

An Approach on Verification and Online Tracking of Boarded Passengers in Railways

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Abstract

The digitization in railway sector has paved a way for easier tracking of the transit of passengers across the globe. However, in developing countries like India, digitization has become a challenging issue. In intercity trains, the Train Ticket Inspector (TTI) has to spend a long time on physical verification of the passengers. This paper proposes a novel approach on verification and online tracking of passengers in railways. This system uses the Near Field Communication (NFC) to read the QR code that contains the details of the ticket of the passenger. The implementation of this approach has shown better efficiency and on line tracking of the passengers.

Keywords: Online tracking, railways, passenger verification, tracking of passengers

I. INTRODUCTION

Recently, the technology advancements have led to the digitization in railway sector. The e-ticket reservation is a major expansion which headed towards an ease of use for public. Further, in urban long distance trains verifying the passengers on board is a hectic task for the Train Ticket Inspector (TTI). Yet, there are no provisions to digitally verify and update the reserved tickets. This issue can be addressed by developing a mobile application which helps to digitally verify the ID and ticket of the passenger on board. The proposed scheme components include, a mobile application which stores the QR (Quick Response) code of the reserved tickets and QR code of the Aadhaar number, NFC (Near Field Communication) reader, Railway central server. Since the present day mobile phones are equipped with NFC (Near Field Communication), when it gets contact to the NFC reader, the QR codes can be transferred through NFC reader equipped smart device to the server. If it is valid, an acknowledgment is send to the user through SMS. Further, the boarding status is updated which can be viewed in the mobile application of the TTI. The NFC reader can be placed in each coach of the train or it can be placed in the entrance of the railway station if highly equipped. If a ticket is not verified within 30 minutes of travel an alert SMS is send to the passenger. If there is no response by further 30

minutes, the ticket is automatically cancelled and the passenger in RAC (Reservation Against Cancellation) is send an SMS regarding the confirmation of his/her tickets.

Originality of Innovation

Until now in Indian railway system, there is no application to digitally verify the ticket and ID of the boarded passengers and that could lively track the verified passengers. The TTI manually goes to every passenger in a coach gets the ticket, ID and manually verifies the information. There is no such automated system for digital verification. Further, the passengers in RAC do not have an idea of their status of confirmation of the tickets. The TTI manually goes to the passenger and informs them about the confirmation of the ticket. There is also a situation where the original about-to-be confirmed RAC tickets are not given to the appropriate passengers on Queue. Through the intervention of TTI it can be given to any passenger by breaking the queue. These issues are still not addressed in any present day system. The proposed system breaks up all the above listed issues by providing a mobile application that verifies the ticket and ID of the passenger and updates the RAC passengers about the confirmation of the ticket.

Scope

- Each user has to register the Aadhaar number of his/her before reservation.
- The mobile number of the user should also be mapped to Aadhaar and ticket.
- If some other user has reserved the tickets other than the passengers, then tickets should be downloaded in the mobile application of the passenger.
- No users other than the passengers should be allowed to verify the tickets.

Benefits

There are two major benefits in this proposed scheme for the passengers. They include the following.

- Passengers often forget to maintain their ID proofs and tickets during travel. This feature helps passengers to verify their tickets by just bringing the smart phone near to the NFC reader enabled smart device. This contactless communication helps the passengers to verify the tickets with ease and comfort.
- The passengers boarded in RAC will never know the status of their tickets once the chart is prepared. The passenger has to go behind the TTI to know the status of his/her RAC status. Further, the order of the RAC queue is manually breached by the TTI without the concern of the legal passengers. This system automatically upgrades the RAC tickets, if any reserved tickets are not verified within one hour of the travel. Further, the RAC queue is also made transparent to the passengers.

II. RELATED WORK

An optimization method on solving the passenger train timetabling problem is proposed by Zahra et. al [1]. This approach was suggested to overcome the collision of trains in railway tracks. Tracking of railway passengers by fusion of low power sensors in mobile devices is developed by Takamasa et. al [2]. This approach employs a novel mobile sensing solution for tracking the railway passengers based on stop and go patterns.

