AN APPROACH FOR RFID TICKETING USED FOR PERSONAL NAVIGATOR FOR A PUBLIC TRANSPORT SYSTEM

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Abstract —**RFID-based public transport ticketing systems rely on widespread networks of RFID readers that locate the user within the transport network in real time to be able to verify whether he can travel at that time with the ticket he holds. This paper presents a system that uses that same RFID-based location information to give the user navigation indications depending on his current location provided that the user has indicated beforehand the places he intends to visit. The system was designed to be cost-effectively deployable on the short term but open for easy extension. This paper is based on ticketing and identification of the passenger in the public transport. In the metropolitan city like Mumbai, Kolkata we have a severe malfunction of public transport and various security problems. Firstly, there is a lot of confusion between the passengers regarding fares which lead to corruption, Secondly due to mismanagement of public transport the passengers faces the problem of traffic jam, thirdly nowadays we have severe security problems in public transport due anti-social elements.The entire network comprises of three modules; Base Station Module, In-Bus Modules and Bus Stop Module. The base station module consists of monitoring system which includes GSM and a PC. The In-Bus Modules consists of two Microcontrollers, GSM Modem, GPS, Zigbee, RFID, LCD and infrared sensor. RFID for ticketing purpose, GSM, GPS is used for mobile data transmission and tracking location. The Zigbee module is also interfaced with the microcontroller which is used to send the bus information to bus stop and to get the information from the bus stop to bus. The Bus Stop Module is fixed at every bus stop consists of Zigbee node which is interfaced with the Microcontroller.**

Keywords—**Radio Frequency Identification (RFID), Global Positioning System (GPS), Liquid Crystal Display (LCD), Zigbee.**

I. INTRODUCTION

The project is implemented using RFID technology, and GPS system. Automated accounting of public transport can be used to provide useful estimates of the cost of travelling from one bus stop to another as well as the crowd density can be measured inside the public transport. But in case of India measuring crowd density is of no use. Radio Frequency Identification (RFID) tags has been proposed to be used in this project. Public would carry RFID card with them. As soon as they enter into the bus they have to show the RFID card to the reader [1]. The data will be stored in the processor attached to the RFID reader. When the person has reached the destination he has to show the RFID card to the reader once again the cost would be automatically deducted according to the distance travelled shown by the GPS. A generic architecture of common public transport RFID-ticketing systems can be seen in Figure 1. Such ticketing systems usually consist in a network of RFID readers placed at the entrance to each transport, be it underground, tram, bus or train [2].
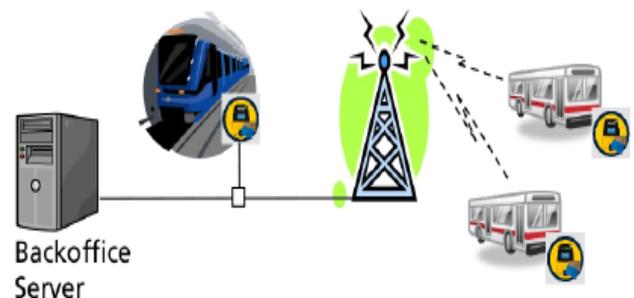

Fig. 1. Generic architecture of an RFID-based public transport ticketing system.

GPS is the latest technology used in varies fields such as navigation, tracking and also in some of surveillance application. Here we going to use this GPS to calculate the distance travelled by the passenger. GPS module can configured to generate the latitude and longitude of the current position of the bus. The position of the bus can be monitored continuously using this GPS module. Combining GPS technology and smart cards we can design a complete bus ticketing system [3]. Every time when the passenger enters the bus he needs to sweep his smart card in the smart card reader. Many researchers have proposed tele- monitoring system to

trace the vehicle like ambulances and the other mobile moving objects. This paper deal with the stand alone structure equipped with the interfaced with the GSM and the GPS based servers [4]. Combining GPS technology and smart cards we can design a complete bus ticketing system. A microcontroller is used to control the entire system. GPS and smart card reader are interfaced with the microcontroller. It can be further connected with liquid crystal display and keyboard for user interface [2].

