Realtime Bus Tracking and Monitoring System

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Abstract : Today's world has the operation of a bus system and the movement of vehicles is affected by unusual conditions as the day progresses such as traffic congestion, unexpected delays and randomness in passenger demand, irregular vehicle dispatching times and incidents. Due to which passengers are suffering and are waiting for their bus on their bus stops for long time since they do not have updated real time information about their buses. In a real-time setting, researchers are making effort to develop flexible control strategies, depending on the specific features of bus transport systems. This paper focuses on the implementation of a Real Time bus Tracking (VTS) system, by installing GPS devices on city buses which will transmit the current location on GPS Receiver via GSM module. Now the GPS Receiver will be interfaced with server and interface driver will auto save data in dot text (.txt) file which will continue till GPS module is working. From here our application will retrieve data and store it in web server from where we will display real time information of bus. The real-time bus position and time monitoring system is a standalone system designed to display the real-time location(s) of the buses in city.

***IndexTerms* - GSM modem, Real Time Bus Position, Time Monitoring System.**

I. INTRODUCTION

In daily operation of public transport systems mainly that of buses, the movement of vehicles is affected by different uncertain conditions as the day progresses such as traffic congestion, unexpected delays, randomness in passenger demand, irregular vehicle-dispatching times and incidents. Many passengers are often late to work; students are late for classes because they decide to wait for the bus instead of just simply using an alternate transportation. A variable message shown on the web that will be real time information about the bus showing the bus arrival time at applications could reduce the anxiety of passengers waiting for the bus. With the advent of GPS and the ubiquitous cellular network, real time vehicle tracking for better transport management has become possible. These technologies can be applied to public transport systems especially buses, which are not able to adhere to predefined timetables due to reasons like traffic jams, breakdowns etc. The increased waiting time and the uncertainty in bus arrival make public transport system unattractive for passengers. The real-time bus position and time monitoring system uses GPS technology along with different application to fetch data and with software that display the data online along with different buses on different route to the user. When this information is presented to the passenger by wired or wireless media or online web media, they can spend their time efficiently and reach the bus stop just before the bus arrives, or take alternate means of transport if the bus is delayed. They can even plan their journeys long before they actually undertake them. This will make the public transport system competitive and passenger-friendly. The use of private vehicles is reduced when more people use public transit vehicles, which in turn reduces traffic and pollution.

II. LITERATURE REVIEW

[1] "Real Time Bus Position and Time Monitoring System" IJSTE-International Journal of Science Technology Engineering, Volume 1, Issue 10, April 2015". Many passengers are usually late to work; students are late for classes as a result of they decide to anticipate the bus rather than simply merely using another alternate transportation. A variable message shown on the web which will be real time info regarding the bus showing the time of arrival at a particular bus stop might scale back the anxiety of passengers expecting the bus. With the advent of GPS and also the ubiquitous cellular network, real time vehicle tracking for higher transport management has become attainable. These technologies can be applied to conveyance systems particularly buses, which are not ready to adhere to predefined timetables owing to reasons like traffic jams, breakdowns etc. The increased waiting time and the uncertainty in bus arrival build conveyance system unattractive for passengers. The real-time bus position and time observance system uses GPS technology alongside totally different application to fetch knowledge and with code that displays the information online on with different buses on a special route to the user. When this info is conferred to the traveler by wired or wireless media or online internet media, they can use their time with efficiency and reach the stop simply before the bus arrives, or take alternate means of transport if the bus is delayed. They can even arrange their journeys long before they really undertake them. This will build the general public transport system competitive and passenger- friendly. The use of personal vehicles is reduced when additional individuals use transit vehicles, which in turn reduces traffic and pollution

[2] "M. B. M. Kamel," Real-time GPS/GPRS based vehicle tracking system," International Journal of Engineering and Computer Science, Aug. 2015**"** The Real Time Bus Monitoring and Passenger Information bus tracking device will serve as a viable notification system that will effectively assist pedestrians in making the decision of whether to wait for the bus or walk. This device is a

standalone system designed to display the real-time location(s) of the buses in Mumbai city. The system will consist of a transmitter module installed on the buses, receiver boards installed on the bus stops, LED embedded map of the BEST bus transportation routes at the centralized controller. It will also have passenger information system software installed at the bus stops, which will provide a user the relevant information regarding all the bus numbers going for his source to destination along with the route details and the cost. Assembly of these modules will enable the tracking device to obtain GPS data from the bus locations, which will then transfer it to the centralized control unit and depict it by activating LEDs in the approximate geographic positions of the buses on the route map. It will also transmit its bus numbers and route names continuously as soon as the bus comes within the range of the receiver at the bus stop. In addition, the device will be portable and sustainable; it will not require an external power source, which will eliminate long-term energy costs:

