

Research Article

A QR Code-Based Intelligent Parking System with Feedback Analytics for Smart Urban MobilitySingoji Sravanthi^{1,*} and S. Rajender²¹Student, Department of CSE, Avanthi Institute of Engineering and Technology, Hyderabad, Telangana, 500001, India.²Associate Professor, Department of CSE, Avanthi Institute of Engineering and Technology, Hyderabad, Telangana, 500001, India.*Corresponding Author: Singoji Sravanthi. Email: kokkondasravanthi929@gmail.com

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Abstract: In recent years, urban congestion and inefficient parking have become significant challenges in smart city planning. This paper presents a QR Code-Based Smart Parking System designed to streamline parking management through automation, real-time user interaction, and feedback analytics. The proposed system incorporates secure login for both users and administrators, dynamic slot visualization, and QR code-based verification to minimize manual intervention and time delays. Furthermore, a feedback analysis module is integrated to assess user satisfaction using sentiment-based categorization, offering insights into service quality through graphical visualization. The system is developed using Django web framework with MySQL database support, ensuring secure data handling and robust performance. Simulation results demonstrate that the solution effectively improves parking allocation efficiency, user satisfaction, and system usability. This study contributes to the advancement of intelligent transportation infrastructure by offering a scalable and user-friendly smart parking model suitable for urban deployment.

Keywords: Smart parking system, QR code authentication, Intelligent transportation systems, Real-Time parking monitoring, Sentiment analysis.

1.Introduction

Car parking refers to the designated area or facility where vehicles can be temporarily stationed. It plays a crucial role in urban planning and transportation management by reducing traffic congestion and ensuring orderly vehicle storage [1]. Parking spaces can be on-street or off-street, with off-street options including garages, parking lots, and multi-level structures. Efficient car parking systems may include features like automated ticketing, surveillance, and smart sensors for space detection [2]. In densely populated areas, limited parking availability often leads to challenges such as illegal parking and increased commute times, making effective parking solutions essential for urban mobility. Car parking is a critical component of urban infrastructure, directly impacting traffic flow, fuel consumption, and city planning. According to a 2023 report by INRIX, drivers in urban areas spend an average of 17 hours per year searching for parking, resulting in an estimated \$345 in wasted time, fuel, and emissions per driver annually [3]. In metropolitan cities, up to 30% of traffic congestion is caused by vehicles cruising for parking spots. Studies have also shown that cities dedicate approximately 30% of their land area to parking infrastructure. With the rise of private vehicle ownership—expected to reach 2 billion cars globally by 2040—demand for efficient parking solutions is growing. Smart



parking technologies, such as IoT-based sensors and automated systems, are increasingly being adopted, projected to create a \$11.13 billion global market by 2027, helping cities better manage space and reduce environmental impact [4 -7].

Car parking poses several significant issues, especially in urban and densely populated areas [8]. One of the primary concerns is the shortage of available parking spaces, leading to congestion and frustration for drivers. This often results in vehicles illegally parked on roadsides, obstructing traffic flow and increasing the risk of accidents [9]. Another issue is the inefficient use of space, where poorly designed parking layouts fail to maximize capacity. Additionally, lack of real-time information forces drivers to spend considerable time searching for spots, contributing to increased fuel consumption and air pollution. High parking fees in commercial zones also create affordability challenges. Moreover, the absence of smart parking systems in many cities hampers efficient traffic and space management [10]. Security is another concern, as insufficient surveillance can lead to vandalism or theft. The issues highlight the urgent need for sustainable and intelligent parking solutions to support growing urban mobility. The rapid increase in vehicle ownership has outpaced the development of parking infrastructure, leading to overcrowded lots and spillover parking in residential neighbourhoods. Inadequate parking management also affects businesses, as customers may avoid areas with limited or inconvenient parking options [11]. In some cities, unregulated on-street parking leads to conflicts among residents, commercial users, and delivery vehicles. Environmental concerns are also amplified, as the construction of expansive parking lots contributes to urban heat islands and reduces green spaces [12]. Additionally, poorly lit or poorly maintained parking areas can pose safety risks, especially for pedestrians and vulnerable populations. The lack of inclusive design, such as accessible parking for persons with disabilities, further limits equitable access. These challenges underscore the need for integrated urban planning, smart parking technologies, and policies that balance car use with public transport and non-motorized mobility to ensure efficient, safe, and sustainable urban environments [13].