II. SYSTEM DESCRIPTION

The project is basically divided into THREE main parts:

    a)   RFID TAGS

    b)   RFID READER

    c)   GPS

RFID Tag It consists of a microchip with data storage, limited logical functionality and an antenna which is tuned to receive radio frequency waves emitted by a reader or transceiver for allowing wireless RFID scanner/readers it consists of a radio frequency module, a control unit and a coupling element to interrogate the tags via radio frequency communication. Readers are usually connected through middleware to a back-end database. GPS is global positioning system which helps in detecting the position of the passenger from the source and destination point. On calculating the bus fare the equivalent amount is reduced by the user. This smart card can be recharged for further travelling when the balance is low.

III. SYSTEM OVERVIEW

The proposed system can be further explained by THREE modules, they are,

    A.   Bus Stop Module
    B.   In Bus Module
    C.   Base-Station Module

Bus Stop Module contains a GSM interfaced with PC together known as coordinator system, used for tracking the bus and showing the route diversion request and emergency situations and also used to give the response for route diversions. The block diagram of these THREE modules as shown in figure 2
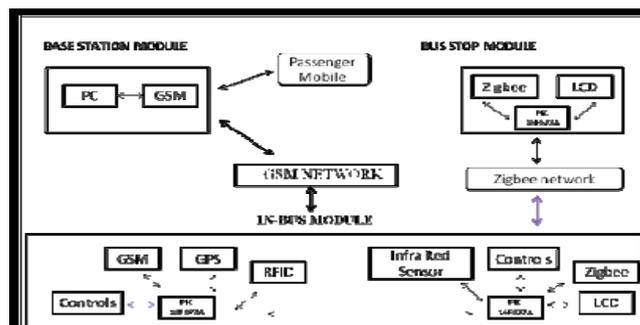

Fig. 2. Block diagram of THREE modules.

IV. OPERATION OF THE PROPOSED SYSTEM

The flow chart of Bus Stop Module as shown in figure 3. This module contains one PIC microcontroller, LCD, Zigbee used for synchronization with bus , it will continuously broadcast the request signal and wait for the reply signal for the provided request from the bus, if any bus available in that
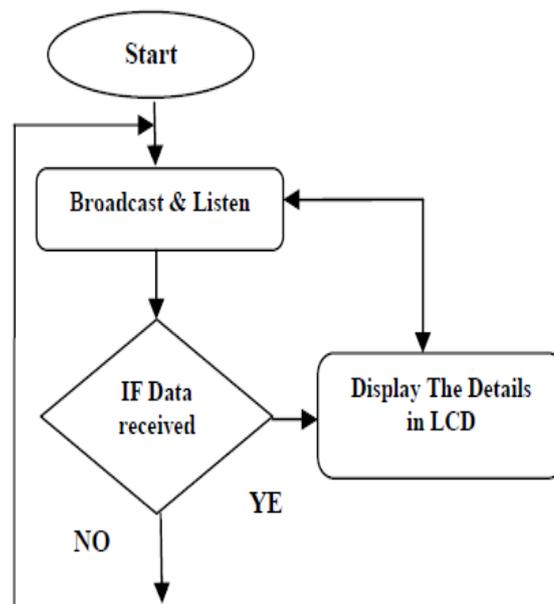

Fig. 3. Flow Chart of Bus Stop Module

range it will synchronize with that by getting bus id and validate whether the bus having the halt here or not and shows he bus information like route , cost , bus type, bus name in the LCD in the bus stop and also sends bus stop details to the bus.

The flow chart of In Bus Module as shown in figure 4. This module contains interfaced with Zigbee, LCD, two control switches and two infrared sensors The Zigbee is used to make synchronization with bus stop and get the bus stop details and display that in LCD [4]. The control switches are used for door open and close purpose. RFID are used for ticketing purpose all the passengers having RFID Tag will

show it and get their tickets registered. Generally the passengers can get monthly, weekly, one day passes passengers not having regular passes can get their ticket by giving money to conductor , conductor have the common pass for that. GSM, GPS are used for tracing the bus from the base station. The control switches are used for providing route details in case of any route diversions, the new route is provided to the bus driver and the other switch purpose is to inform any emergency situation in the bus to the base station. Base Station Module contains a GSM interfaced with PC together known as coordinator system, used for tracking the bus and showing the route diversion request and emergency situations and also used to give the response for route diversions. The passengers can also give request for getting bus information using SMS.

