Predicting Distance and Time by using Mobile Phone Based Participatory Sensing

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***Abstract*—A vehicular ad hoc network (VANET) use cars as mobile nodes in Vehicular to create a network. A VANET contain a number of vehicle communicate to the network in a coverage area. The vehicle has a On Board Unit (OBU) that transmit the information about vehicle or data sharing in any process network communication process in done by this through the wireless network. The proposed RSS is better than past evaluation. The proposed of interference detection algorithm of OBU to perform the high RSS in VANET. The OBU has a high received power and increase the hop communication range. The hop represent the communication between the source to destination. The OBU deploying the better relaying in a network to communicate and predict the vehicle status in coverage area.**

***Keywords*— Bus arrival time prediction, participatory sensing, mobile phones, cellular-based tracking**

I. INTRODUCTION

Bus transport is necessary part in day-to-day life.When traveling with buses, the travelers usually want to know the accurate arrival time of the bus. Most of the bus operating companies provides bus arrival time table based on operating hour and time interval which are not updated properly. The schedule of the bus may be delayed due to traffic conditions and weather situations. So, the traveler may choose another way of transport instead of long waiting for the bus. Providing real time bus arrival service requires cooperation of the bus operating companies. Installing special location tracking devices on buses is more expensive. This project proposes a model for bus arrival time prediction system based on sensing the crowd-participatory. To achieve this goal, the bus passengers themselves cooperatively sense the bus route information using mobile phones.

The sharing passengers may anonymously upload their sensing data collected on buses to a processing server, which intelligently processes the data and distributes useful information to those querying users. Bus arrival time prediction system has three major components. The first one is sharing user. Using mobile phone as well as various built-in sensors to sense and report the cellular signals and the surrounding environment to the back end server.

The second one is querying users, who queries about the time of arrival for a particular bus route using mobile. The third one is the backend server which instantly collecting the reported information from the sharing user and processing that information to monitor the bus route and predicts the arrival time of the bus. The crowd-participated approach for bus arrival time prediction possesses the following several advantages compared with conventional approaches.
First, through directly bridging the sharing and querying users in the participatory framework, we build our system independent of the bus operating companies or other third-party service providers, allowing easy and inexpensive implementation of the proposed approach over other applications.

Second, based on the service mobile phones, our system obviates the need for special hardware or extra vehicle devices, which substantially reduces the deployment cost. Compared with conventional approaches our approach is less demanding and much more energy-friendly, encouraging a broader number of participating passengers.

Third, through automatically detecting ambient environments and generating bus route related reports, our approach does not require the explicit human inputs from the participants, which facilitates the involvement of participatory parties.

The challenges of this system are bus detection, bus classification and information assembling. The sharing users may travel with diverse means of transport, we need to first let their mobile phones accurately detect whether or not the current user is on a bus and automatically collect useful data only on the bus. Without accurate bus detection, mobile phones may collect irrelevant information to the bus routes, leading to unnecessary energy consumption or even inaccuracy in prediction results.

The second thing is the need to carefully classify the bus route information from the mixed reports of participatory users. Without user manual indication, such automatic classification is non-trivial. One sharing user may not stay on one bus to collect adequate time period of information. Insufficient amount of uploaded information may result in inaccuracy in predicting the bus route. An effective information assembling strategy is required to solve the jigsaw puzzle of combining pieces of incomplete information from multiple users to picture the intact bus route status.

The mobile phone instantly sense and report the nearby cell tower IDs. We then propose an efficient and robust cell tower set sequence matching method to classify the reported cell tower sequences and associate with different bus routes. Identify passengers on the same bus and propose a cell tower sequence concatenation approach to assemble their cell tower sequences so as to improve the sequence matching accuracy.

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II. DATA FLOW DIAGRAM

A. DFD

The DFD takes an input-process-output view of a system i.e. data objects flow into the software, are transformed by processing elements, and resultant data objects flow out of the software.

Data objects represented by labeled arrows and transformation are represented by circles also called as bubbles. DFD is presented in a hierarchical fashion i.e. the first data flow model represents the system as a whole. Subsequent DFD refine the context diagram (level 0 DFD), providing increasing details with each subsequent level.

The DFD enables the software engineer to develop models of the information domain & functional domain at the same time. As the DFD is refined into greater levels of details, the analyst performs an implicit functional decomposition of the system. At the same time, the DFD refinement results in a corresponding refinement of the data as it moves through the process that embodies the applications. A context-level DFD for the system the primary external entities produce information for use by the system and consume information generated by the system. The labeled arrow represents data objects or object hierarchy.

