Public Announcement System in Bus Station by Voice Short Message Service

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Abstract--- Now a days public road transports are major source of travelling for every one. In several bus stations many people are waiting for buses without knowing the exact arrival time of a bus of particular route. Due to traffic buses may not come to their destination in time. Real time Public announcement system (PAS) is the need of the hour for the public. In this paper effort is made to innovate and execute a comprehensive solution with GSM technology as bearer. The location and the time advance information for the mobile unit is fetched from the Base Transmitting Station and a new methodology is derived at server to compute and predict the time of arrival at the destination by converting the received signal into voice. This result will be immensely useful for visually challenged people.

Keywords--- PAS, GSM, BTS, SIM, SMS, VSMS, GPS, ETA, SMSC Lattitude & Longitude, CDMA

I.   INTRODUCTION

ADVANCED technologies have taken the world to a greater level and mobile phones are the biggest example of the same. They are becoming a symbol of style and status these days. Today, there are numerous mobile phones and service providers available in the market.

Each service provider uses two technologies namely Global System for Mobile communications (GSM) and Code Division Multiple Access (CDMA). Although in terms of coverage technology, GSM plays a major role than CDMA in rural as well as remote area. The technology is reliable, advanced, meets the needs of the customer.

The present generation needs higher efficiencies, reliability, high speed, more capacity and innovative applications using this network. Today's world needs what and all media so far as done from different media resources/technologies should be done from Mobile systems. Hence demand is more towards mobile systems as it's a challenge for Mobile operator to provide such value added services for the customer.

II.   PROBLEM STATEMENT

Many people depend on Government provided buses to move people from one place to another. But the schedule of bus arrival and departure at individual bus station is uncertain even though specific time period is defined. Routes to rural areas are assigned few buses and if there is a problem the

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same is not known to the passenger at the remote bus station. Hence I am going to use VSMS for the purpose of announcement in bus station. The voice SMS is a Value Added Service which is being a new technology offered by selective service provider. The Push voice SMS will provide passenger a real time information about the position of the bus and when it will come to the bus station.

In the vehicle tracking system the position of vehicle is being monitored through Internet by GPS. But in my development paper the position is being converted into suitable text and then to voice SMS which is being sent to the concerned bus station where in the device installed with SIM will play the voice SMS through audio speaker.

- *Present Status of the Work*

Several attempts have been done in these domain but all the projects do not address output presentation through voice and also void of accuracy of timing and the distance calculation due to inaccurate prediction information from BTS. In our paper we have taken the combination of GPS and BTS information to offset the inaccuracies on time and distance parameter. This is different from the announcement system used in railway station which is done manually.

The paper is organized as follows:

Present/Existing system
Design of PAS & Operational Methodology of PAS
Conclusion

III.   PRESENT SYSTEM

The existing GPS system is described in the diagram as detailed below.
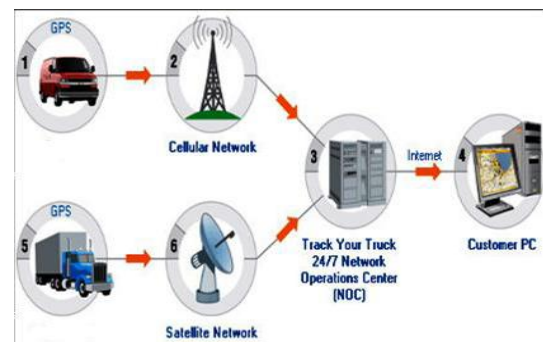
Vehicle with Hardware Control Station Display
Fig.1: GPS Tracking System

The Global Positioning System (GPS), which was developed to meet military needs of the Department of Defense but now is used in every day life, is a radio based

navigation system that gives three dimensional coverage of Earth 24 hours a day in any weather condition.

It is the only system today able to show exact position on the Earth anytime, anywhere and it is one of history's most exciting and revolutionary developments. The GPS system can tell location anywhere on or above the Earth within about 300 feet. Greater accuracy could be achieved (within less then three feet) with corrections calculated by a GPS receiver at a known fixed location. The Department of Defense developed and maintains GPS. Normally if we use it in vehicle we call it as Vehicle Tracking System(VTS). All the Vehicle whose position needs to be monitored is fitted with one GPS systems with network detail as detailed below.