In [3], the passengers are analyzed for their preferences on travel on connecting transits. The analysis done in this approach clearly states the producer and consumer issues, lists out the remedial actions to be taken to overcome the issue.

In [4-6], various mechanisms on congestion analysis and tracking is performed. Yu et. al [7] has developed a new dynamic model for railway vehicles and has framed a model. This paper has derived some theoretical basis on the design of railway vehicles and has done some mechanisms for coordinated control and optimization.

III. METHODOLOGY

This section briefly explains the working of the proposed system. Following are the major components of the proposed system.

A. Mobile application Registration

After downloading the application from play store, each IRCTC user has to register his/her Aadhaar details. So, the mobile number, the IRCTC account and the Aadhaar number are linked with each other.

B. Reservation of e-tickets

During the reservation of e-tickets the mandatory details of each passenger includes the name, age, gender, preference of berth, boarding point, dropping point, Aadhaar number. Once reserved the e-ticket is generated with QR code.

C. Verification of ticket and ID of the passenger

To verify the ticket and ID, the mobile phone of the passenger equipped with NFC and which holds the application has the ability to communicate the reservation details to the NFC reader located in the entrance of the railway station of in each coach of the train. The NFC reader is a smart device equipped with 3G facility. So, the NFC enabled smart device transforms the reservation details to the railway server. If the verification is successful, an SMS is send to the passenger as an acknowledgment.

D. Ticket tracking by TTI

As a ticket is verified, it is updated in the database of the rail server. The TTI can inspect the number of passengers on board from his/her mobile application.

E. Automated up-gradation of tickets

If a passenger does not verify his/her ticket in the first 30 minutes of travel, a notification SMS is sent to the registered mobile as a reminder. Further, if the process is incomplete by the next 30 minutes the ticket is automatically cancelled and the passenger in RAC is

sent an SMS regarding the confirmation of his/her ticket.

The registration component of the mobile application has the fields that include name, age, date of birth, gender, address, mobile number and Aadhaar number. The existing users can register the Aadhaar number as an add-on to the previous available information. An OTP (One Time Password) is sent to the users mobile to verify the validity of the mobile number given. If OTP is valid, the registration is confirmed. Figure 1 shows the registration process of a user.

The reservation of tickets can be done by utilizing the component already available in the IRCTC mobile application. The fields include name of the passenger, age, gender, preference of birth, Aadhaar number, date of journey, train number, train name, boarding point and dropping point. The new feature that has to be extended is to store the QR code of the ticket in the inbox of the user separately.

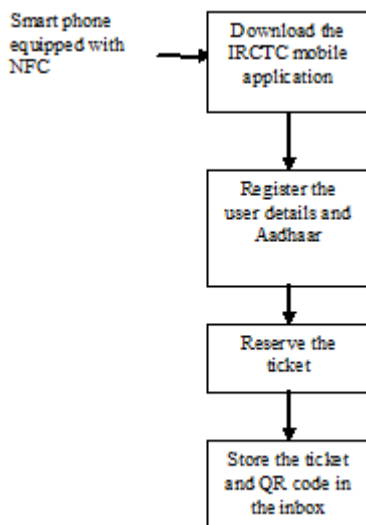


Fig. 1 Registration of user details

The verify component of the mobile application includes the QR code of the Aadhaar and the QR code of the reserved ticket. This information is transferred to the 3G enabled smart device through NFC reader. The NFC ACR122U or any equivalent NFC reader can be used to read the QR codes.

The reservation details are transferred to the rail server for verification. If the data is valid a confirmation SMS is delivered to the passenger. The database in the server is updated with the verification details.

Another component of the mobile application is the verification by TTI. This component includes the coach details and the passenger reservation details. Once when a passenger verifies his/her ticket, it is updated in the database and is viewable for the TTI. Based on his need, the coach details can be retrieved. The details of passengers and the reservation information can be filtered. On a click, the details of non-verified passengers can also be retrieved.

