

Available online at <http://www.mecs-press.net/ijeme>

Save Time for Public Transport Users in a Developing Country

Abdus Salam, Ishtiaq Mohammed Chowdhury, Mohammad Masum Sadeque, B. M Taslimul Haque and Md. Arifur Rahman

Department of Computer Science, American International University-Bangladesh, Banani, Dhaka-1213, Bangladesh

Abstract

A large number of people of a country uses public transport for their daily commute. Public transport users in a developed country get many facilities which is absent in a developing country like frequent transport, less traffic jam, maintaining time schedule, etc. In most of the developing countries, intercity public transports do not have any time schedule to arrive and leave in a stoppage and as a result, a person cannot manage his time accordingly which leads to waste valuable time. In this paper, we have proposed a system which is simple, cost-effective and will be able to save time for a public transport user that might be wasted due to bad timing. The system includes vehicle tracking system to trace the location of the transport and a website for the graphical view of the transport locations. A website has been developed with some dummy data to illustrate the proposed idea.

Index Terms: Vehicle tracking, Global Positioning System (GPS), General Packet Radio Service (GPRS), Public transport, Save waiting time, Developing country.

© 2016 Published by MECS Publisher. Selection and/or peer review under responsibility of the Research Association of Modern Education and Computer Science.

1. Introduction

Public Transport System in developed countries is much advanced than in developing countries. In a developed country, most of the time government maintains public transport and people are very much bound to oblige government policies. The bus is one of the commonly used public transport. For a city, the government usually defines different routes and provides sufficient buses in different routes based on the demand so that people can use bus and travels effectively. One of the most important thing in bus transport is to manage the arrival time and leaving time in a particular stoppage. For other transport like metro or train, it can be easily maintained since their path is fixed and they face very few obstacles in their path like pedestrians, traffic signal, traffic jam, etc. To overcome these types of problems and manage bus transport schedule, most of the developed countries use Bus Schedule and also use a system to inform people the arrival time and leaving time

* Corresponding author:
E-mail address:

in a particular stoppage at a particular time of the schedule. The stoppage has a system to inform people various information regarding the bus of different routes like arrival and leaving time for each route bus that will pass through it, how much time is left for the arrival of a particular bus, etc. Authors in the paper [1] have shown a method of displaying real-time public transport information at stoppages. Using that information, a person can predict about his bus arrival/departure time which saves a lot of time in many perspectives. Most of the developing countries do not have such facilities and very few who have little facilities about it is not enough to get a clear picture about the transport timing. In this paper, we have proposed a system which we can use in developing countries for bus transport with low cost to minimize the waiting time of bus users.

In this introduction section, we have given a general idea about public transport system in developed and developing countries. Section 2 describes the problems of public transport system in a developing country for which we are going to propose a solution. A vehicle tracking system has been described in section 3 which is used in our proposed system. In section 4, some research works have been briefly narrated among which some are closely related to our works and based on some works our system has been proposed. Our proposed system's details and an illustration of the proposed system are given in section 5 and 6 respectively. Finally, we have given a conclusion in section 7 which gives an overview of our work.

2. Problem Statement

Public transport user faces a lot of problems in a developing country because of indiscipline. We can take bus transport system of Bangladesh for an example. Though there are very good bus services, still most of the bus services failed to maintain regularities. There are different types of bus services in Bangladesh. One type of bus runs only from district to district which people uses only to travel long distances. Another type of bus is used to travel short distances which usually runs within a district and it is mainly considered as public bus transport for daily use. Again usually there are two types of bus services in daily transport – local bus service and direct bus service. Local bus service takes as many passengers as it can and stops anywhere in its route. For a direct bus service, all stoppages are fixed from source to destination. And direct bus service only stops on those specified stoppages and takes passenger according to bus capacity. In this paper, we are taking into account only direct bus services. Because people who use bus transport daily tries to use a better service in terms of time and comfort and that is why generally uses direct bus services. When a person wants to go from one place to another, he first goes to the nearest stoppage to catch the bus. All passengers stand on a line so that they can get into the bus on a first come, first served basis. So after reaching the stoppage, he stands on the line for his expected bus. In a line people just wait for the bus and here the problem arises. People actually do not know when the bus will arrive and he will get into the bus and when he will reach his destination.

