

Smart Automated E-Ticket System for Indian Public Transportation System

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ABSTRACT: Now a days we come across theft, terrorist attacks on public transportation systems. Many a time it becomes difficult for investigating agencies to track the cases. We are proposing a Centralized bus control system where a passenger needs to fill up the details by submitting required ID & address proof as per Know your Passenger policy and purchase a unique ID Bus pass card having unique number (RFID Tag). We are using RFID Reader to read the RFID unique Tags. Thus the bus centralized control cell has the passenger's details in their database. Passenger has to get that card recharged in the bus stop (Centralized Cells authorised outlets) or in the bus itself by a conductor. With this proposed system the existing paper ticket system can be removed with an e-ticket by triggering an SMS to the Passenger mobile number when the conductor swipes Passenger card. Hence we are proposing a Smart Automated E-Ticket System for Indian transport system by using RFID Zigbee & GSM technologies using ARM7-LPC2148.

KEYWORDS: Know your Passenger, E-Ticket, RFID Reader, RFID Tags, SMS, GSM, Zigbee and LPC 2148

I. INTRODUCTION

We come across theft, terrorist attacks on public transportation systems & fraud by Passengers or conductors by reusing the old tickets. Sometimes there is problem for the passenger if he does not have the exact change to purchase a ticket; this trivial issue sometimes leads to big fights between conductor & passengers. Also we know it becomes difficult for investigating agencies to track the cases in case of accidents or terrorist attacks with the existing system.

We are proposing a Centralized bus control system where a passenger needs to fill up the details and purchase a unique ID bus pass card having unique number. Thus the bus centralized control cell has the passenger's details in their database. While collecting details the centralised Cell needs to collect the passenger's photo, mobile number, ID proof & address proofs as well. Also this issued card should be valid for only certain time. In our case we are proposing the validity period for 1 year. After Expiry of the card, passenger needs to get the card renewed again in the Centralised cell by paying the prescribed fee. While preparing the data of the passenger, we can use Aadhar number (Unique ID issued by Govt of India) so that unique identity of the Passenger is maintained & hence monitoring & maintenance becomes more easy.

Every time Passenger needs to get that card recharged in the bus stop (Centralized Cell outlets) or in the bus itself by a conductor. With this proposed system existing old system such as the paper ticket can be removed with an e-ticket. Here E-ticket is sent to passenger's mobile number with his journey & amount deduction details in the message. As the E-ticket will have the timestamp & bus number & journey details, it cannot be reused & it will be passenger specific. There is an issue of exact change to be given to the passenger when he buys a ticket. When the conductor/ passenger do not have the exact change, then it will be problem which sometimes results in fight between them. Thus by using proposed system by conductor, a RFID reader automatically reads the unique tag number & Processor processes the transaction & deducts the amount from the passengers tag (card) & updates it in the database via wireless connectivity (here we are using Zigbee). A SMS message which we call here as E-ticket is triggered to the customer/ Passenger stating that certain amount for his journey has been deducted from his tag no. This SMS again will be used by a passenger as an E-ticket for that journey as the message will have timestamp hence valid for that specific journey only

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& hence no issue of reuse of it thus preventing the fraud by the passenger. Thus the proposed system will not only help Indian transport systems such as KSRTC BMTC etc. in preventing fraud but also helps in maintaining the database & helps Security agencies. KSRTC or BMTC can encourage the people for using public transportation system by introducing various lucky draw offers by points system for their journey. Passengers can redeem their accumulated points against their card no for attractive offers or prizes. If the passengers are regularly using the public transport system, to encourage them discounts should be offered. To encourage people occasionally offers need to be given so that they can prefer public transport system over their own vehicles.

II. BLOCK DIAGRAM OF THE PROJECT AND ITS DESCRIPTION

The block diagrams of the project areas shown below.

