International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

Predicting the Bus Arrival Time Using GPS and GSM Technology

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Abstract: ***The primary information to most city transport travelers is bus arrival time. It often discourages the passengers for excessively waiting long time at bus stops and makes them reluctant to take the public transport, buses. To enable the passenger to track the vehicle or bus an electronic device is installed in a vehicle is known as Vehicle tracking System. This paper proposes a bus arrival time prediction using GPS and GSM technology. It would also work as anti theft system and cheapest source of vehicle tracking. It is an embedded system using GPS (Global Positioning System), GSM (Global System for Mobile Communication) and Microcontroller for tracking the bus. The real time co-ordinates obtained from the GPS will continuously monitor a moving vehicle and report the status of the vehicle on request to passengers. The GPS/GSM unit is mounted on the bus sends the data to the central monitoring system microcontroller using the GSM module and displays bus location name on the LCD. The position i.e Latitude and Longitude of a vehicle from remote place is sent by the GSM module to the Server and then the server calculates the arrival time of the bus and sends to the requested user through GSM module.***

Keywords: GPS, GSM, Microcontroller, Vehicle Tracking, Bus arrival time and mobile phones

1. Introduction

The transportation system serves as the heart in the economic and social development of the country. Due to the fast rate of population in India there is a rapid increase in vehicle which results in a burden on metropolitan traffic management. As the public transport has become an important part of the urban transportation advance in easily available technology can be implemented which not only help the person who commutes between a suburb and city to get the travelling information and also help a person in command to track down there fleet with the final real time location [1].In many parts of the world, public transport especially the bus transport has been well developed. In order to reduce the fuel consumption, private car usage and alleviate traffic congestion we can use the bus transport services. The passengers want to know the accurate arrival time of the bus, when travelling with the buses. The passengers become anxious while extremely waiting for a long time at the bus stop and make them hesitant to take buses. Many travelers are usually late to office and most of the students are delayed to the class as they decide to wait for the bus instead of taking an alternate transportation. The passengers are often in a dilemma whether to walk or to take a cab or a rickshaw or else to wait for a next bus in order to reach their destination quicker. [2] The 38% is the overall approval rate of the current transportation notification service. About 96% of the people insisted to know the position of the bus so that they can decide whether to wait for a bus instead of walking and also to know the location of the buses is more productive of wait time than an exact arrival time. Around 75% of people claim that they had been delayed to their destination as they decided to wait for the bus instead of walking. The passengers can make an exact decision of whether or not to wait at a bus stop if they had an easy approach to see which bus is near to their location and an accurate time it would take to reach the bus stop. A design of an embedded system which is used for tracking and positioning of any vehicle by using Global Positioning System (GPS) and Global system for mobile communication (GSM) is proposed in this paper. A combination of computer hardware and software, and perhaps additional mechanical part designed to perform a specific function is known as an Embedded System. An embedded system is software driven, real-time control system, microcontroller-based, reliable, human or network interactive, autonomous, operating on diverse physical variables and in diverse environments and sold into a competitive and cost conscious market. The quality of life in every society can be contributed by effective movement of people and goods which is lead by the efficient transportation system.

2. Literature Survey

Participatory Sensing, user activity recognition and Urban Sensing provides a rich contextual information for applications of mobile such as location based services and social networking**.** Mobile devices consumes huge amount of energy by continuously capturing this contextual information. A new design framework for an Energy Efficient Mobile Sensing System (EEMSS) is proposed in this paper. To recognize user states as well as to detect state transitions EEMSS uses hierarchical sensor management strategy. EEMSS significantly improves device battery life by powering only a minimum set of sensors and using appropriate sensor duty cycles. A set of users' daily activities in real time using sensors on an off-the-shelf high-end smart phone can be automatically recognized by EEMSS. This approach increases the mobile battery life by more than 75% while maintaining both low latency and high accuracy in recognizing transitions between end-user activities by design , implementation and evaluation of EEMSS with 10 users over one week has been presented in this paper[3]. To provide location-based or context-aware services many emerging smart phone applications require position information. In spite of the GSM/Wi-Fi based positioning

