Dynamic and transparent seat allocation using QR Code in a Mobile Application

[1]Joydeep Singh, [2]Vaibhav Shukla, [3]Ruchi Tawani

[1,2,3]Computer Science Department, Vidyalankar Institute of Technology, University of Mumbai, India

Abstract: *Indian Railway is world's largest human transport system which is currently dealing with a lot of problems, such as availability of confirming seat to waiting list passengers after its departure. Moreover, there is no such system/ regulation in Indian railway that instantly 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. Adding to more benefits, dynamic authentication to the wireless device is incorporated with respect to which is passenger specific. Through this research paper our approach is to make fair processing in seat reservation or allocation in Indian Railway.*
This project will help make the daunting task of booking and confirming a waiting list ticket very easy. Railway is the most feasible and economical solution, but some middle men and agents try to extort a huge amount of sum from a common man, taking an undue advantage of his predicament. This system will hugely help in clamping down such malpractices.

Keywords: *QR Code, Mobile Application, Dynamic Seat Allocation [DSA]*

I. Introduction

Indian Railway is largest human transport system in the world. Over 20 million passengers travel daily by train all over India. Along with that, it has the most interconnected facilities which ranks top in the world. Since, it is the most connected and viable transport in India, it also has the certain complexities in terms of its operations with respect to book the tickets. The problem arises because of the exorbitant number of passengers travelling each day.

In the proposed system, a QR code reader is installed around the door of the train. When the passenger scans the ticket while boarding the train, the QR reader encodes traveller specific URL, and by this the passenger Checks-in. In the Check-in process, it redirects to the SQL database server and verifies the data stored of the passenger and updates the information of the passengers that have boarded the train. A dynamic seat allocation (DSA) system is using QR Code which contains passenger specific URL. It is used for the allotment of the seats. Further, if any seats remain vacant, then those seats can be given or sold to the other passengers (waitlisted) instantly. This system clears out the intricacies of the booking and makes it transparent in terms of the vacant berths available in the train. Thus, it makes the ticket checking process fast.

1. Quick Response (QR) Reader

QR was originated in the prodigal country of technology, i.e. Japan. Denso wave, a technological company is the founder of QR code. Interestingly, this company is also a subsidiary of Toyota Inc. which has mastered itself in the quality management. Hence, this new development itself can be perceived to be at a high sophisticated level with having a quintessential performance. Further, this QR code was mainly designed to decode contents at a high speed. Therefore, the main use of barcode in the product is to read with perfect accuracy and its functionality.

II. Existing System.

The major drawback of the Indian railway system is due to the lack of the optimal use of advanced technology that is proving to be precarious for its revenue. The largest railway system is still using the primitive technique of checking the reservation. I.e. use of pen by travelling ticket examiner (TTE). This causes a major problem for the immediate passenger who wants to board the train. The reason for the problem is the pre-charted form that is prepared four hours before the departure of the train. Hence, the vacant seats in the train from the starting point of the departure remain unsold. Notwithstanding with the fact that these vacant seats could be filled from passengers boarding from other stations, still there comes a gap where revenues are missed. There is no seat allocation method or system designed for the waitlisted passengers which is making the journey very inconvenient for them.

