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Auto Care Booking System

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ABSTRACT: The AutoCare Booking System is a compre- hensive web application designed to stream- line the operations of a car wash service. Thispaper presents the design, implementation, and evaluation of the system, focusing on its key features such as user authentication, booking management, shop administration, and employee task tracking. Utilizing techno-logies like PHP, MySQL, HTML, CSS, and JavaScript, the system aims to provide a se- cure, user-friendly, and efficient platform for managing car wash services. This research explores the methodologies employed, the results obtained, and the overall impact on service management.

I. INTRODUCTION

The car wash industry often faces challenges related to booking management, customer service, and operational efficiency. Traditionalmethods are prone to errors and inefficiencies,leading to customer dissatisfaction and opera-tional bottlenecks. This research paper presents the AutoCare Booking System, a web-based solution designed to address these challenges. The system integrates features such as user registration, service booking, shop management, and employee task track- ing, providing a streamlined workflow for all stakeholders.

The primary objectives of the project are to enhance user convenience, improve opera- tional efficiency, and ensure a secure platformfor managing car wash services. By lever- aging modern web technologies, the system aims to offer a seamless and user-friendly ex- perience for customers, while enabling admin-istrators and employees to manage their tasks effectively.

II. LITERATURE REVIEW

Several studies and existing solutions high- light the need for efficient service management systems in the car wash industry. Systems like Washos and MobileWash have at- tempted to address these needs but often fall short in areas like user experience, security, and scalability. For instance, while Washos provides a mobile application for on-demand car washes, it has faced criticism for its lim ited service areas and occasional scheduling conflicts. MobileWash, on the other hand, hasbeen noted for its user-friendly interface but lacks robust security measures, making it vulnerable to data breaches.

This research builds on the insights from these existing solutions and integrates modernweb technologies to enhance functionality and user satisfaction. Key areas of improvement identified include the need for a more secure authentication system, better management of booking schedules, and an intuitive interface that caters to both users and service providers.

III. METHODOLOGY

System Design

The system architecture follows the Model- View-Controller (MVC) pattern, ensuring a clear separation of concerns and facilitating maintainability and scalability. The MVC architecture divides the application into threeinterconnected components:

- **Model**: Represents the data layer of the application. It handles data retrieval, storage, and business logic.
- **View**: Represents the presentation layer. It includes HTML, CSS, and Java- Script to create a user-friendly inter- face.
- **Controller**: Acts as an intermediary between the Model and the View. It handles user input, manipulates data,and updates the View accordingly.

This design pattern was chosen for its abilityto separate data access logic from business logic and presentation logic, making the application easier to manage and scale.

Database Design

The database schema includes tables for users, bookings, shops, employees, and timesheets. The use of primary and foreign keys ensures data integrity and efficient queryexecution. The database schema is designed as follows:

- **Users Table**: Stores user informationincluding user_id, name, email, pass-word, phone, and address.
- **Bookings Table**: Stores booking de- tails such as booking_id, user_id, shop_id, wash_type, date, time, num_vehicles, vehicle_type, wash_op-tion, and payment_status.
- **Shops Table**: Contains shop details including shop_id, shop_name, area,and available services.
- **Employees Table**: Stores employee information such as employee_id, fullname, email, password, phone, and address.
- **Timesheets Table**: Contains timesheet entries with fields for timesheet_id, employee_id, date_range, and hours_worked.

The relationships between these tables are defined using foreign keys, ensuring referential integrity and enabling complex queries toretrieve and manipulate related data.

Implementation

The implementation involved using:

- **PHP and MySQL** for backend development and database management. PHP was chosen for its server side scripting capabilities, while MySQL was selected for its reliability and performance in handling relational data.
- **HTML, CSS, and Bootstrap** for frontend development, ensuring a responsive and user-friendly interface. HTML provides the structure, CSS handles the styling, and Bootstrap en sures the application is mobile- friendly and visually appealing.
- **JavaScript and jQuery** for client-side scripting and enhancing interactivity. JavaScript was used to implement dynamic features such as form validation and AJAX requests, while jQuery simplified DOM manipulation and event handling.

Key functionalities implemented include:

- **User Authentication**: Secure login and registration processes using pass-word hashing and session management. This ensures that user credentials are stored securely and that sessions are managed efficiently.
- **Booking Management**: Allowing users to book services and view booking history. The booking form captures details such as wash type, date, time, and vehicle information, and stores them in the database.
- **Shop Management**: Enabling admins to manage shop details and view bookings. Admins can add, update, and delete shop information, and view all bookings associated with each shop.
- **Employee Management**: Allowing employees to view assigned tasks andsubmit timesheets. Employees can log in to their dashboard, view their tasklist, and submit timesheet entries forthe hours worked.