Fig. 4. Flow Chart of In Bus Module.

V. USAGE SCENARIO

The typical usage scenario is that the user tells the navigator service where he wants to go through the web interface. This can be done either by clicking on a map, by entering an address, or by choosing the destinations from a list of relevant points of interest, e.g. touristic attractions, public offices, universities, hospitals. Then, the user inputs his mobile phone number and passes his RFID ticket on a reader. After that, the user starts on his journey. Whenever the user validates his ticket at the entrance to a transport, he receives an SMS on his mobile phone with indications on how to get to one or more destinations. Actually, the user always receives enough information to reach the next ticket validation machine. The information is relevant in the context of the public transport network, i. e. the user is told on which station to get off the current transport, which destinations he can reach from there, in which station to catch the next transport, and which transport to take next. An example SMS can be in Figure 5 [3].
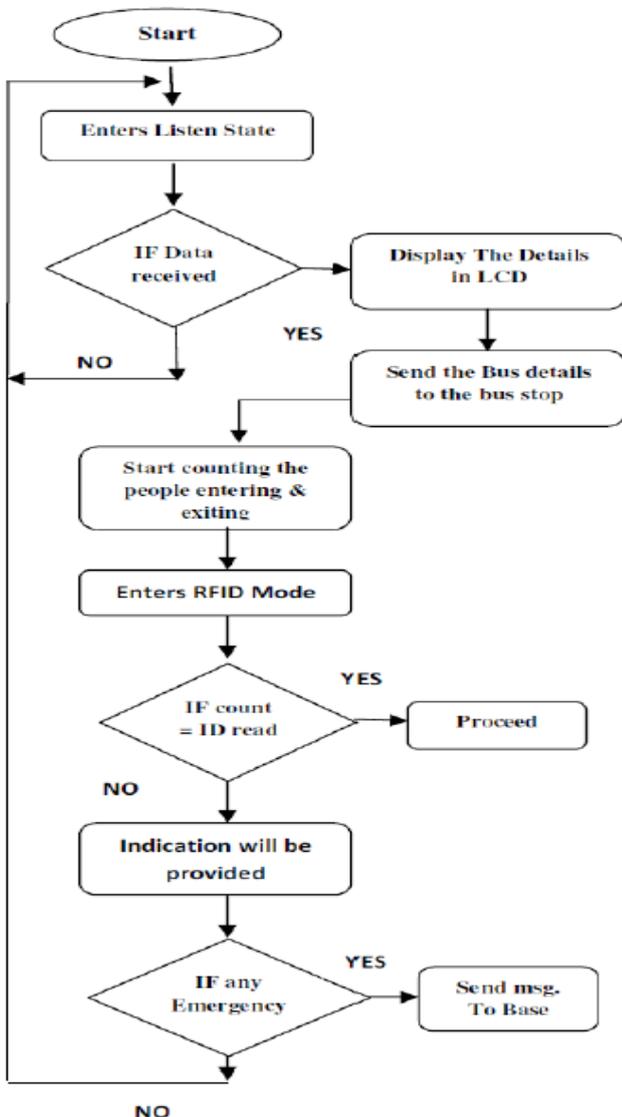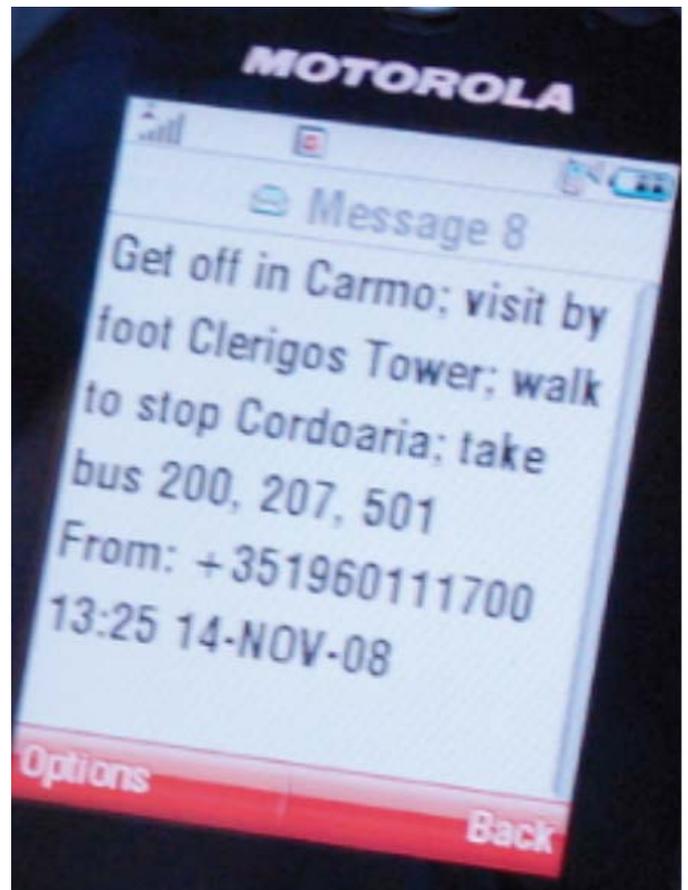

