Project Report

A

Project Report

On

Smart and Effective real-time Management of street parking

Submitted in partial fulfilment of the requirements for the award of degree of

Bachelor of Technology Computer Engineering

By

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CANDIDATE'S DECLARATION

I hereby certify that the work which is being carried out in this Project titled "**Smart and Effective real-time Management of street parking**" in fulfillment of the requirement for the degree of Bachelor of Technology in **Computer Engineering** and submitted to "**J. C. Bose University of Science and Technology, YMCA, Faridabad**", is an authentic record of my own work carried out under the supervision of **Dr. Atul Mishra**

(signature)

Shahjhan

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<u>CERTIFICATE</u>

This is to certify that the work carried out in this project titled **"Smart and Effective real-time Management of street parking"** submitted by **Shahjhan** to "**J. C. Bose University of Science and Technology, YMCA, Faridabad**" for the award of the degree of Bachelor of Technology in **Computer Engineering** is a record of bonafide workcarried out by them under my supervision. In my opinion, the submitted report has reached the standards of fulfilling the requirements of the regulations to the degree.

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CHAPTER 1:INTRODUCTION

1.1 Introduction

In India, the constant increase in the number of vehicles, coupled with a shortage of parking spaces, due to rapid population growth, has led to familiar urban challenges: traffic congestion, illegal parking, and environmental concerns. To address these issues, a smart parking solution is proposed, utilizing real-time data on parking availability, dynamic pricing based on demand, and a user-friendly web app for reservations and payments. This comprehensive approach not only improves urban mobility and environmental sustainability but also supports economic growth by optimizing revenue streams. Encouraging traffic compliance and orderliness, this innovation aligns with the Ministry of Housing and Urban Affairs' goal of addressing pressing street parking issues in Indian cities.

Our solution addresses the specific issues of inefficient parking allocation, time-consuming searches for parking spots, and the lack of real-time data by integrating IoT sensors with a user-friendly web app. This innovative solution provides drivers with real-time updates on parking availability, leverages machine learning to predict parking demand patterns, and offers an easy-to-use mobile app for locating parking swiftly. By optimizing parking space allocation and reducing congestion, It not only empowers drivers to find parking efficiently but also contributes to traffic decongestion, time savings, and a more sustainable urban environment.

1.2 Problem Statement

In urban environments, the escalating challenges of street parking management are evident in congested streets, revenue leakage, frustrated drivers, and environmental impacts. Conventional systems, reliant on static regulations and manual enforcement, fail to adapt to the dynamic nature of urban mobility. This results in inefficient space utilization, financial losses for municipalities, negative user experiences, and increased vehicular emissions. The inability of traditional parking management to flexibly address evolving urban demands highlights the pressing need for a shift towards smart and real-time solutions. Embracing advanced technologies is imperative to mitigate these challenges and establish a responsive and sustainable street parking infrastructure that aligns with the demands of contemporary urban living.

1.3 Purposed Solution

he proposed solution involves the development of a smart street parking management system using a combination of a robust database, HTML, CSS, and PHP technologies. The system will employ sensor technology to detect real-time parking space occupancy, with the data stored and managed in a dynamic database. The front end, built with HTML and CSS, will offer a user-friendly interface accessible through web browsers and mobile devices. PHP will facilitate seamless communication between the database and the user interface, ensuring real-time updates on available parking spaces, navigation assistance, and secure payment processing. This integration of database management and web technologies aims to create an efficient, responsive, and easily accessible street parking solution, addressing the limitations of traditional systems while providing a user-centric experience.

1.4 Objectives

The objectives of the "Smart and Effective Real-time Management of Street Parking" project are multifaceted, aiming to address key challenges associated with urban parking and enhance the overall experience for both drivers and local residents. The project objectives include:

1. **Efficient Space Utilization**:
   - Develop a system to monitor and analyze parking spaces in real-time.
   - Optimize the allocation of parking spaces to maximize utilization.

2. **Traffic Congestion Reduction:**
   - Implement measures to streamline the parking process, reducing traffic congestion caused by drivers searching for parking spaces.

3. **Enhanced User Experience:**
   - Create a user-friendly mobile application and website to provide real-time information on parking availability.
   - Facilitate easy and convenient payment options for parking fees.

4. **Data-Driven Decision Making:**
   - Collect and analyze data on parking patterns, peak hours, and user behavior.
   - Provide city planners and local businesses with valuable insights for urban planning and policy decisions.