People also faces another problem if there are more than one bus services for the same destination. Let's say there are two bus services - Bus A and Bus B. After coming into the stoppage, a passenger stands on the line for Bus A. But after some time Bus B arrives. At that time, he just cannot change the line from Bus A to Bus B and cannot get into Bus B. If he could know the arrival time for both Bus A and Bus B, he will stand on line for Bus B and could save some time.

Again if a bus user can know the arrival time of his expected bus prior to going to the stoppage, it could also save a lot of his time. To demonstrate this, we can consider the scenario of a bus user who catches bus daily after his office. Let's say it takes only 5 minutes to go to the stoppage for his bus. One day after office, he goes to the bus stoppage without knowing the bus arrival time. Unfortunately, the bus comes after 30 minutes after he reaches the stoppage. So it takes about 35 minutes to get into the bus after he left his office. But if he could know that the bus is coming after approximately 30 minutes then probably he would not go to the stoppage at that time. In that case, since he can know the approximate bus time of arriving, he will leave office just about 10 minutes before the bus will come to the stoppage. It will take 5 minutes to go to the stoppage and after approximately 5 minutes he will get the bus. Finally, it will take total about 10 minutes to catch his bus after he left the office. So if we can provide a user's expected bus location and distance information from the stoppage which will help to guess the approximate arrival time of his bus then surely it will reduce his waiting time.

In this paper, we are going to propose a system which will help to solve these problems for daily bus users in a developing country. Our idea is to install a vehicle tracking device in every bus of a bus service. Using this device, we will track a bus running under a particular bus service. Next, we will provide a graphical view through which a bus user will know about a bus location and its distance to the stoppage where the user will be waiting. And using this information, he will be able to predict about his timing, bus timing and also which bus service he should take.

3. Vehicle Tracking Device

To trace a bus, we will need a device which can collect location information of the bus and send this information to a server. Global Positioning System (GPS) [2] can be used to trace the location of any object. GPS device will collect the location information of a bus such as latitude and longitude information from the satellite. And General Packet Radio Service (GPRS) [3] can be used for internet connection which will send bus location information to a server. There will be a server which will receive bus location information sent by the tracking device. Then this information will be used for the graphical view of the bus location for the bus user.

4. Related Work

A very close work has been done in [4]. Authors in this paper have shown that a vehicle location can be displayed on Google map by setting up a device which consists of a microcontroller, GPS, and GPRS. They have also shown vehicle location on the map in two different time which indicates the direction of the vehicle. A similar technique has been used in the paper [5] for real-time vehicle tracking. But authors here have only shown the current location of the vehicle on Google map along with some other information at a particular time. Authors in the paper [6] have shown that the similar technique can be used for continuous vehicle tracking at real-time. Their system periodically collects location information and after a certain time it sends the data and that data is shown on the Google map to show vehicle locations. Their system also can show vehicle's location at real-time.

Our proposed method uses the same technique authors have shown in papers [4] [5] [6] for tracking the vehicle. By tracking vehicle, we want to show bus locations of a bus service on a map for a particular route which will also show all stoppage locations.

Lots of work has been done and also going on based on vehicle tracking. There are also some papers which have worked on time scheduling of public transport [7] [8] [1]. But very few works have been done regarding this targeting a developing country. In our best knowledge, no system has been proposed or developed for public transport in a developing country for effectively managing transport timing or to save users waiting time at stoppages. The process followed by a developed country to manage public transport timing is somehow always not feasible in a developing country because of different constraints such as traffic jam, lack of transport, etc. and also comparatively much expensive. That is why our proposed method will be a very good solution in a developing country for saving bus users waiting time.