III. Proposed Model

This model is designed specifically to eliminate the problems and inefficiency of the ticket booking system of the Indian railways. The model is using QR code to identify the passenger details through the embedded URL. It reduces the tedious task of TTE and makes it more proficient. The tickets will be booked straight from the application that is designed. To use the application, the user needs to create an account by using the national identification number that can be Permanent Account Number (PAN), Aadhar Card Number or Passport Number. With the help of these identification numbers that is synchronised with the account, the user can book or cancel tickets from anywhere and at any time. A QR code is generated immediately after booking the ticket that is used for scanning before boarding the train. Also, the record of the ticket is maintained in the account history. The customers can pay for the ticket via E-wallet i.e. electronically; the person can make the payment.
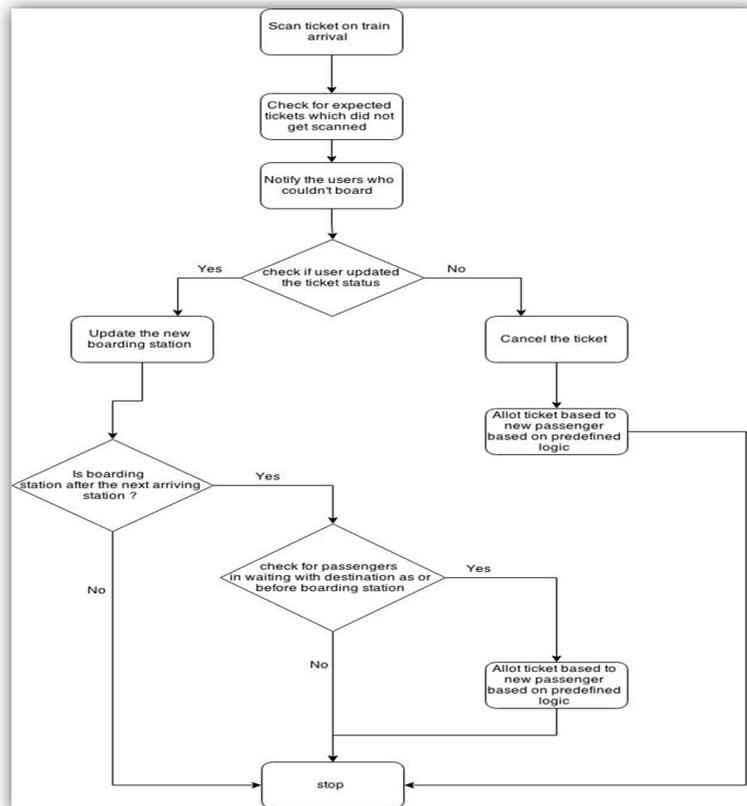

Fig 1: Flow Chart

1. Check-in Procedure

When the passenger is boarding the train, the traveller has to scan the ticket on the QR scanner that is installed at the door. This will recognise the presence of the travellers who have boarded the train.

Any passenger who fails to board the train, his QR code arrival procedure isn't done, and after the particular time interval the DSA Server notifies the ticket holder to check the status. If cancelled, the DSA server allots this seat to the waitlisted passengers according to the predefined logic.

If still some seats remain vacant then reflect them as available across the railway network from where any passenger willing to board the train can book their ticket. It also assures fast, efficient and transparent way for the berth allocation system and also makes the ticket checking process fast. The TTE can start checking the tickets of the passengers whose check-in procedure is not completed and if the passenger is not present, and then the seat can be marked as vacant for the next booking. On the other hand, the passenger can also check-out via application where he / she is getting down, thus making the seat vacant for the next abrupt passenger.

The waitlisted passengers will be allocated the seats as per *first-come-first-serve*. During allocation, the first five passengers from the database will be considered and the one with the longest journey will be treated as a priority for their convenience. On the second condition, the tickets will be booked as per the descending kilometres with respect to travellers' destination. If there is no waiting list, then the expedite passenger can book the ticket instantly. The seats will be dynamically filled through this system by the DSA server. Hence, this will bridge the gap between the missing revenues.
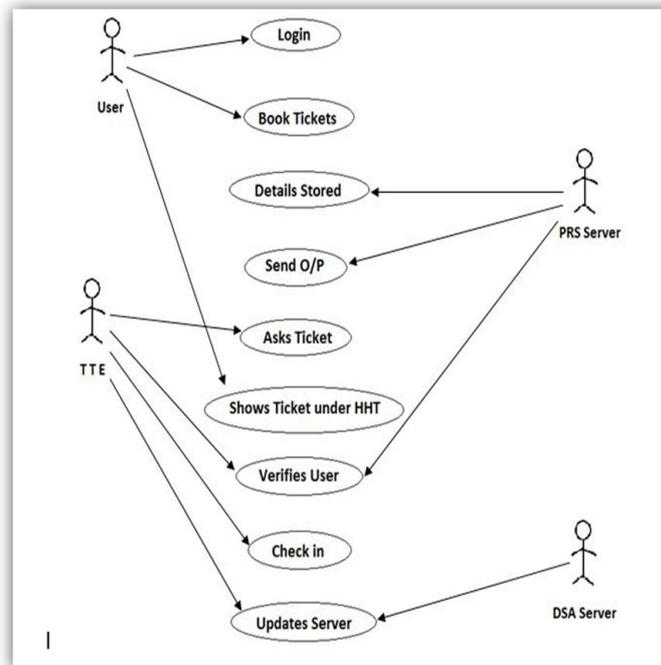
Fig 2: Use Case Diagram