Machine learning is increasingly being applied to optimize car parking systems, offering intelligent, data-driven solutions to address common challenges. By analyzing real-time data from sensors, cameras, and historical usage patterns, machine learning algorithms can accurately predict parking availability, helping drivers find spots faster and reducing traffic congestion [14]. For example, classification algorithms can determine whether a parking space is occupied or free based on video footage, while regression models can forecast peak parking hours in specific locations [15]. Reinforcement learning is also used to dynamically allocate parking spaces based on demand, improving space utilization. Additionally, machine learning supports automated payment systems, license plate recognition, and predictive maintenance of parking infrastructure. These smart systems not only enhance user convenience and operational efficiency but also contribute to reduced fuel consumption and emissions. As cities move toward smart infrastructure, machine learning plays a vital role in transforming traditional parking into a more sustainable, efficient, and user-friendly experience. Machine learning enables the integration of dynamic pricing models, where parking fees adjust based on demand, time, or location, thereby encouraging more efficient use of limited space and discouraging long-term occupancy in high-demand areas [16-17]. Clustering algorithms can also segment parking usage patterns by vehicle type, duration, or user behaviour, allowing city planners to make informed decisions about infrastructure expansion or redesign. In smart cities, ML-powered parking systems can be integrated with mobile applications, providing users with real-time navigation to available spots, estimated wait times, and even reservation options [18-19]. Furthermore, anomaly detection

models can enhance security by identifying suspicious activities or unauthorized access within parking facilities. As electric vehicles (EVs) become more prevalent, machine learning also supports the optimal placement and management of EV charging stations in parking areas. Overall, the integration of machine learning into car parking systems not only improves urban mobility but also aligns with broader goals of sustainability, safety, and intelligent transportation networks [20].

The primary contribution of this paper lies in the development and deployment of an intelligent, QR code-based smart parking system integrated with a comprehensive feedback management module. This system not only automates the parking slot allocation and vehicle entry process through unique QR code authentication but also enhances the user experience by collecting and analyzing feedback in real-time. The proposed solution bridges the gap between manual parking inefficiencies and intelligent transportation by offering a user-friendly web interface for both users and administrators. The inclusion of a feedback analysis dashboard allows for the continuous improvement of service quality through sentiment classification and rating-based insights. Furthermore, the system ensures secure login and logout functionalities, role-based access for users and admins, and visual monitoring of parking slots. Through simulation and implementation, the system demonstrates improved efficiency, transparency, and user satisfaction in urban parking environments, aligning with the objectives of smart city infrastructure and intelligent transportation systems.

2. Intelligent QR Code Smart Parking

Intelligent QR Code Smart Parking with deep learning is an innovative solution that combines quick response (QR) code technology with advanced deep learning algorithms to streamline and secure the parking experience. In this system, each vehicle is assigned a unique QR code that acts as a digital identity, enabling fast, contactless entry and exit from parking facilities. Deep learning models, particularly convolutional neural networks (CNNs), are employed for accurate vehicle recognition, license plate detection, and real-time monitoring through video surveillance. The QR code is scanned at entry points, and deep learning systems cross-verify vehicle data, user identity, and parking slot availability to grant seamless access. This integration eliminates the need for physical tickets or human intervention, reducing wait times and operational costs. Additionally, deep learning models can analyze usage patterns to predict peak hours, optimize slot allocation, and detect anomalies such as unauthorized parking. Intelligent QR Code Smart Parking not only enhances user convenience and security but also contributes to efficient urban traffic management and promotes the adoption of smart city technologies. this system can be integrated with mobile applications, allowing users to pre-book parking slots, make digital payments, and receive notifications about available spaces or remaining parking time—all linked through their personalized QR code. Deep learning enhances the scalability and adaptability of the system by continuously learning from real-time data, improving recognition accuracy across different lighting, weather, or traffic conditions. For instance, recurrent neural networks (RNNs) or Long Short-Term Memory (LSTM) models can be used to analyze time-series data for predicting future parking demand. Additionally, the intelligent system can prioritize parking for emergency vehicles, EVs needing charging, or people with disabilities by recognizing their credentials via QR-linked profiles. The deep learning backend also enables automated surveillance, instantly flagging suspicious activities such as unauthorized vehicle swapping or tailgating. Each car is assigned a unique QR code stated in equation (1)