Fig. 5. Example of an SMS: where to get off the bus, what to visit there by foot, the next bus stop to go, the next bus to catch.

VI. SYSTEM ARCHITETURE

The system designed to provide the service described is depicted in Fig.6. Although the navigator is an enhanced service on top of the PTN with RFID ticketing, we opted for an open system architecture that enables different necessary services to be provided by different providers and, ultimately, even the navigation service can be operated independently of the PTN. In the latter case, the PTN operator must agree to make the necessary information available. Currently, some PTN operators have made APIs available on the Internet to enable developers to access not only transport routes and schedules but also real time information on the transport, like expected arrival time at a certain stop, so this is not unreasonable.
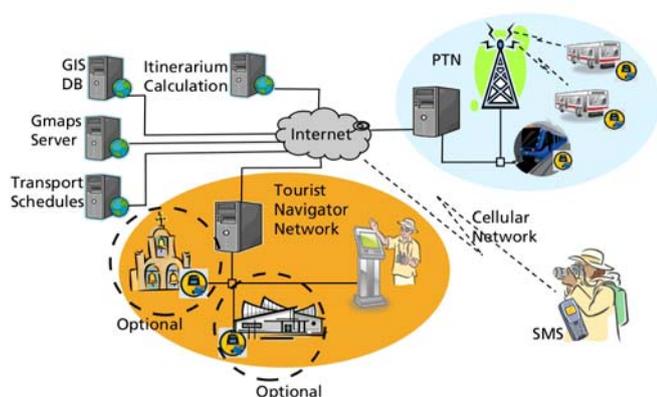

Fig.6. Architecture of the navigator service for a public transport network (PTN).

Besides information on the bus schedules, it is also necessary to have a geographic information system (GIS). Only geographically indexed points of interest or streets are supported destinations, so it is necessary to have the geographic coordinates of the PTN stations and reverse geo-coding for addresses. However, this information must not belong to the navigator service operator. It can be provided by specialized service providers that offer those services online through a known (or agreed) interface. The itinerary calculation, a core module of the service, must also not be implemented by the navigator service provider. Finally, even the maps used on the graphical user interface (GUI) can be provided by an external entity. In the prototype developed, the Google Maps API from Google is used for geo-coding, maps and display of transport routes.

VII. CONCLUSION

This paper presents a novel enhanced navigator service for public transport networks that use RFID ticketing. The service presented takes advantage of a side-effect of RFID-based ticketing: a positioning system within the transport network. To our knowledge there is no other service taking advantage of this intrinsic hidden feature of RFID ticketing systems. The navigator service described is an added value service that can be deployed at low extra cost on top of an existing infrastructure, thus supplying a further argument for the case of RFID ticketing in transport networks. By implementing this paper as a real time project many disadvantages mentioned early can be rectified. The time taken by the microcontroller for computation will be in few microseconds, so time consumption is reduced. Nowadays almost everyone has ATM card or credit card. This system can be upgraded by changing the program for using ATM card or credit card instead of smart cards. Also GSM module to transmit bus location to the bus terminal can be used. Further GSM can be used to tell information about the accident happened and bus break down. program for using ATM card or credit card instead of smart cards. Also GSM module to transmit bus location to the bus terminal can be used. Further GSM can be used to tell information about the accident happened and bus break down.

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