5. **Smart Payment and Booking System:**
   - Enable mobile payments for parking fees to eliminate the need for physical currency.
   - Implement a booking system for users to reserve parking spaces in advance.

6. **Integration with Smart City Infrastructure:**
   - Collaborate with existing smart city initiatives and infrastructure to ensure seamless integration.
   - Utilize IoT devices and sensors to connect with broader traffic management systems.

7. **Adoption of Emerging Technologies:**
   - Stay abreast of technological advancements and integrate emerging technologies to enhance the effectiveness of the system.
   - Explore the integration of technologies like machine learning for predictive analytics.

8. **Community Engagement:**
   - Engage with local communities to raise awareness about the benefits of the new parking management system.
   - Address concerns and gather feedback for continuous improvement.

By achieving these objectives, the project aims to create a comprehensive and sustainable solution for real-time street parking management that not only meets the immediate needs of urban areas but also sets the foundation for future advancements in smart urban mobility.

CHAPTER 2: LITERATURE REVIEW

The literature review for the "Smart and Effective Real-time Management of Street Parking" project. You can use these as a guide to search for relevant studies, research papers, and articles in academic journals and conference proceedings:

1. Original Publication Citation Biyik, C., Allam, Z., Pieri, G., Moroni, D.,O'Fraifer, M., O'Connell, E., Olariu, S., & Khalid, M. (2021). Smart parking systems: Reviewing the literature, architecture and ways forward. Smart Cities, 4(2), 623-642. https://doi.org/10.3390/smartcities4020032.

2. L. Mainetti, L. Palano, L. Patrono, M. L. Stefanizzi, and R. Vergallo, Integration of RFID and WSN technologies in a smart parking system," in Proc. 22nd Int. Conf. Softw., Telecommun. Comput. Netw. (SoftCOM), 2014, pp. 104110.

3. Hamada R. H.Al-Absi, Justin Dinesh Daniel Devaraj, Patrick Sebastian, Yap Vooi Voon "A vision based car parking system"

As you review the literature, look for trends, common challenges, and best practices that can inform the development and implementation of the Smart and Effective Real-time Management of Street Parking project. Pay attention to both successful and less successful case studies to gather insights for effective project planning and execution.

CHAPTER 3: REQUIREMENTS

The project statement or requirements document for a parking management system using HTML, CSS, PHP, and potentially incorporating a "HASHKEY." Below is a sample project statement that outlines the requirements for a Smart Parking Management System. Note that "HASHKEY" is a term that generally refers to a cryptographic hash function; however, its specific application in your project might need further clarification.

Technology Stack:

Frontend: HTML5, CSS3, JavaScript
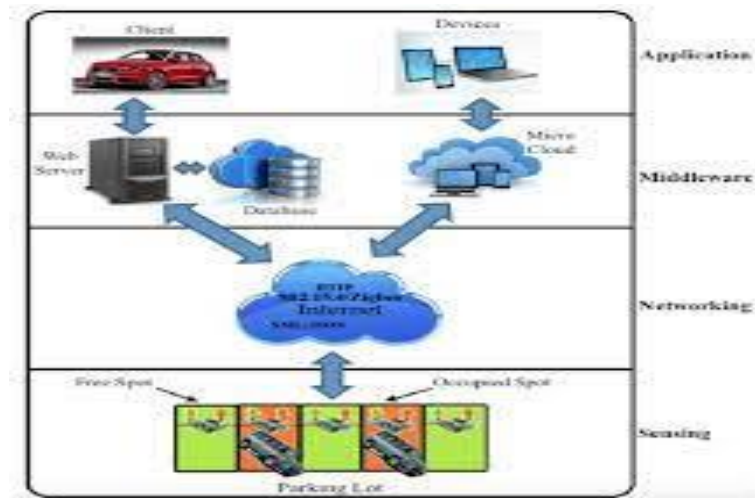**Backend: PHP, MySQL**
web Application: Hybrid framework
Security: Encryption (HASHKEY), HTTPS

Requirements:

1.User module

2.Admin module

3. Integration Module

4.Security and Privacy

5.Guard module

CHAPTER 4: METHODOLOGY

The methodology for developing a Smart Parking Management System involves a systematic and phased approach to ensure a successful implementation. Below is a suggested methodology that encompasses key stages from planning to deployment

1. Technology Selection:

1.1 Evaluate Technology Stack:

Choose appropriate technologies for the frontend (HTML, CSS, JavaScript), backend (PHP, MySQL), mobile application framework, and security measures (HASHKEY for encryption).

