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Effortless Entry and Exist with QR-Code Powered Parking

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ABSTRACT—

This paper's focused on the parking issues in urbanisation namely the Centre Develops Smart Parking System with the use of QR-Code Technology, because it is perceived that a solution could be achieved with basic QR-Codes. Parking payment and space management is simple due to the fact that the QR-Codes can be scanned, allowing the system to be cheap and efficient. Customers phone while making a reservation and are instantly provided with a QR-Code unique to that reservation. The customers vehicles are checked through QR-Codes upon entering and exiting the parking facility allowing for automatic payment and verification. Space usage also allows for search and traffic time to be minimized because it employs real time data to track space availability. Its architecture is reliable and scalable due to the eld of IoT and cloud computing. The current space leads to wastage of resources such as time and therefore unfair customer service in a global competitive environment.

KEYWORDS: Smart Parking, QR Code Scanning, Contactless Payment, Real-time Parking, Vehicle Tracking, Digital Tickets, Reservation System, Access Control, Mobile App, User Authentication, Parking Analytics, Exit Validation, Dynamic Pricing, Parking Slot Availability, Secure Transactions, Cloud-Based System

HIGHLIGHTS

- Efficient Parking Management: QR codes enable seamless entry and exit by scanning at barriers, reducing manual intervention and saving time.
- Enhanced User Convenience: Users can quickly locate, reserve, and pay for parking spaces through QR code-enabled apps, streamlining the entire process.

1. INTRODUCTION

The Smart Parking System incorporates QR-Code technology to improve parking spaces utilization in urban areas. It facilitates a cashless and easy way of parking through the use of QR-Codes. Users of the system can obtain parking facilities by scanning the parking codes that are placed at the facility's site. The QR-Code system integrates with an application for making or paying for reservations. The use of the QR-Code system leads to a reduction in the use of paper as no physical tickets are required for clients, which is cost-effective and saves the environment.

Smartphones come into play in facilitating this technology as they can be used for negotiations and transactions through wallets or apps. For the operators, it is made easier by having real-time analytics of how much space is occupied, the resources and people available, and who does not authorize parking. It also secures the system better since it keeps all the vehicle and transaction information in the cloud.

The Smart Parking System minimizes traffic caused by using paper tickets for parking in cities with heavy traffic by streamlining the processes for parking. It also minimizes the amount of time spent by users looking for parking, reducing stress caused by searching for parking. Economically feasible and expansible. It begins with the admin registering vehicles and their corresponding QR-Codes in a centralized database. Users scan their QR-Codes at the parking facility, which are then verified against the stored data.

2.PROBLEM DEFINITION

Design a project of parking monitoring and control system to count the number of automobiles entering and leaving a parking, open the gate for authorized personnel, provide information about free parking spaces, create data base to provide statistics about people entering and leaving the parking space in addition to using this system for security issues such as preventing violating people to enter the parking space. This system uses efficient sensors and

display circuits to withstand the surrounding environment. The system will be powered form power utility available to supply the system components with required supply for sensors, display, Arduino, door motor, and data base computer.

3. OBJECTIVE

Enable admins to securely login and register vehicles into the database for efficient tracking and management. Allow users to input a QR-Code that the system will recognize, helping identify the vehicle and link I to the registration details. Store and manage vehicle and user information in a centralized database to facilitate verification and tracking. Verify the QR input against the stored data to confirm parking access and permissions. Sende mail notifications based on predefined conditions, such as excessive parking duration or other alerts needed by the admin.

4. SUMMARY OF ISSUES

• Role of IoT in Smart Parking Systems

• Real-Time Data Processing

• Integration of QR Code Technology

• Challenges in Implementation

• Smart Parking in Smart Cities

• Technological Advances and Solution

5. EXISTING SYSTEM

- The currently existing system for face and number plate recognition in the concept of smart parking will include a variety of technologies that are integrated together, which will be designed for security purposes, ease the process of access control, and ensure an easy time for the user. Within this system, high resolution cameras with two functionalities: face recognition and license plate recognition, will be placed at the entrance and exit point of the parking place.

- These cameras would act as the first contact points that capture vital information from both drivers and vehicles. Advanced facial recognition software component would be used to capture and authenticate the identity of drivers and passengers as they approach these points using deep learning algorithm. Then it recognizes the number plate with corresponding faces using optical character recognition with OTP verification.

DISADVANTAGES

- High Initial Costs: Setup of cameras, software, and secure infrastructure is expensive.

- Environmental Dependence: Poor lighting or weather may affect recognition accuracy.

- Maintenance Needs: Regular upkeep is required, adding to operational costs.

6. PROPOSED SYSTEM

- The process starts with the admin logging into the system to register vehicles. After logging in, the admin registers the vehicle information, storing it in the central database. Users input a QR-Code that uniquely identifies their vehicle. The system scans and recognizes the QR-Code, verifying it against the database.