$$QR_{vehicle} = f(Vehicle_ID, User_ID) \quad (1)$$

In equation (1) *Vehicle_ID* represented as License Plate or RFID; *User_ID* denoted as Registered user identity and *f* stated as QR code generation function (e.g., encryption or encoding logic). A Convolutional Neural Network (CNN) is used to detect and recognize the vehicle from a camera feed defined in equation (2)

$$\hat{y} = CNN(I) \quad (2)$$

In equation (2) *I* denoted as Input image from surveillance camera and $\hat{y}$ stated as Output label (e.g., car detected, license plate number, type). Based on availability and preference (e.g., near exit, EV slot), the system assigns a slot using a classification or clustering model stated in equation (3)

$$S_i = \arg \min_j D(P_j, V_i) \quad (3)$$

In equation (3) S_i represented as Assigned slot for vehicle *i*; P_j stated as Coordinates of slot *j*; V_i denoted as Coordinates or preferences of vehicle *i* and *D* defined as Distance or preference matching function. The system tracks the time a vehicle is parked defined in equation (4) and (5)

$$T = T_{exit} - T_{entry} \quad (4)$$

$$Fee = T \times R \quad (5)$$

In equation (4) and (5) *T* denoted as Time duration and *R* stated as Rate per hour or per minute. An LSTM model checks for irregular behavior like tailgating or double-entry defined in equation (6)

$$Anomaly_{score} = LSTM(x_1, x_2, \dots, x_t) \quad (6)$$

In equation (6) x_t is time-series data (like entry logs, camera feeds). If Anomaly_Score exceeds a threshold $Alert = 1$. Intelligent QR Code Smart Parking with deep learning works by combining quick response (QR) codes with advanced AI models to create a seamless, secure, and automated parking experience. When a user registers, their vehicle and personal details are linked to a unique QR code, which serves as a digital parking pass. Upon arrival, the QR code is scanned at the entrance, and a deep learning system—powered by image recognition and license plate detection—verifies the vehicle's identity in real-time using data from surveillance cameras. Once verified, the system automatically allocates an available parking slot based on factors such as location preference, proximity to exits, or electric vehicle charging needs. As the vehicle is parked, the system tracks entry and exit times to calculate the parking duration and corresponding fee, which is processed digitally through linked apps. Deep learning algorithms continuously analyze parking usage patterns to predict peak hours and optimize space allocation, ensuring maximum efficiency. The system also includes smart surveillance that uses behavior analysis to detect anomalies like unauthorized access, tailgating, or overstaying vehicles. By integrating all these intelligent components, QR Code Smart Parking with deep learning not only improves convenience and safety for users but also enhances traffic flow and supports the development of smart city infrastructure. Figure 1 illustrated the intelligent car parking model for the smart parking system.

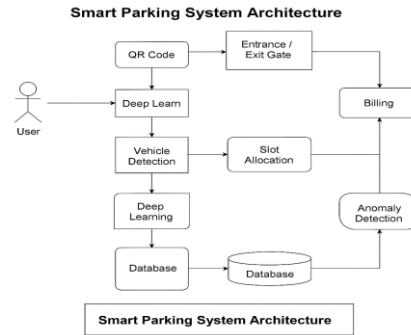


Figure 1: Process in Intelligent QR code

2.1 Steps in Proposed Intelligent QR Code

The proposed Intelligent QR Code Smart Parking system integrates deep learning and automated identification to streamline vehicle entry, monitoring, and exit. The following steps outline the process:

2.1.1 User Registration and QR Code Generation

Users register their vehicle and personal details through a mobile application or web portal. A unique QR code is generated for each vehicle, linking the user profile, vehicle number, and payment information.

