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Smart Railway Ticket Checking System

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Abstract: *India's transportation system ranks among the largest in the world, with the railway network playing a major role in daily passenger travel. Managing passenger verification, compartment security, and ticket validation efficiently is an important aspect of railway operations. Therefore, we are focusing on Indian railway transportation, which aims to improve passenger discipline and safety in a smarter way. For this purpose, we are proposing a Smart Railway Ticket Checking System. This system uses a QR-code-based ticket with authentication where the QR code contains stored passenger ticket details and the scanner scans the QR code to verify the passenger information. Passenger details such as PNR number, UID/Aadhaar number, train details, coach number, journey date, and ticket status are stored in the database during ticket booking. At the entrance of the reserved railway compartment, passengers scan their QR-code-based ticket. The system checks the ticket details from the database in real time. If the ticket is confirmed and all details are valid, access is allowed by turning ON the Green LED and automatically opening the barricade gate at the compartment entrance so the passenger can enter the reserved coach. If the ticket is invalid, unauthorized, or not confirmed, the barricade gate remains closed and red LED is turned on. The passenger verification status is updated in the Smart TC Dashboard, which reduces manual ticket checking and improves passenger safety by preventing unauthorized entry into reserved compartments. The system checks real-time ticket status from the database using the PNR details stored in the QR code. If a WL or RAC ticket becomes confirmed, the same QR code can be used for passenger authentication without generating a new QR code.*

Keywords: QR Code, Smart Railway System, Passenger Verification, Smart TC Dashboard, Ticket & Database Authentication

I. INTRODUCTION

Indian railways is one of the largest railway transportation networks in the world and is used daily by millions of passengers. With the increasing number of passengers, maintaining security, passenger discipline, and efficient ticket verification inside reserved compartments has become an important challenge. At present, ticket verification is mainly performed manually by ticket collectors (TC's), which can be time-consuming and difficult to manage during crowded travel conditions[1-80].

Unauthorized passengers entering reserved compartments, confusion regarding ticket and seat verification, and manual checking of waiting list or RAC ticket status are some common problems faced in railway transportation. Manual verification also increases the workload of TC's and may reduce monitoring efficiency during peak travel hours[81-178].

To overcome these problems, the proposed smart railway ticket checking system provides a smarter and more secure method for railway ticket verification using QR-code-based tickets with authentication, database integration, and automated entry control. The system verifies passenger details in real time and updates the passenger boarding status in the smart TC dashboard. It also controls a barricade gate installed at the compartment entrance, which opens only for authorized passengers after successful ticket verification.

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The system additionally supports automatic ticket status updates. During QR scanning, the system checks the latest database status, ensuring real-time and accurate passenger verification for RAC or WL ticket status.
The main aim of this project is to reduce manual ticket checking efforts, improve passenger safety and compartment security, prevent unauthorized entry, and make railway passenger verification faster, easier, and more efficient using automation and real-time monitoring.

II. EXISTING SYSTEM

In the existing railway ticket checking system, Ticket Collectors manually verify passenger tickets inside the railway compartments. Passengers show physical or digital tickets to the TC for verification. This method requires continuous manual checking and consumes significant time, especially during crowded travel conditions.

The current system also faces problems such as unauthorized entry into reserved compartments, difficulty in managing large passenger volumes, and manual verification of RAC and Waiting List ticket updates. Since verification depends completely on human monitoring, mistakes and delays may occur during the checking process.

Another limitation is that passengers can enter reserved compartments before proper verification, which may create confusion and reduce passenger safety. The existing system does not provide automated access control or real-time passenger monitoring.

III. PROPOSED SYSTEM

The proposed Smart Railway Ticket Checking System is developed to provide secure, automated, and real-time passenger verification in railway reservation compartments. The system uses QR-code-based authentication, database verification, barricade gate control, LED indicators, and a Smart TC Dashboard for monitoring passenger entry status.

