Bus Notification System

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Abstract- *A key challenge for rapidly growing cities of today is to provide effective public transport services to satisfy the increasing demands for urban mobility. Towards this goal, The smart bus notification system will develop an Android Mobile Application to provide two novel information services for passenger which includes navigation(where the bus is being) and to know the current available seats. Next the passengers boarding the bus can make payments through smart cards which is a cashless feature. Further the system also enables the passengers to know the current status and boarding points the bus has passed. Thus the passenger comes to know the destination.*

Keywords- Smart transport, Navigation, Bus, RFID Payments

I. INTRODUCTION

As cities continue to grow in size and population, new challenges arise for the design of urban mobility infrastructures. While public bus transport systems have the capacity to absorb large masses of urban travellers, their public image often suffers from a negative perception. First, from a passenger's point of view, bus networks in dense urban areas are often considered as complex and difficult to navigate. Second, in contrast to private modes of transport, traveling on buses offers only a low level of comfort and convenience. To overcome these inherent weaknesses of the physical bus transport system, digital technologies are employed in order to improve the perceived quality of bus transport. To fill this gap, embedding smart technology provides great opportunities to improve existing public transport system into real world transport usage contexts. In particular, there is potential to design traveller information system which can foster a closer relationship between physical and digital travel experiences. There is empirical evidence that enhanced information availability and accessibility is an important factor for increasing readership and satisfaction with public transport services to improve the experience of public bus usage and present the notification of number of passenger in buses, a personalized bus navigation system with the ability to seamlessly interconnect bus passengers with the real-world public bus infrastructure.

II. RELATED WORK

Passenger Perceptions And The Ideal Urban Bus Journey Experience.

Respondents living close to a Quality Bus Corridor indicated which of 68 items were 'Things I dislike or things that discourage me from using the bus in Edinburgh'. Eight underlying factors are reported: feeling unsafe (e.g., 'Drunk people put me off travelling by bus at night'); preference for walking or cycling (e.g., 'I prefer to walk'); problems with service provision (e.g., 'No direct route'); unwanted arousal (e.g., 'The buses are too crowded'); preference for car use (e.g., 'I feel more in control when I drive'); cost (e.g., 'The fares are too expensive'); disability and discomfort (e.g., 'There are not enough hand rails inside the bus'); and self-image (e.g., 'Travelling by bus does not create the right impression'). The influence of age, gender, household income, car availability and frequency of bus use on factor scores is reported. Analysis of write-in responses extended interpretation to include travelling by bus as a social behaviour in an exchange space and a formulation of the ideal, 'hassle-free', urban bus journey as pleasant/deactivated.

1. **Micro-navigation for urban bus passengers: using the internet of things to improve the public transport experience**

Public bus services are widely deployed in cities around the world because they provide cost-effective and economic public transportation. However, from a passenger point of view urban bus systems can be complex and difficult to navigate, especially for disadvantaged users, i.e. tourists, novice users, older people, and people with impaired cognitive or physical abilities. We present Urban Bus Navigator (UBN), a reality-aware urban navigation system for bus passengers with the ability to recognize and track the physical public transport infrastructure such as buses. Unlike traditional location-aware mobile transport applications, UBN acts as a true navigation assistant for public transport users. Insights from a six-month long trial in Madrid indicate that UBN removes barriers for public transport usage and has a positive impact on how people feel about public transport journeys.

Crowd density estimation for public transport vehicles

Existing information systems for urban public transportation are empowering travelers to optimize their trips with respect to travel duration. Experience with such systems shows that this is a viable approach. However, we argue that solely relying on trip duration as the primary indicator for satisfaction can be limiting. Especially, in urban settings providing additional information such as the expected number of passengers can be highly beneficial since it enables travelers to further optimize their comfort. As technical basis for determining the number of passengers, we have built an inexpensive hard-and software system to estimate the current number of passengers in a vehicle. Furthermore, we have deployed the system in several buses in the city of Madrid. In this paper, we describe the overall design rationale, the resulting system architecture as well as the underlying algorithms. Furthermore, we provide an initial report on the system's performance. The initial results indicate that the system can indeed provide a reasonable estimate without requiring any manual intervention.