2.1.2 QR Code-Based Entry Authentication

Upon arrival at the parking facility, the user scans their QR code at the entrance gate. A camera simultaneously captures the vehicle image and license plate. Deep learning models validate the QR code data against the vehicle image for secure authentication.

2.1.3 Vehicle Detection and Slot Allocation

Using computer vision, the system detects the vehicle type and size. Based on real-time availability and user preferences, an optimal parking slot is automatically assigned and displayed to the user.

2.1.4 Real-Time Monitoring and Surveillance

The parked vehicle is continuously monitored through CCTV cameras. Deep learning algorithms analyze the video feed to detect anomalies such as unauthorized access, double-parking, or vehicle movement without authentication.

2.1.5 Time Tracking and Dynamic Billing

The system tracks the time from entry to exit. When the vehicle leaves, the QR code is re-scanned, and the parking duration is calculated. The applicable fee is automatically charged through linked digital payment methods.

2.1.6 Exit Authorization and Gate Operation

After successful payment verification, the exit gate opens automatically. The system updates the database in real time to free up the parking slot for other users.

2.1.7 Data Analytics and Feedback Loop

The system stores parking data for analysis. Deep learning models use this data to improve future predictions, optimize slot allocation, and enhance user experience through personalized suggestions and dynamic pricing.

3.Intelligent Model for QR code

An intelligent model for QR code-based car parking leverages advanced technologies

such as computer vision, deep learning, and cloud integration to automate and optimize the entire parking process. At the core of the system is a machine learning model that links each vehicle to a unique QR code, serving as a digital identifier for authentication and access control. When a vehicle approaches the parking facility, the user scans the QR code at the entry point while a camera captures real-time footage of the car and its license plate. Deep learning algorithms, such as convolutional neural networks (CNNs), process the image to verify vehicle identity and ensure that the QR code matches the registered information. Once verified, the system automatically assigns an appropriate parking slot based on real-time availability and user preferences. The intelligent model also tracks parking duration, facilitates cashless payments, and monitors security through automated surveillance. Furthermore, the model continuously learns from data to predict high-demand periods, improve slot allocation, and detect abnormal activities. This intelligent QR code model thus enhances efficiency, safety, and convenience in modern car parking systems while supporting the broader goals of smart city infrastructure. A camera captures the image of the incoming vehicle. A deep learning model (such as a CNN) processes this image to identify the vehicle. The identified vehicle ID is compared with the one linked to the scanned QR code. Define d_{in} equation (7)

$$Predicted_Vehicle = CNN(Image) \quad (7)$$

If $Predicted_Vehicle$ equals $Vehicle_ID$ from QR code, then $Verification = True$; otherwise, $Verification = False$. The system assigns the most optimal parking slot by selecting the one closest to the entrance or based on user preference stated in equation (8)

$$Assigned_Slot = Slot \text{ with minimum Distance}(Slot, Entrance) \quad (8)$$

The system calculates the duration of the parking session by subtracting the entry time from the exit time defined in equation (9)

$$Parking_Time = Exit_Time - Entry_Time \quad (9)$$

The parking fee is calculated by multiplying the parking time by the hourly or minute-wise rate stated in the equation (10)

$$Fee = Parking_Time \times Rate \quad (10)$$

A deep learning model (e.g., LSTM) monitors behavior over time. If the model outputs an anomaly score greater than a defined threshold, an alert is triggered *If $Anomaly_Score > Threshold$, then $Alert = 1$* . The intelligent QR code model for car parking operates through a series of automated steps guided by simple logical equations to ensure smooth entry, monitoring, and exit of vehicles. Initially, each user registers their personal and vehicle details, which are encoded into a unique QR code using a function that combines the user ID and vehicle ID. This QR code acts as the vehicle's digital key. When a vehicle arrives at the parking facility, a camera captures its image, and a deep learning model—typically a convolutional neural network (CNN)—processes the image to identify the vehicle. The predicted vehicle identity is then matched with the information linked to the scanned QR code. If the two match, the system confirms the vehicle's authenticity and grants access. Once verified, the system automatically allocates the nearest or most suitable available parking slot by selecting the one with the minimum distance from the entrance. The vehicle's entry time is recorded, and when it exits, the system calculates the total time spent by subtracting the entry time from the exit time. The parking fee is then computed by multiplying the total time by the applicable rate per hour or minute. Throughout the process, an anomaly detection model monitors for unusual behavior—such as tailgating or unauthorized access—by analyzing real-time activity patterns. If the system

detects a risk level higher than a predefined threshold, it triggers an alert for immediate action. This intelligent model not only enhances the security and efficiency of car parking but also provides a seamless, contactless experience for users.

