

GPS AND RFID BASED INTELLIGENT BUS TRACKING AND MANAGEMENT SYSTEM

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Abstract - Now a days, a bus tracking system has been widely used for fleet (group of buses) management and asset tracking. GPS and RFID Based Intelligent Bus Tracking System is useful, accurate, robust, flexible and economical. In this work, GPS is used for obtaining the location of the bus using Google Map and RFID is used for the identification of bus. RFID card is also used here for transactions related to fuel filling. Therefore, whole information of a particular bus is stored in database at the server side. An ultimate aim of this system is to develop a flexible, cost effective and user-friendly vehicle tracking system that can cater the needs of owner of transportation companies with minimum technologies backing at the user end. In developing countries, such technologies are very useful for tracking of vehicles.

Key Words: GPS, RFID, Bus Tracking, RFID Tag, RFID Reader, Google Map.

1. INTRODUCTION

Today, the fundamental support for global economy of many industries is the transportation of people, goods, and services. The owner of transportation networks no longer see the actual movement of bus, but the owner expects a certain quality of service in terms of the safety assurance, journey time, facilities provided during travel. Vehicular tracking systems has proved to be as a useful technology for bus traveler agencies with good facilities. Bus information taken care with RFID and existing location taken care with GPS.

Current tracking processes that are in use, such as barcode scanning software, in situations where hundreds of bus are present, the act of scanning each individual bus to check for proper placement can become a tedious and inefficient use of company time and energy. With the design and implementation of an vehicle monitoring system, we are able to drastically reduce the effort needed to monitor and track a large number of target vehicles. This prototype, when implemented, will allow for a more efficient vehicle tracking system that saves time and, in the end, saves money while providing a simpler tracking device. Using active RFID hardware and a medium strength RFID

receiver, we designed a prototype tracking unit to be used to solve the issues surrounding large scale vehicle monitoring. The prototype combines the capabilities of the RFID receiver with a GPS tracking unit and an onboard embedded device to provide a complete base unit capable of tracking, monitoring, and saving vehicle information within one device. A successful and complete prototype was designed and implemented over the course of this project. The prototype properly tracks any number of target vehicles through RFID tag scanning and GPS location checking, entered vehicle information. Individual bus details can be accessed by the user through various menus that are provided during the running of the program. This will allow the prototype to be adapted to many different areas of use, instead of a predetermined work environment.

1.1 Global Positioning System(GPS)

The **Global Positioning System (GPS)** is a space-based navigation system that provides location in all weather conditions. GPS satellites continuously transmit their current time and position. A GPS receiver monitors multiple satellites and solves equations to determine the exact position of the receiver and its deviation from true time. At a minimum, four satellites must be in view of the receiver for it to compute four unknown quantities (three position coordinates and clock deviation from satellite time).

1.2 Radio Frequency Identification (RFID)

A radio-frequency identification system uses *tags*, or *labels* attached to the objects to be identified. Two-way radio transmitter-receivers called interrogators or readers send a signal to the tag and read its response. RFID tags can be either passive or active. Passive tags collect energy from a nearby RFID reader's interrogating radio waves.

2. RELATED WORK

Many researchers have contributed to the development of Intelligent transportation system (ITS) for various applications like vehicle position tracking systems, vehicle

anti-theft tracking systems, Bus Tracking system and fleet management systems. These applications are intended to track the system with respect to the workstation PC and Smartphone. Authors in [1] demonstrate VERTIGUO (VEhiculaR TrackInG Using Open source approach), a GPS,GSM and GPRS technology based vehicular tracking system. Authors in [2][3] demonstrate an SMS based vehicle tracking system to transfer the latitude, longitude from GPS and automobile data to end systems and map their exact location in Google Earth using Keyhole Mark-up Language(KML). Researchers have also worked on SMS tracking system with theft identification and lock feature.

In [4], An intelligent vehicle tracking system (IVTS) is generally used for tracking and navigation of vehicles. These tracking as well as navigation are possible by using GPS in vehicles. Tracking provides a continuous track of the vehicle whereas Navigation guides the user to the desired destination. In [5], The Real Time Bus Monitoring and Passenger Information bus tracking device is a standalone system designed to display the real-time locations of the buses in metropolitan city. This system will enable the tracking device to obtain GPS data of the bus locations, which will then be transferred to a centralized control unit by using GSM and then transmitted to a bus stop and displayed on the GLCD as per the passenger's request. For bus positioning in real time, in-vehicle unit and a tracking server GSM is used. For this, tracking server also has GSM modem that receives vehicle location information stores this information in database. In [6], Four functions have been realized in this management system, such as system personnel management, vehicles management, vehicle information management, and freights information registration and inquiry. The distribution of system personnel authority and the registration and inquiry of the in-and-out vehicles & cargo information have been achieved in this management system, thereby enhanced the efficiency of the current vehicles and security, and promoted a more effective flow of goods.

3. HARDWARE

The hardware part consists of Transmitter and Receiver. Transmitter is placed on the respective bus and receiver is on the administrator's side. The transmitter will transmit the values of position of the bus via GPS technology and also it transmits the value of RFID tag which will be scanned by our RFID reader i.e. placed on our transmitter. Both GPS device as well as RFID tag transmits the alphanumeric values. The respective information which is sent by the transmitter is received by the receiver, receiver collects this information and with the help of software part all the required output will be shown on the screen.

3.1 Transmitter

A Transmitter consists of various modules like GPS module,

zigbee RFID transmitter, RFID reader module and RFID tag and Relay. This transmitter will be kept on the bus and transmits the data to the receiver.

