IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 4, April 2026

DOI: 10.17148/IJARCCE.2026.154147

BIKE ON RENT: A WEB-BASED BIKE RENTAL MANAGEMENT SYSTEM

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Abstract: The Bike On Rent system is a full-stack web-based application designed to simplify and automate the process of renting bikes. Traditional bike rental systems are often manual, time-consuming, and lack real-time availability tracking, which leads to inefficiencies and poor user experience.

This project introduces a modern bike rental platform developed using the MERN stack (MongoDB, Express.js, React.js, Node.js), providing a centralized system for users, vendors, and administrators. The system allows users to browse available bikes, check details, and book rentals online with ease. Vendors can manage bike inventory, update availability, and track bookings through a dedicated dashboard.

Real-time updates are enabled to ensure accurate bike availability and seamless booking experience. Secure authentication mechanisms are implemented to protect user data and transactions. The system also includes admin control for monitoring and managing overall platform activities.

Overall, the application improves efficiency, reduces manual effort, and provides a scalable and user-friendly solution for bike rental services.

Keywords: Bike Rental System, MERN Stack, Web Application, Online Booking, Rental Management

I. INTRODUCTION

Bike rental services have become increasingly popular due to their convenience and cost-effectiveness for short-distance travel. However, traditional rental systems rely heavily on manual processes, which are inefficient, time-consuming, and prone to errors.

To overcome these challenges, the Bike On Rent system is developed as a web-based platform that digitizes the entire rental process. The system allows users to easily search for available bikes, book rentals online, and manage their bookings efficiently.

The platform is designed using modern full-stack technologies to ensure scalability, security, and real-time data handling. By automating rental operations, the system enhances user experience and improves operational efficiency for vendors.

II. SYSTEM DESIGN AND METHODOLOGY

The Bike On Rent system is developed using a modular full-stack approach based on the MERN stack. The development process begins with requirement analysis, followed by system design and implementation.The system architecture consists of three main components: frontend, backend, and database. The frontend is developed using React.js to provide a responsive and user-friendly interface. The backend is built using Node.js and Express.js, which handle business logic and API integration. MongoDB is used as the database to store user data, bike details, and booking information.

The system includes three main modules: user module, vendor module, and admin module. Users can register, log in, browse bikes, and make bookings. Vendors can add and manage bike listings, while the admin monitors system activities and ensures smooth operation.

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The Data Flow Diagram (DFD) represents how data flows from users to the backend, gets processed, and is stored inthe database. The system ensures secure authentication, real-time updates, and efficient data management.

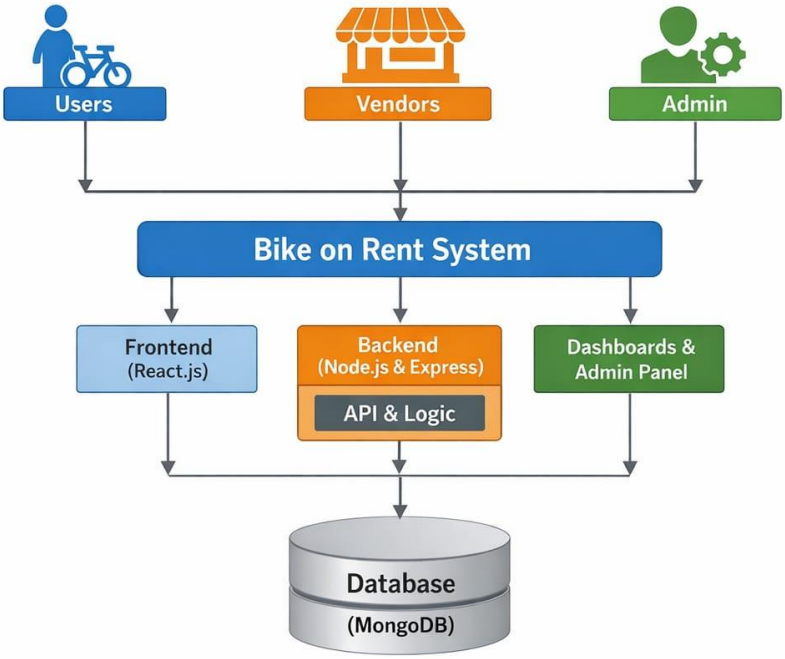

Fig. Data Flow Diagram

III.MODELING AND ANALYSIS

The system is designed using a structured approach where data is processed across multiple modules. The core functionality includes managing bike listings, user bookings, and rental transactions.
User inputs such as registration details and booking requests are processed through REST APIs and stored in the database. The system validates and processes this data to ensure accuracy and consistency.
The vendor module allows bike owners to manage inventory and update availability in real time. The admin module provides complete control over users, vendors, and system data.
The system ensures efficient interaction between all modules, providing real-time updates and seamless user experience. This structured modeling approach ensures reliability, scalability, and efficient performance

IV. RESULTS AND DISCUSSION

The results show that the Bike On Rent system significantly improves the efficiency of bike rental operations. Compared to traditional systems, the proposed solution offers faster booking, better data management, and improved user experience.
The system reduces manual effort and minimizes errors by automating the rental process. Real-time updates ensure accurate bike availability, which enhances user satisfaction.
However, the system depends on internet connectivity for real-time operations, and integrating multiple technologies increases system complexity. Despite these limitations, the system provides a strong foundation for future enhancements such as online payment integration, GPS tracking, and mobile application support.

V. CONCLUSION

The Bike On Rent system successfully provides a modern solution for managing bike rental services. It automates the booking process, improves efficiency, and enhances user experience.The use of MERN stack technologies ensures scalability, flexibility, and high performance. The system reduces manual work, minimizes errors, and provides a centralized platform for users, vendors, and administrators.

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In the future, the system can be extended with advanced features such as online payments, location tracking, and mobile app integration to further enhance functionality and usability

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