There are three Main units available in the GPS.

- A Hardware unit which is mounted in the vehicle
- A Control Station run by the service provider
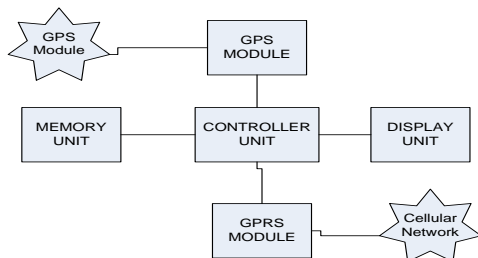- A Server on the Internet which displays the position of the vehicle

Fig.3: Hardware Unit to be Fitted in Vehicle

The above diagram shows the components of hardware unit fixed in the vehicle. It consists of GPS Module, GPRS Module, Control Unit, Memory Unit and display unit. The GPS module interact with satellite by means of diferential positioning and GPRS unit for the purpose of sending SMS to the main server location.

The hardware unit in the Vehicle computes an exact latitude and longitude position when it receives data from at least 3 GPS satellites. This position and certain other data such as heading (direction), speed and time are encoded, compressed and sent by SMS to the Control station.
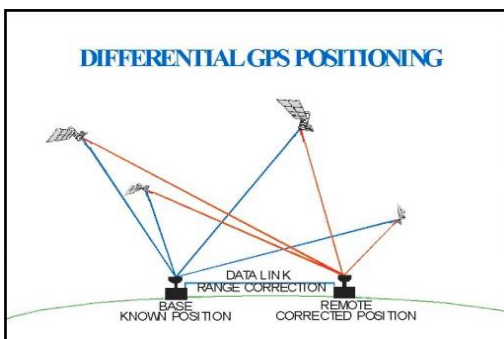

Fig.2: Differential Position of GPS of Satellite

- The time interval between SMS messages can be set or changed from the Control Station or the end user's screen.

- It is possible to have SMS set to an 'On Demand' mode. This is useful in scenarios where continuous monitoring is not required. Whenever it is necessary to track the vehicle, a command is sent out from the Control station / end user and the current location of the vehicle is plotted on the screen.
- Data is sent in an encrypted format, so it cannot be decoded by anybody except the intended receiver.
- Data is sent in a compressed form. This allows us to send data for at least 20 positions in one SMS. Hence, if the frequency of SMS messages is set at 1 hour, when one SMS message is received by the Control Station, it updates the last 20 positions the vehicle has traveled, on the map (one position every 3 minutes).
- Besides time, speed, position and heading, other parameters can also be monitored and the data sent in the SMS
- The Control station sends the decoded data from the Vehicle to the Web server. The Web server displays the position of the vehicle together with any other data specified, on the map. The data is also stored in a database.

IV. DESIGN OF PAS & OPERATIONAL METHODOLOGY

The above Data is computed taking the time and distance input for predicting the exact arrival time of bus stop located in a fixed distance.

1. On Receipt of SMS from GPS unit will be compared with master location file for the purpose of identifying the location.
2. The location needs to be translated into text format.
3. The text forma needs to be converted into audio format.
4. The same is sent to distant end by VSMS.

- *The Technical Implementation*

In the Public announcement system the following major blocks of units are being utilized.

1. Bus with GPS System
2. Main controller Unit
3. Storage unit with comparator
4. Text to voice convertor unit
5. Push VSMS unit to remote end
6. Audio to play the VSMS received.

The Bus transport department has to identify the routes on which the PAS needs to be installed. Based on the route and bus stop information, the bus route and the number of stopping with approximate time to travel from one stop to another etc., are to be created in the server.

The same needs to be mapped against the latitude and longitude of the approaching bus stop. This plays a major role as based on the GPS information only the announcement is going to take place. Even in the same route more than one bus also will run, hence the buses are identified with route number with some identified prefix for the purpose of identification.

The Main functions of server are

a. Maintain data base of all route/Bus play on a specific route with stopping
b. Continously receive location from GPS unit and also the speed at which the bus is moving.
c. Calculate the Exact Time arrival(ETA) of bus to the next terminal

The sample table format is given below.