5. Proposed Method

As we said our proposed method works based on tracking bus using GPS which is one of the most popular methods for tracking objects and there will be a graphical view which will help a user to visualize bus locations. Steps of our proposed method are as following:

- Vehicle tracking device will be installed on each bus that runs on a particular route of a bus service.
- The tracking device will periodically collect bus location information using GPS and send it to the server using GPRS.

- The server will store location information of all buses running on a particular route sent by their tracking devices. This will also store the time information each time it receives a bus location information. So for a particular bus, we will have its location information for a consecutive time which will also help us to trace its direction.
- For a graphical view, there will be a website which will show the locations of all buses on a map which will give a clear picture about the distance between a bus and a particular stoppage. This will also show the bus direction. Only bus location is not that much helpful if we do not know the direction of the bus because a bus may go in any direction of the route. So if we do not know the direction of a bus then we will not know either the bus is arriving or leaving a stoppage.

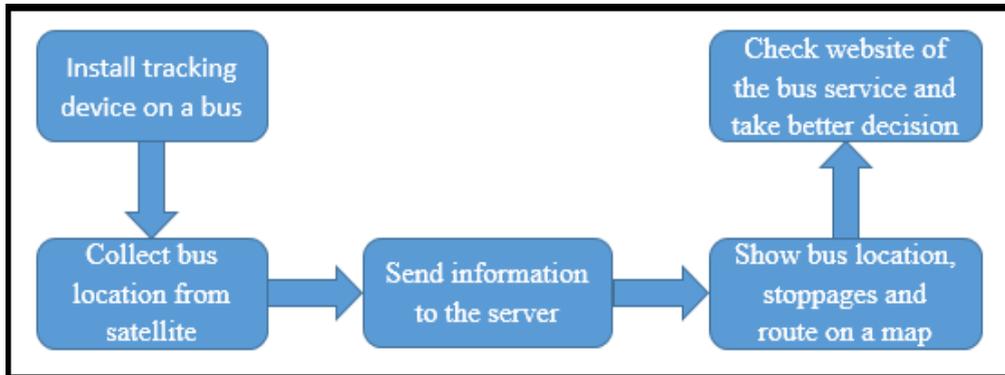


Fig.1. Steps of Our Proposed Method

The direction of a bus can be determined by using its location information at two different times. Fig.2 shows how the direction can be determined. It shows that at time 14:20 the bus is in a different location from where it was at 14:15. So by using the latitude and longitude information at these two time, we can determine its direction and can say that it is heading towards stoppage at Location B.

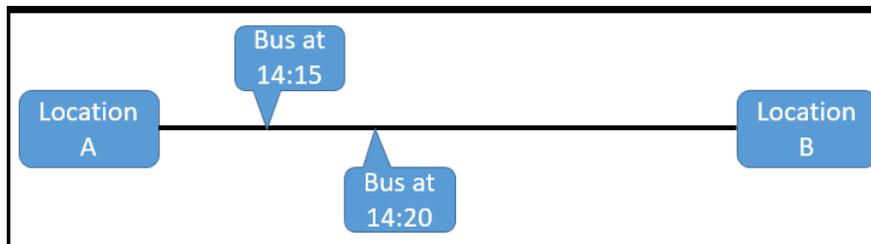


Fig.2. Determining Bus Direction using Location Information at Two Different Time

6. Proposed System Illustration

We are going to illustrate our proposed idea using some sample scenarios, images and a website that we have developed. To do this, we are considering that we have vehicle tracking devices installed on buses running on a route. Those devices periodically send bus location information to the server. The server has a database to store bus location information. Time information is also saved along with location so that we can trace the direction of a bus where it is heading.

