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A QR Code Based Processing For Dynamic and Transparent Seat Allocation in Indian Railway

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Abstract

Indian Railway is world's largest human transport system, is currently dealing with a lot of problems, such as availability of confirming seat to waiting list passengers after its departure. However there is no such system that presently in Indian railway gives accommodation to waiting list passengers during their journey. This paper proposes the Dynamic Seat Allocation (DSA) system considering the advantage of QR code processing along with one of the standards of wireless communication. Moreover, dynamic authentication to the wireless device is incorporate which is passenger specific. Through this research paper our approach is to make fair processing in seat reservation or allocation in Indian Railway.

Keywords- *Indian Railway, QR Code, Reservation System, Dynamic Seat Allocation.*

1. INTRODUCTION

(a) Indian Railway

Indian Railway is India's third largest human transport system over which 2 crore [1] passengers travel daily all over India. Out of this, in peak seasons more than half of the passengers having tickets of waiting. These waiting list passengers accomplish their journey from their source station to destination in standing mode. The number of passengers in Indian Railway has been increasing drastically in every year, in a rate of 5 to 15 percent from its previous year [1]. Such increase also increases the number of waiting list passengers in every train. Increasing number of waiting list passengers, increase rushes in train which results "happy journey" slogan of Indian Railway in to "unhappy journey".

(b) QR Code

QR code is originated by the Denso wave a subsidiary of Toyota Inc. from the technology hungry country Japan in year 1994. It is a two dimensional bar code designed to decode the contents at a high speed. The acronym for Quick Response is QR. The bar code used in commercial product is beneficiary because of its reading speed, supreme accuracy and functionality [2]. It is getting popularized very quickly all around the world because of its huge data storage capacity [3]. The most commercial use of QR code is in the telecommunications industry where the mobile phones seem to be the biggest driver of the popularity. QR code bridges the gap between print media and online media.

2. PROBLEMS IN CURRENT SYSTEM

- There is more space for touts to book tickets illegally and sell them at exaggerated price, [4].
- Less exposure of technology, for example Travelling Ticket Examiner (TTEs) still use pen and reservation charts to verify the passengers.
- A passenger cannot get the reservation after chart is prepared; i.e. chart is prepared four hours earlier of train departure; however train may remain vacant.
- Lack of optimization in seat allocation, for example whether passenger has boarded or not his seat remains reserved till his destination.
- A seat can remain vacant if passenger has not arrived and if after departure of train he cancels the ticket then loss of revenue to the Railway.

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- There is no dynamic seat allocation for waitlisted passenger in place of vacant seats, if passengers with reserved ticket have not arrived.

Our proposed DSA model is an attempt to solve the above problem with the help of QR code. QR code is used to embed the URL in the ticket. It facilitates faster ticket checking process. One of the wireless standards is used for connectivity between HHT and DSA server by which authentication is provided to every ticket.

Very often, every journey starts with the purchase of the tickets at a ticket counter or from the machine such as personal computer. It would be convenient to have electronic systems which make the task of passenger easy and convenient. The expanded use of mobile phones, their computational capabilities and their ability to connect to the internet make them suitable. Several new technologies have been used for this purpose. A very interesting system is touch and travel which is operational in German Railway.

Many problems in Indian Railway still exist after the adoption of latest technologies in electrical, mechanical and commercial department. One of the problems is, with the waiting list passengers, because they are not able to get their confirm seat up to their destination due to rush. The Indian Railway has decided to solve this problem by increasing the number of coaches for waiting list passengers by making their tickets confirm. But still the problem continues because of non-availability of coaches, because near about 10,000 trains run every day all around India.

Through this research paper we are attempting to propose the DSA model which minimizes the problem of waiting list passenger's up-to a certain level. Moreover transparency in the system comes with use of technology. In this model we have enhanced the use of QR code with communication Network of Indian Railway as technology. QR code is a 2 dimensional bar code that can be easily created and decoded with the help of smart phones. Therefore we have suggested the use of mobile phones for secure distributed document processing in the developing world since the smart phone is the pervasive information appliance of choice.

3. RELATED WORKS

In the current scenario of Indian Railway a device called palmtop is given to ticket checker. This device will replace the reservation list carried by TTEs. Palmtop is connected to central server. From the Palmtop TTE update the passenger's presence in the train to central server. From this, the status of availability of seats would be shown on the railway network and that could be booked by anyone who is willing to travel in the train at the upcoming stations. But, here we proposed that, if there are waiting list passengers and if any seat is available during their journey then the seat is provided to that passenger which is having waitlist 1, which means available seat is allocated on first come first serve basis [5].