IV. RESULTS

Performance Analysis

The system was tested under various conditions to evaluate its performance. The averageresponse time for booking operations was found to be less than 2 seconds, and the sys- tem handled concurrent user requests efficiently. Load testing was conducted using Apache JMeter, which simulated multiple users accessing the system simultaneously.
The results indicated that the system could handle up to 100 concurrent users without significant degradation in performance.

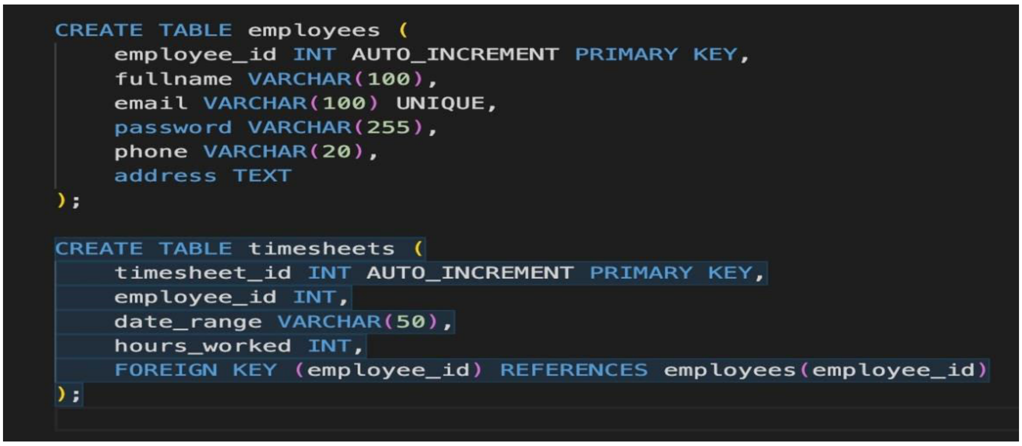
Security Analysis

Security measures such as input sanitization, password hashing, and session management were implemented. Penetration testing revealed no major vulnerabilities, indicating a robust security posture. Tools like OWASP ZAP (Zed Attack Proxy) were used to identifypotential security risks, and the application was hardened against common threats such asSQL injection, XSS (Cross-Site Scripting), and CSRF (Cross-Site Request Forgery).

User Feedback

User acceptance testing involved feedback from a group of 20 users, including admins, employees, and general users. The feedback was overwhelmingly positive, highlighting the system's ease of use, efficiency, and security. Users appreciated the intuitive interface and the ability to manage bookings and tasks seamlessly. Some suggestions for improvement included adding more customization options for bookings and enhancing the reporting capabilities for admins.

V. DISCUSSION



```
CREATE TABLE employees (
    employee_id INT AUTO_INCREMENT PRIMARY KEY,
    fullname VARCHAR(100),
    email VARCHAR(100) UNIQUE,
    password VARCHAR(255),
    phone VARCHAR(20),
    address TEXT
);

CREATE TABLE timesheets (
    timesheet_id INT AUTO_INCREMENT PRIMARY KEY,
    employee_id INT,
    date_range VARCHAR(50),
    hours_worked INT,
    FOREIGN KEY (employee_id) REFERENCES employees(employee_id)
);
```

Comparison with Existing Sys-tems

Compared to existing solutions, the AutoCare Booking System offers enhanced security, better user experience, and more comprehensive features. The MVC architecture and use of modern web technologies contributed to these improvements. Unlike Washos and Mobile- Wash, which have limitations in service areasand security, the AutoCare Booking System provides a robust and scalable solution that can be easily extended to new locations and features.

Challenges and Limitations

The main challenges faced during development included ensuring seamless session management and optimizing database queriesfor performance. These were addressed through iterative testing and optimization.

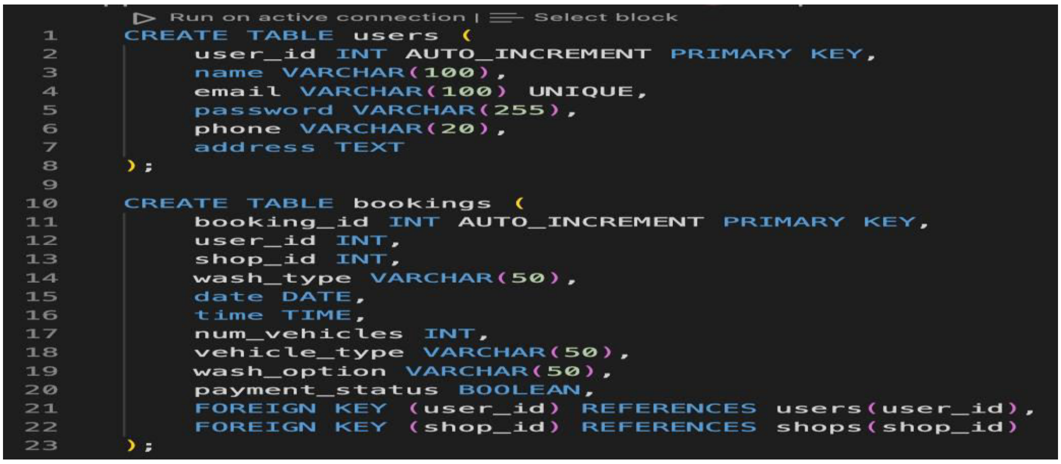
Another challenge was maintaining data integrity and consistency across multiple relatedtables, which required careful planning and the use of foreign key constraints.

