WEtransport: A Context-based Ride Sharing Platform

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ABSTRACT

In densely populated urban areas high amounts of traffic pose a major problem, which affects the environment, economy, and our lives. From a user's perspective, the main issues include delays due to traffic jams, lack of parking space and high costs due to increasing fuel prices (e.g., if commuting long distances). Collective transportation (CT), e.g., public transport systems, provides a partly solution to these issues. Yet, CT does not support door-to-door transportation hence reducing convenience; it might be limited in off-peak hours, and it is still a cost factor when travelling long distances. A solution to these issues is ride sharing, an evolving form of CT making alternative transportation more affordable. In this paper we present a modular, context-aware ride sharing platform. We aim at enhancing convenience, reliability, and affordability of different forms of ride sharing by means of context data. Additionally our approach supports an easy server- and client-side expansion due to the modular platform structure.

Author Keywords ride sharing, ticket sharing, mobile phone, collective transportation, car pooling

ACM Classification Keywords H3.5 [Information Storage and Retrieval]: Online Information Services – Web-based services

General Terms Human Factors, Economics

INTRODUCTION

Urban areas nowadays often suffer from high traffic volumes especially during rush hour. Despite resulting problems such as air pollution, traffic jams, and high fuel prices, convenience is still a driving factor leading to that people are using cars individually. Whereas public transport sometimes provides a good alternative (e.g., while commuting), there are many situations where public transport is inconvenient, e.g., when trying to reach remote locations, or in off-peak hours where services are limited. Another factor are high costs involved with using public transport, especially when used irregularly so that no discounts (e.g., for monthly tickets) are applicable. For these situations, a new form of transportation, called ride sharing, is becoming more and more popular. People organize themselves to share cars (car pooling), taxis or (group) tickets for trains. However, ad-hoc situations (e.g., getting home from a party) make it often difficult to find other people taking the same / similar routes as they cannot be planned in advance.

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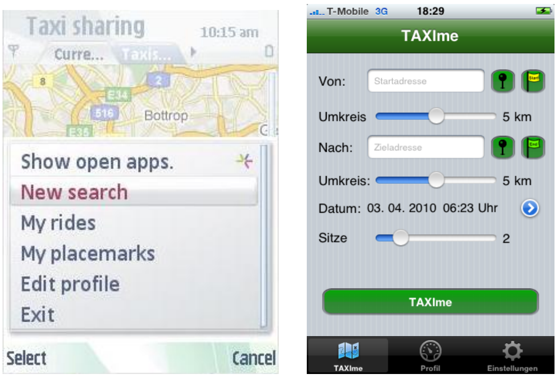
Various systems exist nowadays which support users in finding rides for their trips, e.g., [5] and [4]. Cab-sharing is a type of ride sharing, proposed in [2], aiming at using unoccupied cab space to reduce the cost of transportation. Further, optimization of CT has been investigated in [6], [1], and [3] focusing on how the ride sharing requests can be grouped together efficiently through mathematical algorithms to utilize the ride sharing and achieve significant savings. Therefore a ride sharing request (including the origin and destination) is usually sent from a mobile phone or a web platform to a system, which processes and automatically groups the requests. Then the result (including the schedule and cost) is send back to the requestor.

In this paper we report on the design and implementation of a modular, context-based ride sharing platform. The contribution of our research is twofold. (1) We assess how context information can be obtained and used to enhance the ride sharing process (e.g., how can location information be used to find potential co-riders in the vicinity). (2) We present a modular platform supporting ride sharing for different means of transport (e.g., taxi, car, or train). By using a modular approach customized applications can simply be added on top of our platform to suit different requirements.

THE WEtransport SYSTEM

Ride sharing can be found for different types of transportation, such as cars, taxis, trains, etc. Current approaches mainly focus on one type of transportation, hence limiting the amount of available options and increasing the investigation time. In order to support ride sharing, a system requires a set of information in order to find appropriate matches, i.e., people, having the same or similar way of travel. *General information* includes time, origin, destination, or rating of co-riders (this is often important to establish a trust relationship). *Transportation specific information* depends on the chosen mode of transport. This might be the number of available seats (e.g., car, cab), the type of ticket (e.g., group tickets when travelling by train), etc.