2. Identifying the information needs of users in public transport

The development process of user-centered passenger information in public transport requires decisions in the areas addressees, location and information characteristics. To support these decisions, this paper describes a framework for identifying information needs of users of public transport systems based on the results of an information classification and an extensive task analysis. Transportation companies, as providers of transport services and passenger information, obtain new possibilities for the development of passenger information. Passenger information may not only be stationary, collective and static but mobile, individual and dynamic in order to fulfill the information needs of their users. Identifying these information needs to develop user-centered passenger information systems, is difficult. Devadson and Lingam point out that users have different reasons for not answering questions about their information needs, precisely. Users may not know their real information needs in a special case or they don´t want to reveal their need for information, due to social reasons.

3. An Examination of the Public Transport Information Requirements of Users

This paper focuses on the provision of public transport information in Dublin, Ireland. It examines both existing and potential methods of accessing information, with particular focus on the implementation of various intelligent transport systems applications. One of the main objectives of this paper is examining the stages a passenger goes through when deciding to undertake a public transport trip and in what form they require information at each stage. This paper defines these stages as "pre-trip to destination," "at-stop," "onboard," and "pre-trip to origin" (this is the return journey). Each of these four stages is examined in this paper. A web-based survey was used to collect data on passenger preferences and describes the methods of information delivery each passenger requires at each stage. This paper primarily deals with the respondents' stated preference for public transport information and does not examine revealed preferences. The survey also details results of passengers' opinions of the different information provision formats such as call centers, mobile phones, the Internet, and paper-based methods. This paper concludes with the results of this exploratory research.

4. Path2Go: Context-aware services for mobile real-time multimodal traveler information

Mobile platforms are now becoming a more and more important medium for providing information to travelers on the move. To improve the accuracy and relevance of the mobile traveler information, context awareness has become a active research topic. In this paper, we describe algorithms and services provided by Path2Go, a multimodal traveler information system developed by California PATH, UC Berkeley. The Path2Go activity detection algorithm, the core of the context-aware design, has made the following contributions: (1) it uses a rule-based multi-hypothesis Bayesian method for mode detection, to address the limitations of using mobile phone GPS for activity detection and increase the speed of convergence; (2) it fuses GPS data from transit vehicles and the GPS of the user's mobile phone for better activity detection; and (3) it enables several experimental services, including variable-frequency client-server communication and need-based GPS use. Field testing of the Path2Go activity detection algorithms showed reasonably good results. The Path2Go application has also been made available to the public through iPhone, Android and Windows Mobile platforms, with some of the features discussed in this paper included.

5. Learning and inferring transportation routines

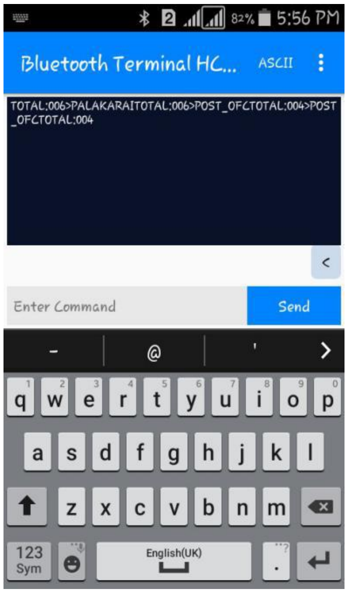
This paper introduces a hierarchical Markov model that can learn and infer a user's daily movements through an urban community. The model uses multiple levels of abstraction in order to bridge the gap between raw GPS sensor measurements and high level information such as a user's destination and mode of transportation. To achieve efficient inference, we apply Rao–Blackwellized particle filters at multiple levels of the model hierarchy. Locations such as bus stops and parking lots, where the user frequently changes mode of transportation, are learned from GPS data logs without manual labeling of training data. We experimentally demonstrate how to accurately detect novel behavior or user errors (e.g. taking a wrong bus) by explicitly modeling activities in the context of the user's historical data. Finally, we discuss an application called "Opportunity Knocks" that employs our techniques to help cognitively-impaired people use public transportation safely. This paper introduces a hierarchical Markov model that can learn and infer a user's daily movements through an urban community. The model uses multiple levels of abstraction in order to bridge the gap between raw GPS sensor measurements and high level information such as a user's destination and mode of transportation. To achieve efficient inference, we apply Rao–Blackwellized particle filters at multiple levels of the model hierarchy. Locations such as bus stops and parking lots, where the user frequently changes mode of transportation, are learned from GPS data logs without manual labeling of training data. We experimentally demonstrate how to accurately detect novel behavior or user errors (e.g. taking a wrong bus) by explicitly modeling activities in the context of the user's historical data. Finally, we discuss an application called "Opportunity Knocks" that employs our techniques to help cognitively-impaired people use public transportation safely.

