

LOW COST AUTOMATED RAILWAY TICKETING SYSTEM FOR BANGLADESH

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Abstract- This paper presents the design and implementation of a Low Cost Automated Railway Ticketing System (ARTS) for Bangladesh where passengers can purchase ticket without encountering the rush and harassment of blacker. Blacker purchase almost all of the tickets just after the tickets are available at the counter and sell them at higher price before the departure of the train. The technology of purchasing tickets used in Bangladesh Railway is limited to employment of ticketing clerks which leads to increase in labor cost. Concerning all these problems this paper has designed Radio Frequency Identification (RFID) based ticketing system for the country which is more secured and cost effective. Passengers must register themselves by providing their personal data and collect RFID card from the railway authority. They can purchase ticket by touching this card to reader which will be kept at the ticket counter. For the persons without registration there can be an arrangement for cash purchase also. In this case they must match their national id number to prevent black marketing the railway tickets.

Keywords: RFID, PHP, Ticketing system, Security, Railway.

1. INTRODUCTION

In Bangladesh almost 70% people use railway system as common transport. Among them majority of the train commuters have to endure undesirable difficulties in collecting ticket as the existing railway ticketing system is severely engulfed by corruption. Up to now Bangladesh railway system has been using a manual ticket issuing system. This leads to long queue and wastage of time and corruption. So the train commuters have to experience difficulties when purchasing their tickets. An effective and secured solution to this problem is to automate the system. In most of the developed countries of the world there are automated ticketing systems based on smart card. Now-a-days this automation in ticketing system is very much obvious around the developing countries of the world. Our proposed system for Bangladesh Railway is low cost automated ticketing system using RFID card. If RFID cards are provided to train commuters as a step of Government, this will be easily accessible to passengers. Commuters have to be registered when collecting card [4]. During registration passengers must provide their information regarding to address, name, age, profession. Then railway will give a unique password to them. The information of user including password, discount facilities and others are stored in database. At the time of purchasing tickets when the card is touch to the ticking machine for a few millimeters from the reader, user id no and corresponding password is asked for matching to the database. If this information is verified then the user can

purchase ticket for desired destination. The screen of the machine on which user can feed all the information regarding date, time, arrival and departure stations will be appeared if the person is verified. On this display passenger can be provided with extra facilities to observe all the information about stations and trains. Touch screen display will be more convenient to user. When all the information will be given, sufficient amount will be deducted from the card. This information is stored in database [1]. RFID systems are widely used for identification and security [6].

This paper is arranged in the following order. In section 2, a brief overview on the system has been discussed. Section 3 has illustrated the structure of the whole system. Working principles and flow of purchasing tickets have been narrated in section 4. In section 5, benefits over conventional system are introduced. Section 6 concludes the proposed system.

2. SYSTEM OVERVIEW

Figure 1 represents the overview of the system. The RFID tag will be issued through the card counter supervised under railway authority. Each tag contains a unique card number and some electronic money. Registration is the prime requisition for collecting RFID card. The personal details and id of each user will be saved in database of the main server and the registered passenger will be provided with a unique password for security purpose. Main server is the storage to record the

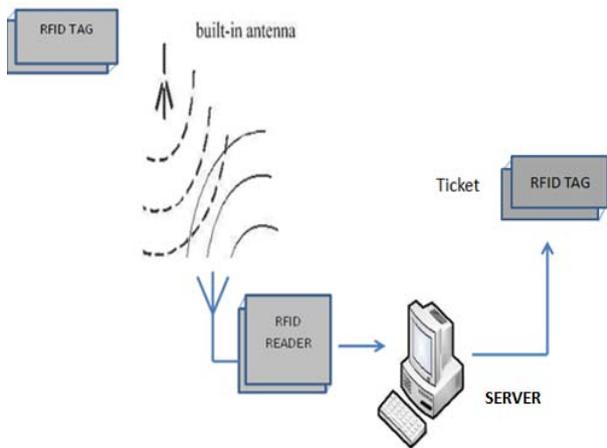


Figure 1: Overview of the ticketing system

information about the stations and trains. When the card is taken in proximity to the reader it reads the id no which is embedded in the card. Then if this id number is matched with the pre-defined id no which is stored in the database during registration, a screen will appear where the passenger has to feed information like destination, date, time, number of tickets to be purchased etc. When these information are fed into the screen, a page regarding date, arrival and departure time will be shown and amount will be deducted from the card as the tag will itself act as a ticket. The screen will show "Ticket Unavailable", if there is no seat available for the desired train [1], [4].