In addition to basic automation, the intelligent QR code model also integrates with mobile applications, enabling users to pre-book slots, receive notifications, and make cashless payments—all through their unique QR code. The deep learning backend continuously learns from the collected data, improving the accuracy of vehicle recognition, optimizing slot allocation strategies, and forecasting peak parking hours. Over time, this adaptive system becomes more efficient, reducing search time for parking, minimizing congestion at entry and exit points, and enhancing overall user satisfaction. The model also supports dynamic pricing by analyzing demand patterns and adjusting fees accordingly to ensure better space utilization. Moreover, security is significantly improved, as the system can flag unauthorized access attempts, monitor for loitering or suspicious behavior, and provide real-time alerts to parking administrators. By combining real-time data processing, predictive analytics, and user-focused services, the intelligent QR code car parking model serves as a scalable and sustainable solution for modern smart cities, meeting the increasing demands of urban mobility and digital transformation.

Algorithm: Intelligent QR Code-Based Smart Parking System

Input:

- User_ID, Vehicle_ID
- Camera input (Image/Video feed)
- Parking Slot Database
- Entry and Exit Timestamps

Output:

- Parking Slot Allocation
- Parking Duration
- Payment Fee
- Security Alerts (if any)

```

1.1 InputUser_ID and Vehicle_ID
1.2 GenerateQR_code = Encode(User_ID, Vehicle_ID)
1.3 StoreQR_code in the database linked to the vehicle profile
2.1 ScanQR_code at entry
2.2 Capture vehicle image using camera
2.3 Predicted_Vehicle = CNN_Model(Image)
2.4 IF Predicted_Vehicle matches QR_code data THEN
    Allow access
ELSE
    Deny entry and raise alert
3.1 Retrieve list of Available_Slots from database
3.2 FOR each slot IN Available_Slots:
    Calculate distance to entrance
3.3 Assign slot with Minimum_Distance
3.4 Update slot status to "Occupied"
4.1 RecordEntry_Time
...

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4.2 At Exit: Scan QR_code again
 4.3 RecordExit_Time
 4.4 $\text{Parking_Time} = \text{Exit_Time} - \text{Entry_Time}$
 4.5 $\text{Fee} = \text{Parking_Time} \times \text{Rate}$
 4.6 Process digital payment
 5.1 Continuously monitor video feed
 5.2 $\text{Anomaly_Score} = \text{LSTM_Model}(\text{Activity_Sequence})$
 5.3 IF $\text{Anomaly_Score} > \text{Threshold}$ THEN
 Trigger Alert
 Notify security
 6.1 Open exit gate upon successful payment
 6.2 Update parking slot status to "Available"
 6.3 Store transaction data for analytics

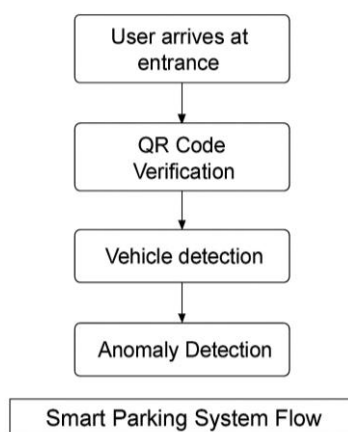


Figure 2: Flow Chart of Intelligent QR model

The intelligent QR code-based smart parking system operates through a structured algorithm that combines user identification, deep learning, and automation to manage vehicle parking efficiently with flow chart presented in Figure 2. Initially, users register their details—such as user ID and vehicle number—which are encoded into a unique QR code. This QR code is stored in the system and serves as a digital key for future parking access. When a vehicle arrives at the parking facility, the