[3] “Maruthi R., Jayakumari C., “SMS based Bus Tracking System using Open Source Technologies”, in International Journal of Computer Applications (0975 – 8887) “, Volume 86 – No 9, January 2014."Wireless Modules" > GSM/GPRS Module > "SIM300". SIMCom Wireless Solutions Co”, This Paper is a survey to implement a method that makes transport much convenient for individuals who commute daily using the public bus transport of the city, for effective time management and making it trouble-free, not just for the commuters but the Transport Department to create an efficient public transport system. There are applications available in the market today which specifies the route and the timings, predict arrival times of different buses but the survey presented here aims to build an application that takes it to the next step by making information about the vacant seats and the current location of any bus in Real-Time, accessible to the daily commuters with a novel and economical wireless system. These methodologies offer incremental improvements in bus system to meet the capacity requirements of different size cities and presents a review of strategies which can be employed to satisfy public transport demands of different city sizes. Their aim is to build a flexible, comfortable, easily available and reliable bus service which may encourage shift from private vehicles to public, **Ease to Use.**

III. PROPOSED SYSTEM

The proposed system is used for positioning and navigating the vehicle with an accuracy of 10 m. The Exact location is indicated in the form of latitude and longitude along with the exact Navigated track on Google map. The system tracks the location of particular Bus and sends to users mobile in form of data and also to micro controller. The arrived data, in the form of latitude and longitude is used to locate the Vehicle on the advanced Realtime Bus Tracking and Monitoring Application with the help of Google maps.

IV. COMPONENTS

4.1 ARDUINO UNO REV3 Microcontroller

Arduino is open-source hardware. The hardware reference designs are distributed under a Creative Commons Attribution Share-Alike 2.5 license and are available on the Arduino website.

fig -1: arduino uno r3

Layout and production files for some versions of the hardware are also available. The source code for the IDE is released under the GNU General Public License, version 2. Nevertheless, an official Bill of Materials of Arduino boards has never been released by Arduino staff. Although the hardware and software designs are freely available under copy left licenses, the developers have requested the name Arduino to be exclusive to the official product and not be used for derived works without permission. The official policy document on use of the Arduino name emphasizes that the project is open to incorporating work by others into the official product.

Several Arduino-compatible products commercially released have avoided the project name by using various names ending in -duino. An early Arduino board with an RS-232 serial interface (upper left) and an Atmel ATmega8 microcontroller chip (black, lower right); the 14 digital I/O pins are at the top, the 6 analogy input pins at the lower right, and the power connector at the lower left. (ATmega8, ATmega168, ATmega328, ATmega1280, ATmega2560) with varying amounts of flash memory, pins, and features. (it shows in fig1) The 32-bit Arduino Due, based on the Atmel SAM3X8E was introduced in 2012.The boards use single or double-row pins or female headers that facilitate connections for programming and incorporation into other circuits.

4.2 GPS Module neo6mv

The NEO-6 module series is a family of stand-alone GPS receivers(dedicate) featuring the high performance u-blox 6 positioning engine. These flexible and cost effective receivers offer numerous connectivity options in a miniature 16 x 12.2 x 2.4 mm package. Their compact architecture and power and memory options make NEO-6 modules ideal for battery operated mobile devices with very strict cost and space constraints. The 50-channel u-blox 6 positioning engine boasts a Time-To-First-Fix (TTFF) of under 1 second. The dedicated acquisition engine, with 2 million correlators, is capable of massive parallel time/frequency space searches, enabling it to find satellites instantly. Innovative design and technology suppresses jamming sources and mitigates multipath effects, giving NEO-6 GPS receivers excellent navigation performance even in the most challenging environments.

fig -2: gps module

The two independent direct conversion receivers have state-of-the-art noise figure and linearity. Each receive (RX) subsystem includes independent automatic gain control (AGC), dc offset correction, quadrature correction, and digital filtering, thereby eliminating the need for these functions in the digital baseband. The AD9361 also has flexible manual gain modes that can be externally controlled. Two high dynamic range ADC per channel digitize the received I and Q signals and pass them through configurable decimation filters and 128-tap finite impulse response (FIR) filters to produce a 12-bit output signal at the appropriate sample rate. (it shows in fig 2)

