Smart Local Railway Ticketing System using RFID
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Abstract— RFID technology has spread its application all over the world and is becoming a necessary in some area like corporate life and schools for regular attendance any many more. This paper explains the use of RFID technology in railway system. Traditional system has its disadvantages like forming large queues and daily rush due to this many people don’t bother to buy tickets, which results in huge loss to railway department. Ultimately RFID system can be a solution for this. RFID card can be used to uniquely identify the passenger and his/her daily travel. All his/her travel can be done by using these tiny cards so that there will no need to form queue every now and then. Passenger will carry this card every time during the journey. Meanwhile railway department will also get benefits from this, as one dedicated railway account is associated with this RFID card and a passenger has to recharge his/her account either online or offline.

Key words: MFRC 522 RFID, Rxtx, Arduino, Server, Tags

I. INTRODUCTION

The system aims at providing smart ticket or smart travelling for daily travellers like Mumbai local train traveller. There daily routine often contains travelling though train. In a traditional system passenger has to stand in queue to buy the ticket which needed manpower to control and also during rush hours this seems disgusting and hectic. This result in people don’t buy tickets....which ultimately affect on the railway’s financial budget and railway department often have to confront to huge loss daily. The modern system however can be an effective solution to recover from this disadvantages. Smart ticket or smart travelling makes use of RFID technology. RFID technology has two types in it Active RFID reader and Passive RFID reader. Further in every type there are modules in it reader and tags. The reader is used to read the tags whenever it comes into the range. In this system we have used passive RFID reader for the demonstration. Tiny modification in the infrastructure of station is a necessary part of this project, as the RFID readers need to be installed at the entrance of the station. So that the sensing of every card can be done easily without concerning to passenger.

Once the card is sensed, all related information relating to that id will be processed in the background. This process is executed twice. Firstly with source station and secondly on destination station, as soon as the destination is sent to main server distance between source and destination is calculated and depending on this distance accordingly fare will be calculated and this fare is deducted from passenger’s railway account.

II. RFID

RFID is an abbreviation for a “Radio Frequency Identification” and is now one of the most popular and necessary hardware in many areas like private companies, schools etc. RFID kit contains one RFID tag and one RFID reader. Basically there are two type of RFID Active RFID and Passive RFID. Active RFID tag contains transmitter and battery. The circuit broadcast the signal to reader once it gets scanned. Passive RFID does not contain any battery they pass the electromagnetic wave at the time of scanning. Costs of active tags are very high that is about 25-100 dollars whereas passive tags are very cheap and are easily available at the cost of 15-20 cents. RFID tag is comprised of an integrated circuit (called an IC or chip) attached to an antenna that has been printed, etched, stamped or vapour-deposited onto a mount which is often a paper substrate or Polyethylene Terephthalate (PET). The chip and antenna combo, called an inlay, is then converted or sandwiched between a printed label and its adhesive backing or inserted into a more durable structure. Tag antennas collect energy and channel it to the chip to turn it on. Generally, the larger the tag antenna's area, the more energy it will be able to collect and channel toward the tag chip, and the further read range the tag will have RFID tag will be sensed once it gets in contact with RFID reader. RFID reader will then capture the tag and returns long digit number this number is the id of the tag. This number will help us in project to uniquely assign one id to each passenger. This id will be processed at the backend of project.

III. SURVEY

We have used two base papers and they are included in the reference section. This papers have proposed the system for railway reservation using RFID and Android phone where RFID tag will be attached to the android phone and each time passenger has to carry the phone while going for travel. This limitation has been reduced in our project that no any connection will be maintained in the android phone and the RFID tag. Instead passenger will have his/her own tag and that will be carried at the time of travel. In the another paper automatic vending machine is implemented and can be accessed with the RFID card or smart card but this process will not be that much effective because even though machines will be available at station restrictions won’t be made to each passenger to buy the ticket which may again lead to loss of money. The main aim behind our project is to make the restrictions to buy the ticket to every passenger which will ultimately help to generate the revenue.

IV. PROPOSED SYSTEM

A. Working

When passenger buys the RFID tag, one railway account will be created for that tag id. This account will contain the id and all personal information about the passenger. This information will be accessed at the time of travelling. When passenger enters into the station the tag will be sensed and tag id will be send to the local server which is located on the station. The aim of local server is to attach the station name, date and time of the travelling to the tag id and sends it to main server. As it is the first station in the entry so it is
considered as the source station and this entry will be put in “active entries”. Now when passenger reaches to destination station this same process will be executed again at the station door but with new station name and time of travel. After all this the distance between source and destination is calculated. Depending on this fare is computed and is deducted from passenger’s railway account.

