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Smart Onboard Public Information System using GPS & GSM Integration for Public Transport

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ABSTRACT – ***This paper describes challenges of urban transportation and one of the cost effective approach to intelligently manage the public transpiration in the city. The GPS based urban transportation management system in which the fleet tracking using GPS & GSM/GPRS technology and public information system unit mounted at bus. The real-time co-ordinates help to guide the onboard commuter to destination. The unit mounted on bus sends the data using GSM/GPRS module to central monitoring system & displays it on City Map. This application is easy to deploy and provide effective management tool to urban transportation authorities for optimal utilization of present resources for improvements in term of load management, optimal route designing & real-time monitoring and control of the fleet.***

Keywords-GPS tracking , GSM/GPRS , public informaiton system, fleet management, maps , central monitoring & control

1. I. INTRODUCTION

The effective transportation system leads to the effective movement of goods and people, which significantly contribute to the quality of life in every society. In the Heart of every economic and social development, there is always a transportation system. However rapidly increasing vehicle population in India due to outcome of population boom and economic upturn lays a very highly complex burden on metropolitan traffic management. As the Public Transport has became vital part of urban transportation however most of such mass transit facility are operating with manual method of fleet management and any intelligent technology based tracking & navigation is still not used widely in such public transportation which results in more effort to manage such a large system and dependency manual methods which could be prone to error.

If the advanced but easily available wide spread technologies get used then it will not only helps the commuter to get information while travelling but also help the Central controlling authority to track down the fleets with its latest real-time location on map to manage it precisely and optimally.

The existing wildly used & proven technology known as Global Positioning System (GPS) can be used to manage this traffic chaos very intelligently and more economic manner. These systems offer an effective tool for improving the operational efficiency and utilization of vehicles along with

Global System for Mobile (GSM) & General Packet Radio Service (GPRS) technology can be used to communicate the real-time location, velocity & time data from moving Bus to central monitoring & control authorities on application like google map or any customized city map.

If this application is being used in city bus with purpose of centralize monitoring & control to enable the authorities or a third party to track the vehicle's location, collecting data in the process from the field and deliver it to the base of operation to track the fleet throughout the city in real-time on city map & it Will also help commuter as navigation aid tool and bus stop information in audio and visual mode.

The application device with GPS & GSM/GPRS module on every bus will receive location co-ordinates from

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satellite & regularly update the central Monitoring & Control base about the station it arrives at. Also it will alert the passengers about the present and next station based on comparison of real-time GPS co-ordinates and already stored data of co-ordinates for respective location on LCD display in bus and also announcement using speaker. The movement of buses can be monitored on City Map or Google Map application & it can be made available to public to access as web based application.

2. II. METHODOLOGY

The overall system is divided in to two sections. The first one is field device and public information system on the bus & second is Central Monitoring & command.

The most basic function in all bus tracking & public information system is the vehicle tracking component. This component is usually GPS-based, or a cellular triangulation platform. Once vehicle location, direction and speed are determined from the GPS components, additional tracking capabilities transmit this information to a fleet management software application. Methods for data transmission include both terrestrial and satellite. Satellite tracking communications, while more expensive, are critical if vehicle tracking is to work in remote environments without interruption. Users can see actual, real-time locations of their fleet on a map. This is often used to quickly respond on events in the field. In this system we use the GSM/GPRS module for data transmission between central command and moving bus. A passenger information [display] system (PIDS) is an electronic information system which provides real-time passenger information. It may include both predictions about present station, next bus stop, speed etc.

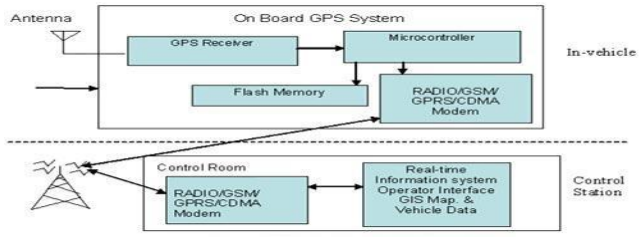

Fig. 1. Typical architecture of GPS tracking System

The Central Monitoring & command center is also having the connectivity by internet or even GSM data can also be directly use for updating the City Map with real-time location data of respective bus. The central monitoring can thus get real-time location and speed data along with journey time. Fig.1 illustrated a typical architecture of GPS tracking system.

The location of bus displayed on city map can help commuter to plan the journey accordingly , this information system can be installed on all the bus stops throughout the city & also the authorities can track the journey in terms of time and can make necessary changes for optimal utilization of available fleet resources and maximizing the load handling capacity by effectively planning the routes within the city area & real-time monitoring system is also tool analyze the effectiveness and performance of the planning at central location & accordingly make the necessary changes if needed.