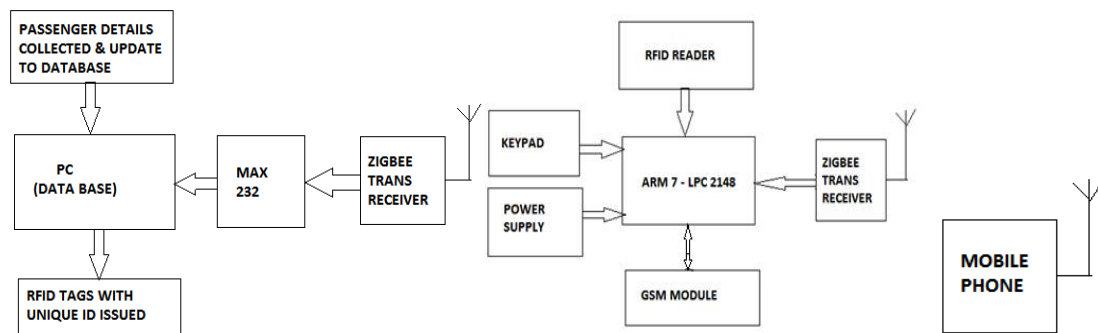


Fig 1: Centralized Cell Fig 2: Tx Part (Installed in Bus- used by Conductor) Fig 3: Passenger Rx part

Brief explanation of functioning of each blocks of the system is given below

Centralized Cell:

The concept here is to introduce a highly advanced & technically equipped Controlling Cell which I have named as centralised cell. This cell will have all advance equipment's necessary for modern public transportation system.

A Passenger needs to visit the outlets created for the purpose of issuing the Unique Bus Pass ID card. Know your Passenger policy needs to be introduced, as per that every passenger needs to submit his photo ID, Mobile number, address proof with Aadhar card number & other necessary details to obtain his/her Unique Smart ID card. All these obtained necessary data needs to be maintained in the centralised cell database.

Whenever Passengers does the journey, all the transactions need to get updated in to the systems database. From Centralised cell the e-tickets issued by conductor need to be monitored & updated in the database.

Transmitter Part (Installed in Bus- Will be given to Conductor):

Conductor will be provided with an advanced ticket issuing machine which will have an option to print the e-tickets as well. Whenever the unique ID card is swiped, as per its balance, the required action needs to occur. The machine will have the auto SMS triggering capability necessary to issue the e-tickets automatically. Simultaneously the wireless transfer of the data occurs between it & the centralised cell as well. Thus everything needs to function in sync.

Passenger Receiver part:

The passenger's mobile phone will receive the e-ticket through SMS to the already provided number in the centralised cell database.

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III. HARDWARE IMPLEMENTATION

Let us discuss the Hardware Implementation of the Project and its Description.

We have used much hardware equipment such as Arm 7 micro controller, Zigbee trans-receiver, GSM SIM 900A module, RFID Reader, Keypad, LCD display etc.,.For demo purpose a working SIM with SMS facility is used, using this SIM 900A module will trigger the SMS to the passenger's mobile numbers present in the database. LCD display will show the necessary details on its display screen.

The Pin description of the proposed system is shown in the figure.

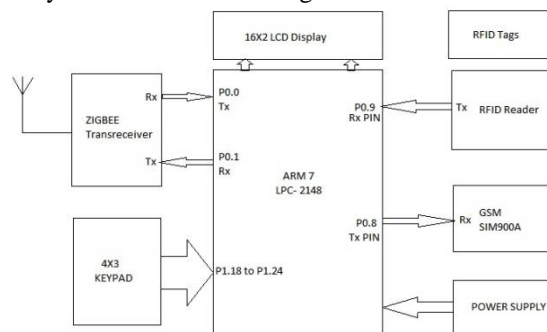


Fig 4: Pin Diagram details of the System

We know that Arm 7 has only 2 UARTs, hence we have used UART 0 for Zigbee trans-receiver and Receiver pin of UART 1 for RFID reader & transmitter pin of UART 1 for GSM SIM 900 A module. Let us go through brief description about the components used below.