Further, once the ticket is not verified within one hour of boarding, it remains cancelled and the RAC passenger waiting in queue is send an SMS regarding the confirmation of the ticket.

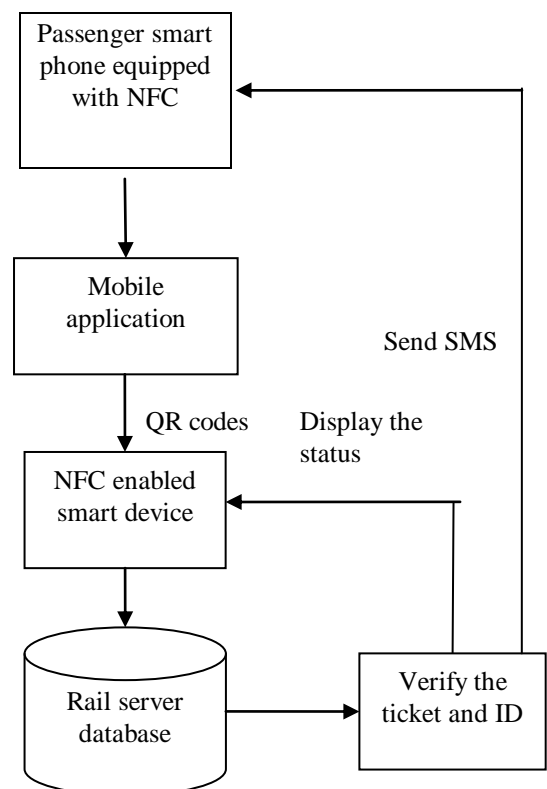


Fig. 2 Verification of passenger ticket and ID

Utility to Passengers

There are two major benefits in this proposed scheme for the passengers. They include the following.

- Passengers often forget to maintain their ID proofs and tickets during travel. This feature helps passengers to verify their tickets by just bringing the smart phone near to the NFC reader enabled smart device. This contactless communication helps the passengers to verify the tickets with ease and comfort.

- The passengers boarded in RAC will never know the status of their tickets once the chart is prepared. The passenger has to go behind the TTI to know the status of his/her RAC status. Further, the order of the RAC queue is manually breached by the TTI without the concern of the legal passengers. This system automatically upgrades the RAC tickets, if any reserved tickets are not verified within one hour of the travel. Further, the RAC queue is also made transparent to the passengers.

IV. EXPERIMENTAL DISCUSSION

Feasibility of implementation

Since a mobile application is already available for IRCTC reservation and features, this proposed feature can be an add-on to the application. In the passenger point of view, there is no necessity for a new modification in the infrastructure. All he/she needs to do is to download the application and register the Aadhaar details before its usage. Concerned with the verification of the tickets in railway station or in coaches after boarding, a NFC enabled smart device with 3G facility is required to retrieve and send the passenger information from the smart phone of the passenger to the rail server for verification. Since the modern smart phones are equipped with NFC it is more feasible to implement.

Integration of the existing infrastructure in the proposed innovation

- This feature of verification can be added with the already available IRCTC mobile application.
- The QR code available in the e-ticket can be used to share the information about the passenger during verification.

V. CONCLUSION

Until now in Indian railway system, there is no application to digitally verify the ticket and ID of the boarded passengers and that could lively track the verified passengers. The TTI manually goes to every passenger in a coach gets the ticket, ID and manually verifies the information. There is no such automated system for digital verification. Further, the passengers in RAC do not have an idea of their status of confirmation of the tickets. The TTI manually goes to the passenger and informs them about the confirmation of the ticket.

There is also a situation where the original about-to-be confirmed RAC tickets are not given to the appropriate passengers on Queue. Through the intervention of TTI it can be given to any passenger by breaking the queue. These issues are still not addressed in any present day system. The proposed system breaks up all the above listed issues by providing a mobile application that verifies the ticket and ID of the passenger and updates the RAC passengers about the confirmation of the ticket.

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