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BookMyTurf: Smart Turf Booking System with Real-Time Scheduling and Digital Payment Integration

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Abstract: *The TurfBook project presents a modern web-based platform designed to streamline the booking of sports turfs for players and facility managers. The primary motive is to replace inefficient manual processes such as phone calls and spreadsheets with a digital solution offering real-time slot availability, instant confirmation, secure payments, and a built-in wallet system. By integrating React.js for the frontend and Firebase for backend services, the system aims to enhance user convenience, reduce scheduling conflicts, and promote greater participation in sports activities.*

The purpose of this project is to create an accessible, responsive single-page application that supports turf discovery via interactive maps, flexible booking with date and time selection, payment through Razorpay, booking history management, player community features, and a review system. TurfBook addresses key pain points in the sports ecosystem by providing transparency, operational efficiency for turf owners, and a seamless experience for end users, ultimately contributing to better utilization of sports infrastructure in urban areas like Nagpur and beyond.

Keywords: Turf Booking, Firebase, React, Razorpay, Real-time System, Payment Integration, Wallet, Rating System, Sports Management

I. INTRODUCTION

The TurfBook system is a modern single-page web application (SPA) specifically designed for online booking and management of sports turfs. The user interface was developed using React 18 functional components combined with custom CSS styling, ensuring a clean, intuitive, and fully responsive design without dependency on heavy external UI libraries. Navigation across various sections such as turf listing, booking page, wallet, history, and profile is efficiently handled by React Router DOM version 6, while Lucide React provides consistent and lightweight icons. The integration of Leaflet.js enables users to visually locate nearby turfs through an interactive map, significantly improving the overall user experience on both desktop and mobile devices.

Data generation and management in TurfBook rely entirely on Firebase as the backend service. Real-time data including turf details, available time slots, user bookings, wallet balances, and reviews are dynamically fetched and updated using Firebase Firestore queries and onSnapshot listeners. This approach ensures instant synchronization across all active users whenever a booking or cancellation occurs. The application uses custom React hooks and service modules to encapsulate authentication, database operations, and payment logic, maintaining clean separation of concerns and improving code maintainability. No traditional server-side classes are required due to the serverless nature of Firebase.

The software requirements for developing and running TurfBook include Node.js environment, React 18 with Vite 5 as the build tool for fast development and optimized production bundles, Firebase SDK version 10.7 for authentication and real-time database, Razorpay for payment processing, and Leaflet for mapping functionality. The project is configured for easy deployment on Vercel through a dedicated vercel.json file, with environment variables managed

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securely via .env files. This combination of technologies results in a lightweight, scalable, and production-ready application suitable for both individual developers and potential commercial expansion.

II. LITERATURE REVIEW

Existing literature on sports facility booking systems consistently highlights the drawbacks of conventional manual reservation methods, including lack of real-time availability information, high chances of booking conflicts, delayed payments, and limited record-keeping capabilities. Several earlier studies proposed basic web or mobile applications built with PHP, MySQL, or native Android frameworks, which primarily focused on simple booking and payment modules but suffered from scalability issues and absence of real-time features. These systems often required significant server maintenance and failed to provide seamless user experiences across devices.

Recent research has shifted toward modern JavaScript frameworks and cloud-based backend services. Multiple projects have explored the combination of React.js with Firebase for developing real-time applications in domains such as event booking, hotel reservations, and sports facility management. Studies have demonstrated that Firebase's real-time database and authentication services significantly reduce development time and improve data synchronization compared to traditional client-server architectures. However, most reviewed systems still lack integrated digital wallet functionality, community features for finding fellow players, or comprehensive review mechanisms that enhance user trust and engagement.

Comparative analysis of existing turf or ground booking applications reveals that while some solutions offer map integration and payment gateways, they often remain platform-specific (Android-only) or suffer from slow update speeds. Literature also emphasizes the growing importance of user-centric design, responsive interfaces, and secure payment options in increasing adoption rates. The TurfBook project builds upon these findings by incorporating real-time Firestore listeners, Razorpay integration, a dedicated wallet system, and community features, thereby addressing several gaps identified in previous works and offering a more holistic solution for sports turf management.

III. PROPOSED SYSTEM

A. Overview:

The proposed TurfBook system is a complete end-to-end web platform that enables users to discover, book, and manage sports turfs efficiently through a single intuitive interface. It supports core functionalities such as user authentication, advanced turf search with map visualization, real-time time-slot selection, secure online payments, wallet-based transactions, booking history tracking, cancellation with refunds, and user reviews. By combining these features, the system creates a transparent and convenient booking ecosystem that benefits both individual players seeking quick reservations and turf owners looking for better occupancy management. The inclusion of an "Available Players" feature further fosters a sense of community among sports enthusiasts.

B. System Architecture

TurfBook adopts a client-side rendered architecture powered by React 18 and Vite, with Firebase functioning as a complete Backend-as-a-Service (BaaS). The frontend communicates directly with Firebase Authentication for secure email/password login and Firestore for all data storage and real-time operations. Payment processing is managed through the Razorpay SDK, while wallet logic and booking records are maintained as Firestore documents. Leaflet.js is integrated for geospatial services, allowing users to explore turfs geographically. This serverless design eliminates the need for a custom backend server, resulting in reduced operational costs, automatic scalability, and real-time data updates through Firestore listeners. The entire application is configured for seamless deployment on Vercel using the provided vercel.json configuration.