2.1 RFID SYSTEM

RFID stands for Radio-Frequency Identification [6]. A Radio-Frequency Identification system has three parts: a scanning antenna, a transceiver with a decoder to interpret the data, a transponder or RFID tag. RFID is the communication medium between tags and readers. It creates a unique identity for the user. The RFID device must be scanned to retrieve the identifying information. A RFID tag which is programmed with information has two parts. First is an antenna to receive and transmit the electromagnetic signals. Second is the microchip circuit which stores the user identification number. This circuit modulates the electromagnetic signals which are transmitted by the reader [5].

2.2 Why RFID is preferred

RFID system is more convenient to the other smart card systems because of RFID requires no line of sight communication between card and reader to exchange data. But barcode reader requires. Again external field cannot distort the data of RFID card which occurs in magnetic card which makes RFID system as the most essential in this perspective.

3. SYSTEM STRUCTURE

Devices used in our system are represented in a block in the following figure (Figure 2). RFID system (tag and reader), USB to Serial converter, computer (server) are the prime components of the system.

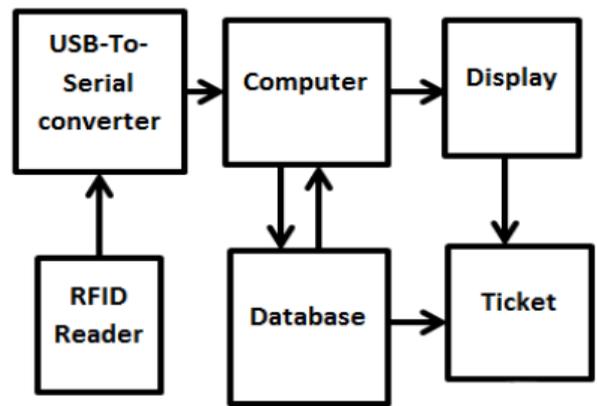


Figure 2: Block diagram of the devices used in ticketing system.

Structural description is provided in the following order:

3.1 Data from RFID Card to Reader

A passive RFID tag draws power from field created by the reader and uses it to power the integrated circuits [5], as they do not have on-board power systems. The chip then modulates the waves that the tag sends back to the reader and the reader converts the new waves into digital data. In our system we used passive tag.

3.1.1 Data Format:

In ASCII output Data Structure has 9600 baud, no parity and one Stop bit. Baud rate is pulse per second. Normally parity bit is used to solve the problem of parity error. A stop bit is a character in communication that lets a receiver know that the byte being transmitted has ended.

STX (02h)	DATA (10 ASCII)	CHECK SUM (2 ASCII)	CR	LF	ETX (03h)
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STX is a code indicating the start of a command frame (02h). Care must be taken to place this code in the first byte of a command frame. Data is of 10 ASCII value. CHECK SUM is the Exclusive OR of the 5 hex bytes. ETX is a code indicating the end of the text(03h).

3.2 Data from RFID reader to PC:

RFID is the wireless non-contact use of radio-frequency electromagnetic fields, for the purposes of identifying and tracking tags. By powering the module and holding up a 125 kHz card, a serial string output containing the unique ID of the card can be found.

Features of Reader:

- 2.8 - 5V supply
- 125kHz read frequency
- EM4001 64-bit RFID tag compatible
- 9600bps TTL and RS232 output Magnetic stripe emulation output.
- Read range of 180 mm

3.2.1 USB to Serial converter:

This device creates a virtual COM port on PC. It enables PC to communicate with the USB device through virtual COM port. If the Virtual COM Port drivers are used, the data format and baud rate are set during serial port configuration on the PC. Users can re-configure default virtual COM port settings (such as baud rate, data bits etc.) according to target application requirements.

Default Virtual COM port configuration:

Baud rate	Data bits	Parity	Stop bits	Flow control	Port number
9600	8	None	1	none	3(say)

3.3 Data read from COM Port and sent to Server

To read data from Communication Port a code written in C# was used, which reads data from serial port and send it to server. It shows data in a message box.