2.2 Integration Planning:

Plan integration with smart city infrastructure, IoT devices, and any other relevant technologies.

3. System Design:

3.1 Architectural Design:

Design the system architecture, considering scalability, modularity, and the separation of concerns.

3.2 User Interface Design:

Develop wireframes and prototypes for the user interface, ensuring a user-friendly experience.

3.3 Database Design:

Design the database schema to efficiently store and retrieve parking-related data.

4. Development:

4.1 Frontend Development:

Implement the user interface using HTML, CSS, and JavaScript.

Ensure responsiveness across various devices.

4.2 Backend Development:

Develop the backend logic using PHP, including user authentication, parking availability algorithms, and payment processing.

4.3 Web Application :

Build the web application using a hybrid framework, integrating with the backend.

4.4 Integration Implementation:

Integrate the system with smart city infrastructure, IoT devices, and other relevant technologies.

5. Security Implementation:

5.1 User Authentication:

Implement a secure user authentication system, protecting user accounts and sensitive data.

5.2 Data Encryption:

Utilize HASHKEY or equivalent encryption methods to secure communication and sensitive information.

6. Testing:

6.1 Unit Testing:

Test individual components to ensure they function as intended.
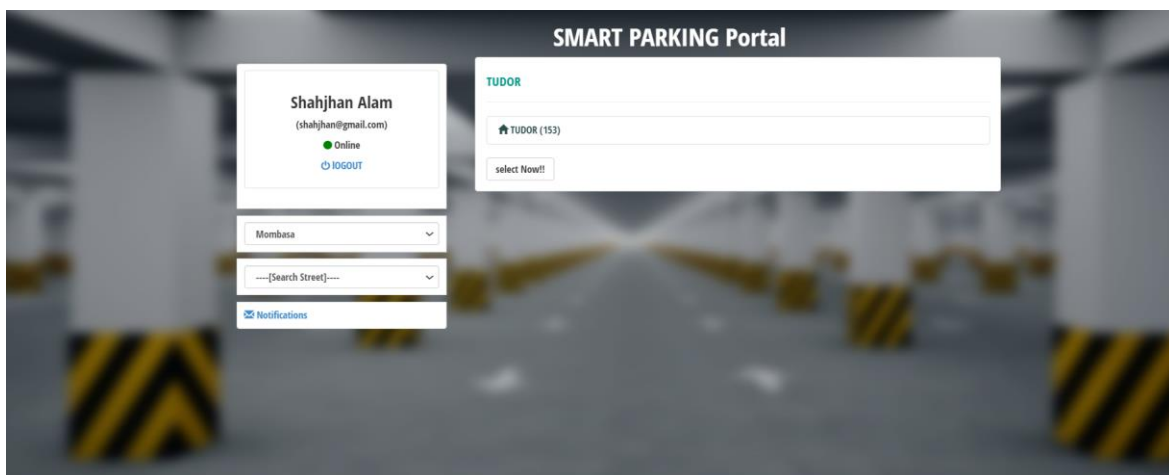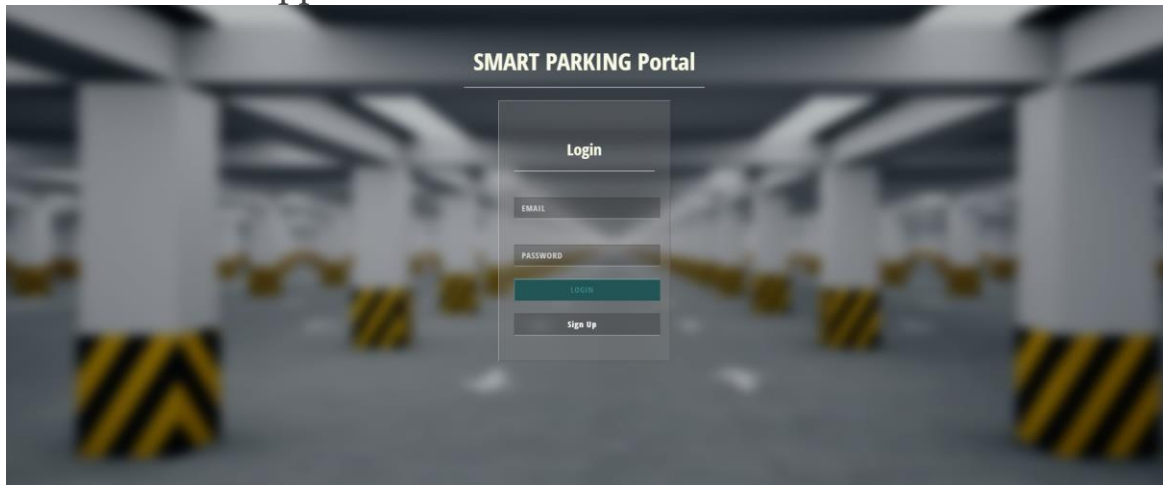
6.2 Integration Testing:

Verify the interaction between different modules and components.

6.3 User Acceptance Testing (UAT):

Conduct UAT with real users to validate the system's usability and functionality.

CHAPTER 5: RESULTS

We have built an application which looks like:

CHAPTER 6: IMPLEMENTATION

```php
admin_login.php
1   <?php
2   session_start();
3   require 'update_slots.php';
4   require 'mysqlConnect.php';
5   ?>
6   <!DOCTYPE html>
7   <html lang="en">
8     <head>
9       <meta charset="utf-8">
10      <meta name="viewport" content="width=device-width, initial-scale=1.0">
11      <meta name="description" content="">
12      <meta name="author" content="Dashboard">
13
14      <title>Admin</title>
15
16      <!-- Bootstrap core CSS -->
17      <link href="assets/css/bootstrap.css" rel="stylesheet">
18      <!--external css-->
19      <link href="assets/font-awesome/css/font-awesome.css" rel="stylesheet" />
20
21      <!-- Custom styles for this template -->
22      <link href="assets/css/style.css" rel="stylesheet">
```

```php
attendant_portal.php
160       <script type="application/javascript">
161         $(document).ready(function () {
162           $("#date-popover").popover({html: true, trigger: "manual"});
163           $("#date-popover").hide();
164           $("#date-popover").click(function (e) {
165             $(this).hide();
166           });
167
168           $("#my-calendar").zabuto_calendar({
169             action: function () {
170               return myDateFunction(this.id, false);
171             },
172             action_nav: function () {
173               return myNavFunction(this.id);
174             },
175             ajax: {
176               url: "show_data.php?action=1",
177               modal: true
178             },
179             legend: [
180               {type: "text", label: "Special event", badge: "00"},
181               {type: "block", label: "Regular event", }
```

PHP and HTML code snippet for page. This page seems to be part of a larger system for managing parking slots. Below are some observations and suggestions:

HTML Structure:
Ensure that the HTML structure is consistent and follows best practices. For example, you might want to consider organizing your HTML elements with appropriate indentation for better readability.
Form Action and Method:
The form action is set to action="admin_login.php". Make sure that the PHP logic for handling the form submission is in the same file (admin_login.php).

The form method is set to method="post". Your PHP logic checks for $_POST['admin_login'], so make sure it aligns with your form submit button.

Password Security:
The password is currently being directly used in the SQL query without any hashing. For security reasons, consider using password hashing and storing hashed passwords in your database.

SQL Injection:
Use prepared statements or parameterized queries to prevent SQL injection. The current code is vulnerable to SQL injection because user inputs ($password and $email) are directly used in the SQL query.

Redundant Code:
The form button has an attribute href="index.php". If this button is meant for form submission, you might want to remove this attribute, as the form's action is already defined.

Session Security:
When starting a session with session_start(), consider checking and validating session variables to enhance security.

UI Enhancement:
Consider adding feedback messages to inform users about the success or failure of their login attempts.

Second part:

HTML Head Section:
Favicon:
Consider providing a more descriptive favicon filename for clarity (e.g., favicon.ico).

Session Handling:
Session Start:
Ensure that session_start() is called at the beginning of all pages where session variables are used.
PHP Logic:
Redirection:
Consider using exit or die after a header redirect to ensure that no further code is executed.

Session Username Check:

Instead of if (!$_SESSION['username']), consider using if (!isset($_SESSION['username'])) for better error handling.

Sidebar:
Profile Image:
Ensure that the image file (assets/img/assistant-144.png) is present, or provide a default image if it might be missing.

