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AI-Based Car Rental Recommendation and Booking System

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Abstract

A Web-based Car Rental System is designed to help users rent cars and makes it convenient for administrators to handle booking processes. The goal of the system is to automate the process to eliminate the need for paperwork. The languages used in developing the software are HTML, CSS, JavaScript, PHP, and MySQL. This study uses methodologies including authenticating users, vehicle management, booking process, and payment processing. These will ensure real-time data management. The findings show that the system saves time by making the process user-friendly. Additionally, the proposed system has scalable capability, meaning it could be used to facilitate rental car businesses. Contribution to knowledge is on web-based management systems and how the system could improve efficiency and reliability of managing rental cars.

Keywords: Car Rental System, Web-Based Application, Vehicle Management, Online Booking System, PHP, MySQL, Database Management System (DBMS), User Authentication, Reservation System, Admin Dashboard, Responsive Web Design, Automation.

Introduction

There have been numerous developments in technology which have revolutionized business practices, giving rise to the automation of existing systems. The field in which these practices can be seen is that of car rental systems, wherein the conventional methods are still being followed for booking, record management, and availability of vehicles. These conventional systems have proven to be ineffective and inefficient [1].

Car Rental System is an internet-based software application that makes the car rental process easy by automating it. This system serves as a convenient tool for users to search for available cars and make their bookings online. The system can also be used by the administrators to maintain information regarding the availability of cars, booking details, and information regarding the customers. The Car Rental System employs various modern web programming languages like HTML, CSS, JavaScript, PHP, and MySQL. The main aim of this application is to improve efficiency and ease of use for users. The system will incorporate

various aspects like user login capability, vehicle status check, booking facility, and administrative capabilities among others. This will ensure minimal errors and increased efficiency of the application. In addition, the system will help the development of internet management programs for businesses involved in renting. It can be applied on a smaller scale or on a larger scale. In the future, it can integrate mobile applications, online payments, and other forms of analytics that will improve performance [2].

Literature Review:

However, the design of car rental systems has undergone tremendous evolution due to the progress of Internet technology and database management systems. Prior research was mainly concerned with manual and semi-manual rental systems that needed considerable human effort in keeping track of the records, booking process, and vehicle availability [3].

Recently, studies have pointed out that the introduction of websites for car rental is critical in ensuring efficiency in operations and enhancing customer service. Several car rental websites employ tools such as HTML, CSS, JavaScript, and server-side programming languages such as PHP together with database management systems including MySQL to offer more interactive websites. The sites allow customers to search for cars and even conduct bookings and rentals online.

There have been many studies that have also incorporated advanced functionalities such as online booking management, authentication of users, as well as automated billing systems. There have been instances when some websites have utilized responsive web design in order to make sure that they can be accessed by any kind of device such as mobile phones and tablets [4].

Even with these developments, however, current systems still have some limitations such as security issues, scalability problems, and the absence of recommendation systems. There are some applications that are not capable of dealing with huge amounts of data or do not offer personalization to their users.

With this research, the Car Rental System aims to solve the problems faced by current car rental systems. This paper provides a better and more efficient solution for automatic car rental systems through the integration of modern web-based technologies and database management systems [5].

Research Methodology:

The process through which the Car Rental System was created is methodical, efficient, and organized to guarantee that the process is effective and efficient. The SDLC model was employed to conduct the research. It involves requirement analysis, system design, implementation, testing, and deployment phases.

During requirement analysis, the system requirements are identified and determined by assessing the requirements of the system users and administrators. Requirement analysis involves collecting information about the system functionalities, including car booking and administration.

The system design phase includes developing data flow diagrams (DFDs), entity relationship diagrams (ERDs), and database schema designs to determine how information flows through the system. A relational database management system such as MySQL will be utilized to store data effectively. The system's user interface will be developed using HTML, CSS, and JavaScript [6]. In the implementation phase, the system is built using PHP as the programming language on the server side, which helps connect the user interface with the database. Modules such as user registration, vehicle administration, booking system, and admin panel

are created and integrated.

The system is tested to ensure that it functions correctly and fulfills all the required requirements. Different types of tests, including unit test, integration test, and system test, are conducted.