The Northern Railway have been decided to include the Palmtops in some Rajdhani and Shatabdi Trains, after the Pilot project introduced in 2009 have been successful. It brings efficiency and transparency in booking of tickets in running trains.

This system has been developed by the Center for Railway Information System (CRIS), a railway public sector company which provides consultancy and IT services to the human transport system. Presently, this system is operational in Amritsar, Ajmer and Dehradun Shatabdi Express [6]. But the Palmtops have connectivity problems on some stretches, so an alternative method should be sought.

Therefore the communication technology which is proposed to use for proper implementation of this assignment is based on that communication technology which are currently used in real time movements of trains in Satellite Imaging Rail Navigation (SIMRAN).

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4. PROPOSED MODEL

The dynamic seat allocation system is the proposed model which is helpful to Indian Railway in many ways.

- Check-in for all the boarded passengers.
- If anyone willing to discontinue the journey then check-out procedure will be followed that gives the vacant seat information to the PRS and PRS will allot this seat to a non-confirmed passenger informing by an SMS.

In TTE's device there will be 3 interfaces as follows.

   i.   CHECK-IN
  ii.   CHECK-OUT
 iii.   BOOKING

Our proposed DSA model is divided in the following sub-module.

(A) Little modification in current Passenger Reservation System.
(B) Check-in, Check-out and Booking procedure.
(C) Automatic up gradation procedure.
(D) Allocation Procedure.

A. Little Modification in Current Passenger Reservation System

Today PRS is available at 8000 counters more than 2380 locations throughout the countries, including all major stations, and important non-railhead locations such as tourist centers and district head quarters. The PRS services are available to passengers for 23 hours in a day. Passengers can reserve a berth for any train 120 days in advance. In addition to the railway counters, multiple delivery channels have been provided to Rail passengers to access the PRS services. I-Ticketing and E-ticketing and through Internet was launched in year 2002 and 2005respectively. Booking through Post offices was launched in year 2007 [7].

Besides all these facilities provided by Indian Railway one attempt that was tried to make is to reduce the usage of paper as much as possible. Passengers are requested to use their Mobile Phones as journey

tickets, because the ticket is stored in Mobile Phone either as an SMS sent by IRCTC or in the PDF format store in memory card in the case of e-ticket [7].

In an attempt with the Indian Railway our proposed Model suggest the use of QR code in the ticket generated from the counter and e-ticket, which contains the URL, for example http://xyz.in/nr/c4Lj9gMwhich is passenger specific and give the detail of that passenger from whom the QR-Code is extracted. A sample of QR-Code image is given in the following Figure 1. The above URL has three parts which are described as:-

- o **xyz.in:** server site of Indian Railway.
- o **nr:** Northern Railway of Indian Rail network.
- o **c4Lj9gM**: Passenger Specific unique Code randomly generated. It is same as user id of various mail servers.

Fig.1: Sample of a QR Code on a Ticket.

So the steps in above proceedings in passenger view points are:-

START OF THE JOURNEY:

- ➢ Obtain the reservation ticket either confirm or waiting with the QR-code print over the ticket.
- ➢ In the case of mobile phone ticket QR Code image is sent to the multimedia handset of Passenger.
- ➢ If the Passenger does not have any multimedia handset, he must take printout of the ticket.

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B. Check-In, Check-Out and Booking Procedure

Now from here the job of the TTEs starts to check each and every passenger's ticket and make the entry from his Hand Held Terminal. The Hand Held Terminal is equipped with the Android platform and operating system of smart phone, based on Linux Kernel [8]. In the proposed model passenger are required to check-in at the beginning of their journey with the help of HHT. Now the TTEs will perform the following steps to accomplish his job:-

i. CHECK-IN

➢ TTEs make a request to passenger to show his ticket.
➢ Passenger places his Mobile Phone or ticket in his hand near Hand Held Terminal of TTEs to read QR barcode for check-in as shown in figure 2.
➢ A TTEs uses application of his Android HHT to read the QR Code over the ticket or from the screen of passenger's phone and verifies it.
➢ Application of HHT give the URL after decoding information from QR Code, this URL helps the TTEs to login in PRS server to extract the information in respect of passenger.
➢ The information obtained from PRS is then matched with the ticket of passenger.

If the information matched along with any identification proof carried by passenger then the TTEs will push the button of check-in shown in the figure below to make an entry of the presence of passenger to the DSA server.