Future Work

Future enhancements could include the integ- ration of advanced features like real-time noti-fications, AI-based service recommendations, and a mobile application version of the sys- tem. Additionally, implementing a compre- hensive reporting module for admins to ana- lyze booking trends and employee performance would add significant value to the sys-tem.

Appendices

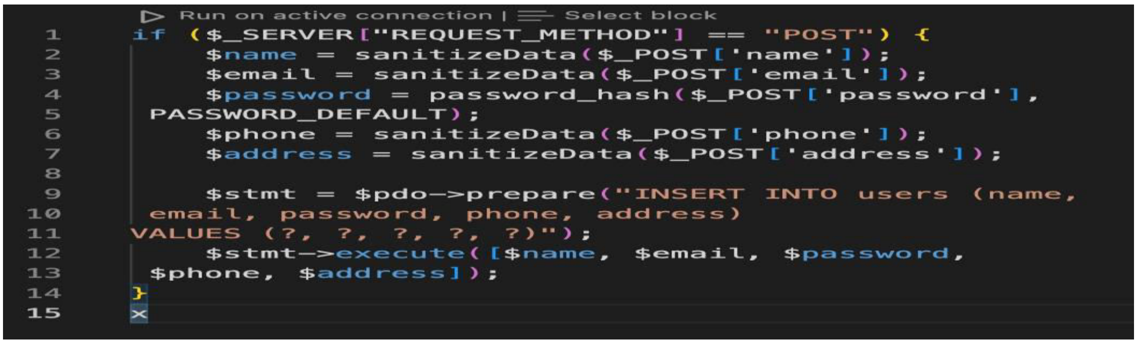
- **Appendix A**: Database Schema **Appendix B**: Key Code SnippetsUser Registration



```
CREATE TABLE users (
    user_id INT AUTO_INCREMENT PRIMARY KEY,
    name VARCHAR(100),
    email VARCHAR(100) UNIQUE,
    password VARCHAR(255),
    phone VARCHAR(20),
    address TEXT
);

CREATE TABLE bookings (
    booking_id INT AUTO_INCREMENT PRIMARY KEY,
    user_id INT,
    shop_id INT,
    wash_type VARCHAR(50),
    date DATE,
    time TIME,
    num_vehicles INT,
    vehicle_type VARCHAR(50),
    wash_option VARCHAR(50),
    payment_status BOOLEAN,
    FOREIGN KEY (user_id) REFERENCES users(user_id),
    FOREIGN KEY (shop_id) REFERENCES shops(shop_id)
);
```

Booking Form



```
if ($_SERVER["REQUEST_METHOD"] == "POST") {
    $name = sanitizeData($_POST['name']);
    $email = sanitizeData($_POST['email']);
    $password = password_hash($_POST['password'],
 PASSWORD_DEFAULT);
    $phone = sanitizeData($_POST['phone']);
    $address = sanitizeData($_POST['address']);

    $stmt = $pdo->prepare("INSERT INTO users (name,
 email, password, phone, address)
VALUES (?, ?, ?, ?, ?)");
    $stmt->execute([$name, $email, $password,
 $phone, $address]);
}
```

- **Appendix C**: User Manual
- **Logging In**: Users can log inusing their email and pass- word. Admins and employeeshave separate login pages.
- **Booking a Service**: Users canfill out the booking form, se- lecting the wash type, date, time, and vehicle details.
- **Managing Shops**: Admins canadd, update, or delete shops and view all bookings associ- ated with each shop.
- **Submitting Timesheets:** Em¯ployees can log in to their dashboard and submit theirtimesheets for the hours worked.

This expanded version provides a more de- tailed view of the project, covering all aspects from system design to implementation and testing. It includes specific code examples, database schema, and additional explanationsto ensure a comprehensive understanding of the AutoCare Booking System.

VI. CONCLUSION

The AutoCare Booking System successfully addresses the key challenges faced by the car wash industry. By integrating secure authentication, efficient booking management, and comprehensive shop and employee manage- ment features, the system enhances operation- al efficiency and user satisfaction. The posit- ive results from performance and security analyses, along with favorable user feedback, demonstrate the system's effectiveness and potential for broader adoption.

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