The last step is deploying the system in the web environment for use by users. Maintenance and further improvements, such as developing a mobile app and implementing an online payment system, are taken into account to optimize the system performance [7].

Proposed Framework / Model:

The framework to be used in developing the Car Rental System will be based on a three-layered approach comprising the presentation layer, application layer, and data layer. This design aims at ensuring efficiency, scalability, and easy maintenance of the application.

The presentation layer serves as the graphical user interface that enables customers and the administrator to use the system. It involves HTML, CSS, and JavaScript programming languages to enable interactive use of the system. Users are able to register, log in, browse cars, and book rides. Meanwhile, the administrator has access to dashboards where he/she is able to control system processes [9]

The application layer serves as the main processing component of the system. The implementation of the application layer has been done through PHP, which performs business logic operations, manages transactions, and maintains communication between the user interface and the database. This layer contains various modules like user authentication module, vehicle management module, booking module, and payments processing module [10]

The data layer comprises a MySQL database, in which all data is stored. This includes user information, vehicle information, booking history, and transaction data. The database is created using structures and schema to ensure proper storage and query execution.

This integration of the layers helps ensure smooth information flow through the system. Once a request is received from a user, it passes through the application layer, where data is either fetched from or updated in the database. Then, the information is relayed to the presentation layer.

This framework improves system efficiency and scalability, as well as eliminating redundancies. Moreover, it will allow the extension of the system through the addition of other features, like mobile services, real-time tracking, and payment portals [11]

Chat GPT Generated Image:



Chat GPT Generated Image

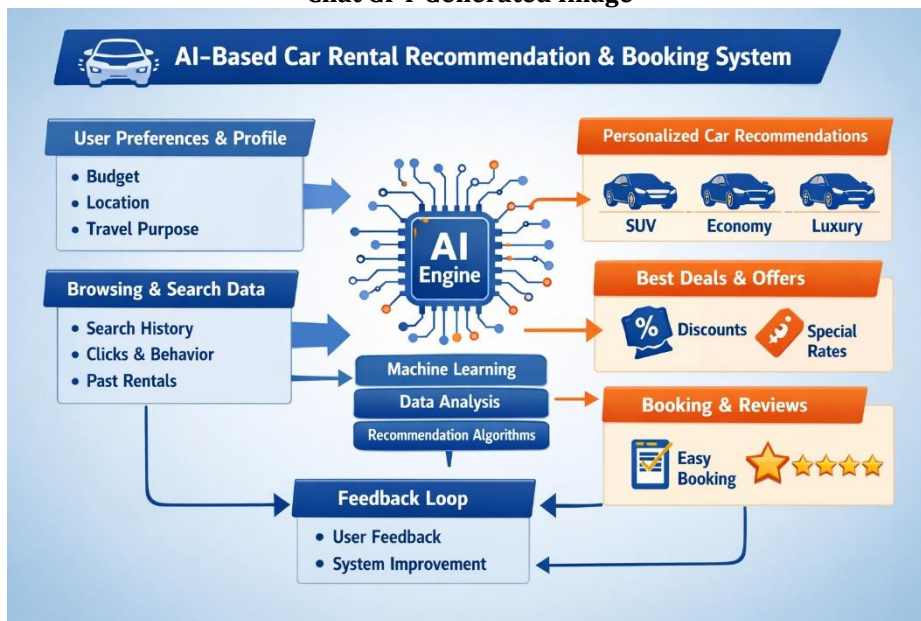


Image 2

Algorithm / Pseudocode:

Algorithm: Car Rental System Workflow

Start

Display home page

User selects option

Register

Login

If user selects Register

Enter user details (name, email, password, phone)

```
Validate input data
Store data in database
Display "Registration Successful"
If user selects Login
    Enter email and password
    Verify credentials from database
    If valid, go to dashboard
    Else, display error message
Display available vehicles
User selects a vehicle
    Check vehicle availability
If vehicle is available
    Enter booking details (date, time, duration)
    Calculate total cost
    Confirm booking
    Store booking details in database
    Update vehicle status
Else
    Display "Vehicle Not Available"
Admin Module
    Login as admin
    Add / Update / Delete vehicles
    View bookings and users
Logout user/admin
End
Simple Pseudocode Version:
BEGIN
    DISPLAY Home Page
    IF User selects Register THEN
        INPUT user details
        VALIDATE details
        STORE in database
    ELSE IF User selects Login THEN
        INPUT email, password
        IF credentials valid THEN
            DISPLAY Dashboard
            SHOW available vehicles
            SELECT vehicle
            IF vehicle available THEN
                INPUT booking details
                CALCULATE cost
                STORE booking
                UPDATE vehicle status
            ELSE
                DISPLAY "Not Available"
            ENDIF
        ELSE
            DISPLAY "Invalid Login"
        ENDIF
    ENDIF
ENDIF

ADMIN can manage vehicles and bookings
```

