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Real Time Passenger Information System

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Abstract
In today's world public transport systems plays an important role in the development of the country. Many factors such as mobility, environmental and energy objectives place demands on public transport systems. Current systems which are old and in need of upgrading, must expand service area, improve efficiency and increase service frequency to serve these demands of the public travelling through the improved transportation system. This paper provides means by which the transport industry can develop innovative near-term solutions to meet demands placed on it. The main objectives of this design paper are: (1) RTPIS display at bus stops – showing time of arrival of buses in real time. (2) Web based interface for admin control room to monitor buses in real time. (3) RTPIS display in the bus-showing next and previous bus stops, time to reach destination, advertisement based on location. (4) Future scope of designing mobile application for home users to find out bus schedules and RTPIS.

Keywords
GPS, AVL, RTPIS, ETA

I. Introduction

The use of GSM and GPS has made them popular in their own context. Integrating these technologies can prove to be a am-boyant solution for many unsolved problems. Real Time Passenger Information and Bus monitoringsystem(RTIBMS) is the combinationof these two technologies. In today's world, public transport systems plays an important role in the development of the country. Many factors such as mobility, environmental and energy objectives place demands on public transport systems. Current systems which are old and in need of upgrading, must expand service area, improve efficiency and increase service frequency to serve these demands of the public travelling through the improved transportation system.AVL system could be captured and used to provide passenger in order to reach their daily needs by giving real-time predictions of bus arrivals. Simultaneously, many transit systems in Europe were demonstrating the benefits of providing such real-time information to their passengers [2][5].A Real-Time Passenger Information System (RTPIS), which uses various technologies to track the locations of buses in real time and all other data which is helpful to generate the information, used to predict bus arrival timings at each stops along the route. When this information is provided to passengers by wired or wireless media, they can spend their time efficiently rather waiting for delayed bus and reach to the bus stop just before the bus arrives, or take alternate means of transport if the bus is delayed. This system will make the public transport system competitive and it will attract many passengers. Such system will make passengers to use public transport system rather than private vehicles. This will result in less traffic and reduced pollution as fuel will be less consumed.They can even plan their journeys long before they actually undertake them.Reference [1] describe arrival time prediction algorithms which is very effective in calculating the arrival time.Reference [12] describes that Helsinki & Finland are also having approach to the use of RTPIS. Reference [13] proposes commercial passenger information system that provides information via SMS (Short Messaging Service), web pages, on-board and at-stop displays, location-based advertisements, alerts if schedule changes suddenly and a journey planner. Reference [3] is also commercial system which is carried out with only onboard and at-stop displays for next stop and waiting time display.

II. System Design

The proposed system can be visualised by system design diagrams:

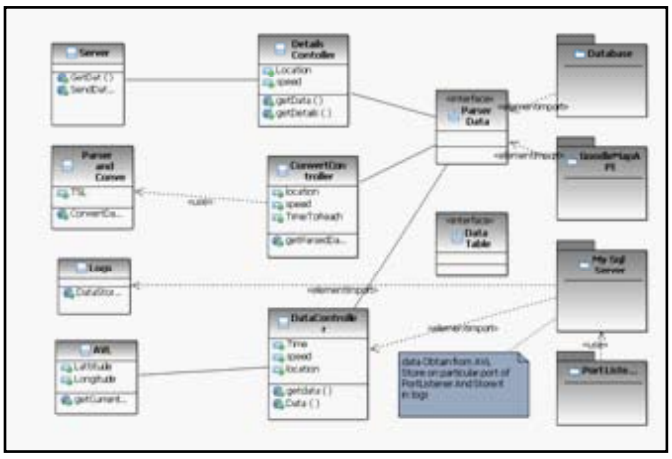

Fig. 1: Class diagram

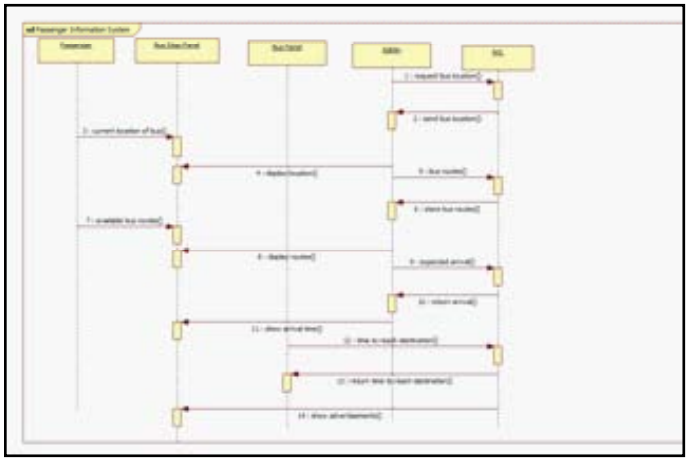

Fig. 2 : Sequence diagram

III. Methodology

The system of the RTPIS will be implemented as follows:

Bus Unit

The module inside Bus performs following functions:
(a) It downloads coordinates of stops, names of stops and points

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of interest from the server.
(b) It computes current location and direction.
(c) It directs the computed information to the central server using GPRS.
The GPS receiver which is stored in the bus unit computes the current location of the bus. The latitude, longitude of the bus received from GPS is sent continuously to a central server using GPRS. The bus unit will display all this information on the bus panel.