A website has been developed and dummy data has been saved on the database to illustrate our idea. This website is not a final version and is designed at a very basic level. Through the website, the user will select the

bus service which has a route to go to the destination for the user. After selecting the route, the user will select in which direction he wants to go. Then the system will show a map (Google map has been used) where the road of the route from source to destination will be highlighted with a color. On the highlighted route, all stoppages of the route will be shown using a stoppage icon. And all buses will be shown on the route according to their locations using bus icon. In the map, we do not need to show the direction of the bus where it is going as the map will show only those buses which are going in the direction that the user has selected and the buses going in the opposite direction will not be shown. Using the information shown on the map – route, source, destination, stoppage and buses location, the user will be able to estimate his timing to go to his expected stoppage.

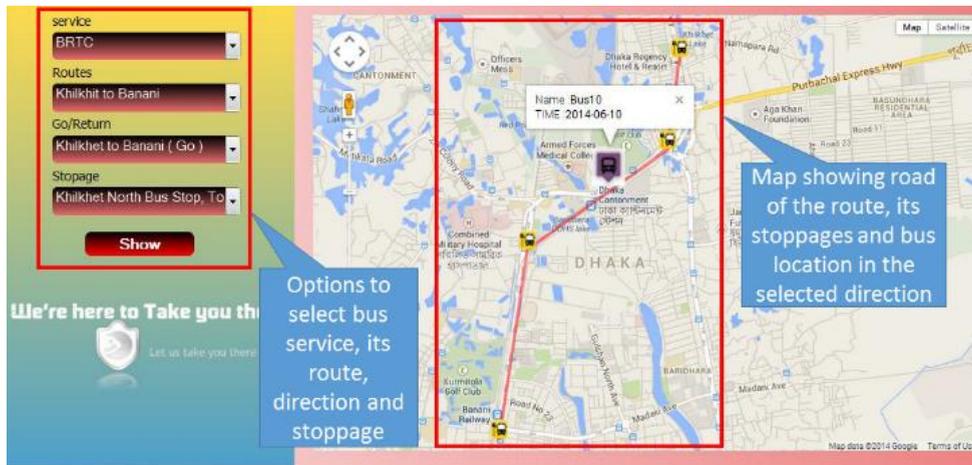


Fig.3. Snapshot of Our System Showing the Road (Highlighted Road with Pink Color) of the Selected Route, Stoppages (Yellow Bus Stoppage Icons) and a Bus Location with Additional Information (White Bus Icon)

If there are multiple bus services for the same route on the same stoppage location then using this system user can also decide which bus service he should catch that will save his time. To do this, the user will check bus locations of all bus services that go to the destination where he needs to go. Then based on the information that our system will show, the user will select the bus service that appears to be the best option to him. Let's assume that a user is in a location C. He wants to go to Location B. In location C, two bus services Bus1 and Bus2 have their stoppage from where they go to location B. Website can show bus location information for both Bus1 and Bus2. Now standing at location C, the user will look on the website to check bus locations. If he finds that the Bus1 is nearer to location C than Bus2 then he will stand on the line for Bus1. This will save time and energy for the user since he will be able to catch the bus in earliest possible time. This scenario has been demonstrated in Fig.4.

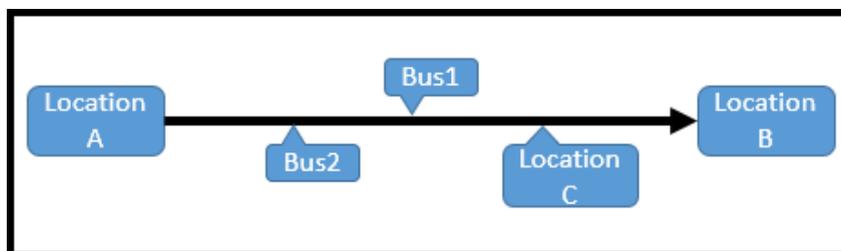


Fig.4. Illustrating the Scenario for Selecting a Bus Line by a User to Wait If He Has Multiple Options

7. Conclusion

In this paper, we have proposed a system through which a bus user in a developing country can save a lot of time in his daily life. Though we have shown our technique using bus transport which is a public transport from the perspective of Bangladesh transport system, we believe with minor modification this technique can be used in other public transport as well to serve the same purpose. Also, a mobile phone application can be developed with the same features. Since nowadays almost everyone has a smartphone with an internet connection, a user will be able to easily check information on his phone using that application. This will be a more convenient and interactive solution.

