Live Public Transport Information Service Using Crowdsourced Data

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Abstract for demonstration

***Abstract*—Infrastructural problems of modern cities cannot be solved through sheer power of will alone. The public transportation system is one of the most effected parts and as the situation is degrading, more and more people become reluctant to take public transport. The fine tuning of the system, or even its restructuring, requires an immense amount of data, which traditionally can only be collected via costly and time consuming ways, like deploying sensors, conveying surveys, just to name a few. Not to mention that during this process, the citizens do not experience too much improvement, and become easily skeptical concerning the outcomes. Is there really no other way? In this demo, we present and demonstrate our approach to solve this problem in the form of a smart phone application providing real-time feedback on public transport, transits, and user-reviews based on crowdsensing.**

I. Introduction

Urbanization is a threatening phenomenon of our age. As the population of cities grows more and more problems come to the surface, that our current infrastructure cannot handle. Thus, the need for major improvements arises. One of the most important infrastructure segments of modern cities is their public transportation system, therefore the maintenance and from time to time development of this system are inevitable. Infrastructural advancements usually call for gathering an immense amount of data to be able to monitor and track the current environment, its changes and the user needs. This requires, at least following the traditional ways, costly and time consuming investments, such as deploying sensors/backend informatics system/frontend user information equipments, conveying user surveys, etc.

In this demo, we present and demonstrate our alternative approach to overcome this problem, which does not require such investments, since it is based purely on the mobile crowdsensing [1], or often called participatory sensing, of public transport traffic. We have implemented our ideas in the form of an Android application, which is light weighted, simple and intuitive, and it is built upon our open framework [2] for developing crowdsourcing based smart city applications. Our application visualizes live public transit information on a fully functional map of the given city (using Google Maps at the moment). The users can subscribe to information channels associated with traffic lines, thus they are provided with live traffic updates basically on the timetable and status information of the transportation vehicles along the route.

To gather real-time transit data the establishment of a wide, constantly growing user base is required. In order to reach that and motivate passengers to use our application from its launch, we provide a static timetable as an inital service based on existing schedules issued by transportation companies. The collected information is basically the timestamped arrival/departure events of the vehicles at/from the stops and/or simple annotation data. Data collection requires at the moment user interaction with our application but we are working on the automation of this process as much as possible.

II. Live Public Transport Information Service

The main features of our application cover the representation of urban environment through a map interface and the visualization of the real-time movement of public transportation vehicles. It predicts the arrival time of selected vehicles at given stops both from static timetable data or live data gathered by the crowd (or even from their combination). In addition, it supports social interaction through sharing mutually beneficial information concerning the state of the vehicles presented, such as damaged equipments, malfunctions, inconveniences and crowdedness.

A. Demo Setup

We did set up an XMPP (Extensible Messaging and Presence Protocol) server, which is the core of our open framework [2] and which communicates with the mobile wireless clients running our application through the publish/subscribe communication paradigm. We have also developed an emulation software that runs on this server, too. This emulator is designed to process trace files containing traffic information about preselected transportation lines. This data is based on the BKK's (Budapesti Közlekedési Központ - Center for Budapest Transport) officially distributed copy of the GTFS (General Transit Feed Specification) database, consisting of the most up-to-date information available.

In the demo, multiple Android devices equipped with our application are used in parallel to send/receive massages to/from the server responsible for information dissemination. The live traffic updates appear in real-time on the devices.

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B. Application Details

As the user starts the application, he has to log into the system. The main view presented to the user is the map of the city on which the traffic information is made visible (see Fig. 1). Here the user can follow the movement of the vehicles connected to the channels he has subscribed to. In case the user already have subscriptions, he starts getting data associated with them. Otherwise, in the Setting Menu he can subscribe to any channel of his interest. Subscriptions are freely manageable afterwards. In the News panel, annotations baring information on the active vehicles are listed.

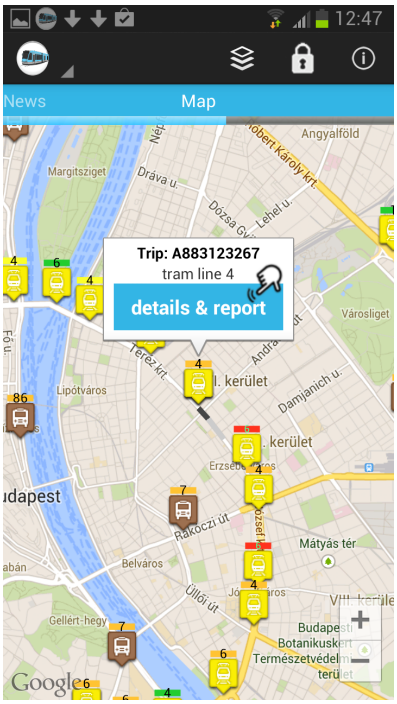

Fig. 1. Main View

Visualization of the incoming data is an essential part of this application as it serves to maximize user experience and provides a clean surface for navigation between components. Hence, the vehicles of a subscribed line are presented by clickable markers on the map. By clicking on a marker, the reporting board appears (see Fig. 2), on which the user can leave feedback. This varies from crowdedness indication through damage report to self-composed messages the user feels worth of sharing. Since the feedback is not collected automatically, it is prone to subjective judgment, not to mention the possibility of receiving intentionally given misleading information. To avoid this situation the development of a server side processing logic is of paramount importance, which is among the imminent tasks of our project.

C. Advanced Features

Extending the core functionality, advanced features have been added as motivation for the users to provide feedback. Such an addition is the layer selection logic, which provides an option for the user to pick certain lines of interest among the ones he had subscribed to, meanwhile hiding the others. Moreover, the estimated time of arrival of the selected vehicle

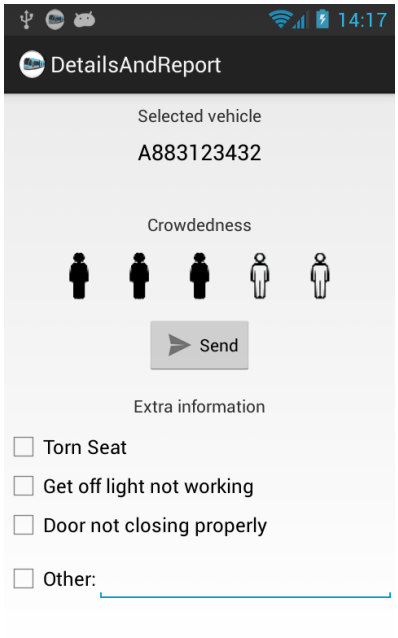

Fig. 2. Reporting Board

is being visualized by a progress bar on the top, and by an advancing line over the map.

III. Summary

In this demo paper, we presented a crowdsourcing based smart city application, which is aimed to monitor and provide live traffic updates of the complete public transportation system of any modern city in case of sufficient participatory users.

As future work, we plan to focus on the automation of the data collection process up to the technological limits, and provide the user with even more advanced features, putting the emphasis on user comfort. It is our adamant belief that through automated line and stop detection, the user experience will reach that high level, where the nuisance of occasionally required human assistance will pale in comparison to the beneficial content every user gains by using our application.

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