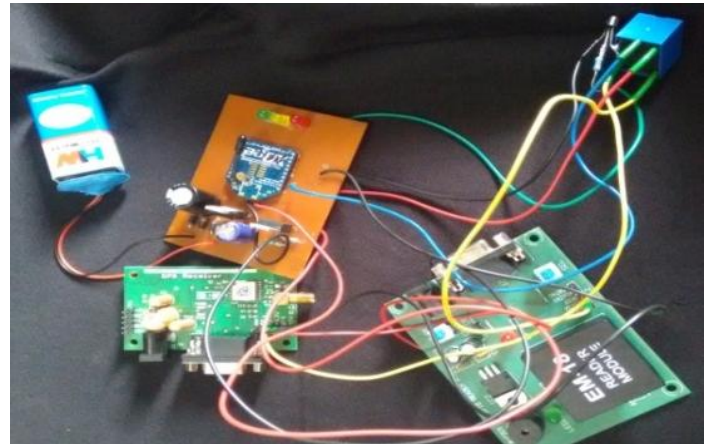


Fig.1: Transmitter

3.1.1 GPS module

A GPS is made up of constellation of satellites orbiting around Earth. Each satellite has an atomic clock on its board, so it knows the precise time. As it is orbiting around the Earth, each satellite is continuously transmitting its location at 1.575 GHz. With the help of GPS receiver pointing at the sky, we can listen to these transmissions. When listening to 3 or more satellites transmissions, we can triangulate our location on earth. Finally, with the help of the GPS receiver we could find the following:

- Location
- Latitude and Longitude

3.1.2 Zigbee RFID Transmitter Module

This module includes some subcomponents such as: RFID module(sender) which is used to transmit data from transmitter at bus to receiver at server side. The reasons for using Zigbee RFID are that :

- It requires less power of 3.3V
- It is secured
- It provides free frequency 2.4GHz
- It produces its own Personal Area Network

A 12V battery is connected to this module through which an Alternate Current (AC) is supplied. This AC is converted to Direct Current(DC) with the help of p-n junction diode and this Direct Current is pulsating. To convert this pulsating DC to smooth DC we have used capacitor filters. The whole current flowing throughout the circuit taken care with resistors. Voltage Regulator is used to provide power of 3.3V to RFID module(sender). The LEDs are used to indicate the various states of system. One is for showing Zigbee power, one is for showing connecting range and one is for indicating sending or receiving.

3.1.3 RFID reader module and RFID tag

The system is based on Radio Frequency Identification (RFID) technology and consists of a passive RFID tag. The passive micro information about the Tag ID and sends this information to the base station. The base station receives, decodes transponder tag collects power from the 125 KHz magnetic field generated by the base station, gathers and checks the information available in its Database and used to send those information. The system performed as desired with a 10cm diameter antenna attached to the transponder. RFID Reader Module, are also called as interrogators. They convert radio waves returned from the RFID tag into a form that can be passed on to Controllers, which can make use of it. RFID tags and readers have to be tuned to the same frequency in order to communicate. RFID systems use many different frequencies, but the most common and widely used Reader frequency is 125 KHz.

3.1.4 Relay

Relay is used to toggle sending of GPS data and RFID data automatically. When the bus is in motion the GPS receiver sends the values to relay and relay forward these values to Receiver and when the bus is not in motion and the RFID tag is scanned on RFID reader, it sends the RFID data to relay. Relay forwards this data to receiver for further processing.

3.2 Receiver

Receiver consists of various modules like zigbee RFID Receiver and Step-down transformer. Receiver will be at the server side where all data transmitted by transmitter will be received and location is found with the help of software.

3.1.1 Step Down Transformer

Step-down Transformer is used to convert main 230V AC into 12V AC. This AC is supplied to the Receiver.

3.1.2 Zigbee RFID Receiver

This module includes some subcomponents such as: RFID module(receiver) which is used to receive data from Zigbee RFID transmitter at bus to receiver at server side.



Fig 2 : Receiver

The reasons for using Zigbee RFID are that :

- It requires less power of 3.3V
- It is secured
- It provides free frequency 2.4GHz
- It produces its own Personal Area Network

12V AC provided by Step-down Transformer is converted to Direct Current(DC) with the help of p-n junction diode and this Direct Current is pulsating. To convert this pulsating DC to smooth DC we have used capacitor filters. The whole current flowing throughout the circuit taken care with resistors. Voltage Regulator is used to provide power of 3.3V to RFID module(receiver). The LEDs are used to indicate the various states of system. One is for showing Zigbee power, one is for showing connecting range and one is for indicating sending or receiving.

4. Software

It consist of an panel which is attached to varies electrical devices from which a single person can handles all system from one position This operations are controlled by interfacing it using buses with a personal computer. All operations are controlled through keyboard inputs of a PC. All these executions are made possible with the help of a most powerful programming language the 'c# language. The software is comprised of 'Visual C#' language programs when executed give . The desired physical results hence all operations can be easily managed with the PC. The software part is being build afterwards.

5. CONCLUSIONS

This paper mainly studied the overall design of bus management system based on multi-node RFID cards and GPS. In this work we have developed AISFBRM- the autonomous informative services for bus route map that is flexible, affordable, customizable and accurate. Through this technology, we enable travel agent to track information about their transportation service. We have also demonstrated the credibility of the design through field trials and the initial results obtained through our prototype are very promising. but the advent of this technology, it

would make more sense for commuters to know the current location of bus and expected time of arrival and also delay if any before coming to bus stop or while standing at bus stop without having to depend on display system and this has been the major contribution of our research.

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