References

- [1] K. Dziekan and K. Kottenhoff, "Dynamic at-stop real-time information displays for public transport: effects on customers", *Transport Research Part A: Policy and Practice*, vol. 41, no. 6, pp. 489-501, 2007.
- [2] Bernhard Hofmann-Wellenhof, Herbert Lichtenegger, and James Collins, "Global Positioning System: Theory and Practice", Springer Science & Business Media, 2012.
- [3] Jain Cai, and D. J. Goodman, "General packet radio service in GSM", *IEEE Communications magazine*, vol. 35, no. 10, 1997.
- [4] P. Chairapa, S. Kiattisin and A. Leelasantitham, "A Real-Time GPS Vehicle Tracking System Displayed on a Google-Map-Based Website", University of the Thai Chamber of Commerce, 2011.
- [5] S. Muruganantham and P. R. Mukesh, "Real time web based vehicle tracking using GPS", *Journal of World Academy of Science, Engineering and Technology*, vol. 61, pp. 91-99, 2010.
- [6] N. Chadil, A. Russameesawang and P. Keeratiwintakorn, "Real-Time Tracking Management System using GPS, GPRS and Google Earth", in proceedings of the 5th ICoEETIT, Thailand, 2008.
- [7] E. Mazloumi, G. Currie and G. Rose, "Using GPS data to gain insight into public transport travel time variability", *Journal of Transportation Engineering*, vol. 136, no. 7, pp. 623-631, 2009.
- [8] T. B. Reed, "Reduction in the burden of waiting for public transit due to real-time schedule information: a conjoint analysis study", in proceedings of Vehicle Navigation and Information Systems Conference, Seattle, WA, 1995.

Authors' Profiles



Abdus Salam is working as an Assistant Professor at American International University-Bangladesh (AIUB). His research interest includes Data mining, Machine Learning, Semantic Web, Intelligent Systems, and Human Computer Interaction etc. He has received his B.Sc. in Computer Science and Engineering from AIUB and M.Sc. in Computer Science major in Software Technologies from University of Trento, Italy. He can be contacted at salamt2@aiub.edu.



Ishtiaq Mohammed Chowdhury is currently working as a Software Engineer in Techlogicians Solutions, Dhaka. He has completed his B.Sc. degree in Computer Science from American International University-Bangladesh (AIUB). His research interest includes Embedded System, Data Mining, and Mobile User Experience. He can be contacted at ishtiaqchowdhury1992@gmail.com.



Mohammad Masum Sadeque is working at Technology Division in BRAC Bank Limited, Dhaka. He has completed his B.Sc. degree in Computer Science from American International University-Bangladesh (AIUB). He is interested in Technology Infrastructure and Systems & IT Inventory Management. He can be contacted at masum.sadeque@gmail.com.



B. M Taslimul Haque is an IT Executive in SQUARE GROUP, Dhaka. He has completed his B.Sc. in Computer Science and Engineering from American International University-Bangladesh (AIUB). His research interest includes Software engineering, Data mining, and Intelligent systems. He can be contacted at bmtaslim12@gmail.com.



Md. Arifur Rahman has completed his B.Sc. in Computer Science from American International University-Bangladesh (AIUB). He is currently working as a System Engineer in the department of Network Planning & Optimization at Grameen Phone LTD. Dhaka, Bangladesh. He has two years of experience in this field. He can be contacted at my_cyberwar@ymail.com.

How to cite this paper: Abdus Salam, Ishtiaq Mohammed Chowdhury, Mohammad Masum Sadeque, B. M Taslimul Haque, Md. Arifur Rahman, "Save Time for Public Transport Users in a Developing Country", International Journal of Education and Management Engineering(IJEME), Vol.6, No.6, pp.27-33, 2016.DOI: 10.5815/ijeme.2016.06.03