Our ride sharing platform, called WEtransport, allows for storing rides consisting of both general and transportation specific information within a database. A RESTful API allows external applications or services to access the platform's information and tailor its user interface for the use among different means of transport. Such services might include mobile clients, but also monitors showing available ride sharing options in the vicinity of event locations.



(a) (b)

Figure 1: (a) S60 phone client (b) iPhone client

Web Client

To participate in the system, we provide a web-based client where users can register and log in. After logging in, users are able to accesses the system's functionalities, e.g., searching for available rides or offering rides, viewing rides' details and passengers, exchanging messages with ride-mates, viewing user profiles, rating ride-mates, etc.

To search and find appropriate rides users simply enter the date, departure time, origin, destination, preferred means of transport, and number of required seats. Origin and destination points can be defined either by entering the postal address or using a map. For each origin and destination point a radius as well as a time offset before and after the planned departure-time can be defined to enlarge the search window. Based on input data existing rides matching this temporal-spatial query are retrieved from the server and returned to the client, sorted by distance. The returned information for each ride includes the address of origin and destination, departure time, number and list of confirmed co-riders, distance of the fastest route, and estimated costs per person. Since the users chose available rides by themselves, no matching algorithms are required hence making the approach robust and reliable. However, we use a simple algorithm to filter irrelevant information (e.g., too far away or too late) while processing a ride request. Thus, based on users' queries, appropriate available rides are provided leaving the decision and matching to the users.

Additional information provided to the user includes past and future rides, collected ratings, place marks (short-cuts for frequently used origin or destination points), personal details and motivational statistics such as overall completed distance or monetary- and CO_2-savings.

Client applications and services

Our modular approach allows for creating arbitrary clients, such as mobile applications providing a specialized UI for a certain mode of transport or arbitrary (web) services. In our first prototype we implemented two different mobile client applications for ride sharing in taxis and in trains. *WEtaxi* is tailored for sharing taxis among multiple persons. We implemented two clients for Symbian S60 phones and for the iPhone (see Figure 1). *WEticket* supports finding people in a train who have a ticket that allows to take additional people onto a journey (e.g., using a group ticket).

Social Implications

The WEtransport platform includes several social components. One of them is *user profiles*. Similar to buying items on the Internet from unknown people (e.g., eBay), ride sharing with strangers requires trust between all parties. User profiles and ratings are a way to check other users before signing up for a ride. Users who have participated in a ride are asked to rate their ride-mates after the ride is finished. In this way users can impart their experiences with other users for future usage. The *ride message board* allows users for coordination of, e.g., a meeting point or time.

CONCLUSION

In this paper we presented a platform called WEtransport, which allows users to find co-riders hence saving money while at the same time preserving the convenience of an own car. We use a modular approach, which allows for extending our platform with different types of transport and implemented two mobile clients supporting taxis and trains. To ease the ride sharing process we take into account the users' context when signing up for rides (e.g., his location).

As a future work we plan to evaluate our platform in the real world, focusing on user acceptance and social impacts. We also plan to add further assistance to certain stages of the ride sharing process with a focus on additional context information. The meeting of ride-mates before collectively catching a taxi could, e.g., be supported by a Bluetooth-based proximity detection feature. We further plan to release an open, fully documented API allowing for writing further client applications and to use the platform in a more generic way. Hence it would be possible to extend ride sharing to arbitrary modes of transportation by simply adding required ride-specific information and to support further types of ride sharing related services.

REFERENCES

[1] Crainic, T.G., Malucelli, F., and Nonato, M. Flexible many-to-few+ few-to-many= an almost personalized transit system. TRISTAN IV, Miguel Azores Islands

[2] Gidófalvi, G. and Pedersen, T.B. Cab–Sharing: An Effective, Door–to–Door, On–Demand Transportation Service. Proc. of ITS, (2007), 1–8.

[3] Gidofalvi, G., Pedersen, T.B., et al. Highly scalable trip grouping for large-scale collective transportation systems. Proc. of EDBT, (2008), 678–689.

[4] Hitchstrers. http://www.hitchsters.com

[5] Texxi: http://www.texxi.com/

[6] Transportation Problems: www.di.unipi.it/optimize/transpo.html