LPC2148:

LPC2148 arm processor is used for controlling purpose in our proposed system. ARM processor is used because of its extra features when compared to other microcontrollers. It controls LCD, RFID Reader module, GSM Module, Zigbee module etc. Over all we can say it's like central processing unit for us. It receives input commands from switches or pins and controls GSM module, RFID reader module and Zigbee modules when to transmit or receive the data, it also performs the comparison and gives commands to LCD to display messages to direct the users to use it properly and also it displays the appropriate directions as well as results.

RDIF Reader Module:

A RFID reader is a device that provides the connection between the passenger tag data and the processing system that needs the information. The reader communicates with tags that are within its field of operation. The RFID reader uses an attached antenna to capture data from tags. It then passes the data to a system for processing. Just like RFID tags, there are many different sizes and types of RFID readers. RFID Readers can be integrated into a Machine device such as an embedded portable system we are discussing here to make use of it for reading the passengers tag numbers.

ZIGBEE

ZigBee is a specification for communication protocols used to create personal area networks built from small, low-power digital radios. ZigBee is based on an IEEE 802.15 standard. They are low-powered devices & can transmit data over long distances by passing data through intermediate devices to reach more distant ones.

We have used Zigbee or Xbee to connect the e-ticket vending machine used by conductor with centralised cell wirelessly. In real-time scenario we can use Wi-Fi or internet to connect the same.

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GSM Modem

A GSM modem is a type of modem which accepts a SIM card (operating SIM card) and operates over a subscription to a mobile operator just like a mobile phone. A GSM module looks just like a mobile phone from the mobile operator perspective.

When a GSM modem is connected to a computer or laptop, this allows the computer or laptop to use the GSM modem to communicate over the mobile network using AT commands. While most of times GSM modems are frequently used to provide mobile internet connectivity, here we using for sending e-ticket SMS messages to the passenger mobile numbers.

IV. FLOW CHART

Fig 5 shows the flow chart for the proposed system. All the hardware components used are initialised at first. Welcome message screen is to be displayed on screen & LCD and a welcome SMS is sent to check if the set up ready.

Every time the Passenger unique ID tag is brought near RFID reader which will sense it & sent it to arm 7 micro controllers via uart1 receiver pin. The processing is done at the micro controller end, if the tag no is not found in database, Passenger tag not found is shown & passenger asked to purchase a new card or if the possessed card has expired then he is asked to get it renewed.

If the passenger tag number is found in the database then appropriate action is undertaken as per the different scenarios such as the card having balance or fewer amounts in it. Conductor can initiate the recharge process himself if asked by the passenger. For that purpose, the machine will ask for the password to confirm whether the person initiating the recharge process is authorised to do such action or not. Passenger has another option of getting his unique ID card getting recharged via designated centralised outlets of the public transportation system.

