A Review: Enhanced City Bus Tracking System

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Abstract: Primary information for the most city transport travellers the bus arrival time. Excessively there often discourages the travellers due to long waiting time at bus stops and for taking buses makes them reluctant. In this system, based on bus passengers’ participatory sensing we are going to present a system which will predict the time of bus arrival. With commodity mobile phones, for estimating the routes of bus traveling and to prediction of arrival time of bus at different bus stops, the passengers of bus are effectively collected and also utilized context of surrounding environmental. On the participating users collaborative effort there solely relies the and it is not dependent from the operating companies of bus, so without support requesting from particular bus operating companies for supporting the universal bus service systems it can be adopted easily. We resort to energy efficient sensing and more generally available resources, including signals of cell tower, statuses of movement, recordings of audio, etc., instead of referring to GPS enabled information of location, to the participatory party and bring less burden by encouraging their participation.

1. Introduction

In many parts of the world there has been well developed the public transport, especially the bus transport. Due to the bus transport services there reduce the uses of the private car and fuel consumption as well as alleviate congestion of traffic. There serves over 3.3 r million bus rides every day on average in Singapore with around 5 million residents by the bus system in 2011 as it is one of the most affordable and comprehensive means of public transport.

The travellers usually want to know the accurate arrival time of the bus when traveling with buses. Excessively there may drive away the anxious travellers due to long waiting time at bus stops and make them reluctant to take buses. Nowadays, timetables of the have provided by the most bus operating companies on the web freely available for the travellers. However, there provided very limited information in the bus timetables, which are typically not timely updated. Many public services (e.g., Google Maps) are provided for travellers other than those official timetables. For the bus travellers they are far from satisfactory although such services offer useful information. For example, due to many factors which are unpredictable, there may be delay the bus schedule. To take alternative choices for transport instead the next bus accurate arrival time will allow travellers, and thus their anxiety mitigate and their experience is improve. Towards this aim, the real time bus arrival time offer there to the public by many commercial providers of bus information. However, there requires the cooperation of the operating companies of bus and substantial cost incurs for such services providing. This paper is, based on sensing of crowd-participatory we present a novel system which predict the bus arrival time. For acquiring the bus arrival time we interviewed bus passengers. Most passengers want to instantly track the next buses arrival time that indicate by them and to help to establish a system for the estimation of the various bus stops arrival time for the community they are willing to contribute their information of location on buses. To bridge those who want to know the arrival time of bus to those who are on the bus and able to share their instant information of bus route to design a crowd-participated service this motivates us. For achieving such a goal, with the help of commodity mobile phones we let the passengers of bus themselves cooperatively sense the information of bus route. In particular, to a processing server, which intelligently processes the data, there may anonymously upload the sharing passengers their sensing data collected on buses and distributes information which is useful to those querying users.

2. Related Work

There provide free bus timetables on the web by the bus companies. However, only provide very limited information, by such bus timetables and according to instant traffic conditions which are typically not timely updated. Although there offer the real time bus arrival information by many commercial bus information providers, the service usually comes with substantial cost. The installment of in-vehicle GPS systems incurs tens of millions of dollars with a fleet of thousands of buses. There raises the deployment cost even higher by the network infrastructure to deliver the transit service, which would eventually translate to increased...
expenditure of passengers. For those reasons, to acquire transit information current research works [12] explore new approaches independent of bus companies. To continuously and accurately track the absolute physical location of the buses is the common rationale of such approaches, for localization which typically uses GPS. Although there are available many GPS-enabled mobile phones on the market, without GPS modules a good number of mobile phones are still shipped. Without using GPS signal or other localization methods, those typical limitations of the localization based schemes motivate alternative approaches. Besides, There consumes substantial amount of energy by GPS module, the lifetime of power-constrained mobile phones reducing significantly many mobile phone users turnoff GPS modules to save battery power due to the high power consumption.

