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Smart Bus: A Smartphone based Framework for Public Transport Ticket System using QR Code and Implementing Delay Payment Method

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Abstract: *The bus transportation system we have in present day is affordable for almost everyone, it reduces air pollution and increases fuel efficiency also it's safe and reduces traffic but it still uses the conservative ways for ticketing and payment i.e. the fare collection. The speed of boarding in traditional system is slow-paced and time consuming. There are various technologies emerging today to make the transit simple like Quick Response (QR) Code, Cloud, E-wallet, RFID, etc. are used for making the system fast-paced Smart Bus is an application that makes bus ticket process in public transport much easier. User can do pre-booking, on moment booking and post- booking i.e. delay payment which will increase the speed of transaction by making payments through Quick Response (QR) code even in absence of internet connection.*

Keywords: *Android, Quick Response (QR) Code, Electronic Wallet, Flutter, Delay Payment*

I. INTRODUCTION

Having an affordable and reliable public transport is a crucial need in modern world. [1] Bus transit is one of the most affordable and safe way of public transportation [2].

Smart Bus provides an effective proposal for public transport to provide ticket using an android application and also to pay for it online. Smart Bus is useful for the users who want to pre-book a ticket and be able to book a ticket by selecting source and destination also for users who want to book a ticket and do the payment instantly i.e. users who want to do on-moment booking.

A. Statement Of Problem

'Smart Bus: A smartphone based framework for public transport ticket system using QR code and implementing delay payment method.'

In User's module, the user will scan QR code generated on admin's app and the required amount for the ticket will be deducted from user's wallet and ticket will be sent to a user. Smart Bus is android application for QR scanning of bus tickets for both online payment system and offline payment system otherwise known as delay payment system. The QR code will be scanned by user from the admin in the bus. The user should update admin about their destination address, after scanning the QR code, amount will be deducted from user's wallet to the company's account which is maintained by manager. Then user will get message of travelling ticket. After that amount collected by the admin will be stored in database along with the details of tickets.

Using firebase for creating a cloud storage system to store data and files on cloud. Introducing delay payment method for QR scanning payment where users will have an option to pay for their travel afterwards as in case of unavailability of internet connection. The details of the offline QR code scans will be stored locally on the phone and when the user is back online, the payment will be done accordingly.

The structure of QR is shown in following figure 1.



Fig 1: QR Code

The flow of this research paper will be from literature review, proposed framework, and setup requirements.

Sr. No.	Author	Title Of Paper	Limitations	Key points
1	Reddy, Et al.	Bus Ticket System for Public Transport Using QR Code	User can have issue if the internet connection is not stable	QR code, Bus information, Easy ticket process.
2	Vinayak Nair, Et al.	Online Bus Tracking and Ticketing System	Precise results were not provided such as location and time	Android, Blue-Tooth Printer, Bus Tracking, Electronic-wallet, Global Positioning System, Quick Response Code
3	Anuradha, Et al.	Smart bus ticket system using QR code in Android App	User can buy tickets only when online	Smart bus ticket, QR code, android bus ticket, web application
4	Balaji, Et al.	Smart Bus Ticket System Using QR Code In Mobile Application	Scanning codes from Aadhar card can be a safety issue	QR Code scanner, Web services, Location based services, Android , GPS, Smart Phones, Public Transport
5	Goden, M. N., Et al.	Smart Bus Ticket System Using QR Code In Android App	Unavailability of internet can be a problem	Smart bus ticket, QR code, android bus ticket, web application
6	Kushal Pal Singh, Et al.	Android Suburban Bus Ticket System	Ticket should be brought before, no option for on moment payment while being offline	Android, SQLite, Cloud Database, QR code
7	Prof. B. A. Khivsara1, Et al.	Smart Bus Ticketing System	E-payment system not present, RFID reader not in machine, thumb system, no data transfer machine to cloud, no tracking system[7]	Smart bus ticket, QR code, android bus ticket, web application
8	Miss. Mohini S. Shirsath, Et al.	A Review on Smart Bus Ticketing System using QR-Code	Use of Arduino could raise the price also precise results were not provided such as location and time	Ticketing System, QR-Code, Arduino, GPS ,GSM
9	A. Nunesa Et al.	Urban public transport service co-creation: leveraging passenger's knowledge to enhance travel experience. Antonio	Precise results were not provided such as location and time	public transport, value, mobile, crowdsourcing

II. LITERATURE REVIEW

The “Smart Bus - A smartphone based application for public transport ticket system using QR code implementation” is designed for booking tickets online via QR code. In the traditional methods, users have to wait at a ticket counter and stay in the queue for seat confirmation .This gives the freedom of choice and simultaneously solves the problems with the existing classical approach.[3] And with the introduction of the delay payment method, the procedure becomes quite user convenient.