systems; GPS is often preferred over its alternatives as it is known to be more accurate. A positioning system that provides accurate position information while spending minimal energy is the main requirement of such applications. This paper proposes a Rate-Adaptive Positioning System (RAPS) for smart phone applications. Generally GPS is less accurate in urban areas, so it is sufficient to turn on GPS only when it is necessary to achieve this accuracy. To cleverly determine when to turn on GPS, RAPS uses a collection of techniques. It turns on GPS adaptively only if the estimated uncertainty in position exceeds the accuracy threshold based on the location-time history of the user to estimate user velocity. Using a duty-cycled accelerometer it efficiently estimates user movement and to reduce position uncertainty among neighboring devices it make use of Bluetooth communication. To avoid turning on GPS it employs cell tower-RSS blacklisting to detect GPS unavailability i.e indoors. Using a prototype implementation on a modern smart phone .We evaluate RAPS through real-world experiments and prove that it can increase mobile battery lifetime by more than a factor of 3.8 where GPS is always on[4]. A crucial task in many applications is Activity monitoring, often conducted using expensive video cameras. Analyzing images from multiple cameras in effectively monitoring a large field remains a challenging issue. In other way it is necessary to attach the special devices to track the object which is not feasible in many scenarios. To resolve this issue, this paper proposes to use RF tag arrays for monitoring the activity where data mining plays a vital role. Due to the low cost of RF readers and tags the RFID technology provides an economically attractive solution. The tracking objects do not need to be equipped with any RF transmitters or receivers is another important feature of this design. The noise of RF tag data and mine frequent trajectory patterns are offset to model the regular activities by designing a practical fault-tolerant method. The feasibility and the effectiveness of this design can be determined by empirical study using real RFID systems and data sets [5]. Most of the emerging context aware services and location based applications require the position information. These applications make use of more energy-hungry GPS instead of preferring the use cell tower-based localization because of its inaccuracy. This paper proposes a Cell-ID Aided Positioning System (CAPS). CAPS influence the position history of a user and near-continuous mobility to significantly achieve better accuracy than the cell tower-based approach by keeping the low energy overhead. Based on the insight that users exhibit consistency in routes traveled, and that cell-ID transition points that the user experiences on a frequently traveled route, uniquely identify position CAPS is designed. To estimate current position based on the GPS position sequences that match the current cell-ID sequence and history of cell-ID CAPS uses a cell-ID sequence matching technique. CAPS have been implemented on Android based smart phones and evaluates it at different platforms, and different carriers and locations which results in 90% of the energy spent by the positioning system compared to where GPS is always used and reasonably provides a accurate position information with less than 20% of errors than the cell tower-based scheme[6]. In order to use a EasyTracker, a transit agency must obtain android- based smart phones, install an application and to place a phone in each transit vehicle. The online algorithm in transit vehicle automatically determines the location server, infer schedules and locate stops at a given time and predict its arrival time in its upcoming stops. The main goal of this paper is to reduce the cost and complexity in offering these services by developing an an automatic system for mapping, transit tracking and arrival time prediction i.e. EasyTracker. This system consists of four main components 1. Smartphone - installed in each bus or vehicle, which functions as a tracking device or an automatic vehicle location system. 2. Back-end server- which stores vehicle trajectories into schedules, route maps and prediction parameters, 3. Online processing - which uses the real-time location of a vehicle to predict arrival time. 4. User interface - allows a user to access current vehicle locations and predicted arrival times [7].