III. Operational procedure

A. *Operation of unit installed on bus:*

Operation of field Device located in bus gets start just after power on. The GPS module starts the scanning of available satellite signals (Ref. Fig.2) A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites high above the Earth. Each satellite continually transmits messages that include the time the message was transmitted satellite position at time of message transmission

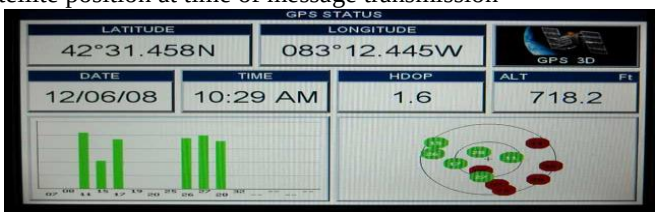

Fig.2. GPS Receiver Display

The receiver uses the messages it receives to determine the transit time of each message and computes the distance to each satellite. These distances along with the satellites' locations are used with the possible aid of trilateration, depending on which algorithm is used, to compute the position of the receiver. This position is then displayed,

Perhaps with a moving map display or latitude and longitude; elevation information may be included. Many GPS units show derived information such as direction and speed, calculated from position changes.

Fig.3.On board Display for Passenger Information System

The actual GPS co-ordinates of all the location within the City bus service area are already stored in memory of the bus unit. When GPS module scans the satellite and finds the real-time co-ordinates then these co-ordinates are comparing with pre-

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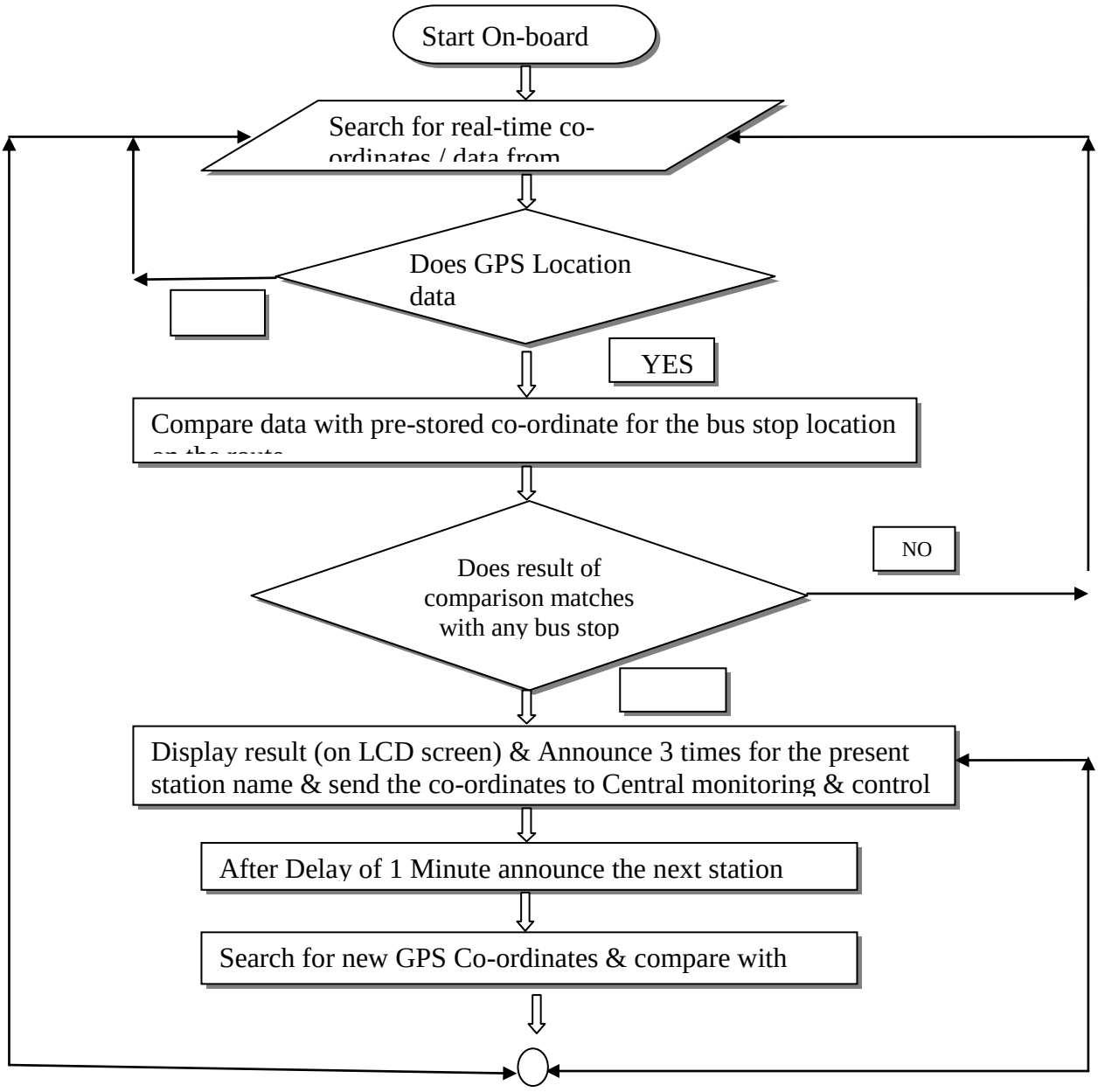
stored co-ordinates of the respective bas stop. If the co-ordinates matches within the range of stored data. The result is shown as Station Name on LCD display (Ref. Fig 3) and also announcement of that station using speaker. At the same time these co-ordinates send to central monitoring and control using GPS/GPRS module.