2. TTE [Travelling Ticket Examiner]:
        The TTE will be handed a terminal that has specifically designed application for checking the authentication of the passenger and ticket. To use the app, the TTE will have to login through his ID that is generated by the administration. This app will notify the TTE whose check-in procedure is not completed. Hence, the TTE will be able to complete the allotment of those passengers on a first priority basis and the same app will also enable the TTE to check the passenger details. The TTE will scan the QR code that is generated while booking the ticket by the passenger. While scanning the QR code, the application will fetch the customer details from the server. The TTE will match the server data with the passenger details and verify it.
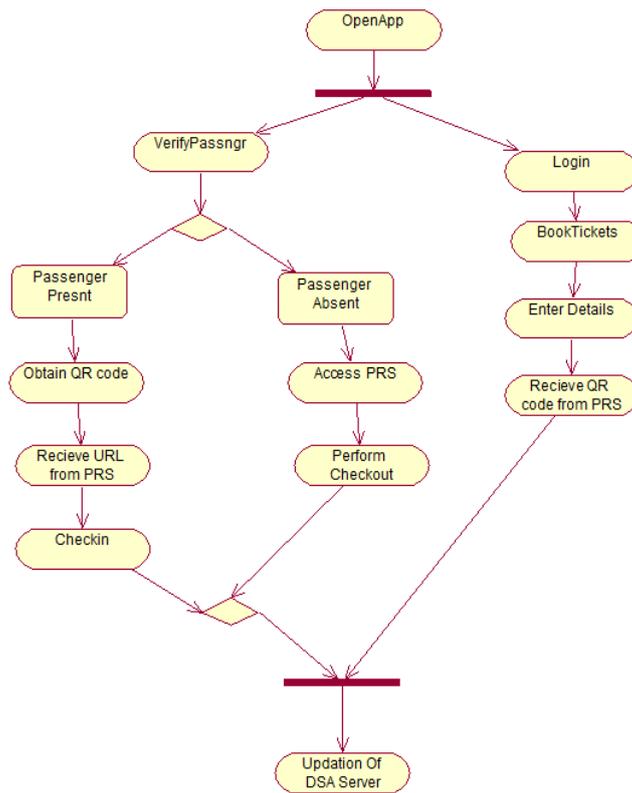
Fig 3: TTE ER Diagram