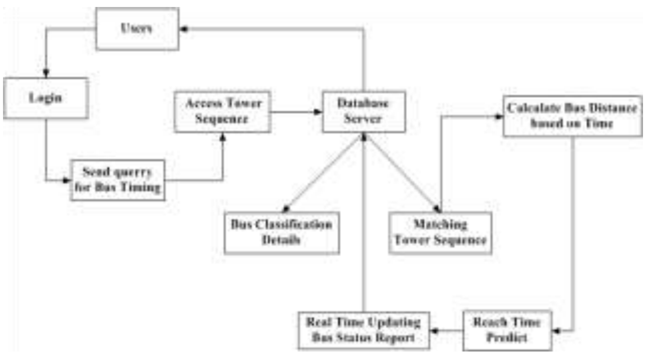


Fig. 1 DFD

III. RELATED WORK

A. RADAR: An In-Building RF-based User Location and Tracking System

The present experimental results that demonstrate the ability of RADAR to estimate user location with a high degree of accuracy. In this project, we have presented RADAR, a system for locating and tracking users inside a building. RADAR is based on empirical signal strength measurements as well as a simple yet effective signal propagation model. While the empirical method is superior in terms of accuracy, the signal propagation method makes deployment easier. We have shown the despite the hostile nature of the radio channels, we are able to locate and track users with a high degree of accuracy. The median resolution of the RADAR system is in the range of 2 to 3 meters, about the size of a typical office room.

Our results indicate that it is possible to build an interesting class of location-aware services, such as printing to the nearest printer, navigating through a building, etc., on an RF wireless LAN, thereby adding value to such a network. This, we believe, is a significant contribution of our research. Our eventual plan is to combine location information services with the RADAR system and deploy this within our organization..

B. Mobile Phone based Video Highlights via Collaborative Sensing

This project explores a new notion of "social activity coverage". Like spatial coverage in sensor networks (where any point in space needs to be within the sensing range of at least one sensor), social activity coverage pertains to covering moments of social interest. Moreover, the notion of social activity is subjective, and thus identifying triggers to cover them is challenging. We take a first step through a system called Mobile Phone based Video Highlights (MoVi). MoVi collaboratively senses the ambience through multiple mobile phones and captures social moments worth recording. The short video-clips from different times and viewing angles are stitched offline to form a video highlights of the social occasion. We believe that MoVi is one instantiation of social activity coverage; the future is likely to witness a variety of other applications built on this primitive of collaborative sensing and information distillation

C. Automatic Transit Tracking, Mapping, and Arrival Time Prediction Using Smart phones

We have presented Easy Tracker, an automatic system for low-cost, real-time transit tracking, mapping and arrival time prediction. Based on our experience with building a campus shuttle tracking system for our University, we have found out (the hard way) how labor intensive the collection of this data can be. To address this problem, we have demonstrated how high-value data such as routes, stops, and transit schedules, can be computed automatically from simple GPS traces. Our system produces high-fidelity route maps, extracts transit stop locations, and constructs transit schedules that consistently out-perform the official schedules produced by the Chicago Transit Authority. Last but not least, EasyTracker provides accurate transit tracking and real-time arrival time predictions, all without manual intervention.

D. Human Localization using Mobile Phones

This project identifies the problem of social localization, where the goal is to help a person, Alice, navigate to another person, Bob. Our key observation is that knowledge of users' absolute locations are not necessary. Instead, we show that by recording users' movement patterns (via phone compasses and accelerometers) and mutual encounters (via audio signaling), a graph can be created on a common coordinate system. Using such a graph, a human can be routed to any other human. We use these intuitions to develop Escort, and demonstrate the feasibility of escorting a user to within 8m of her destination. We believe a mature version of such a technology can enable a new class of social proximity based applications.

D. Existing System

In existing system, the bus arrival time is predicted on the basis of distance and time of departure from the bus station. The bus companies provide timetable for bus arrivals on the basis of operating hours and time intervals. The GPS (Global Positioning System) is used to track the bus locations. The GPS is enabled in every bus. By monitoring the movement of the bus, the bus arrival time is predicted.

1) Disadvantages

- Predicting the location using time table is not accurate one. Because of changes in the traffic environment.
- Predicting the location based on GPS is not more accurate.
- The GPS provides the location information only. Sudden traffic and accident may cause bus wait more time on same location.
- This affects the accuracy of bus arrival prediction.

E. Proposed System

The proposed system introduces a novel way of predicting the arrival of bus. This system uses a participatory user. The signal of the cellular phone and the bus ID is collected to process the bus arrival time prediction. The query of the user is based on the bus ID.

The information from the sharing user and the bus ID is used to match the query to identify the bus location and predict the time of arrival. Transit IC card readers or cellular tower signal is collected at a periodic interval. And the information is collected in the server. During user query, the location information and the arrival time of a particular bus can be predicted accurately.