- The recognized QR-Code is matched with the database records for authentication. Thus, only registered vehicles are granted access. Once authenticated, the system begins tracking the parking duration for each vehicle. Emails are sent to users about parking time or any alerts, enabling them to manage parking more efficiently.

ADVANTAGES

- Enhanced Security: Control access by verifying registered vehicles.

- Efficient Registration: Quick vehicle registration process.

- Automated Alerts: Sends email notifications for key events.

- Data Storage: Easy data retrieval and record-keeping.

- Improved User Experience: Speeds up entry and exit for users.

7. SYSTEM REQUIREMENT SPECIFICATION

This chapter describes about the requirements. It specifies the hardware and software requirements that are required in order to run the application properly. The Software Requirement Specification (SRS) is explained in detail, which includes overview of dissertation as well as the functional and non-functional requirement of this dissertation.

A SRS document describes all data, functional and behavioural requirements of the software under production or development. SRS is the most basic document, which forms the base of the software development process. It is the complete description of the behaviour of a system to be developed. Requirement Analysis discusses the conditions to be met for a new or altered product. Requirement Analysis is critical to the success to a development project.

The requirement must be documented, measurable, testable, and related to in identified business needs or opportunities and defined to a level of detail sufficient for system design. The SRS can be said to serve like a blueprint for the completion of a project. The preparation of the SRS document is for the purpose of:

- Facilitating communication between the customer, analyst, system developers, maintainers.

- To form a foundation for the design phase.

- Support system testing facilities.

- Controlling the evolution of the system.

8. SYSTEM ARCHITECTURE

HARDWARE REQUIREMENT

Processor: Intel i3/i5/i7

Ram: 4 GB

Hard disk: 160 GB

Monitor: 18inch Lcd/Led

Webcam
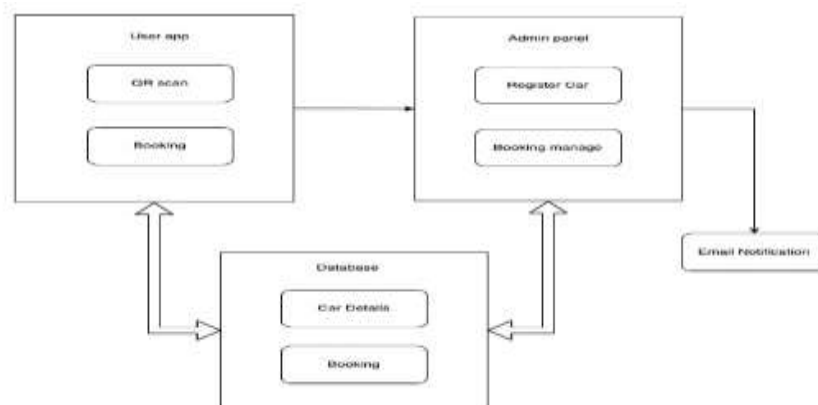
SOFTWARE REQUIREMENT

OS: Windows 8/10/11

Editor: VS Code

Python 3.7

Python with its neural network libraries

Keras – module for deep learning

9. SYSTEM ARCHITECTURE

10. PROCEDURE

- Login Page

- Select car and fill the Details

- Scanning the QR-Code

- Select the parking6duration

- Mail alert

CONCLUSIONS

This study proposes the Smart QR-Code Car Parking System presents an innovative solution to urban parking challenges, where efficiency, convenience, and flexibility are crucial. By leveraging QR-Code technology, the system simplifies the reservation and management of parking slots, significantly reducing the need for manual intervention. The QR-Code based entry and verification mechanism minimizes wait times and traffic buildup within parking areas, improving the overall user experience. Additionally, the hourly reservation system contributes to better turnover rates, allowing more vehicles to be accommodated throughout the day, especially during peak times.

The system's real-time monitoring feature provides instant updates on slot availability, which enhances transparency and helps users make informed decisions about parking. This functionality also benefits parking facility operators, who can efficiently manage slot allocation and prevent unauthorized parking. By automating notifications for reservation status, the system ensures smooth transitions, preventing overstays and optimizing resource use. Furthermore, the project has implications for future scalability, as it can be adapted to incorporate additional features like predictive analytics for anticipating demand patterns, integration with mobile payments, and possible expansion into multi-level or complex parking environments.

In conclusion, this project demonstrates a modern approach to parking management, incorporating digital tools to address longstanding inefficiencies in urban parking. The Smart QR-Code Car Parking System not only provides a user-friendly experience but also has a positive impact on reducing congestion, conserving resources, and promoting sustainable urban planning. Its potential for scalability and ease of integration into different urban settings make it a promising solution to the growing parking demands in smart cities, offering a model that can transform traditional parking into an efficient, tech-driven service.

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