3.4 Data read from Server and matched to the Database

Wampserver creates a local server. A GET command in PHP language reads data from server and shows the data (id no) on the login page where password of corresponding id no is required. Then the id no and password are matched with the database. We use MySQL Software for database. But practically as this system has to be implemented in vast field, Oracle should be used for database.

3.5 Feeding information about traveling

If the user is proved authentic by matching with database, the display shows the information about journey such that journey date, Destination, Present location, Name of the train, Number of required ticket. After filling up these options and submitting the user can purchase ticket easily. One person cannot purchase more than two tickets at a time. If the user is not authentic he cannot purchase ticket.

3.6 Checking all the information about Railway

If user needs to know the information of all other trains it will be possible to know by selecting the options. All the information are stored in database. By selecting an option it calls the information from database. By observing the information he can choose the suitable train to go to the destination.

4. WORKING PRINCIPLE OF THE SYSTEM

Procedures of working in a block diagram, process of purchasing tickets in a flowchart and the algorithm we used in our system have been described below.

4.1 Working principal in a block diagram:

Working principles of the system are described in a block in Figure 3. Processing steps of our system are given below:

Step 1: The RFID reader retrieves the information contained by card as it is taken in the range of few

millimeters from reader.

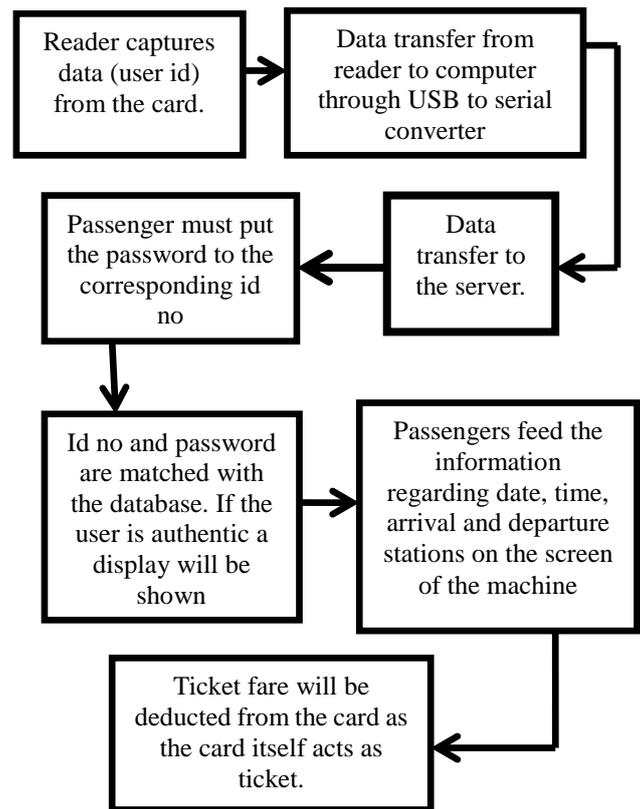


Figure 3: Working Principle in a Block Diagram

Step 2: After receiving the tag information, reader sends this information to COM Port of PC by USB To Serial converter.

Step 3: Data from COM Port is sent to central server for confirmation. The central server queries to database and retrieve corresponding information after receiving the data from the reader.

Step 4: Once the tag information is verified, Server requests the passenger to put the information related to the journey on a display.

Step 5: All the information regarding journey will also be transferred to database for further security.

4.2 Suggested Algorithm

Flow chart of purchasing ticket is represented in Figure 4 which can be described by following algorithm:

- Register yourself and collect the card with your password.
- Please keep in mind your password.
- When you go to purchase ticket, please take the card in proximity of the reader. Reader reads the tag id.
- RFID reader transmits the id to Computer and corresponding password is asked.
- Now enter your password which was given during registration.

- f. On the screen, you will see a control panel including some options.
- g. Now click the option of purchasing ticket. All necessary pages can be accessed from this panel.
- h. A new screen appears with the description of the journey.