- A. “Online Bus Tracking and Ticketing System” would allow the staff to enter the destination of the bus and then generate the QR code based on staff input for the user to scan. The staff has to manually add the destination. We solve this by planning all future routes for faster ticket generation and providing a better user experience. [1][3][5]
- B. “Online Bus Tracking and Ticketing System”, puts emphasis on the public bus transport system and shows the downfalls and limitations of the current bus transport system available for the general public. It describes the problems faced by the user while waiting for the public transport as well as the undefined clarity of schedule which is present in the current system. The time wastage while waiting and the cash problems that the users had to face is briefly mentioned. [2][6][4]
- C. “Bus ticket system for public transport using QR code” point towards the actual methodology from the user and administrator point of view. It iterates over how the ticket booking system and payment system will work on both sides and explains the ticket generation and ticket booking process briefly. It also explains how the implementation of QR codes is done to ensure cashless transactions and data tracking for business analysis. [3][5][8]
- D. By using QR code of Aadhar for bus ticket, users can scan QR code of Aadhar car instead of ticket. [4]. QR code payment might be a contactless payment methodology where payment is performed by scanning a QR code from a mobile app. [7] [8]
- E. It proposes new spatial validation features to increase the accuracy of destination results and to verify key assumptions present in previous origin-destination estimation literature. It only applies to distance based fare system. [9]

III. PROPOSED FRAMEWORK

Quick Response (QR) code is quite popular and used in many applications for bus ticketing systems. [5] In this application, users can book a ticket through pre-booking, on moment booking i.e. they can book a ticket onsite where the admin will select source and destination for the user, a QR code will be generated. After the user scans the code, the amount will be deducted from the user's wallet and the ticket will be generated. After that the details of tickets will be automatically stored in the database. Creating a cloud storage system to store data and files on cloud. Introducing delay payment method for QR scanning payments, where users will have the option to pay for their travels in case of missing internet connection. This is designed to assist in strategic planning with the right level of information and details for your future goals.

A. Classes And Their Characteristics

- 1) *User Class*: Users can search for buses which are travelling through their desired routes. Users can book seats, view the bus and route fares in advance and can pre book their seats as per user convenience.
 - a) Users can book bus using pre-book, on moment book or post book
 - b) For pre-booking: select destination, time and available buses will be displayed
 - c) On moment booking: by scanning the QR given by admin , scanner will be on
 - d) Post-booking: if internet connection is not secure then the scanned data will be saved offline on users phone and when connected to internet it'll automatically deduct money from wallet(only for on moment booking)
- 2) *Admin Class*: Admins can add routes and fares. Admin can also add buses in the company catalog. The details of routes and fares of the buses specified by the admin is passed on towards the manager for verification and validation process.
 - a) Admin can access database for saved buses or registration for a new bus(step 3)
 - b) Edit the already saved buses if needed and send for confirmation
 - c) If new bus then admin will enter the required information for bus and send for confirmation
 - d) QR will be generated for every destination
 - e) Passenger information will be stored with their respective destination
- 3) *Manager Class*: Managers approval of the added buses is required for the addition of a new bus in the catalog as well as any change on the original schedule is to be verified by the manager until then the old schedule will be followed.
 - a) Managers can login or new registration themselves
 - b) A database is automatically created for each registration
 - c) Managers can manage and confirm their bus schedule
 - d) Manage the database for buses, admin and payments
 - e) Have full access on administration activity
- 4) *Bus Class*: Bus class stores the information about the bus, which includes bus_plate_no, bus_company_name, total_seats, route_details (route locations, route timings, and fares) and payment_methods.
- 5) *Payment Class*: The user must be logged on to the system, a specific amount of money in the wallet, internet connection available for pre-book and post-book, payment account details of users and manager.
 - a) *For pre-booking*
 - The user clicks on desired time and destination
 - The system retrieves the desired buses information from DB
 - The system shows the available seats from the selected bus
 - The system shows the details of the payment
 - Send an mail or message for confirmation
 - b) *For on Moment*
 - Check offline user dataset for wallet information
 - If required amount is available proceed with the booking
 - c) *For post-booking*
 - Check the user database on phone for new entries
 - If yes then connect the user wallet to payment and deduct the amount
 - Send message to user for deduction of amount from wallet

B. Functions

- 1) Login and Signup Class (The user or admin must be a member of the system)-
 - a) Users enter their usernames/email-id or new registration (step 6)
 - b) Users enter their passwords
 - c) Users click login button
 - d) System connects to database
 - e) Homepage for respective users is displayed
 - f) For new registration, enter all the required information and then login
- 2) Logout Class (The user or admin must be a member of the system)-
 - a) The system users click to logout button
 - b) DB connection terminated
 - c) The system logout the user successfully
 - d) The system redirect to the homepage

IV. SETUP REQUIREMENTS

A. Database Requirements

- 1) Firebase for data storage and server instances
- 2) Use of MySQL for local testing environment and database testing.

B. Software Requirements (Platform Choice)

- 1) Android Studio as an IDE also using flutter framework for Application development (Dart)
- 2) Service and broadcast receiver for Android Image Processing and QR generation
- 3) MySQL

C. Hardware Requirements

- 1) Windows
 - a) Microsoft Windows 7/8/10 (64-bit)
 - b) 4 GB RAM minimum, 8 GB RAM recommended.
 - c) 2 GB of available disk space minimum, 4 GB Recommended (500 MB for IDE + 1.5 GB for Android SDK and emulator system image)
 - d) 1280 x 800 minimum screen resolution.

V. FUTURE WORK

- A. We can add GPS for the navigation
- B. Location based tracking is possible
- C. Wake up reminder for the passenger that the passenger has reached the destination
- D. Bus service rating, Helpline number
- E. Travelers' Insurance

VI. CONCLUSION

Bus Transport system is very useful, mainly in cities as it has much more advantages than other transport services in busy cities. To overcome the drawbacks of manual and traditional ticketing system, we have used QR-Code for the purpose of ticket booking and payment. In the proposed system, the user will have more effortless journey and the usage of public transport will be increased as well. By using the scanner in Smart Bus, user will scan the QR code as well as book and pay simultaneously. People won't have to wait for a long time in the queue for tickets and without knowing when the bus would come. Or if there is some problem with internet connection then the user can still get the ticket and reach the destination. The delay payment system ensures a convenient method for the users to pay for their travel.

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