sensors on the parkings, crowdsourcing information provided by drivers releasing a spot, cars with different types of sensors able to detect free places, etc.).
- It supports different types of parking spaces: on-street parking, private parkings and garages, home parking available for rental during specific time periods, etc.

At a very high-level, the architecture supporting HappyParking is composed by four modules: the *Data Capture* module, the *Knowledge Discovery* module, the *Payment* module, and the *Incentives* module. The system is able to offer real-time parking recommendations. It computes the likelihood of parking at the estimated time of arrival: in a certain area, at certain times, and taking into account especial external real-time events (e.g., a big concert or music festival in the city). On the one hand, it offers recommendations that maximize the success probability, the user's satisfaction, and the global benefit for the community of drivers. On the other hand, those recommendations can minimize the distance to the final destination, the time to park, and the economic cost (fuel consumption). For this purpose, it learns the user preferences over time. Finally, for some types of parking spaces it is possible to book and pay for a guaranteed parking spot (e.g., based on a dynamic pricing schema).

In accordance to the above description, this kind of application would be useful for a variety of parties, such as drivers, garages, owners of private parking spaces, municipalities, car manufacturers, OEMs, ecologists and health systems. Nevertheless, the unique combination of features indicated requires additional research work to make such an application a reality.

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5.3 Ichibi – Everything you ever wanted in a multi-modal travel app

Caitlin Cottrill, Jan Fabian Ehmke, Glenn Geers, Franziska Klügl, and Sabine Timpf

Due to the multitude of travel options and prices, travel planning has become challenging nowadays. For the individual traveller, it is not easy to determine her best travel option. Existing travel apps offer only limited functionality for the consideration of complex traveller's preferences. Furthermore, there is hardly any en-route assistance, especially when it comes to multi-mode travel alternatives. Multi-mode travel options tend to be much more complex, though. En-route assistence would allow for real-time adapation and reaction to travel disruptions.

Ichibi provides pre-trip and en-route functionality and thus comprises everything you ever wanted in a multi-modal travel app. *Ichibi* is

1. Smart – learns the travelers' preferences and constraints,
2. Efficient – sets the travelers' preferences, selects the traveler's preferred alternative, books tickets, and it is
3. Timely – it reacts to travel disruptions and provides alternative travel options if needed.

Ichibi uses a middleware based approach that leverages available transport services and relevant data for travel planning by canonicalizing travel information into a consistent internal format that is able to be processed efficiently. It is able to intelligently manage journey risk and reliability of travel options by pre-computing alternative routes-to-destination from each interchange point. Location awareness enables Ichibi to provide correct and up-to-date travel