To GPS satellites when they are placed without line-of-sight paths there may perform poorly the mobile phones in vehicles [9]. To fill this gap, by cellular signals utilizing we propose to implement a bus arrival time prediction system which is a crowd-participated. The system bridges the gap between the querying users who want to know the arrival time of bus to the sharing users willing to offer them real-time bus information independent of any bus companies. Unifying the participatory users, for realizing the passengers common welfare is our aim of design. To encourage more participants no explicit location services are invoked, so for localization as to save the requirement of special support of hardware. There is negligible the marginal energy consumption of collecting celltower signals on mobile phones with the comparison of high energy consumption of GPS modules. Without reducing battery lifetime on sharing passengers’ mobile phones Our system therefore the celltower signals utilizes. For accurate localization of bus the need obviate by our design. As a matter of fact, the knowledge of the current position on the route (1D knowledge) since the public transport buses travel on certain bus routes (1D routes on 2D space), and to predict its arrival time at a bus stop the average velocity of the bus suffices. As shown in Figure 1, for instance, say the bus is currently at bus stop 1, and its arrival time want to know to a querying user at bus stop 6. There requires the distance between bus stop 1 and 6 along the 1D bus route as well as the average velocity of the bus for accurate prediction of the arrival time. In general, the physical positions of the bus there are not strictly necessary and the bus route on the 2D maps. In our system, we logically map the bus routes instead of pursuing the accurate 2D physical locations to a space featured by sequences of nearby cellular towers. We classify and track the bus statuses in such a logical space so as to predict the bus arrival time on the real routes. To enable automatic and intelligent data collection and transmission we leverage various lightweight sensors on mobile phones. Although we can make use of a basket of instantly available sensor resources, on energy-friendly and widely available sensing signals we mainly focus. The purpose is to attract more participants to make the solution lightweight and pervasively available.

3. Proposed System

The proposed approach is as shown in Fig. 1. The functions of each entity are described as follows:

Objectives:

1. To design a system which give exact bus location and tell predicted bus time to the passenger.
2. To design a simple bus ticket management system by introducing new approach of valid OTP till destination.
3. To design and develop smart bus location tracker and management system in which conductor can give information to next bus stand if any failure is occurred.

The architecture of our system is shown in Fig.1

There are 3 major components:

A. Querying User:

It is shown in Figure 1, by sending the request to the backend server a querying user queries the bus arrival time. The interest bus route and bus stop indicates by the querying user for receiving the predicted bus arrival time.

B. Sharing User:

There contributes the information of mobile phone sensing by the sharing user to the system. The
data collection module starts for collecting the sequence of nearby celltower IDs after a sharing user gets on a bus. The collected data is transmitted to the server via cellular networks. To detect whether the current user is on a bus or not by mobile phones since with different means of transport the sharing user may travel. As shown in Figure 2 (left side), the surrounding environment samples there periodically and extracts transit buses identifiable features by the mobile phone.

It starts sampling the celltower sequences and sends the sequences to the backend server once the mobile phone confirms it is on the bus. Ideally, there automatically performs the data collection and transmission by the mobile phone of the sharing user without the manual input from the sharing user.

4. Algorithm

1. Route creation:

   A novel method has been developed to automate the process of creating new routes and populating the database, with little human intervention. To create a route, a bidirectional graph has been used. This graph will be used in ETA for calculating the estimated time of arrival. The bus stops will be represented as nodes and the route will be in the form of chain of links.

2. ETA prediction:

   Arrival time prediction forms the core of any RTPIS system. The algorithm can be very simple, involving only a bus schedule table, zone based or could be very complicated, involving Artificial Neural Networks, space-time correlation and time series modeling. Bus schedule table and past location data can be used to predict arrival time. This system provides a platform for executing any ETA algorithm, though here the implemented algorithm is simple one that adapts to changing traffic conditions. This algorithm works by recording the time it takes to traverse each link. Predictions are based on the present and past observations of a bus passing through each link. The past observations get lesser weight as time progresses; this reflects current traffic conditions better. The predicted ETA at bus stops is bounded by an upper limit of one round trip time of the route, though the ETA can be predicted infinitely into the future by simply adding integral number of round trip times to the smallest ETA.

5. Modules of Proposed System

A. User Module:

   This is the main module of system for whom we are developing this application.

   1. To get information by using application user needs to register to the system.
   2. User can search bus available and provide feedback about system.
   3. The token which is generated at time of travelling OTP get send on user registered mail id.

B. Depot Manager:

   1. This is the superior user of the system.
   2. The functions of depot manager are different from user, he can add new buses to the depot, he also add new routes or change routes. The depot manager can also add conductor to the system.
C. Conductor Module:

1. Conductor can provide bus fare details to the passenger. He can also generate OTP at time of assign the seat to passenger.

In the online processing stage The celltower sequences and audio signals are processed by the backend server from sharing users on the buses. The backend server first distinguishes the bus route that the sharing user is currently traveling with receiving the uploaded information. With the reported celltower sequence information the backend server classifies the uploaded bus routes primarily. Based on the current bus route statuses the bus arrival time on various bus stops is then derived.

6. Conclusion

In this paper, using commodity mobile phones we present a crowd-participated bus arrival time prediction system. There efficiently utilizes lightweight on board sensors by our system which encourages as well as attracts participatory users. There provides the cost-efficient solutions by proposed system to the problem which primarily relying on widely and inexpensive available cellular signals. System deployed on the Android platform through a prototype with two types of mobile phones we comprehensively evaluate the system. A flexible framework provide by the proposed scheme provides for participatory contribution of the community being independent of any support from transit agencies and location services.

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8. References