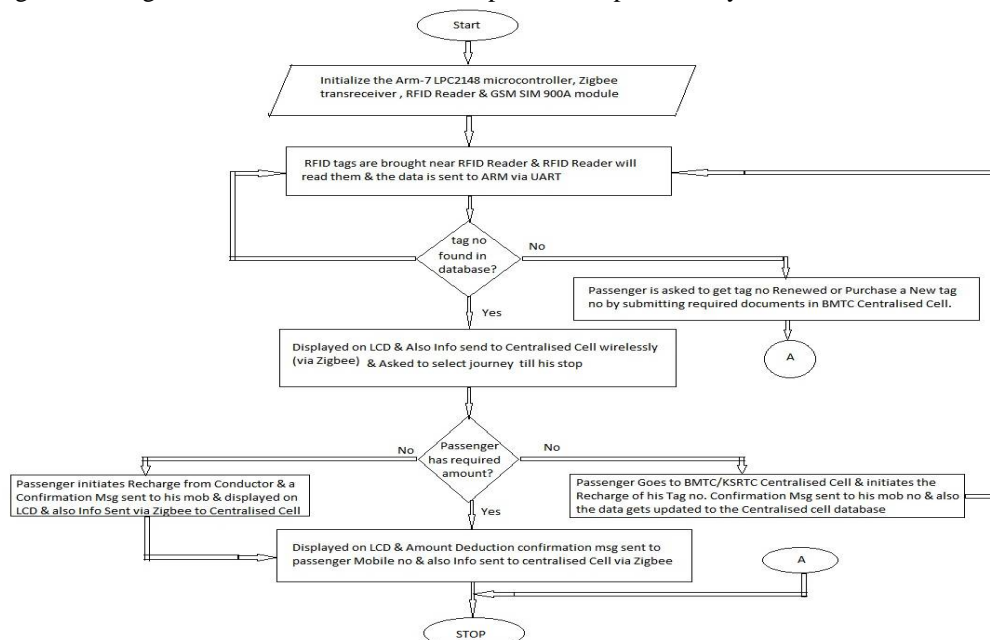


Fig 5: Flow chart for the proposed system

V. RESULTS

Let us discuss the results obtained after implementing the proposed system.

As discussed the proposed has been implemented using low cost hardware's such as ARM 7 LPC 2148, RFID Reader, GSM SIM 900A module, Zigbee module keypad etc. As per electrical specifications of the components used we need to provide the power supply.

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Fig 6: Hardware Implementation-welcome screen Fig 7: Screen to enter Passenger tag number

Above screenshots are taken to explain the implementation of the hardware part. Fig 6 is Hardware Implementation of the proposed system displaying the welcome screen and Fig 7 shows the Hardware Implementation of the proposed system displaying the screen to enter Passenger tag number.



Fig 8: Centralised Cell (Laptop used here) displaying the screen to enter Passenger tag number

The Passenger's RFID tag number is being asked in fig 8. Zigbee transmits these messages from ARM7 & on PC we can check using any of the terminal software's.

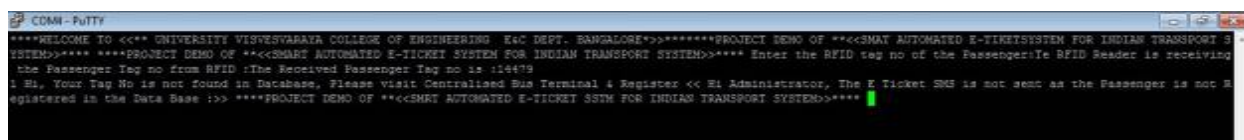


Fig 9: Centralized Cell (Laptop used here) displaying the screen to Show Passenger tag number not found in database.

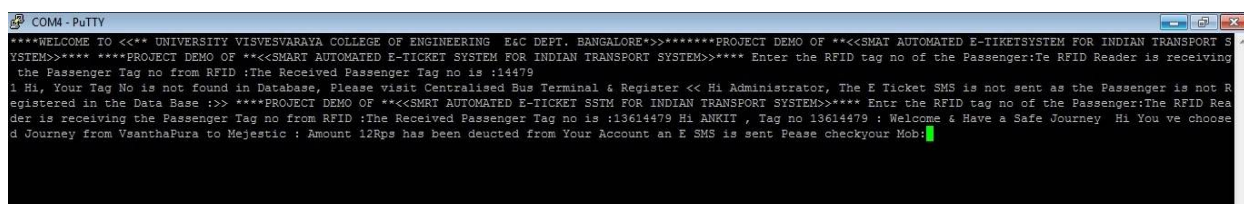


Fig 10: Centralized Cell (Laptop used here) displaying the screen to Show Passenger tag number found in database & amount deduction & other journey details.

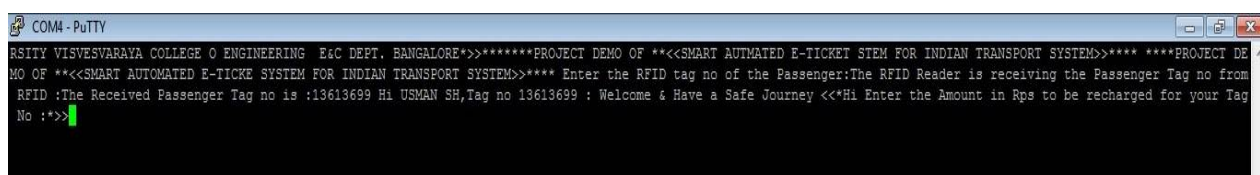


Fig 11: Centralised Cell (Laptop used here) displaying the screen to Show Passenger tag number found n database & Asking amount to be recharged for the tag no.