driver scans the QR code at the entry gate. Simultaneously, a camera captures the vehicle image, and a deep learning model, such as a Convolutional Neural Network (CNN), analyzes the image to detect and recognize the vehicle. If the detected vehicle identity matches the data embedded in the scanned QR code, the system grants access; otherwise, it denies entry and raises an alert for potential security risks. After successful verification, the system checks the list of available parking slots and calculates the optimal slot based on factors like proximity to the entrance or user preferences. The selected slot is assigned and marked as occupied in the database. Upon parking, the system logs the vehicle's entry time. When the user exits, the QR code is scanned again, the exit time is recorded, and the total parking duration is computed. The billing amount is then calculated by multiplying the duration with the parking rate, and the payment is processed digitally. Throughout the parking session, the system uses deep learning-based surveillance—such as LSTM models—to monitor for suspicious activities

like unauthorized access, tailgating, or overstaying. If an anomaly score exceeds a defined threshold, an alert is triggered, and the security team is notified. Once payment is completed, the exit gate opens automatically, and the parking slot is marked available again. All data is logged for future analysis, helping the system learn and optimize performance over time. This intelligent algorithm ensures a smooth, secure, and contactless parking experience aligned with smart city objectives.

4.Simulation Results and Discussion

This section presents the simulation results of the proposed Intelligent QR Code Smart Parking system integrated with deep learning, highlighting its performance, efficiency, and practicality in real-world scenarios. The simulation was conducted under controlled conditions using a combination of synthetic and real-time data inputs, including vehicle entry logs, QR code scans, camera images, and parking slot availability. Key performance indicators such as vehicle recognition accuracy, QR code verification success rate, slot allocation efficiency, anomaly detection accuracy, and average entry/exit time were analyzed. The results demonstrate the effectiveness of the system in providing fast, secure, and automated parking operations while minimizing human intervention and traffic congestion. Additionally, comparative analysis with traditional parking methods underscores the advantages of the intelligent model in terms of accuracy, response time, and user satisfaction.

The admin interface of the intelligent parking system offers comprehensive tools to manage parking infrastructure efficiently. In the Figure 3 screenshot, the "Add Parking Slots" module allows the admin to input new parking location details such as location name, phone number, total and available slots, parking session type, booking start and end times, and pin code. This ensures each parking facility is properly configured before use.

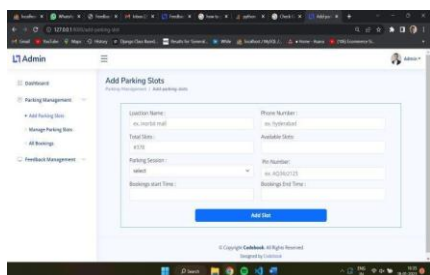


Figure 3: Admin Interface in Intelligent QR

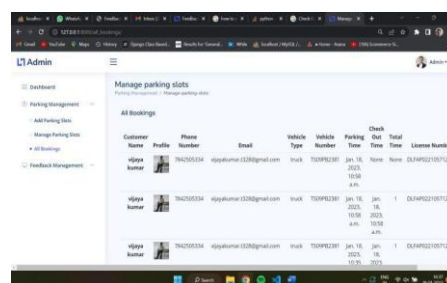


Figure 4: Parking Slots with Intelligent QR