When a passenger books a ticket, all passenger details are stored in the database and a QR code is generated on the ticket. At the compartment entrance, the passenger scans the QR code and Aadhaar/UID card. The system verifies the details from the database in real time.
If the ticket is valid and confirmed, the Green LED turns ON and the barricade gate opens automatically, allowing the passenger to enter the reserved compartment. If the ticket is invalid, unauthorized, or not confirmed, the access is denied.

The passenger verification details are updated in the Smart TC Dashboard for monitoring by the Ticket Collector. The system also supports automatic RAC and Waiting List status updates when confirmed tickets are cancelled. Due to real-time updates in the Smart TC Dashboard, the Ticket Collector can identify passengers who have not boarded the train, allowing seats to be allocated to the next eligible WL passenger.

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IV. BLOCK DIAGRAM

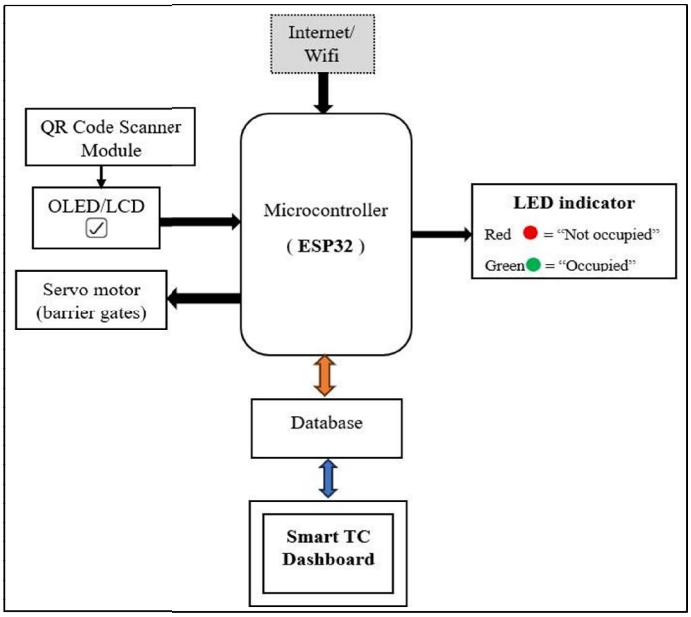

Fig.1 Block diagram of Smart Railway Ticket Checking System

V. FLOW CHART

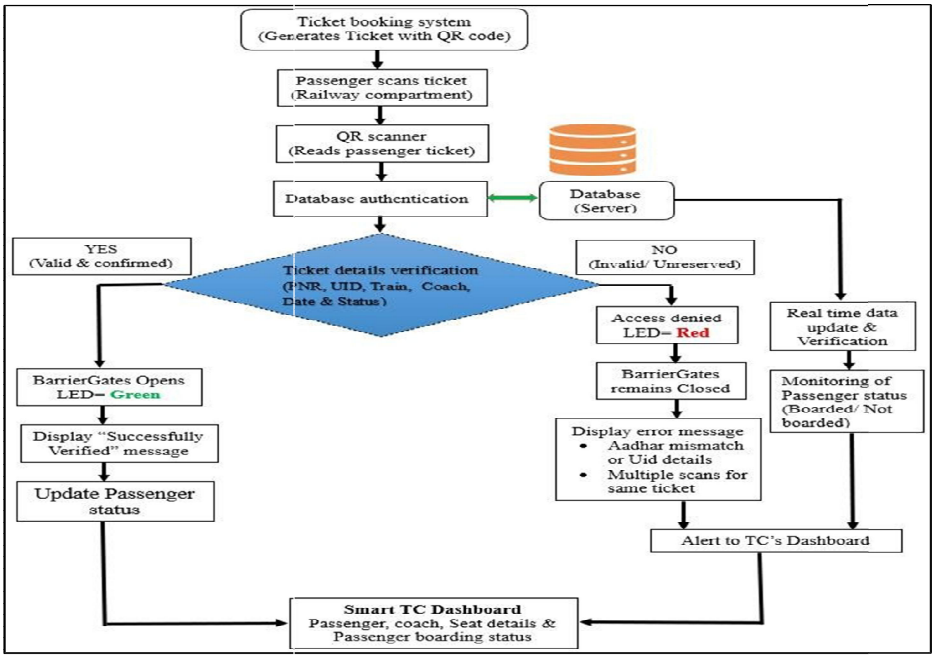

Fig.2 Flowchart of Smart Railway Ticket Checking System

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VI. WORKING

The proposed Smart Railway Ticket Checking System works by combining QR-code-based ticket verification with real-time database authentication and automated compartment access control. When a passenger books a railway ticket, details such as PNR number, passenger name, UID/Aadhaar number, train details, coach number, seat number, journey date, and ticket status are stored in the database. A QR code containing passenger verification details is generated on the railway ticket.

At the entrance of the reserved railway compartment, the passenger scans the QR code using the QR scanner module. The system checks the passenger details, journey date, coach information, and ticket status from the database in real time.

If all details are correct and the ticket status is confirmed, the Green LED turns ON and the barricade gate installed at the compartment entrance opens automatically so the passenger can enter the reserved coach. The passenger boarding status is also updated in the Smart TC Dashboard for monitoring by the Ticket Collector.

If the ticket is invalid, unauthorized, or not confirmed, the barricade gate remains closed, Red LED on and access is denied. This helps in preventing unauthorized passengers from entering reserved compartments.

