Global Positioning System (GPS) Based Transit Tracking System

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ABSTRACT: The need for a more efficient transit system has led transit agencies across the country to implement Automatic Vehicle Location systems. This enables them to observe, collect, and analyse location information about a commuter vehicle in real time and transmit this information to the transit management centre and passengers. This information gives the ability to make better and more informed decisions while also providing quicker response to emergencies. The benefits to the passengers mean better on time performance and less waiting time at bus stops. This paper deals with the implementation of cost effective and intelligent solution "Global Positioning System (GPS) Based Public Transit Tracking System" which will provide current location of the BUS and also send messages to the registered passengers/Users when bus reached at specific stoppage. GPS Based Public Transit Tracking System collects real time GPS data from android mobile of the driver and sends it to the server. The server takes decision to inform the registered user via short messaging service about the current location of the Bus/Vehicle. This application is easy to deploy and provide effective management tool for optimal utilization of present resources so that user can use public transport rather than private vehicles.

Keywords : GPS, Android, GPRS, GSM, SMS, Transit Tracking

1 INTRODUCTION

In developed countries, most people use private vehicles, and the level of vehicle ownership is rising rapidly, resulting in increased traffic congestion, which poses a threat to the overall quality of life of people in many countries. Traffic congestion also leads to a decrease in accessibility, excessive travel time and air pollution [1]. A variety of techniques for reducing congestion has already been suggested (Glen, W., 2008). One suggestion is to improve and expand the public transport system [2]. However, the growth in populations, the need to facilitate mobility, environmental concerns and energy objectives place demands on public transport systems.These systems must be constantly upgraded, improved and expanded to meet these demands. Improving public transportation systems does not necessarily mean building new roads or repairing infrastructure [3]. Instead, using new computer software and hardware techniques as well as communication networks can help in improving existing transport systems by providing real-time transit information to the public when and where they need it [3]. Many people using public transit in their daily life face problems such as waiting for a long time at bus stops without knowing when the next bus will arrive or without getting enough information about the buses arriving at or leaving from bus stations [4]. This is because buses are not tracked when they are on route. This has caused huge inconveniences to passengers who travel by bus. Transit operators need tools to track their bus fleet in real-time and be able to monitor schedule adherence and service efficiency. By tracking their bus fleet in real-time, operators can give better operational support and provide users with real time service information [5]. The "GPS based Public Transit Tracking System" projects is designed and develop to accommodate the needs of today's public transit vehicles keep track where is or how much time it will take to reach the stop. It is a very useful and versatile system. The desired output from the system will be the data such as position, speed, and time obtained from the GPS receiver (Android Application) and will displayed on the computer screen.The overall concept of this project is based on the use of android mobile which have working GPS and mobile 3G/2G services. The android application will be to continuously collecting the GPS data and updated to the server. This mobile will be put with the driver of the bus. We can use other GPS devices in place of android mobile. The output of this system will be the data obtained from the GPS receiver. The data contains information such as speed, position and time. The data from the GPS receiver will be sending using mobile internet to the receiving end or database. A windows based server application will also be developed which will display the GPS data using GOOGLE map.

2 ARCHITECTURE

GPS based transit tracking system is a combination of software and hardware. Android based mobile phone is used as hardware unit. Each software contains its own modules which are responsible for specific task. The overall architecture of GPS based tracking system is shown in fig 1. The working of GPS based tracking system can be explained with help of block diagram as given in fig 1. The GPS Data collector software is installed on android mobile of bus driver. The GPS collector application continuously fetching the information of current coordinates from the satellites with help of Google APIs. After detecting the new coordinates, the GPS Collector software updates the coordinate's information to the server. The Public Transit Tracking System (PTTS) works as master software for administrator. The PTTS software provides the complete access to administrator to add or remove the GPS collector devices. The PTTS software can register the mobile user or update the details of the users. The administrator can view the real location of any of particular bus.
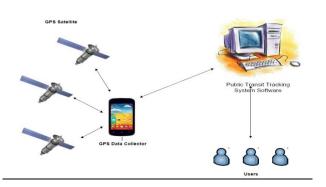
Fig 1. *Architecture of GPS based Transit Tracking System*

2.1 Public Transit Tracking System

The PTTS windows server is in charge of keeping track of the bus GPS information, preparing the database for the users, buses, routing SMS to all the users and decision making for appropriate operation. The main screen of PSST is given in fig 2. The PTTS software is a window based application developed in Microsoft visual Studio 2008 with DONET framework 3.5 sp1. The coding is done in C#. The Microsoft SQL Server 2008 is used as a backend.