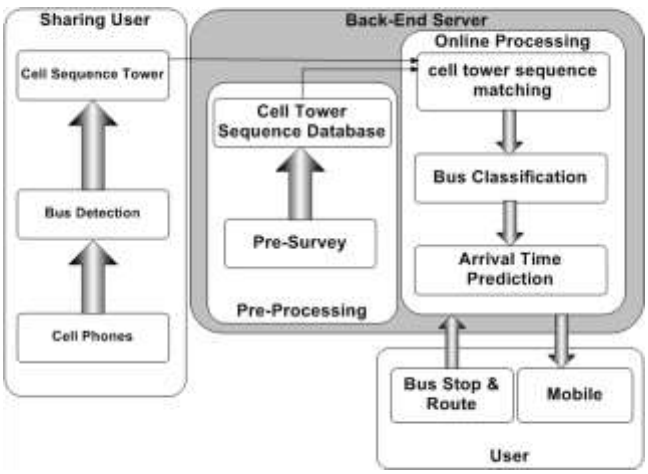


Fig. 2 System Architecture

1) Advantages

- The arrival time of a bus is predicted more accurately by the help of shared users.
- Automatically detecting ambient environments and generating bus route related reports. This approach does not require any human input from participants.
- The proposed solution is more generally available and energy friendly.

IV. MODULES

1. User Query for Bus Arrival Time
2. Identifying the Localization using bus location in Tower Sequence
3. Estimating the bus Speed and Distance
4. Real time Prediction and Updating to Server for User Response

1) *User Query for Bus Arrival Time*

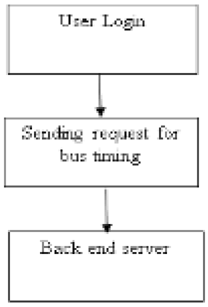


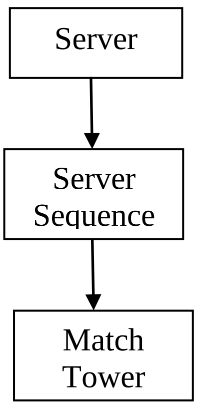
Fig. 3 User Query

A user queries the bus arrival time by sending request to the backend server through the mobile phone. Mobile phone indicates the linking server to the nearest tower to link the server. The querying user indicates the interest bus route and bus stop to receive the predicted bus arrival time.

2) *Identifying the Localization using bus location in Tower Sequence*

The sharing user on the other hand contributes the mobile phone sensing information to the system. After a sharing user gets on a bus, the data collection module starts to collect a sequence of nearby cell tower IDs.

Fig. 4 Identifying the Localization



The mobile phone periodically samples the surrounding environment and extracts identifiable features of transit buses. Once the mobile phone confirms it is on the bus, it starts sampling the cell tower sequences and sends the sequences to the backend server. Ideally, the mobile phone of the sharing user automatically performs the data collection and transmission without the manual input from the sharing user.

3) Estimating the bus Speed and Distance

We shift most of the computation burden to the backend server where the uploaded information from sharing users is processed and the requests from querying users are addressed. Two stages are involved in this component. In order to bootstrap the system, we need to survey the corresponding bus routes in the offline pre-processing stage. We construct a basic database that associates particular bus routes to cell tower sequence signatures. Since we do not require the absolute physical location reference. And calculating the speed and distance based on the mobile tower signals.

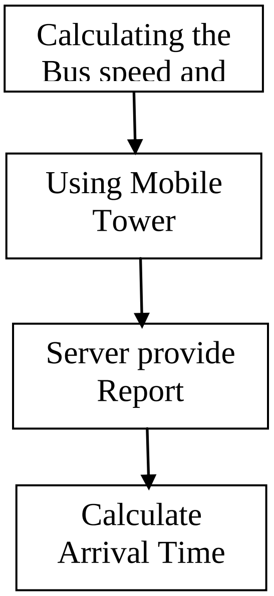


Fig. 6 Updating to Server for User Response

4) *Real time Prediction and Updating to Server for User Response*

The bus routes and record the sequences of observed cell tower IDs, which significantly reduces the initial construction overhead and provide the real time prediction among to the server. The backend server processes the cell tower sequences from sharing users in the online processing stage. Receiving the uploaded information, the backend server first classifies the uploaded bus routes primarily with the reported cell tower sequence information. The bus arrival time on various bus stops is then derived based on the current bus route status.

V. CONCLUSION

The participatory User bus arrival time prediction system is relying on inexpensive and widely used cellular signals; this system provides cost-efficient solutions. This system evaluate through the android prototype system. This system accurately predicts the bus arrival time and being independent of any transit agencies and location services, it provides a flexible framework for participatory contribution of the community. The proposed solution is more generally available and energy friendly.

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