4.3 GSM Transceiver SIM900A

This is an ultra-compact and reliable wireless module. The SIM900A is a complete Dual-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900A delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mmx24mmx3mm, SIM900A can fit in almost all the space requirements in user applications, especially for slim and compact demand of design. (it shows in fig3)

fig -3: gsm module

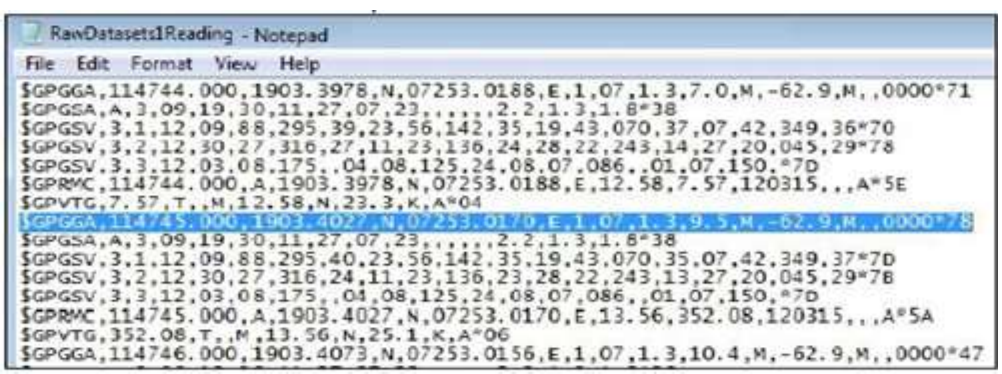
Features

- Quad-Band 850/ 900/ 1800/ 1900 MHz
- Dual-Band 900/ 1900 MHz
- GPRS multi-slot class 10/8GPRS mobile station class B
- Compliant to GSM phase 2/2+Class 4 (2 W @850/ 900 MHz)
- Class 1 (1 W @ 1800/1900MHz)
- Control via AT commands (GSM 07.07 ,07.05 and SIMCOM enhanced AT Commands)
- Low power consumption: 1.5mA (sleep mode)
- Operation temperature: -40°C to +85 °CD. Relay

V. RESULT

5.1 Capturing the Current Location of the Bus:

Here in this phase the GPS module is used that contains prolific PL 2303 driver serial output through USB 2.0 interface. This is the hardware part of the project where the data about the position of the bus is captured in real time and is sent over the internet to the server database. The serial output contains the fields in the format given in the Figure 4. The string that start with "$GPGGA" contains the fixed data that provides - "hhmmss.ss" (in UTC (coordinated universal time zone)UTC used be known as GMT), "ddmm.mmmm,N" (latitude of the GPS position fix), "dddmm.mmmm,W" (longitude of the GPS position fix) , "q" (quality of the GPS fix (1 = fix, but no differential correction)), "ss" (number of satellites being used), "y.y" (horizontal dillution of precision), "a.a,M" (GPS antenna altitude in meters), "g.g,M" (geoidal separation in meters), "t.t" respect (age of the deferential correction data), "iiii" (deferential station's ID), "*CC" (checksum for the sentence).



RawDatasets1Reading - Notepad

File Edit Format View Help

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$GPGGA,114744.000,1903.3978,N,07253.0188,E,1,07,1.3,7.0,M,-62.9,M,,0000*71
$GPGSA,A,3,09,19,30,11,27,07,23,,,,,,2.2,1.3,1.8*38
$GPGSV,3,1,12,09,88,295,39,23,56,142,35,19,43,070,37,07,42,349,36*70
$GPGSV,3,2,12,30,27,316,27,11,23,136,24,28,22,243,14,27,20,045,29*78
$GPGSV,3,3,12,03,08,175,,04,08,125,24,08,07,086,,01,07,150,*7D
$GPRMC,114744.000,A,1903.3978,N,07253.0188,E,12.58,7.57,120315,,,A*5E
$GPVTG,7.57,T,,M,12.58,N,23.3,K,A*04
$GPGGA,114745.000,1903.4027,N,07253.0170,E,1,07,1.3,9.5,M,-62.9,M,,0000*78
$GPGSA,A,3,09,19,30,11,27,07,23,,,,,,2.2,1.3,1.8*38
$GPGSV,3,1,12,09,88,295,40,23,56,142,35,19,43,070,35,07,42,349,37*7D
$GPGSV,3,2,12,30,27,316,24,11,23,136,23,28,22,243,13,27,20,045,29*7B
$GPGSV,3,3,12,03,08,175,,04,08,125,24,08,07,086,,01,07,150,*7D
$GPRMC,114745.000,A,1903.4027,N,07253.0170,E,13.56,352.08,120315,,,A*5A
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$GPGGA,114746.000,1903.4073,N,07253.0156,E,1,07,1.3,10.4,M,-62.9,M,,0000*47
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fig -4: raw gps data

"y.y" (horizontal dillution of precision), "a.a,M" (GPS antenna altitude in meters), "g.g,M" (geoidal separation in meters), "t.t" (age of the deferential correction data), "iiii" (deferential respect_Nation station's ID), "*CC" checksum.