3. Related Technology

1. GPS Technology

A highly integrated smart GPS module with a ceramic GPS patch antenna is G7020 GPS as shown in below fig 1. with 14 channel track engine and 51 channel acquisition engine the module is capable of of receiving signals from up to 65 GPS satellites and transferring them into the precise position and timing information that can be read over either UART port or RS232 serial port. Operable at 3.6V-6V, Cold start ≈ 29 seconds under clear Sky, Hot start ≈ 1 second under clear Sky. Capable of Satellite-Based Augmentation System (SBAS) (Wide Area Augmentation System (WAAS)/EGNOS (European Geostationary Navigation Overlay Service)) and Low power control of Integral LNA (Low Noise Amplifier)

Figure 1: GPS Receiver

2. GSM Technology

SIM300 is a Tri-band GSM/GPRS engine that works on frequencies , DCS 1800 MHz, Personal Communication System (PCS) 1900 MHz and Enhanced GSM (EGSM) 900 MHz. SIM300 features GPRS multi-slot class 10/ class 8 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. To get information in SIM card you can use AT Command. Both 3.0V and 1.8V SIM Cards are supported. An internal regulator in the module having nominal voltage 2.8V is used to power the SIM interface. All the pins will be reset to as outputs driving will be low.

Figure 2: GSM Interfacing Board

Figure 3: P89V51RD2 Microcontroller

3. P89V51RD2 Microcontroller

The P89V51RD2 is a 80C51 microcontroller with 64KB flash and 1024B of data RAM as shown in below fig 3. P89V51RD2 has X2 mode option which is one of the key features of the microcontroller. To achieve twice the throughput at the same clock frequency The design engineer can choose to run the application with the conventional 80C51 clock rate (12 clocks per machine cycle) or select the X2 mode (six clocks per machine cycle). By reducing the clock frequency by half the same performance can be achieved is another feature of this microcontroller. Parallel programming and in serial ISP (In – System Programming) are supported by the flash program memory.

4. Design and Implementation

A design of an embedded system which is used for tracking and positioning of any vehicle by using Global Positioning System (GPS) and Global system for mobile communication (GSM) is proposed in this paper. For interfacing with various hardware peripherals P89V51RD2 Microcontroller is used. To continuously monitor a moving Vehicle and report the status of the Vehicle on demand an embedded unit is designed in the bus. For doing so P89V51RD2 microcontroller is interfaced serially to a GPS Receiver and GSM Modem. To send the position (Latitude and Longitude) of the vehicle from a remote place a GPS Modem is used. The block diagram of tracking system using GPS and GSM technology is shown in fig 4

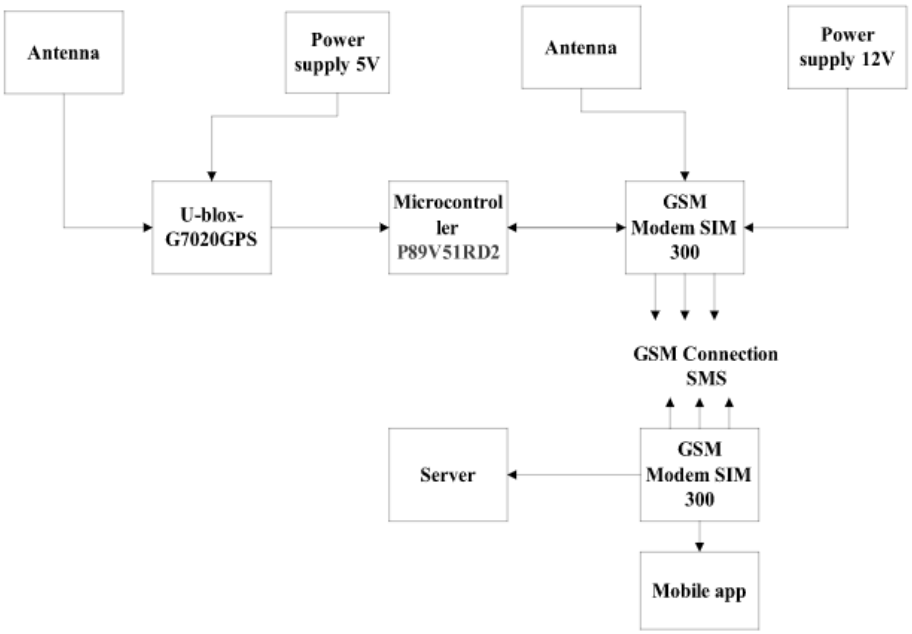

Figure 4: Block Diagram of Tracking system using GPS and GSM

It will send the data i.e. the latitude and longitude indicating the position of the vehicle. The GPS modem gives many parameters as the output and sends it to the Server through GSM modem. When the request by user is sent to the number at the modem, the server system calculate the time the vehicle may take to reach the corresponding user bus stop and automatically sends a return reply to that mobile indicating the time . It is possible to locate the vehicle around the globe with micro controller, GPS receiver, and GSM modem. The microcontroller used is P89V51RD2. The internal memory of Microcontroller i.e. ROM contains the code. It acts as interface between GSM and GPS with help