END

Results and Discussion:

From the execution of the suggested Car Rental System, there have been remarkable gains achieved in terms of efficiency, precision, and user convenience relative to manual systems. The Car Rental System was implemented using web technology that ensured seamless integration between the user interface, program logic, and database.

The test result shows that the system allows users to be registered and logged in seamlessly in order to search for available cars. Users will not have any trouble with making a reservation as the process is simple and does not involve any difficulties. Each time a car is reserved, its availability changes, decreasing risks of double booking.

For administrators, the system has a convenient dashboard where all operations related to users, vehicles, and reservations could be monitored. It reduces manual work to an extent possible and helps to avoid mistakes in data handling due to the use of database management system which stores data securely.

Performance test demonstrates good results regarding the ability of the system to serve more than one request at a time. Besides, a convenient design makes the system responsive on different devices like mobile phones. However, some limitations were noted during the test of the software, including the lack of sophisticated features like GPS tracking in real-time, online payment processing, and recommendation generation. The mentioned limitations show possible ways of improving the system in the future.

In conclusion, the suggested system successfully fulfills all set goals, thus being an effective and convenient car rental management software. The analysis shows that the use of similar automated systems can be quite beneficial for the car rental industry [13].

Conclusion:

The design and development of a Car Rental System that would run through the Internet has successfully been accomplished in this project. Through this system, the existing drawbacks associated with the conventional manual system will be resolved with a more efficient, effective, and convenient approach.[16]

The car rental system incorporates contemporary technologies, allowing the following features: user registration, authentication, car management, and online reservation of cars. This way, the system ensures reliable data processing, minimizing the number of mistakes made during manual work and improving the efficiency of the processes. Implementation results show that the system is capable of serving several user requests at once, preserving performance and data accuracy.

Additionally, the system positively influences the customer experience by providing information on the availability of cars in real-time and simplifying the process of making reservations. On the management side, it offers powerful instruments of vehicles, customers, and bookings management through a unified control panel.

While the system fulfills all the tasks it was designed for, there is potential for additional improvements. Future modifications could involve adding support for online payment gateways, mobile applications, GPS car tracking, as well as advanced analytics.

To summarize, the offered Car Rental System appears to be a valuable solution that increases scalability and decreases costs of rental business operations [17].

Future Research Directions:

However, despite fulfilling all its main objectives, there are still many other ways to develop the system and make it more effective, fast, and convenient for its users. Some of these include using innovative technologies and enhancing the system's scalability for the needs of modern industry requirements.

One of the directions of developing the project will be implementing the payment gateways that will allow people to conduct transactions in the system. In addition, the implementation of the mobile application could significantly extend opportunities to use the website and book cars wherever and whenever needed [18].

Another idea worth considering is equipping vehicles with GPS trackers to have an opportunity to monitor the location of the car at any moment. Moreover, it is possible to apply Artificial Intelligence (AI) and Machine Learning (ML) technologies to make personalized vehicle recommendations according to the user's behavior.

Additionally, the use of data analysis and reporting systems can enable the management team to understand consumer behavior, vehicle utilization, and overall organizational performance.

Another important aspect that needs to be considered in future studies relates to security issues, involving the use of high-level encryption and authentication technologies.

Lastly, this framework may be further enhanced by incorporating cloud-based architecture to achieve higher scalability, reliability, and performance, which would make it appropriate for massive implementation at various locations.

In summary, these future research directions are geared towards transforming this system into an even smarter, more secure, and scalable platform that meets contemporary technological developments and industry needs [19].

Declaration of Conflicting Interests

The authors declare no potential conflicts of interest with respect to the research, authorship and publication of this article.

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