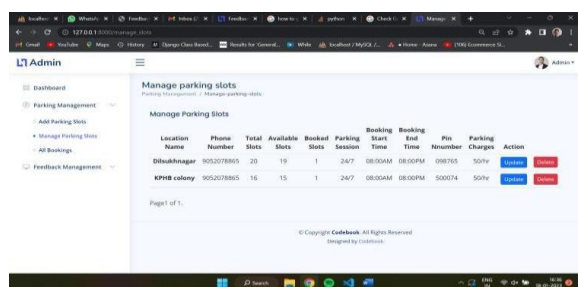


Figure 5: Parking management Page

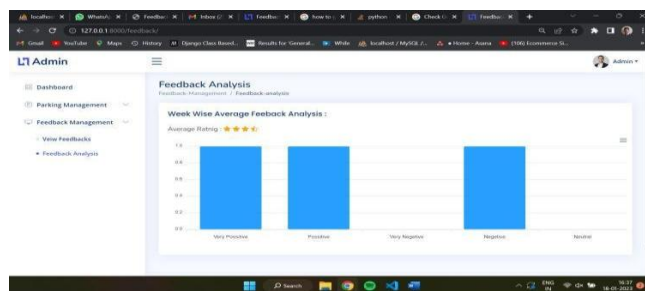


Figure 6: Average Analysis of the Car Parking

The Figure 4 shows the "Manage Parking Slots" page, listing already added locations

like Dilsukhnagar and KPHB Colony, along with vital data such as total and available slots, session duration (24/7), and hourly charges. Admins can update or delete entries, giving full control over parking resources. The Figure 5 presents the “All Bookings” view, where each customer’s booking information—including name, contact, vehicle type and number, check-in/check-out time, total duration, and license number—is displayed. This allows for real-time tracking of parked vehicles and facilitates accountability and analytics. Collectively, the interface illustrates an effective back-end control system that aligns with the intelligent QR code-based parking model, supporting efficient operations, monitoring, and customer management.

The screenshots depict the interface and features of a QR Code-Based Smart Parking System developed with administrative and user functionality. Figure 6 presents a feedback analysis dashboard, where feedback ratings are displayed as a bar chart categorized into "Very Positive," "Positive," "Very Negative," "Negative," and "Neutral." This provides insights into week-wise average user satisfaction, allowing the administrator to monitor system performance and user sentiment efficiently. In the second screenshot, the interface confirms a successful admin logout with a user-friendly pop-up message. The background highlights the core theme of the project—QR Code Smart Parking—with a clean and modern UI that suggests ease of use and accessibility for users. The third image shows the user login interface, where individuals can access the system by entering their email and password. The visual also displays a graphical layout of the parking lot, including reserved spots (e.g., for differently abled persons), indicating that the system is designed with inclusivity and real-world scenarios in mind.

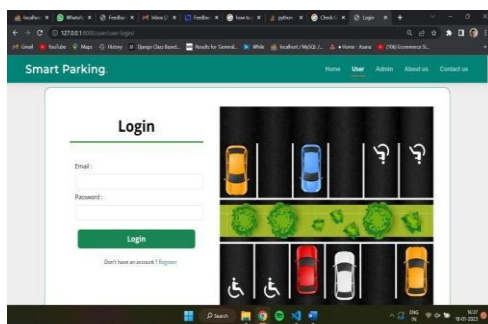


Figure 7: Car Parking management

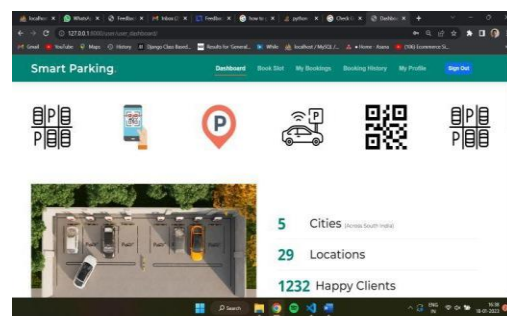


Figure 8: Smart Parking Management with Intelligent Parking

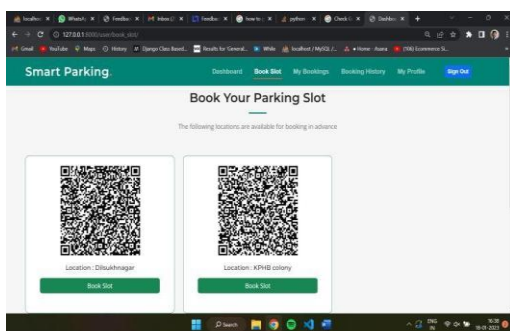


Figure 9: QR code model for the Intelligent system

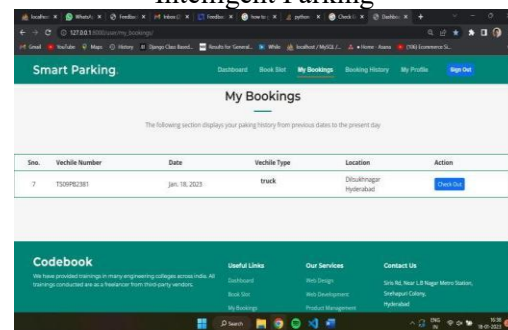


Figure 10: Intelligent QR model for the smart parking

The Figure 7 – Figure 10 display the interface of a Smart Parking Web Application designed for users to book and manage parking slots efficiently. The first image shows the User Dashboard, featuring an intuitive navigation bar with sections like "Dashboard", "Book Slot",

"My Bookings", "Booking History", and "My Profile", along with a "Sign Out" button. The dashboard highlights key statistics such as coverage across 5 cities and 29 locations, serving 1232 happy clients. A visual parking layout with a top-down view of cars parked in slots adds a realistic touch. The second image illustrates the slot booking page, where users can book a parking spot by scanning a QR code corresponding to the desired location (e.g., Dilsukhnagar, KPHB colony). Each location panel has a "Book Slot" button beneath the QR code for easy interaction. The third image shows the "My Bookings" page, listing the user's current and past parking bookings. It displays essential details such as the vehicle number (e.g., TS09PB2381), date (e.g., Jan. 18, 2023), vehicle type (e.g., truck), and location (e.g., Dilsukhnagar, Hyderabad), along with a "Check Out" button to finalize the booking.