Fig.2: A QR Code Having URL.

ii. CHECK-OUT

➢ TTE press the check-out interface and scan the QR code.
➢ HHT redirects to PRS server and fetch the passenger detail.
➢ TTE authenticate the passenger with the Information provided by PRS server and press OK.

iii. BOOKING

This is used when a passenger is boarded in the train without ticket.

➢ TTE press the Booking interface in HHT and its camera is switched on to take a snap of passenger or her ID card or her photograph.
➢ Enters her name and journey detail.
➢ After payment ticket is booked and she is authorized to travel in the train.

Above three procedures can be accomplished through the TTEs, HHT device whose interface is shown in Figure 3.

Fig.3: An Interface of HHT for Check-In Check-Out and Booking.

END OF THE JOURNEY:

➢ Now the check-out procedure is done automatically by the DSA system when the passenger completes his journey and leaves the train.

➢ But if the passenger left the journey in-between due to his personal reason then the TTEs will check-out to give the information to DSA for dynamically allocation of seat.

Now from here the job of the TTEs finishes after checking both confirm and waiting list passengers who are in the train.

C. Automatic Upgradation Procedure

The automatic up gradation procedure of DSA server of Indian Railway makes the Reservation system dynamic. It means that now it is possible to make the reservation when the train is running. This up gradation policy gives the transparency in berth or seat booking either through online or from the counter.

Here we have suggested one more server to be installed parallel to the PRS server, situated at five different cities such as New Delhi, Mumbai, Kolkata, Chennai and Secunderabad.

DSA ARCHITECTURE:

The DSA Architecture is based on 3-tier client-server distributed transaction paradigm as shown in Figure 4. The system has distributed architecture with 5 server clusters placed in server centers in five cities: Mumbai, New Delhi, Kolkata, Chennai and Secunderabad along with the PRS server. The server clusters are connected together by a core network based on a mesh of 02×02 Mbps leased lines using RTR (Reliable Transmission Router) as middleware.
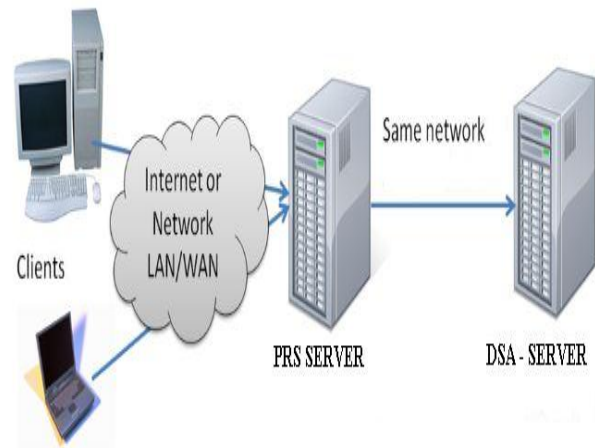

Fig.4: 3-Tier Architecture of Indian Railway.

UPGRADATION POLICY:

Availability of seat on train when it is running is depends upon the following policy.

➢ First the berth is provided to waiting list passengers who are on the train and only those waiting passenger are given first priority whose journey in km is maximum. It means waiting list passengers are arranged in descending order according to their distance to be travel.

➢ Second condition will apply if there will be no waiting list passengers, only then the seat or berth can be booked from counter or through online to the passenger who is willing to start the journey from the next station when the train has to arrive.

In Figure 5 explains all the above procedure which is going to happen.
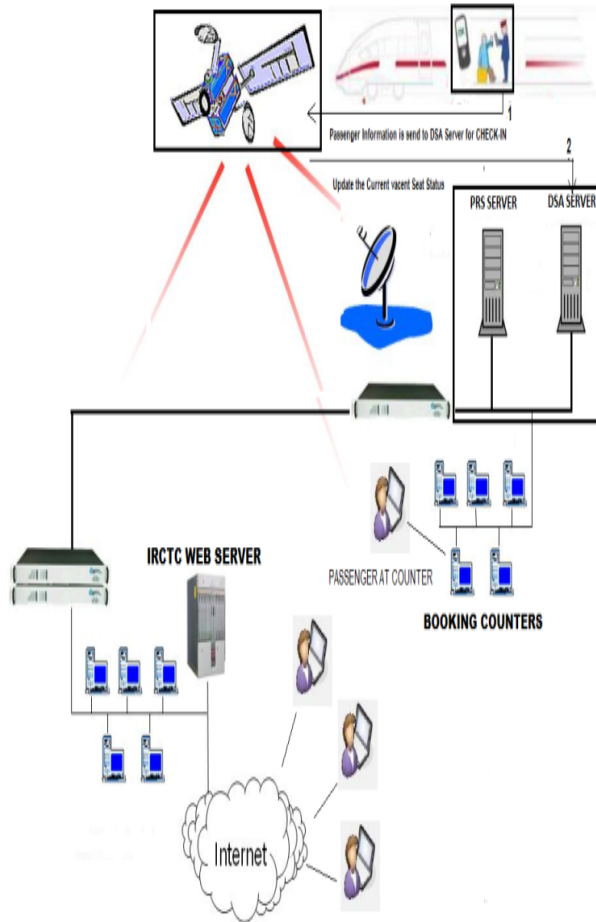
Fig.5: Network Scenario.