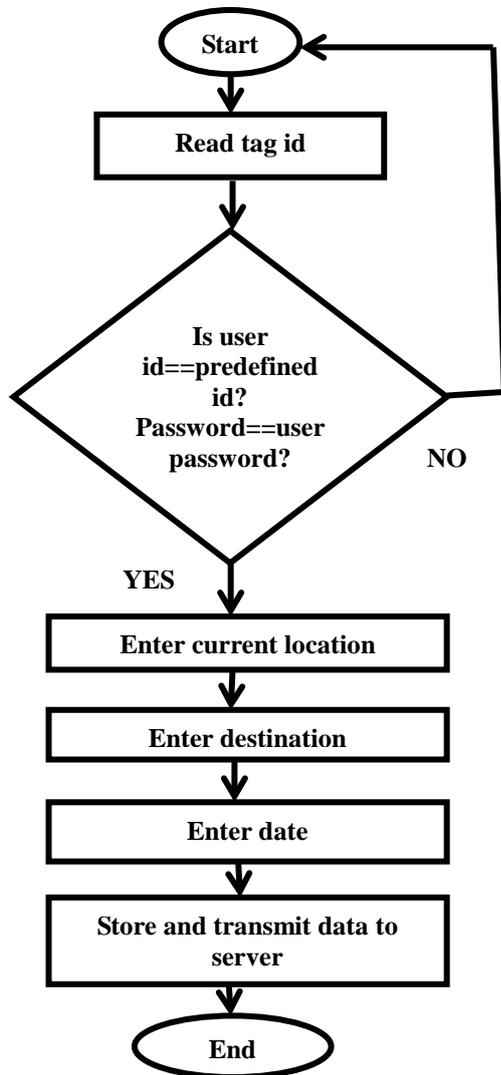


Figure 4: Flowchart of purchasing ticket.

- i. Now fulfill the options for chosen journeys.
- j. It's OK now.

5. BENEFITS OVER CONVENTIONAL SYSTEM

Benefits of this system compared to the prevalent system can be elaborated by the following way:

Queuing Theory: According to queuing theorem, the row number is selected on demand. Gravity of the commuters is regularly visible in the afternoon and in the evening, just after the office hour. Since at midnight, stations are less crowded, all readers need not to be in access. So, Power loss is a major concern if all of the readers are always in running. The number of running module in station should be in proportion to the number of passengers which will save enormous amount of power.

Availability of tickets: It is the primary objective of the present invention to provide an automatic ticketing machine that will make available railway tickets in public space such as shopping center, malls, airports, grocery stores, petrol/gas filling stations, restaurants, or any other place where large number of people may gather. The machines must be connected to the main server which is kept on the station.

Harassment of blacker: Now-a-days collecting tickets is a corrupted phenomenon in railway. Blacker purchase most of the tickets and sell them at a higher price to the customers. Thus, general people are mostly deprived of tickets in need. In our system, one person cannot purchase more than two tickets in a day. By this way, corruption can be reduced to a great extent.

Cost effective and secured: Automated Ticketing System will be proved less expensive and secured. There is no need of presence of clerk at the ticket counter since whole system will be maintained only by the reader modules which must reduce the necessity of employment in this sector. This will surely bring a volcanic upheaval in our economic sector.

Criminal Detection: Information about the journey of the users will be stored in server for at least one week. If corruption occurs at any compartment, the security force can detect the persons traveled on that day by that train .

Saving of paper: In conventional ticketing system, a lot of tickets are printed everyday. In this case tons of papers are used regularly. After traveling, commuters through away the tickets which is continuous wastage of papers. These garbage pollutes the environment badly. Moreover, trees are cut lavishly for preparing papers which creates the ecological imbalance. If the RFID tag is used as ticket, this malpractice can be avoided.

Time saving: Conventional printers are slow which is more time consuming and complex. But in our proposed system, RFID tags are used as tickets, so there will be no requirement of printers which saves valuable time and patience of passengers.

6. CONCLUSION

Though the initial cost of our proposed system is high but if it is implemented once cost will be minimized as the reader modules can be used years after years. The cost of maintaining such high tech system must be such that it should not outweigh the benefits provided by it. In future the system can be extended by using the same tag for identifying the miscreant passengers who will purchase ticket for one station, but elongate their journey to further stations.

7. EXTENDED WORK

Logic gate can be used (here AND gate) to open the gate of the platform. Data from database such that id no and ticket information (yes or no) are sent to the inputs of gate. When two inputs are logic 1 then output of gate will

be logic 1 and drives the motor and finally the platform gate.

8. REFERENCES

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