B. The Central monitoring and control unit:

At the Central Monitoring & Control based on remote site, the real-time data of particular bus is received ether through the internet or GPS/GPRS module. The TCP/IP based web interface can be develop for user interface and thus it can be accessed anywhere. The location information can be shown on map.

Fig.4. Central Monitoring & Control Display



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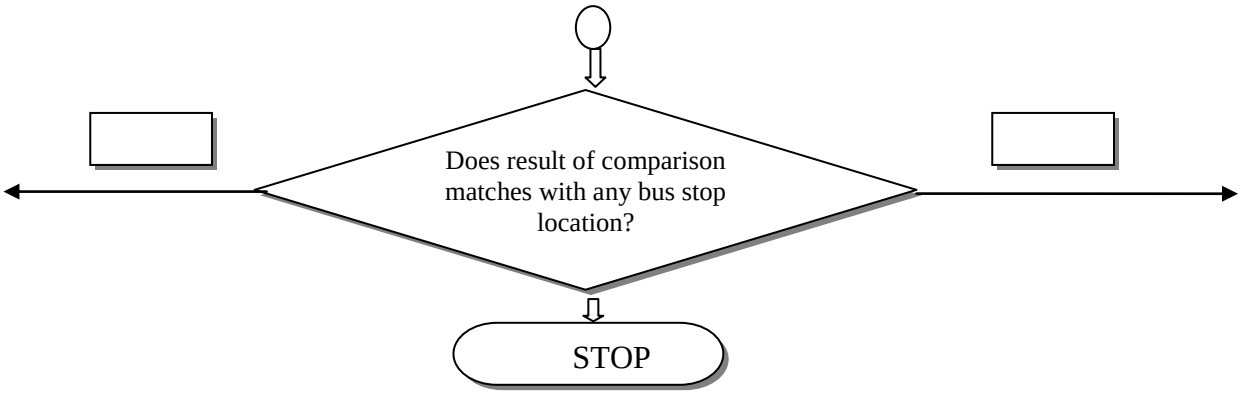

Fig.5: Overall operation of the On Board System

3. IV. RESULT AND DISCUSSION

The automated passenger information system provides commuter the necessary tools to use the public transport service and plan ahead their time with the easy to use route information and estimated time of arrival of the public vehicles.

Public Transportation provides turnkey automated passenger information systems, designed to bring real-time information to transit passengers with access to easy-to-use tools. This tool installed on bus as automated passenger information systems that display the estimated time of arrival and real-time vehicle location and next station information.

The central monitoring & control data of real time bus location is also accessible to commuter along with authorities which provide the easiest & intelligent way of overall management and tour planning of for both.

The proposed application will surely provide smooth and linear transmission of location information to the bus stations which led people to take decision either to wait for Bus or not & for onboard passenger it will help to get station information alert without dependency on others.

4. V. CONCLUSION

The urban transportation need to obtain concrete data in order to improve overall fleet productivity. This system provides ease-of-use for the monitoring and controlling authorities, fleet drivers and most importantly to commuter.

The data from all the bus fleet can also be used for time schedule management and optimal planning of route for maximum load capacity during peak hours

This system thus decreases the vehicle idle time as its being monitored by authorities by central authorities. The optimally designed routes can also benefits in fuel usage.

The speed of vehicle can also monitor centrally thus risk of accident can be reduce by limiting speed and monitoring it in case of any breach by driver.

The record keeping can be made easy as all data is available digitally and same can directly use for analysis and decision making purpose for overall improvement of urban transportation

This system also gives liberty to commuter for getting traffic route relation information and planning for the same. Also on board display and announcement of station related alert in real time help commuter throughout journey till destination. Transportation where large number of busses has to be manages by authorities and maintenance cost can also be kept low due to low cost components & modules available in market.

This system can also integrated with different technologies for additional features and due to use of popular and widely used technology at cost-effective price make it ideal for urban

5. VI. FUTURE SCOPE

The GPS based transportation system & public information system is having full of possibilities and wide scope in variety of field especially related to day to day life.

This application can be effectively use in Public Distribution System which will help to improve the overall distribution in time bound manner and also control the corruption considerably & loop holes due to manual distribution systems without proper monitoring tools.

For faster response times for disaster relief, such as getting utility trucks, ambulance to restore basic infrastructure facilities in severely affected area this system can be used.

In the event of natural calamity such application can more efficient handle the civilian evacuations with smart route planning software.

The application with facility to response from user end can increases the safety of isolated workers or people working in dangerous and remote locations.

It also provides a best mean of effective recovery of stolen assets, alerting authorities to crime rings operating in the area with addition of sensors or additional security modules integration with this system.

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