During this many scenarios came in to the picture like one who is traveling by the express/mail or one who is coming for receiving someone or to drop someone. We have treated this scenarios effectively and successfully in this project. Platform ticket can be computed in this situation. The same process as we have discussed will be executed but on the same station so that when source and destination station is same platform ticket will be calculated. Platform is considered to be Rs. 10 in this demonstration. It can be changed to any value.

B. System Flow

![Activity Diagram of System](image)

Fig. 1: Activity Diagram of System

V. HARDWARE

A. Arduino

Arduino is an open source prototyping platform base on easy to use hardware and software. Arduino boards are able to inputs –light on a sensor, a finger on a button, or a Twitter message – and turn it into an output – activating a motor. Board can be worked accordingly to your instruction to the microcontroller. To do so we have to use Arduino programming language and Arduino IDE software. All Arduino boards are completely open source, empowering users to build them independently and eventually adapt them to their particular needs. Genuine Arduino Uno board contains flash memory, EEPROM, SRAM, Microcontroller and an ARM Cortex. It also support C and C++ language. Specifically there are different Arduinos available in the market like ATmega8, ATmega168, ATmega328, Arduino Uno, Arduino Yun and many more. For this demonstration we have used Arduino Uno board which support ATmega328. This board includes 5v linear regulator and 1534 IC. The Arduino Uno board in this project is necessary to transmit the sensed RFID tag id to webserver. We have programmed the Arduino to sense the tag. On a COM port, this board will continually be in listen mode. Arduino IDE is used for programming the Arduino Uno R3. It uploads the program on the board and it also has its own command line where output can be seen. Small Java program is written which will sense this tag as a string and sends it to the web server, where PHP code will receive it and process it efficiently. Java uses Rxtx library to listen to the hardware on com port. We have linked this library in the classpath so that predefined classes from this library can be used.

B. RFID Reader

The MFRC522 is a highly integrated reader/writer IC for contactless communication at 13.56 MHz. The MFRC522 reader supports ISO/IEC 14443 A/MIFARE and NTAG. The MFRC522’s internal transmitter is able to drive a reader/writer antenna designed to communicate with ISO/IEC 14443 A/MIFARE cards and transponders without additional active circuitry. The receiver module provides a robust and efficient implementation for demodulating and decoding signals from ISO/IEC 14443 A/MIFARE compatible cards and transponders. The digital module manages the complete ISO/IEC 14443 A framing and error detection (parity and CRC) functionality. The MFRC522 supports MF1xxS20, MF1xxS70 and MF1xxS50 products. The MFRC522 supports contactless communication and uses MIFARE higher transfer speeds up to 848 kBd in both directions.

VI. DATABASE DESIGN

However, in this system for a instance we have used MySQL database for storing the journey data and user’s personal data. But in real time this data tends to be huge so we believe that big data concept will be more efficient option. For an instance, we have created four main tables named journey, journey_history, user_details, and stn_dest.

The first table journey is considered to be the temporary table in whole scenario, because this table will contain the most recent entry when the source station is collected immediate entry will be made in this table later on when destination station is received, distance and far computation process will be executed and the imitation of this entry will be saved in the journey_history table. User_details table contains all the personal information of the passengers. This is useful when tag is scanned so that deduction of the balance can be done easily from the passenger’s account. The last table stn_dest contains all the station names and the distance from their previous station. This table will get called when distance calculation is required.

VII. FUTURE IMPLEMENTATION

Some future implementations include the following:

1) Can be used in all public transport.
2) Can be implement for reservation.
3) Option of offline ticket.
4) Security in transactions.
5) Give access to edit own information of passenger.
6) No expiry of card

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VIII. CONCLUSION
In present environment a number of facilities and various modes for providing input to any application are available. It is though unfortunate that with the ever increasing smart environments and corresponding input technologies still many applications are controlled using traditional input devices like keyboard and mouse. We have overcome this by using RFID technology, which will interact with the computer. The most important advantage of RFID is that it needs a simple card to interact with it and it seems feasible. The application of buying ticket in railway for travelling is being proposed and implemented in the present paper. The proposed system provides a suitable, efficient and the most important user friendly approach to interact with daily routines during travelling.

REFERENCES
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