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As per the proposed system, the above figures explain about the working of the Centralized Cell. How a passenger can get his unique tag numbers charged in the authorized outlets.

Table 1: Unique Tag information of the Passengers.

Sl no	Unique RFID Tag no	Passenger Name	Found n Database?	Mob no Available
1	03104909	shariff s	Yes	Yes
2	11056815	saleem m	Yes	Yes
3	03161815	kiran b	Yes	Yes
4	03056175	Ravi AJ	Yes	Yes
5	11063883	Sathish	Need todo Renewal	Yes
6	13627125	Saleem D	Yes	Yes
7	13613699	Usman SH	Yes	Yes
8	13614479	Ankit	Yes	Yes
9	13618737	Suresh	Yes	Yes
10	13616819		Not in database	No

The unique tag numbers used & the data prepared in the centralized cell have been shown in the Table 1. For every passenger, the data has been prepared with his e-ticket receiver mobile phone number in the centralized cell. E-ticket SMS will be sent to that mobile number using GSM SIM 900A module & also a confirmation message will be sent wirelessly from Zigbee to the centralised cell.

We have made the proposed system more advanced & useful by introducing point systems to the regular commuters using the public transport system. With this we can encourage the people to travel in Public transportation system. Passengers can redeem their accumulated points for the prizes etc. offered by the transport department. Thus we can encourage people for using the public transportation system & hence help in air pollution reduction & reduce traffic problems as well. With more use of public transportation system, and creating awareness about its importance, we can avoid a situation of implementation of odd-even formula etc., techniques for reducing the pollution & traffic jams in Metropolitan cities.

VI APPLICATIONS

This project can be used in Vast applications with few applications mentioned below.

1. It saves Time of the conductor. As issue of exact change for passenger if he has no change can be solved with smart card.
2. If bus accident occurs or a bus gets drowned in a river, the deceased passenger can be easily identified & insurance authorities can settle the amount in a faster & smoother way.
3. Old Bus tickets reuse (fraud) by Conductor/Passenger can be avoided.
4. Identification of dead bodies can be easily done with unique ids for investigating agencies.
5. By issuing e-ticket we will go paperless hence save paper & hence trees.
6. Workload of conductor is reduced

Only drawback of this proposed system is, Passenger needs to carry the same mobile number which he had submitted in the database of centralized cell every time for the journey and also if there is an network problem, there is a chance for message not getting delivered to the passenger mobile number on time.

To avoid this situation an option for printing of e-ticket by conductor is given which he should use only upon request by the passenger by charging some fine amount as the whole concept of the proposed project is to go environment friendly by reducing paper usage & using modern advanced technology for the same. If the E-ticket is printed for the passenger due to the issue is of the message is not delivered to his mobile number due to network problem, at that time fine amount should be refunded to the passenger tag number after his journey at the end of the day.

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VII CONCLUSION

The implementation of Smart E Ticket System for Indian Public Transportation System using microcontroller LPC2148 is done successfully. The communication is properly done without any interference between different modules used in the design. Design is done to meet all the specifications and requirements of the project. Software tools like Kiel Micro-vision Simulator, Flash Magic, Putty and Philips flash utility to dump the source code into the microcontroller, have been used to develop the software code before realizing the hardware.

The performance of the system is more efficient. Reading the Data and verifying the information with the already stored database and perform the specified task is the main job of the microcontroller. The mechanism is controlled by the Arm 7 microcontroller .

VII ENHANCEMENT & FUTURE WORK

We can integrate e-mail triggering feature such that an e-ticket can be sent to the passengers email id which he can show whenever required to continue his journey. For this the passenger needs to subscribe to internet facility in his mobile phone.

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