Server Unit

The server unit will maintain a database of all the information of the buses and the routes on which these buses travel. It gets the information of the speed of the bus and the current location of the bus. The admin can easily get to know which bus is over speeding on a particular route. The underlying technology, which is an AVL system, is necessary for determining real-time arrival information.

Bus- Stop Unit

The bus stop unit displays the information of all the incoming buses to that stop. It also shows the time taken by the bus to reach the stop. Using this information the passengers will not waste their time in waiting for the buses and can use alternative means of transport.

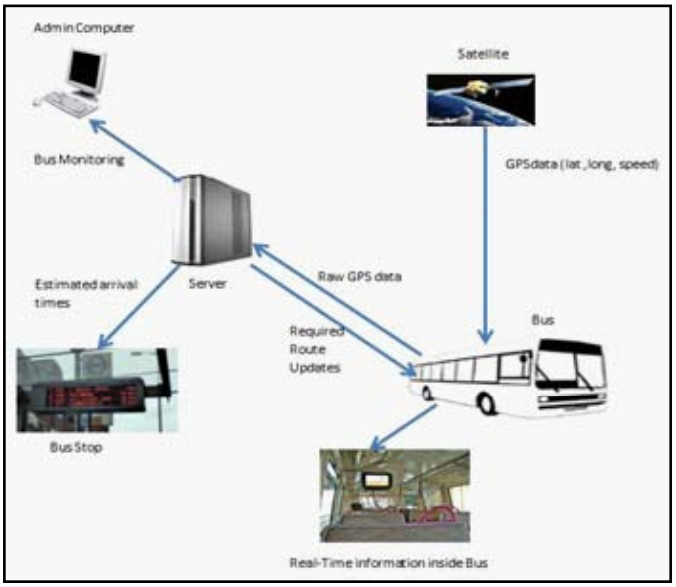

Fig. 3 : System Architecture

RTPIS provides travel information to passengers and tourists enabling them to make informed decisions about modes, routes and departure times. The RTPIS framework can be broadly divided into two contexts: Pre-trip context and On-trip context. The former provides information like timings, fares and routes well before the commencement of travel, through the Internet or the Short Messaging Service (SMS). The On-trip context provides information like location and places of interest (POI) while on the move. This is achieved using onboard and at stop terminals (displays and audio announcement units).

Bus Arrival Prediction Algorithm

There are several commonly used bus arrival prediction algorithms in themarket.One famous algorithm is the Kalman filter.As described by Welch and Bishop (2007):Kalman filter is a set of mathematical equations that providean efficient computational (recursive) solution of the leastsquare method. The filter isvery powerful in several aspects: it supports estimation of past, present, and even future states,and it can do so even when the precise nature of the method system is unknown. The Kalman filter woks in a form of feedback control to estimate a process state. Figure (Welch and Bishop, 2007) shows a lifecycle of aKalman filter. Time update process is responsible for predicting forwardswhile the measurement update process is responsible for giving a feedback,which is to make correction and produce a new measurement according tothe previous prediction. Jeong (2004) has also stated that Kalman filter hasthe ability to adapt situation with traffic fluctuation over time.

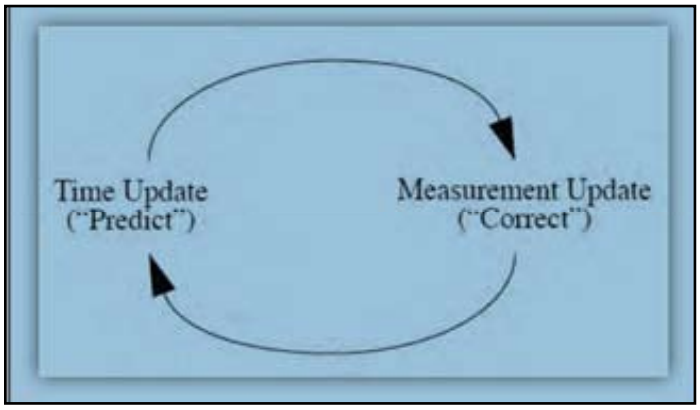

Fig. 4: Discrete Kalman filter cycle.