Table 1 : Data Base Table

Sl.No	Table Name	Content
1	BUS	Bus ID, Type and Route
2	Bus Position	Bus ID, Current co-ordinate, speed, average speed, direction, current link, entry time, estimated and time status
3	Bus position Log	Log of changes made to bus position table
4	Node	Node ID,Co-ordinate, Name
5	Link	Link ID,Node pair, Travel time
6	Route	Rooute number,Sequence of links
7	Stop	Stopname,Node id, Route number, ETA

Normally the route is modeled as set of Nodes which can be a STOP. The ETA algorithm is calculated based on two factors. namely Link Updater & ETA calculator. Link updater is normally travel time for each link and ETA calculate the exact ETA for the bus stop.

V. IMPLEMENTATION

The Buses to be fitted with pre control GPS system with pre determine time to deliver SMS to the main location. Based on the time line define the SMS will be sent to Main location. The received Lattitude/longitude will be compared with the available record in the server for the purpose of converting the same to text format.
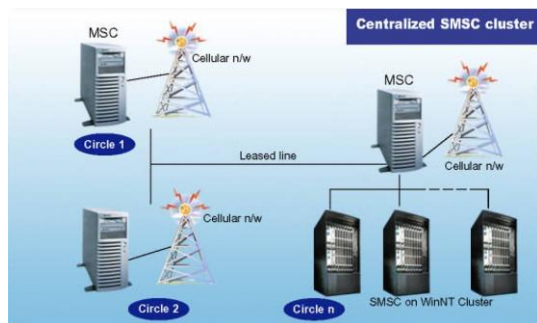

Fig.4: SMSC Server and its Connectivity

On receipt of the SMS, the same will be compared with distance table (which needs to be created for individual route by transport department). Based on the position and distance between the adjacent bus stop, the time will be computed using the table. The resultant predicted data normally in text form, the specified unit will convert text form to voice form for the purpose of PAS.

The voice data will be sent to remote unit/Bus station as VSMS where the GSM Mobile device connected with audio output will play the audio.

If the latitude & longitude received is not matching with the table then it will generate a trigger with a value which will be translated as voice message "the designated bus will not come in this route"

For sending the Push Voice SMS the Main control unit requires one dedicated connectivity between Service provider GSM gate way to his main location.

Provision is available in the server for adding the new router so that if any new route is added by transport department the same can be added in the server.

The passenger waiting at a particular bus stop in a particular route can also query by sending the SMS to the server to know the arrival information of a particular bus.
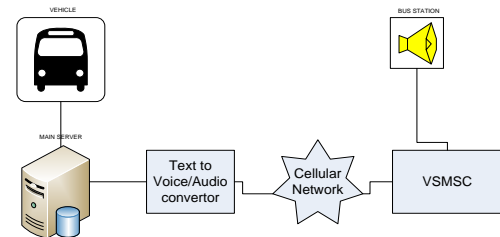

Fig.5: Complete Network Connectivity

VI. FUTURE RESEARCH

This Research can be extended to fleet of buses moving in different directions. In future the project can be further redefined to provide streaming video with location information of the intended approaching bus on the mobile phone of the waiting customer at the bus station.

VII. CONCLUSION

I have developed a new innovative concept to track the current locations of all the buses in the route and calculate the ETA for the particular bus stop. The received content is converted from text to voice and played in respective bus station. In Railway station the announcement is being done manually with pre recorded voice with train number arrival, departure etc., This concept is one step ahead in the above paper by using the latest GSM VSMS technology as a bearer without any man power.

Provision is available in the server for adding the new route, so that if any new route is added by transport department the same can be added in the server.

Acronyms:
PAS: Public announcement system
GSM: Global System for mobile communication
BTS: Base Station Transceiver
SIM: Subscriber identiy module

VSMS: Voice Based Short Message Service
GPS: Global Positioning system
ETA: Exact Time arrival
CDMA: Code Division Multiple access
SMSC : Short message service centre

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Author is Presently Working as Sr.Sub Divisional Engineer in BSNL Tamilnadu Telecom circle Enterprise Business Unit. His core competency job is designing the network for corporate customers based on their need, using latest technology and maintaining the same as per customer satisfaction. His contribution to the field of networking and its innovative application using Value Added services is remarkable one. He plays a major role in integrating value added services like VPNoBB, CDMA VPN with MPLS VPN network. He is a specialist in GSM VPN network and designing the GSM VPN network to customer using VAS.