of serial communication of P89V51RD2 and by using instruction set it processes the instructions. The transmission of data is always carried out by the GPS and the transmission and reception of data is carried out by GSM modem. GPS Transmitter pin TX is connected to microcontroller to the receiver port 3*0 and the GSM pins TX and RX are connected to microcontroller serial Ports 3*1. With the help of serial communication the microcontroller communicates.

First it takes the data from the GPS receiver and then sends the information to the Server in the form of SMS with help of GSM modem. GPS receiver is used to receive the data from space Segment (from Satellites and works on 9600 baud rate. the GPS values of different Satellites are sent to microcontroller P89V51RD2, where these are processed and forwarded to GSM. GSM acts as a SMS Receiver and SMS sender. A battery of 12V/3.2 is used to supply power to components like GSM, GPS and Microcontroller circuitry. To regulate the power between three components, power regulators are used. GSM requires 12v, GPS and microcontroller requires 5v. The overall view of the proposed system is shown in below fig 5

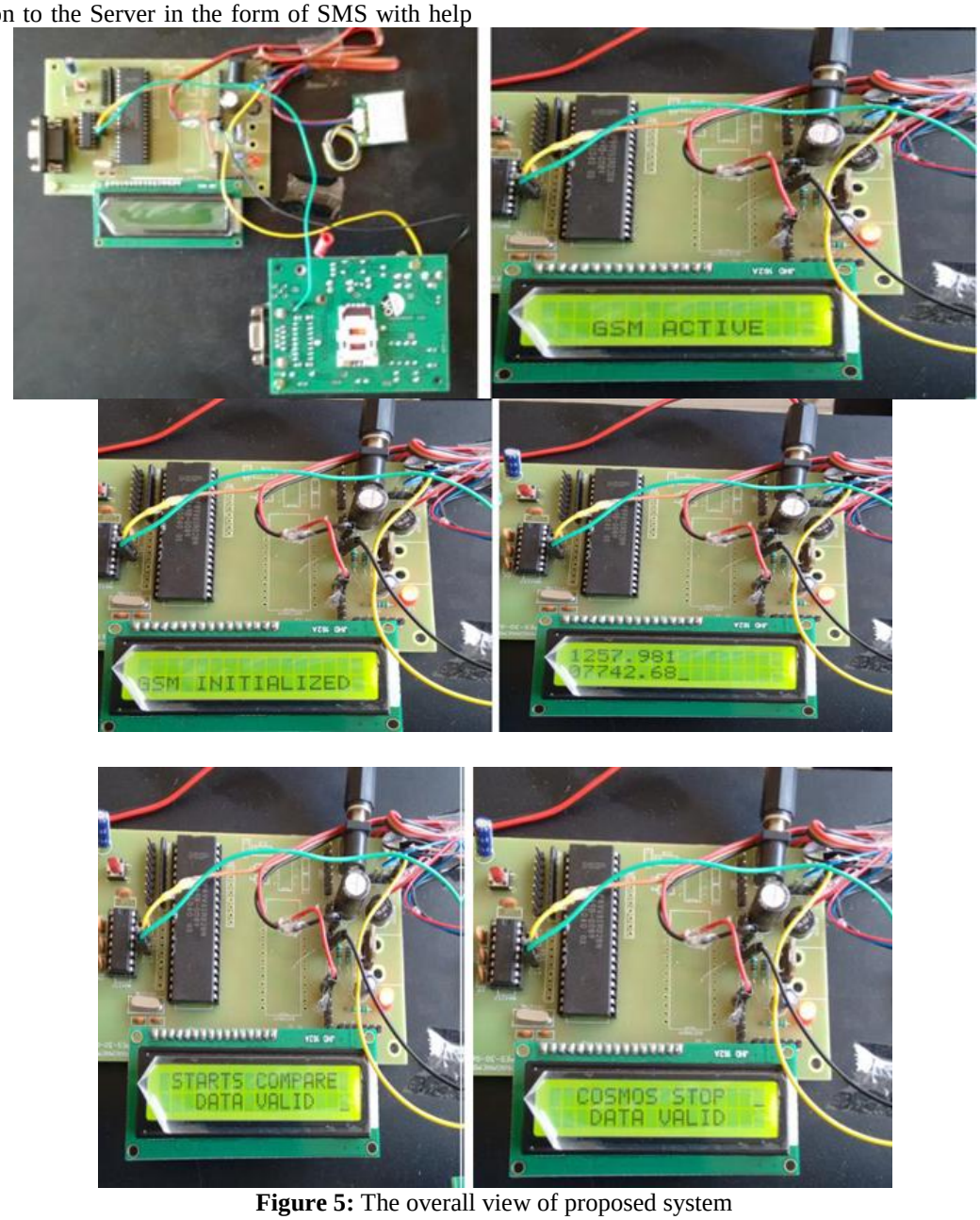

Figure 5: The overall view of proposed system

5. Conclusion and Future Work

This paper proposes the bus tracking and predicts the bus arrival time with a proposed system in it. This system is turn on and uses i.e. self calibrating and works anywhere on earth and does not require a laboratory or artificial environment. Having a GPS is truly an advantage you can determine your location, whether you are travelling locally or in a foreign land and if you think you are lost, you can use your GPS receiver to know your exact location. Monitoring driving behavior, such as an employer of an employee, or a parent with a teen driver are the other applications. It can also be used as an anti theft system, asset tracking, in stolen vehicle recovery and wildlife tracking. GPS signal works efficiently when it is in line of sight and it is unable to pass through solid structures such as work indoors, underground, under the water, or under a dense canopy of trees and it is difficult to determine the GPS signal when it's raining. Other related