IV. Results and Discussion

From this system, we can get real time information of the buses. We can predict the time taken by the bus to reach the next stop and also the passengers on the bus stop can get to know how much time exactly it will take for the next bus to arrive. The bus panel will look as follows:

Fig. 5: Bus Module

This module shows the distance to be covered to reach the next stop and how much time will it take to reach that stop. It also gives the latitude and longitude of the bus and how much distance the bus has already travelled.
The admin module will look as follows:

Fig. 6: Server Module

This module gives all the information to the admin about the current location of the bus. It gives at what speed the bus is traveling and prevents the bus from over speeding. This helps to monitor all the buses in a better way as compared to the existing system.
Lastly, the bus stop module will look as follows:

Fig. 7: Bus Stop Module

This module shows the time required for the incoming buses at the particular stop. This information allows the passengers waiting at the stops to decide for how much time they can wait and take alternative means of transport to reach their destination.
By looking at the existing system, it does not give the real time information of where currently the bus is.But this system provides the real time information at all the stops and also inside the bus about how much time will it take to reach the next stop or how much time will it take to for the bus to arrive at a stop. Also, the admin can monitor all the buses from the server side.

V. Acknowledgement

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VI. Conclusion

In this paper, the implementation and description of Real Time Bus Monitoring and Passenger Information System is stated. The RTPIS monitors the current location of all the buses and estimates their arrival time at different stops in their respective routes. This computed arrival times are updated time to time as soon as every bus sends new updates. It distributes all this information to passengers using display terminals at bus stops and web based GUI.

References

[1] *Brendan Kidwell, "Predicting Transit Vehicle Arrival Times", GeoGraphics Laboratory, Bridgewater StateCollege, August 2001.*
[2] *Carol L. Schweiger, "Real-Time Bus Arrival Information Systems - A Synthesis of Transit Practice",Transportation Research Board, 2003.*
[3] *Caulfield, B. and O'Mahony, M. "An Examination of the Public Transport Information Requirements of Users", IEEE transactions on Intelligent Transportation Systems, Vol. 8, pp. 21-30, 2007.*
[4] *DhavalGada, RajatGogri, PunitRathod, ZalakDedhia, NiraliMody, SugataSanyal and Ajith Abraham, "A Distributed Security Scheme for Ad Hoc Networks", ACM Crossroads, Special Issueon Computer Security. Volume 11, No. 1, September, 2004, pp. 1-17.*
[5] *Hu, K. and C.K. Wong, "Deploying Real-Time Bus Arrival Information and Transit Management Systemsin Los Angeles", abstract prepared for the ITS America 12th Annual Meeting, Long Beach, Calif., April29-May, 2002.*
[6] *Lin, W.H. and Zeng, J., "Experimental Study of Real-Time Bus Arrival Time Prediction with GPS Data." Transportation Research Record, 1666, pp. 101-109, 1999.*
[7] *Mghawish , A. ; AbdelQader , A.A. ; Al- Jezawi , M.A. ; AbuMahfouz , M. "Multi function control system using GSM modem based SM5100B Module , Internet Technology And Secured Transactions" , 2012 International Conference For Publication Year: 2012 , Page(s): 515 -518.*
[8] *SandipanDey, Ajith Abraham and SugataSanyal "An LSB Data Hiding Technique Using PrimeNumbers", Third International Symposium on Information Assurance and Security, August 29-31, 2007, Manchester, United Kingdom, IEEE Computer Society press, USA, ISBN 0-7695-2876-7,pp. 101-106, 2007.*
[9] *S. L. Bangare, A. D. Kadam, P. S. Bangare, P. V. Katariya, C. A. Khot ,N.R. Kankure. Solutions Concerning Information Systems for Real Time Bus Arrival; International Journal of Engineering and Advanced Technology (IJEAT); ISSN: 2249 – 8958, Volume-2, Issue-3, February 2013.*
[10] *XingchenLu ;Weimin Lei ; Wei Zhang , "The Design and Implementation of XMPP-Based SMS Gateway Computational Intelligence, Communication Systems and Networks (CICSyN)", 2012 Fourth International Conference on Digital Object Identifier:10.1109/CICSyN.2012.35 Publication Year: 2012, Page(s): 145 - 148*
[11] *"Review of Current Passenger Information Systems", Prepared for the INFOPOLIS 2 Project (No. TR 4016), Deliverable 1, WP03, Infopolis 2 Consortium, August 1998.*
[12] *Helsinki City Transport System http://www.hel2.fi/ksv/entire/repPassengerInformation.htm*
[13] *Telargo Inc. - Passenger Information Serviceshttp://www.telargo.com/solutions/passener_informationservices.aspx*
[14] *Terron Microsystems Pvt. Ltd.- GPS based Passenger Information System for Buses http://www.terronmicrosystems.com/products.php*