2.2 GPS Data Colletor Softeare

GPS Data Collector Software (GPSDCS) is an Android application as given in fig 3. Android is an open source operating system for mobile devices developed by Google. One of the key features of Android is its ability to extend the functionality of devices through new applications (or apps). These apps are developed by a large community of professional and hobbyist programmers using a customized version of Java [6]. Because of this large community, Android has a lot of documentation and support for new developers.The Android SDK is a collection of APIs and tools that facilitate Android application development. The Android SDK Manager allows developers to install individual API components for different versions of the Android OS with relative ease [10]. One of the key tools of the SDK is the Android emulator which allows developers to deploy and test their code on a number of virtual Android phones with different hardware specifications. I chose to develop an Android application for this project because most modern Android smart phones contain a GPS system that can be easily accessed with the correct security permissions. Java is also a language with which I am very familiar so learning the specific quirks of Android Java seemed like a reasonable goal.
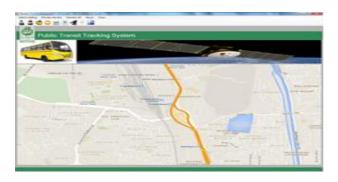

Fig 2. *Public Transit Tracking System Software*

Fig 3. *GPS Data Collector Software*

3 RESULTS AND DISCUSSION

The PTTS software works as a server. We register all the buses to server as given in fig 4. This form contains Information as Bus ID, Bus number, Driver name, driver's mobile number and bus route number. We can modify these details when need or delete as required.The PTTS software works as a server. We register all the buses to server as given in fig 4. This form contains Information as Bus ID, Bus number, Driver name, driver's mobile number and bus route number. We can modify these details when need or delete as required.
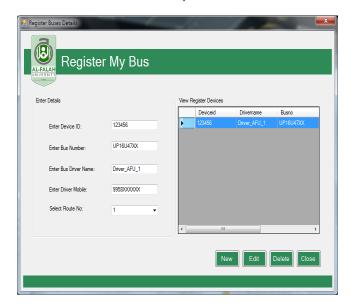

Fig 4. *Register Bus Details*

After successfully registration of all available buses, now we register all the staff members who are authorised to travel to a particular bus based on bus id and route number as given in fig 4. This window contains the detail of staff member or authorized person to travel to the particular bus.
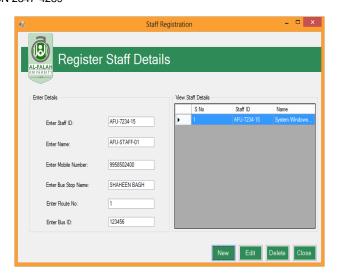
Fig 5. *Register staff Details*

The driver will have the android mobile with GPS Data Collector application installed. The unique ID of the android mobile works as a unique bus id and registered with PTTS software. When driver press Start button of GPS Data Collector software, it start collecting live data of GPS latitude and longitude information and insert in to the database. It updated the database when it receives new locations. Google APIs are used for collection of location details. The live data can be monitor at PTTS Software end. The administrator clicks on View My Bus option and the live data with tabular form and in Google map will show on his/her screen. This is live data and changes as per location received. The screen will show as per selected bus id or can view all buses as given in fig 6.
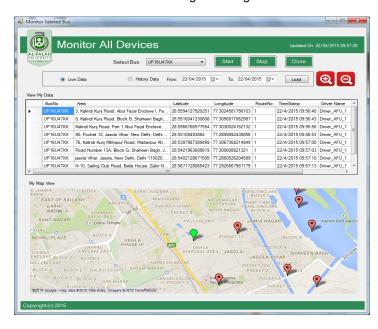

Fig 6. *Live Bus Data*

After successfully registration of all available buses, now we register all the staff members who are authorised to travel to a particular bus based on bus id and route number as given in fig 4.This window contains the detail of staff member or authorized person to travel to the particular bus.

4 CONCLUSION

I consider this project and the proof-of-concept a total success, but a lot more work would have to be done to make this system implementable on a mass scale. Above everything else, a lot more testing would need to be done to ensure the predictions stay accurate and system holds up after an extended period of time. In order to bring this project to the public, I would need to go through an additional stage of testing with multiple devices running the app to ensure that it still held up. Additionally, the system would need to have improved error handling to keep users in the loop if something went wrong. The ability of the system to act on its own can reduce the manpower required at the monitoring centre. Bus drivers will also be more punctual to the bus schedules that have been established, resulting in a more efficient bus circulation system. The system also helps to optimise the travelling time of faculty staff. The system also helps to encourage using public transit system and helps to reduce the pollution in environment. The experimental results show that the system is intelligent enough and able to provide important information to the authorities for monitoring and management of the bus system.

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