Mobil.TUM abstract

Title: Urby-me, a novel way to use smart phone GPS to gather quantitative and qualitative daily mobility data

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Problem Statement

The traditional method for gathering Origin-Destination (OD) survey data consists of calling participants and asking them to recall and describe all their trips from the previous day, documenting the distance, duration, mode and purpose of each trip (Fabbo et al., 2014, p. 10). Typically, these questionnaires do not include questions about satisfaction, perception of time spent travelling or experience during the trips. They also produce data regarding a single day and are not very useful for establishing trends or seasonal comparison data as they provide very little longitudinal information since they are typically performed on a low frequency (once every four to five years). While these surveys provide valuable insight on transportation system usage, they do not inform researchers and public transport operators about the user's perception of the public transport service or how they perceived the time spent in transit.

Research Objectives

These extra information about perception of the travel journey from a large array of perspective can be quite useful for getting a complete picture of the mobility behaviour and how it is perceived in-situ by the users of public transport. Increasing the knowledge on perception of time spent in transit can help refine current time-based modelling which tend to evaluate time spent travelling in negative economic terms. New mobile technologies have enabled many new scenarios when time in transit is not lost time but rather used purposefully either for work or for leisure. Indeed, as (Jain & Lyons, 2008) reported, time travelling can be perceived as a gift rather than a burden by the travelling individual.

Urby-me is a research project that tested a novel tool combining precisely capturing of Origin-Destination data combined with geo-localized user perception data. Considering that current OD survey methods using telephone surveys based on behaviour recall by the participants are not very accurate, the aim of this research was to develop and test in an empirical setting a methodology that uses participants own smartphone's GPS chip in order to record precise trip data (length and duration). Our project also included a user interface for asking experience and satisfaction survey questions by popping-up questions on the smartphone during the trip. Many smartphone apps already track their user's location, but with lower levels of interaction. Our test solution enabled feedback mechanisms to understand user's routines. Researchers and public transport operators could use this data to provide seasonal, monthly or even weekly reporting of usage and perception statistics, allowing operators to improve on their user experience and offering a new level of business intelligence about their users and providing researchers with a new level of accuracy, seasonality and user perception data, not currently offered. This new level of accuracy for the OD data could be used to improve transportation system modelling.

Methodological Approach

This research was performed on the subways of the Lausanne (Switzerland) public transport system (Transports Lausannois). For this research project, we developed a free iPhone app that runs in the background and records the GPS coordinates of every subway trips taken by the users who have installed and enabled it. This was done by regularly checking the phone's position with a low level of position accuracy, in order to conserve battery energy. Once the participants accepted the terms of use and enabled access to their geolocation data, the app started running in the background and frequently used the GPS positioning data to verify if the user is near a subway stop. However, if the position was found to be within the limit of the subway system, our app would heighten the accuracy level of the positioning as well as the frequency and save the already captured data for the previous 20 minutes of positioning for analysis. Once a trip on the subway was detected and confirmed by the user, the trip as well as the coordinates for the next 20 minutes after the trip was recorded and then sent securely to our servers for storage and analysis. During the trip, users were prompted to answer a random set of user satisfaction and perception questions based on the following categories: demographic information, behaviour, journey and activities, comfort, accessibility, vehicles, customer service, information, reliability, safety, payment, entertainment and the stations. In total the app was installed and run by 300 self-selected users of the Lausanne public transport system's two subway lines. The test was run between October 2017 and February 2018 and gathered data on 2300 trips and 4251 survey answers. After the test phase, we invited participants of the study who had been using the app for many weeks to come to a workshop where they could meet and provide their feedback on the usage of the app and their personal insights on the process.

Results

In this paper, we will share the spatial analysis of the trips made, including maps of trip comfort levels, origin-destination statistics for the entire subway system and the number of users for each subway stop. We also include a presentation of the in-situ survey answers regarding each category included in the app. For example, the answers related to comfort, usage of time, the effect of the weather, feedback about station design, where they sit or stand in the vehicle, what is disturbing them, and how they pass the time, etc. We show results from an analysis of the trips as a group, but also examples of single individual level data which the tips and answers of a single user, enabling for the creation of representative users' personas, providing a new perspective on public transport usage over several weeks instead of a single day of usage statistics. We also provide a comparative analysis of the data generated by our testing app with the traditional origin-destination data generated by the local public transport operator. Finally, we share the analysis and feedback from users of the app gathered during our participant workshop held at the end of the study.