D. Allocation Procedure

Once the DSA Server updates its database it will give the vacant seat information to the PRS server every time it will update. Next, if the waiting list passenger are on the train and the seat are vacant then DSA SERVER will automatically allocate the seat to waiting list passenger otherwise it will be booked from counter or through online. In this way it is possible to allocate seat dynamically during the journey of waiting list passenger. The above concept can be best understood by the figure 6.
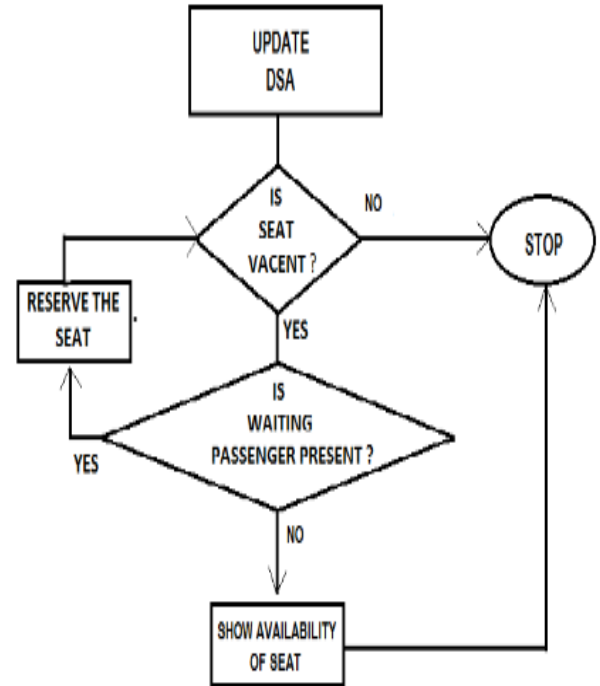

Fig.6: Flowchart of Allocation Procedure.

5. BENEFITS

- This technology will replace the complex reservation chart that is often carried by the TTEs.
- Induction of this technology will facilitate travelling ticket examiners to allot vacant seats to short distance passengers.
- It will enable TTEs to update the status of passengers who are turning up for the journey.
- After this updating, reservation server will come to know about the seats of absent passengers and will allot those seats to RAC/WL passengers informing them by sending an SMS.
- After allotting the seats to all the RAC/WL passengers, if some seats still remain vacant then it will be reflected as available seats across railway network and it could be booked by any passenger which is willing to travel from the upcoming station.
- Revenue of railway is increased.
- Procurement of tickets by touts is eliminated.
- It attempts to reserve each and every seat even vacant for one station to next station.
- It maintains the transparency in berth allocation and makes the ticket checking process fast.

6. CONCLUSION

This model proposes radical change in train operation and passenger experience. Hand Held Devices are given to TTEs for smooth and faster verification of passengers. QR code is printed on the tickets and this QR code is scanned by HHT devices. In QR code a passenger specific URL is stored, when HHT device encode this URL by Check-in process it redirects to PRS server and fetch stored data to verify the passenger. Check-in process updates the information of all passengers available in the train and let the DSA server to make the seat reserve or vacant. DSA server allot the seats of absent passengers to waitlisted passengers and if still some seats remain vacant then reflect them as available across railway network from where any passenger willing to board on it can book the ticket. Apart from this Check-in, a Check-out and Booking process is also provided to the TTE by this HHT. Check-out process provides the passenger to break his journey at any station by getting his remaining money back and at the same time his vacant seat is provided to a waitlisted passenger. Booking interface provides capability to book the ticket for passengers on board. These technology inclusions in the railway bring transparency and reduce the activities of touts at peak seasons.

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