Right Sidebar:
Empty Right Sidebar:
The right sidebar section appears to be empty. If it's meant to contain content, ensure that the relevant HTML/PHP code is included.

JavaScript Libraries:
jQuery Inclusion:
jQuery is included twice in the script tags. You can remove one of them to avoid redundancy.

Commenting:
Inline Comments:
Consider adding inline comments to complex sections of your code to explain the purpose or functionality.

Responsive Design:
Responsive Styles:
Ensure that the CSS styles (assets/css/style.css and assets/css/style-responsive.css) provide a responsive design for various screen sizes.

Security Considerations:
Secure Password Storage:

Ensure that passwords are securely stored using appropriate hashing algorithms.
SQL Injection Prevention:

Use prepared statements or parameterized queries to prevent SQL injection.

CHAPTER 7: SCOPE OF PROJECT

The scope of the project, "Smart and Effective Real-time Management of Street Parking," outlines the boundaries and objectives of the initiative. Below is a detailed scope that defines the key features and functionalities to be included in the project:

1.User-Friendly Mobile Application:
  - Develop a mobile application with an intuitive interface to allow users to check real-time parking availability, reserve parking spaces, and make payments seamlessly.

2.Parking Space Reservation System:
    - Integrate a reservation system to allow users to pre-book parking spaces, reducing congestion and providing a convenient experience.

3.**Community Engagement Features:**
  - Implement features that allow community members to provide feedback, report issues, and participate in the improvement of the parking system.

4.Integration with Smart City Infrastructure:
  - Collaborate with existing smart city initiatives and integrate the parking management system with broader urban infrastructure for enhanced connectivity.

5.Scalability and Future Expansion:
   - Design the system to be scalable, allowing for expansion to cover additional areas in the future. Considerations should be made for increasing the number of sensors, users, and features.

6.User Authentication and Security:
  - Implement a secure user authentication system to protect user accounts and sensitive data. Employ encryption methods for secure data transmission.

7.Emergency Services Integration:
  - Explore integration with emergency services to allow priority parking or provide assistance in emergency situations.

8.Environmental Impact Considerations:
    - Evaluate and address the environmental impact of the parking system, considering sustainability and eco-friendly practices.

The outlined scope covers the major aspects of a comprehensive Smart Parking Management System. Adjustments may be needed based on specific project goals, budget constraints, and the targeted urban environment.

CHAPTER 8: CONCLUSION AND FUTURE ENHANCEMENT

The project "Smart and Effective Real-time Management of Street Parking" aims to revolutionize urban parking by leveraging advanced technologies to improve efficiency, accessibility, and overall user experience. The implementation of real-time monitoring, reservation systems, and data analytics contributes to a smarter and more effective parking management solution.

1. **Smart Predictive Analytics:**

   Enhance the system with predictive analytics to anticipate future parking demands based on historical data, events, and seasonal patterns, allowing for proactive management.

2. **IoT Expansion:**

   Explore further integration with the Internet of Things (IoT) for additional data sources, such as weather conditions, air quality, and traffic flow, to optimize parking management in response to dynamic environmental factors.

3. **AI-Based Decision Support:**

   Implement artificial intelligence (AI) algorithms to provide advanced decision support for city planners, optimizing parking space allocation, and predicting future parking needs more accurately.

4. **Enhanced User Experience:**

   Continuously improve the mobile application's features, incorporating augmented reality for navigation to available parking spaces, personalized user preferences, and seamless integration with other urban services.

5. **Smart Payment Solutions:**

   Integrate innovative payment solutions, such as contactless payments, mobile wallets, and blockchain-based transactions, to enhance the speed and security of payment processes.

6. **Dynamic Pricing Models:**

   Implement dynamic pricing models based on demand, allowing for flexible and fair pricing structures that adapt to varying levels of demand during different times of the day or week.

7. **Collaboration with Local Businesses:**

   Foster partnerships with local businesses to provide incentives or discounts for users utilizing smart parking solutions, creating a symbiotic relationship between the parking system and the local economy.

In conclusion, the project lays the foundation for an intelligent and efficient parking management system, and future enhancements aim to push the boundaries of innovation, sustainability, and user experience in urban parking solutions. The continuous evolution of the project aligns with the ever-changing landscape of smart city technologies and the dynamic needs of urban environments..

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