devices in a vehicle such as sensors can be integrated in a vehicle. An intelligent tracking system can be formed by sensors installed in our vehicle can report the vehicle information to our server.

6. Acknowledgement

I would like to thank Mr. Sudhakar K N for his guidance, support and valuable suggestion.

References

[1] "Mining frequent trajectory patterns for activity monitoring using radio frequency tag arrays," Y. Liu, L.
[2] Chen, J. Pei, Q. Chen, and Y. Zhao in Proc IEEE PerCom, WhitePlains,NY,USA,2007
[3] "A framework of energy efficient mobile sensing for automatic user state recognition," Y. Wang et al, inProc,ACM Mobisys,2009,pp 179-192
[4] Energy-efficient rate-adaptive GPS-based positioning for smartphones," J. Paek, J. Kim, and R. Govindan inProc,ACM Mobisys, Sanfrancisco,CA,USA,2010,pp 299-314
[5] Energy-efficient positioning for smartphones using cell-ID sequence matching," in *Proc. ACM MobiSys*, Bethesda, MD, USA, 2011, pp. 293–306. J. Paek, K.-H. Kim, J. P. Singh, and R. Govindan,
[6] Easytracker: Automatic transit tracking, mapping, and arrival time prediction using smartphones," in *Proc. ACM SenSys*, 2011, pp. 1–14. J. Biagioni, T. Gerlich, T. Merrifield, and J. Eriksson,
[7] Real Time Bus Monitoring System Using GPS Dr. (Mrs.) Saylee Gharge, Manal Chhaya, Gaurav Chheda , Jitesh Deshpande , Niket Gajra, RACST – Engineering Science and Technology: An International Journal (ESTIJ), ISSN: 2250-3498, Vol.2, No. 3, June 2012
[8] Smart Onboard Public Information System using GPS & GSM Integration for Public Transport BY Mr. Prafull D. Patinge , Ms. N. R. Kolhare, International Journal of Advanced Research in Computer and Communication Engineering Vol. 1, Issue V, July 2012