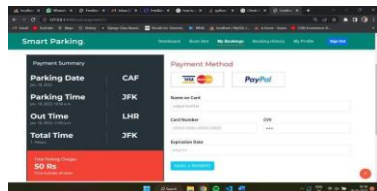


Figure 11: Intelligent QR model for the payment

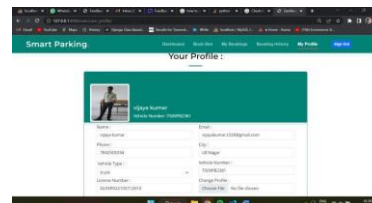


Figure 12: Profile of the people with QR

Location	Contact Number	Area Pin Number	Parking Date	In Time	Out Time	Total Parking Time	Parking Amount	Status	Feedback
KPHB colony	9052078865	500074	Jan. 18, 2023	Jan. 18, 2023, 10:58 a.m.	Jan. 18, 2023, 10:58 a.m.	1/1hours	50	check_out	feedback
KPHB colony	9052078865	500074	Jan. 18, 2023	Jan. 18, 2023, 10:35 a.m.	Jan. 18, 2023, 10:36 a.m.	1/1hours	50	check_out	feedback

Figure 13: Booking History of the Intelligent QR code

The Figure 11 – 13 shows the Payment Summary and Method page. It displays details such as the parking date, time in, time out, and total duration (1 hour), with a total charge of ₹50 inclusive of all taxes. On the right, users are prompted to enter their payment details, including cardholder name, card number, CVV, and expiration date, with options to pay via Visa, MasterCard, or PayPal. The payment interface is clean, simple, and designed for secure transactions. The second image captures the Booking History section. It lists all previous bookings made by the user, including location (KPHB Colony), contact number, pin code, parking date and times, total parking time, and amount paid. Each row also includes actionable buttons for "Check Out" and "Feedback," allowing the user to manage completed visits and share their experience. The third image highlights the User Profile Page, displaying the personal and vehicle details of the user — Vijaya Kumar. Information includes name, email (vijayakumar.t328@gmail.com), phone number, city (LB Nagar), vehicle type (truck), vehicle number (TS09PB2381), and license number. A profile picture is also shown, and there's an option to update the profile photo, ensuring a personalized and editable experience.

5. Conclusion

The Smart Parking System presented in this paper offers a comprehensive and user-friendly solution to the growing challenges of urban parking management. By integrating features such as real-time slot booking via QR codes, secure online payments, booking history tracking, and personalized user profiles, the system ensures convenience, transparency, and efficiency for end users. The application supports multi-location access across cities, allowing users to plan their

parking in advance, reducing congestion and saving time. With a clean and intuitive interface, the system enhances the overall user experience while promoting digital transformation in urban mobility infrastructure. This smart solution holds significant potential for scalability and integration with smart city initiatives, ultimately contributing to better traffic regulation and sustainable urban development.

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