

Smart Card-Based Ticketing with Application for Bus Transport

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Abstract

Manual ticketing is becoming less effective due to urbanization and the growing demand for public transportation. This concept introduces a cashless, automated fare collection system that utilizes smartphone apps and AI-powered smart cards. By integrating smart sensors, GPS tracking, and real-time monitoring, the system enhances both efficiency and security. Automated entry and exit systems help reduce congestion and minimize boarding times. Additionally, a dynamic fare adjustment mechanism ensures fair pricing based on travel distance. For passengers without smart cards, QR-based mobile ticketing enables seamless digital payments. An emergency alert system further enhances safety by ensuring swift responses to accidents or threats. This advanced technology-driven solution significantly improves the accessibility, efficiency, and security of public transportation.

Keywords: GPS tracking, real-time monitoring, smart sensors, emergency alert system, ineffective manual ticketing Secure, accessible, and effective.

1. Introduction

Urban mobility, or the movement of people and services around metropolitan areas, requires public transportation, but manual ticketing and fare-collecting systems result in traffic congestion, delay, and revenue leakage. Smart Card Based Ticketing and Application for Public Transport modernizes public transportation through an automated smart card and mobile Application-based solution. By means of smart card readers for automatic fare collection based on the distance traveled, GPS based on monitoring for the real-time updating of bus positions, and a mobile application for either ticket purchases, card reloading or feedback. A fire alert system also gives the passenger a chance to immediately report any accident or security concerns. By automating fare transactions, you minimize human contact and increase passenger safety, all fostering one intelligent, cashless, and highly effective public transportation network [1].

2. Objective

2.1 Automate Public Transportation Ticketing

- Implement a smart card system to simplify

online purchases.

- Offer a mobile ticketing solution using QR codes for passengers who don't have smart cards.

2.2 Ensure a Smooth and Orderly Passenger Flow

Install designated doors and automated sensors as part of a controlled entry-exit system.

- Minimize congestion and enhance boarding efficiency.

2.3 Boost Fare Transparency and Cost-Effectiveness

- Introduce dynamic pricing based on the distance traveled.
- Enable automatic fare refunds for shorter trips.

2.4 Improve Passenger Safety and Emergency Response

- Integrate an emergency alert system that allows passengers to notify authorities in case of an emergency.
- Implement a real-time location tracking system to help emergency medical services and law

enforcement respond quickly.

2.5 Enhance User Accessibility and Convenience

- Develop a dedicated app that enables mobile ticket purchases, smart card recharges, and trip history tracking.
- Allow passengers to provide instant feedback and report concerns directly through the app.

3. Methodology

3.1 Controlled Entry & Exit

- Dedicated Entry & Exit Points: Buses will have separate entry and exit points to streamline movement and prevent congestion.
- Automated Door Control: Sensors will detect passengers and automatically open doors, ensuring an orderly boarding process.

3.2 Card-Based Payment System

- Passenger Boarding: Travelers will scan their smart cards when entering. The system will deduct the fare for the entire journey (from the boarding station to the last stop).
- Fare Adjustment on Exit: Passengers must scan their cards again when exiting. If they disembark before the final stop, the system will automatically refund the unused portion of the fare [2].

3.3 App-Based Ticketing

- Real-Time Bus Tracking: GPS integration will allow passengers to track bus locations in real time.
- Digital Smart Card Management: Users can recharge, manage, and apply for smart cards through the app.
- Mobile Ticketing: Travelers without a smart card can scan a QR code inside the bus using their phones.
- Online Ticket Booking: Passengers can select boarding and destination points when purchasing tickets online.
- Passenger Feedback & Support: The app will enable users to submit requests, complaints, or feedback.

3.4 Emergency Alert System

- Physical Emergency Button: Buses will be equipped with an emergency button for passengers to report incidents or security

concerns.

- Mobile App Emergency Alert: Travelers can trigger an emergency alert through the app.
- Automated Notification System: In case of an emergency, the system will instantly share the bus's location and details with:
 - The nearest police station
 - Emergency medical services
 - The closest bus stations

4. Expected Outcomes

The execution of Smart Card Based Ticketing & Application for Public Transport systems is expected to bring several benefits to passengers and transportation authority's such as:

4.1 Faster and More Efficient Boarding

- Smart card and mobile-based payments significantly reduce boarding times, eliminating long lines.
- A structured entry and exit system ensure a smooth and orderly flow of passengers.

4.2 Seamless and Cashless Transactions

- By eliminating manual fare collection and cash handling, the system enhances security and transparency.
- Mobile ticketing via QR codes provides a convenient option for passengers who do not have smart cards.

4.3 Real-Time Bus Tracking & Passenger Convenience

- Through a mobile app, passengers can track bus locations in real time, reducing uncertainty and long waiting periods.
- The system offers essential travel details, including route information, estimated arrival times, and live updates.

4.4 Fair and Automated Fare Calculation

- The system ensures accurate and fair pricing by automatically calculating fares based on boarding and exit points.
- Passengers traveling shorter distances benefit from automatic fare adjustments [3].

4.5 Enhanced Passenger Safety with Emergency Alerts

- In case of an accident, crime, or medical emergency, the mobile app and onboard emergency alert system notify nearby hospitals,



police stations, and bus authorities.

- The system enhances safety, particularly for vulnerable passengers, including women and children.

Conclusion

Smart Card-Based Ticketing and an Application for Public transportation is a revolutionary step towards the cashless, automated, and technology-based public transportation system. This technology really enhances the urban transport system with reduced manual fare collection, prevention of overcrowding, proper fare deductions, and improved passenger safety. Because of integration of a mobile application, automatic fare adjustment, real-time tracking and an emergency warning system, taking transit is a safer, more convenient and efficient experience.

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