3. Booking

In our proposed model, the user has to log in through the app and click on book ticket. Following that, the user needs to select the source and destination along with the date. After that, train availability chart will be checked in the database. If available, then the passenger just needs to click the confirm book ticket.
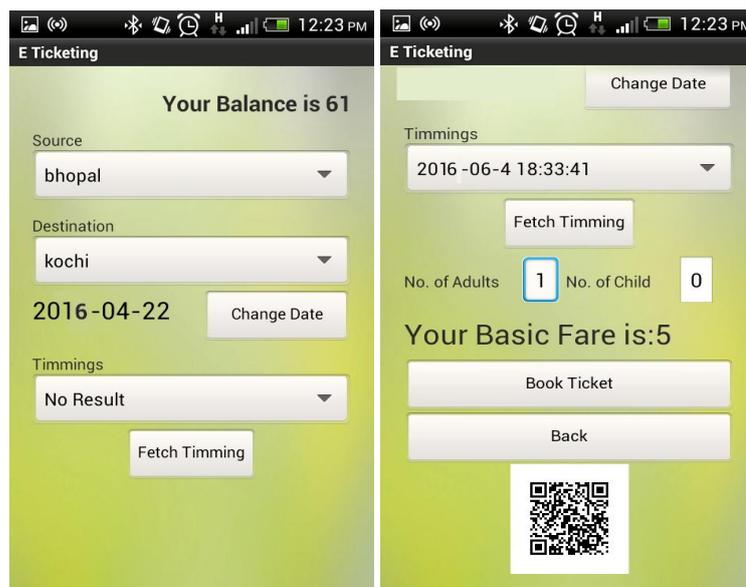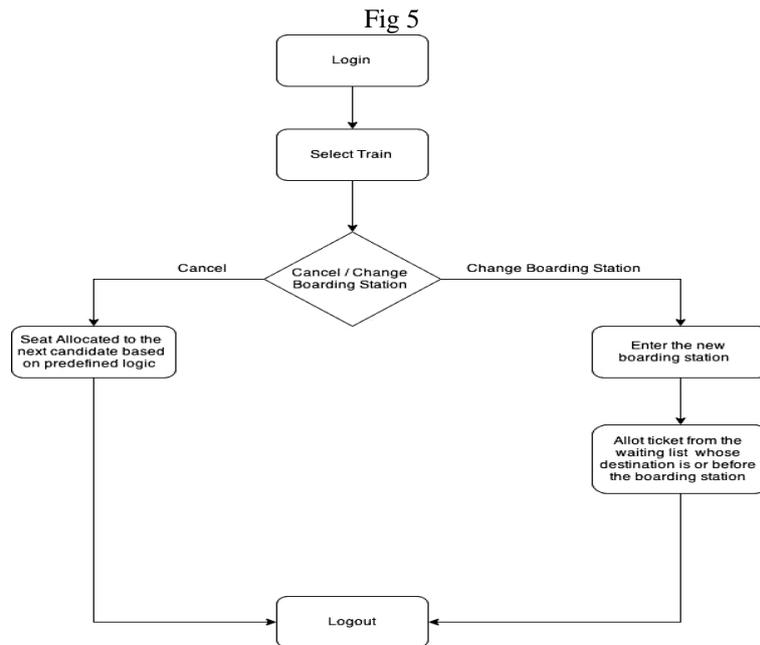

Fig. 4 Ticket Booking and View Ticket

4. Payment

The payment can be done electronically via all kinds of electronic transfer system such as bank cards or through a very much secured system such PayPal. Also, every user can recharge or fill the value in the E-wallet physically through TTE or from Railway counter.

5. Cancel Ticket

After the user logs through the app, the user also has the option to cancel the ticket. If the ticket has been cancelled before the boarding time of the train, then the passenger will get the incumbent amount. The cancelled seat will be reflected as vacant in the server which will be dynamically allocated to waitlisted passenger according to the predefined logic.

Fig 5

IV. Implemented App Screenshots

1. Registration

To buy ticket user needs to register as a new user ID and Atvm Number. When a user purchases a ticket the Atvm Number will be added in the booked history table. Booked history table contains Atvm number ID and ticket ID.

ticketId	AtvmNo	doj	source	destination	fair	Nop	noChild	busid	SeatNo
156	123	2015-04-06 11:06:41	kalyan	Dombivili	4	1	0	2	S1,
157	123	2015-04-06 11:32:37	kalyan	Dombivili	4	1	0	2	S2,
158	121	2015-04-06 11:46:43	kalyan	Dombivili	4	1	0	2	S3,
159	1234	2015-04-06 11:47:05	kalyan	Dombivili	4	1	0	2	S4,
165	121	2015-04-06 12:58:24	kalyan	Dombivili	4	1	0	2	W1,
166	121	2015-04-06 14:53:06	kalyan	Dombivili	4	1	0	2	W2,
167	121	2015-04-06 15:28:49	kalyan	Dombivili	4	1	0	2	W3,
168	121	2015-04-06 15:45:21	kalyan	Dombivili	4	1	0	2	W4,