The QR verification system checks the real-time database status during scanning, passengers with updated confirmed status can enter the compartment even if their original ticket was generated earlier with RAC or WL status. Overall, the system provides faster passenger verification, improved compartment security, reduced manual ticket checking, real-time passenger monitoring, and automated railway ticket management.

VII. TECHNOLOGIES USED

Hardware Component

1. ESP32 Microcontroller
2. QR Code Scanner Module
3. OLED/LCD Display
4. Servo Motor (Barricade Gate)
5. Green and Red LEDs
6. Buzzer/Speaker Module
7. Wi-Fi Module

Software Components

1. Arduino IDE (C/C++)
2. Python
3. MySQL Database
4. VS Code
5. HTML, CSS, JavaScript
6. QR Code Library
7. MySQL Connector

VIII. FEATURES

1. QR-code-based passenger verification
2. Real-time database authentication
3. Automatic barricade gate control
4. Green and Red LED status indication

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5. Smart TC Dashboard monitoring
6. Automatic RAC/WL ticket updates
7. Prevention of unauthorized entry
8. Reduced manual ticket checking
9. Real-time passenger monitoring

- Improves railway passenger security
- Reduces manual ticket checking effort
- Provides faster passenger verification

IX. ADVANTAGES

- Prevents unauthorized compartment entry
- Supports automatic ticket status updates
- Provides real-time passenger monitoring
- Enables real-time seat reallocation
- Reduces confusion during boarding

VI. FUTURE SCOPE

In future, the system can be improved by integrating face recognition and biometric authentication for higher security. Mobile application support can also be added for passengers and Ticket Collectors. AI-based monitoring and live railway server integration can help in improving real-time passenger management. The system can also be expanded for metro railways, smart city transportation systems, and other public transport services.

VII. CONCLUSION

The Smart Railway Ticket Checking System provides a simple and effective way to improve railway ticket verification using QR codes and real-time database authentication. It reduces manual effort, speeds up passenger entry, and increases security by allowing only valid ticket holders to travel in reserved compartments. The Smart TC Dashboard helps Ticket Collectors monitor passenger verification and boarding status in real time, making passenger management easier and more efficient. The system also helps in better seat utilization and smoother train boarding through live updates. Overall, it makes railway operations more efficient, accurate, secure, and passenger-friendly.

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