Delivering Real-Time Bus Tracking Information on Mobile Devices

Bashir Shalaik and Adam Winstanley
National University of Ireland Maynooth
(bsalaik,adamw)@cs.nuim.ie

Abstract. The recent technological advances in mobile communication, computing and geo-positioning technologies have made real-time transit vehicle information systems an interesting application area. In this paper we present a transit application system which displays the transit information on an OpenStreetMap (OSM) web interface and delivers this information on the Google Android mobile device. The content is in the form of predicted arrival/departure times for buses at user-selectable geographic locations within a transit region. This application uses the real-time information such as current location and timestamp of both bus and users to provide bus route information. The public interface provides a graphical view which used to display and updates the vehicle locations and to allow users to see routes, stops and moving buses. The mobile device provides the user with the expected arrival/departure time of the next bus at the bus stop based on the user’s current position.

Keywords: Real-time data, OSM, AVL, Android, Openlayers.

Introduction

In transportation information, different mappings interfaces are used to provide cartographical means for displaying, monitoring, and improving transit vehicles performances. In a pilot project between National University of Ireland Maynooth (NUIM) and Blackpool transit (Great Britain) a prototype of a working web-based real-time bus tracking transit system is developed using OpenstreetMap(OSM). In real-time bus tracking systems data is collected in real-time and transmitted to a central server for analyzing and extracting transit information. Computer software technologies such as Ajax is used to update the map-based display without interrupting the users by switching pages or screens as they view the map[1]. The developed transit system provides services that take advantages of modern technologies to displays bus Arrival/departure time information on the platform of Google Android mobile devices. Doing so will enable passengers to enquire about bus-arrival/departure time to a selectable geographic locations of their interest.

For Bus Arrival/departure time estimation, three prediction models (namely, a historical-data-based model, a multiple linear regression model and one-dimensional Kalman filter model) were implemented and their performance is evaluated using the Mean Absolute Percentage Error (MAPE) [2] [3]. In this paper, the process for
downloading data to platform of the Google Android device and mobile interfaces were designed using the Android operating system for mobile devices and Java programming language. The utility of displaying bus arrival/departure times to selectable geographic locations can be applied to both a fleet management context and a bus information system environment. The developed system provides real-time information about bus routes and bus locations for those who have a mobile device with internet accessibility. They can link to the web site and get the current transit information such as bus arrival time to the nearest bus stop.

1 Related Works

Real-time arrival information for bus, subways, light rail, and other transit vehicles are displayed in a significant number of cities worldwide at places such as rail stations, transit centers, and major bus stops. With the possibility that real-time transit information will not be available on a public display at every stop, the smart mobile devices are being used to help manage the complexity of using transit information. Whether it is a simple phone or SMS interface, or a more complex native mobile application, these systems can provide schedules, routes and real-time arrival information. Google Transit, which was started as a Google Labs project in December of 2005, is now directly integrated into the Google Maps product and provides interfaces to Google Transit which are exist on a variety of mobile devices, making use of location sensors such as GPS and WiFi localization on the device to improve the usability of the transit application. Various mobile-phone-based transit information systems have been developed to provide users with transit information.

The Intelligent transportation system research group at University of Washington has developed a real-time system for predicting bus-arrival time, based on access to transit agency data. The prediction times made available to the traveling public via web site known as MyBus. The usability of public transit system can be enhanced by providing good traveler information system. OneBusAway [4] is a set of transit tools focused on providing real-time arrival information. This application made use of increased availability of powerful mobile devices and the possibility of displaying transit data in machine readable format. In OneBusAway systems, transit information such as bus arrival time to a particular bus stop is displayed on internet-enabled mobile devices. In [5] the usage of a transit vehicle information system that delivers estimated departure times for a large transit fleet is described. Due to the physical restriction of mobile devices which affects the user interaction and data presentation, the WML, has been introduced as the new language for WAP-enabled device.

In transit trip planner (TTP) system known as Trnasitir [6]. The system provides the shortest paths between any two points within the transit network using the real-time information provided by a third party bus arrival prediction system, relying on GPS equipped transit vehicles. Users submit their origin and destination points through a map-based iPhone or through a Java script enabled web browser. Services such as 511.org and Google Transit allow users to plan public transit trip by generating routes based on static schedule data where as with the proposed Transidriod system a Dynamic transit information is received via web services. In [7] a mobile public transportation information service was developed to provide map-based information.