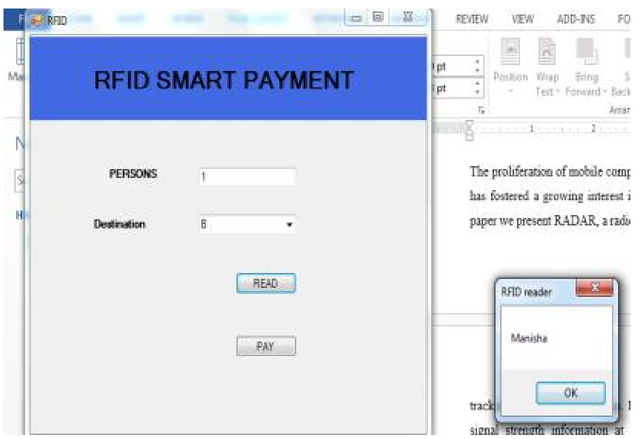
6. **How long to wait? Predicting bus arrival time with mobile phone based participatory sensing,**

The bus arrival time is primary information to most city transport travelers. Excessively long waiting time at bus stops often discourages the travelers and makes them reluctant to take buses. In this paper, we present a bus arrival time prediction system based on bus passengers' participatory sensing. With commodity mobile phones, the bus passengers' surrounding environmental context is effectively collected and utilized to estimate the bus traveling routes and predict bus arrival time at various bus stops. The proposed system solely relies on the collaborative effort of the participating users and is independent from the bus operating companies, so it can be easily adopted to support universal bus service systems without requesting support from particular bus operating companies. Instead of referring to GPS-enabled location information, we resort to more generally available and energy efficient sensing resources, including cell tower signals, movement statuses, audio recordings, etc., which bring less burden to the participatory party and encourage their participation. We develop a prototype system with different types of Android-based mobile phones and comprehensively experiment with the NTU campus shuttle buses as well as Singapore public buses over a 7-week period. The evaluation results suggest that the proposed system achieves outstanding prediction accuracy compared with those bus operator initiated and GPS supported solutions. We further adopt our system and conduct quick trial experiments with London bus system for 4 days, which suggests the easy deployment of our system and promising system performance across cities. At the same time, the proposed solution is more generally available and energy friendly.

III. PROPOSED SYSTEM

The proposed system is an automated contextual real time model. The Bus Notification system would notify about the buses along with the number of available seats through mobile application. Once the passenger boards the vacancies change automatically and are displayed both on board and to the central tracking system.The passenger can get into the bus according to the number of seats available with in the bus when it reaches the bus stop. The passenger may pay the fair using the RFID card by choosing his destination. The amount debited alert is send to the passenger through their mail with currently available balance on their card.





IV. CONCLUSION

Thus the proposed model is a notification system for bus passengers that have the ability to seamlessly interconnect bus passengers with public bus infrastructure. The Bus Notification System relies on an embedded bus computing system, back end computing infrastructure and a smart phone mobile app to detect the presence of passengers on buses and provide continuous navigation along with vacant seats over the complete course of a bus journey with cashless payment of smart swipe.

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