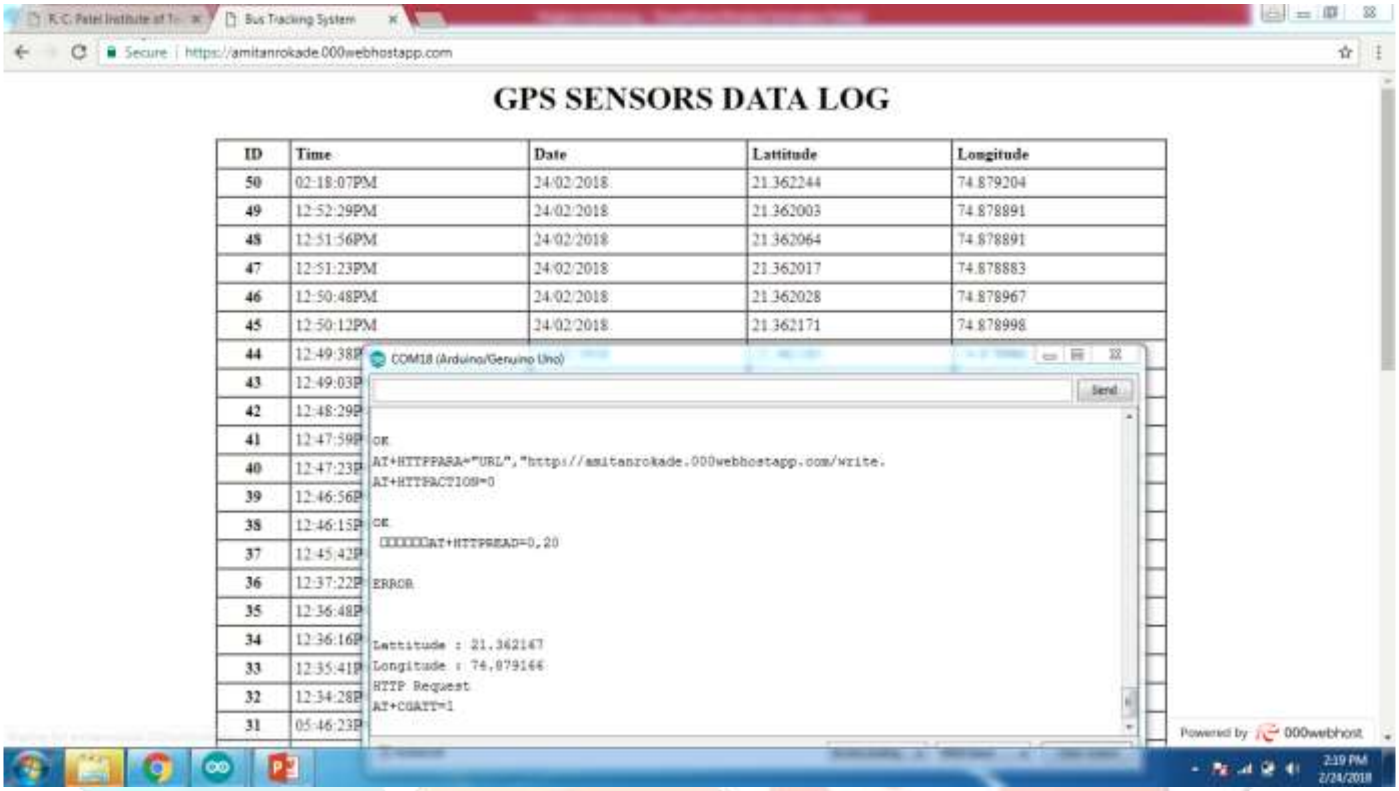

fig -5: decoded gps data

Fig-5 Shows the decoded raw GPS data. After decoding the raw GPS data, it will be sent to ASP Pages with the help of GSM Transceiver using HTTP Protocol. This data will be automatically updated to server in approximate 60seconds. Our Android application also linked to this server page in order to collect the GPS data and then use it in further time vs distance calculation for the bus.