Fig 6: Booked History table

2. Buy Ticket

Whenever user provides necessary details to buy ticket, all the details are checked before purchasing ticket. Example source and destinations are not the same. If all the required field are valid to buy ticket the fare is calculated. Fare is calculated based on distance between two stations. Total fare is calculated sing following formula:

Total Fare = (fare for one adult * number of adults) + (fare for one child * number of children)

Where, fare for one adult and fare for one child are found using 'fare' table in DB

				AtvmNo	Balance
☐	✎	✗		ddsadasda	94
☐	✎	✗		12A21313	0
☐	✎	✗		88888	2000
☐	✎	✗		1231231231	0
☐	✎	✗		16111611	1000
☐	✎	✗		jwalagotit1	996
☐	✎	✗		jwalagotit	1020
☐	✎	✗		15272	996
☐	✎	✗		123	984

			Source	Destination	Fair	Childfair
☐	✎	✗	kalyan	kashmir	500	250
☐	✎	✗	kalyan	thane	8	4
☐	✎	✗	kalyan	cst	20	10
☐	✎	✗	dombivili	thane	4	2
☐	✎	✗	dombivili	cst	16	8
☐	✎	✗	thane	cst	12	6
☐	✎	✗	thane	kalyan	8	4
☐	✎	✗	cstm	panvel	20	10
☐	✎	✗	bhivandi	koparkhairne	50	25

Fig 7: Fair Table   Fig 8: Balance Table

3. Android Application UI Screenshots:

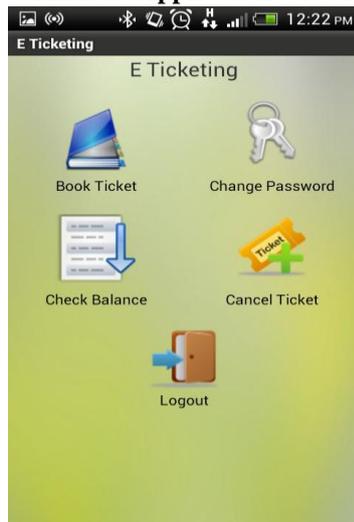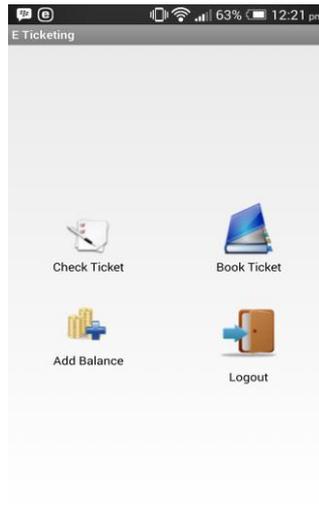

Fig 9: User Home Page   Fig 10: Admin Home Page: Fig 11: Output after scanning QR code:

IV. Conclusion

The above application is designed to maximise the efficiency of the Indian Railway ticket`s booking system for the passenger as well as for the railway administration. The utilisation of QR code provides innate details of the passenger, thus impacting on the eco-system by reducing the use of papers. Hence, the magnitude of the app will be much helpful in contributing towards green environment because of the number of passengers travelling each day across the country. Also, the agony of the waitlisted passengers will be solved in a conventional manner. Along with these benefits for the passengers, this system will also enhance the efficiency of the TTE by making it easier for him to check upon the passenger in a meticulous manner.

V. Future Scope

After the initial success of the application, this app can be also be delved into in different sectors among the travel industry. Thus, the app will be a pioneer in giving the customer satisfaction. As a result, this app will support other travel routes, i.e. Airline, Taxi and cruise booking.

Acknowledgement

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Authors

Joydeep Singh was born on 5th May 1991 in India. He has completed his B.E in Computer Science from University of Mumbai. Works as a Freelance Developer.

Vaibhav Shukla was born in 2nd October 1991 in India. He has completed his B.E in Computer Science from University of Mumbai. Currently employed in an MNC as an Android Developer.

Ruchi Tawani was born on 31st January 1988 in India She has completed his B.E from University of Mumbai. She works as an Assistant Professor at Vidyalankar Institute of Technology.