5.2 Calculating Time, Position and Display to User (Android Application):

This is the final phase where various tables in the database are mapped to retrieve the correct output and display to the passenger. The table which takes entry from passenger takes the passenger location and bus location, the table which takes the real time entry of the coordinates or location of the bus and the initially prepared table which contains the time taken are joined to find out the time that the bus will take to reach the passenger location and also the current bus stop that the bus has already crossed.

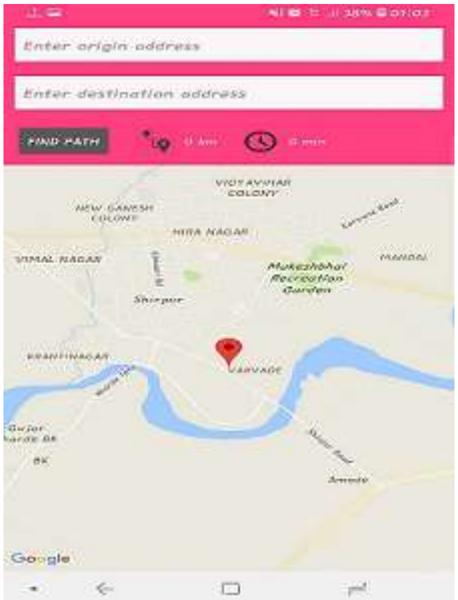

Fig -6: Bus's Location

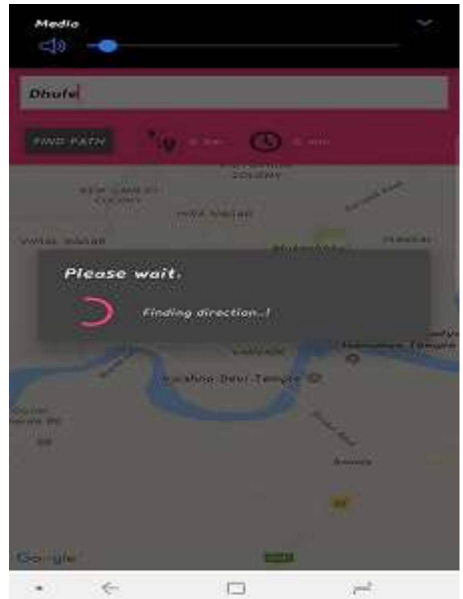

Fig -7: Finding Directions

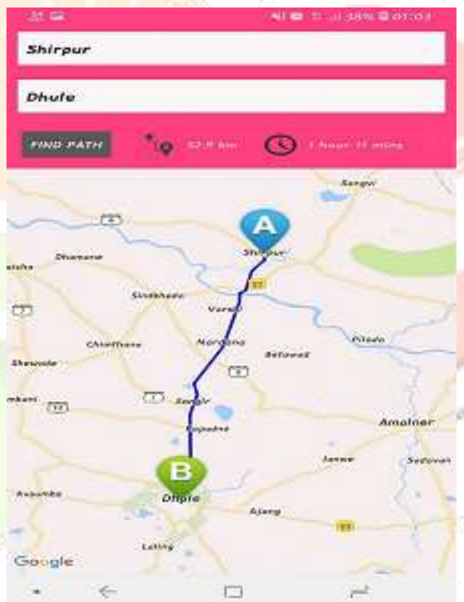

Fig -8: Calculated Time according to Distance

The final output (as shown in fig 8) that is prepared contains the ETA (Estimated time of arrival) which is taken from the database and the latest bus stop that the bus has currently crossed. In Figure 8 output for one sample case is shown.

VI. Conclusion

The with the implementation of the project a complete track can be kept of the buses around the city. The display at the passenger's computer saves the commuter's time. Thus a complete system of the bus transport system is established. The system involves the tracking of every bus at the control unit, bus information for the passengers. With this project the commuter can plan their journey more effectively and the waiting time at the bus stops is reduced. Also the frequency of the buses in the same route can be learnt from this system. The efficient usage of time and also the commuter management or rush manipulation can be easily done by the features of this system.

VII. FUTURE SCOPE

The Future work on this project includes making the GUI simpler and which can make use of mobile phone interface to take input from cell phone gateway and reply on the mobile phone to the user. Also it includes the development of a feature which alerts a user about the Traffic information.

The range of the GPS transmitter can be increased to cover a wider area. The ATVM system can also show a real time map with bus tracking. The project can be extended to other mode of transport such as rail system and for personal use. Some sensors can be put on road to get the exact arrival time of the bus at a particular bus stop.

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