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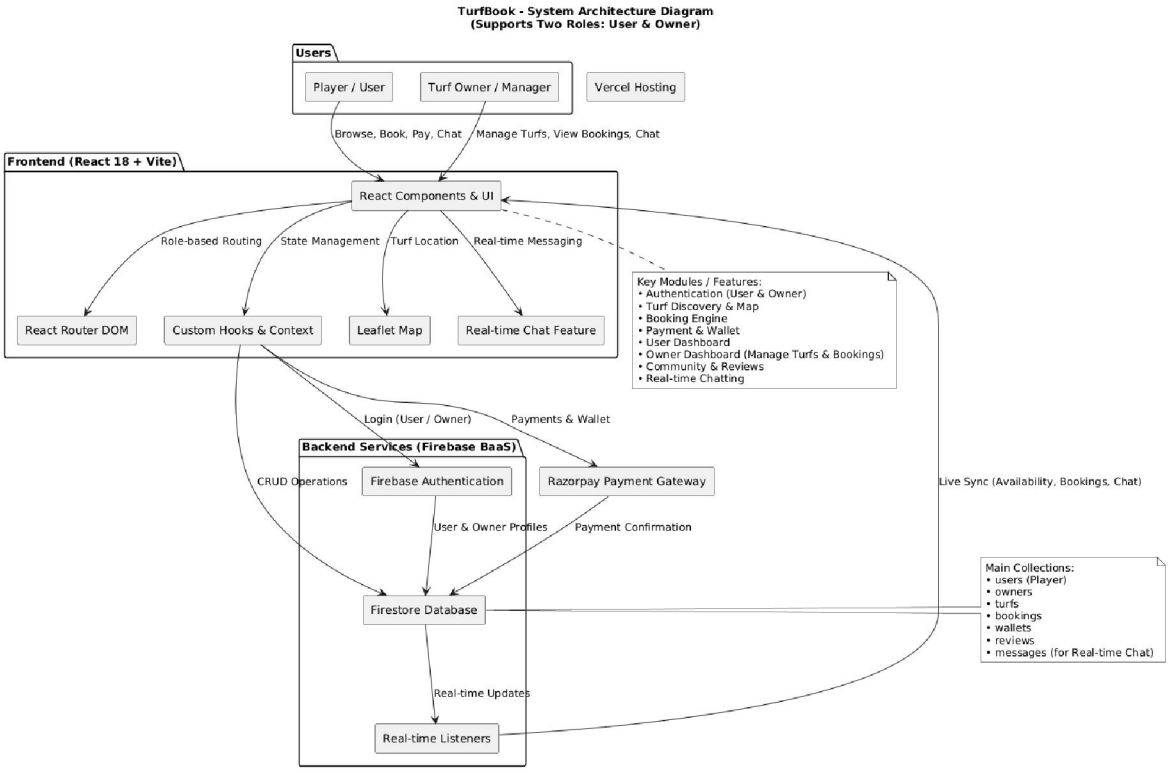

C. Module-wise Breakdown

1. Authentication Module:

Handles user registration, login, logout, and session management using Firebase Authentication (Email/Password). It includes protected routes via React Router and stores user UID in Firestore for linking bookings and wallet data.

Outcome: Provides high security, prevents unauthorized access, and enables personalized user experience across devices.

2. Turf Discovery Module:

Responsible for browsing, searching, and visualizing turfs. It fetches turf documents from Firestore, applies filters (location, sport type, price), and renders an interactive Leaflet map with markers. Turf cards display details like rating, amenities, and availability preview.

Outcome: Improves discoverability, saves time for players, and increases visibility & occupancy for turf owners.

3. Booking Engine Module:

Core logic for date selection (using HTML date picker or React date library), fetching real-time available slots via Firestore queries, and reserving a slot temporarily. It performs conflict checks before proceeding to payment.

Outcome: Eliminates scheduling conflicts, provides instant confirmation, and ensures accurate slot reservation.

4. Payment & Wallet Module:

Integrates Razorpay Checkout for card/UPI payments and maintains a user-specific wallet document in Firestore. Supports top-up, automatic deduction during booking, and refund on cancellation. Stripe JS is also included in dependencies for potential future expansion.

Outcome: Offers frictionless and flexible payment options, reduces payment failures, and enables quick refunds to wallet for future bookings.

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5. User Dashboard Module:

Provides personalized views: booking history (upcoming + past), cancellation option (with policy check), and profile management. All data is pulled from Firestore collections linked to the user UID.

Outcome: Gives users full control and transparency over their bookings, reduces manual follow-ups, and builds long-term trust.

6. Community & Review Module:

Implements "Available Players" feature (shows users who have booked the same turf/slot) and star-rating/review system. Reviews are stored per turf in Firestore and displayed with average ratings.

Outcome: Builds a sports community, helps users find teammates, and improves turf quality through genuine feedback and higher ratings.

4. IMPLEMENTATION AND VALIDATION

Implementation of the TurfBook project was executed using React 18 for building reusable functional components and Vite for rapid development with excellent hot module replacement support. Firebase SDK was integrated to handle authentication, real-time database operations, and data synchronization, while Razorpay's checkout functionality was incorporated for secure payment processing. Custom hooks were developed to manage complex logic such as booking flows and wallet transactions, ensuring clean and maintainable code structure. The project follows modern React best practices with environment variables for secure configuration of API keys.

Validation was performed through systematic testing approaches. Individual React components and hooks underwent manual unit testing to verify correct rendering and state management. Integration testing focused on the interaction between the frontend and Firebase services, including real-time data updates and payment callback handling. End-to-end system testing covered complete user journeys from registration to booking confirmation and cancellation. Cross-browser compatibility and responsive behavior on various screen sizes were also thoroughly validated to ensure a consistent user experience.

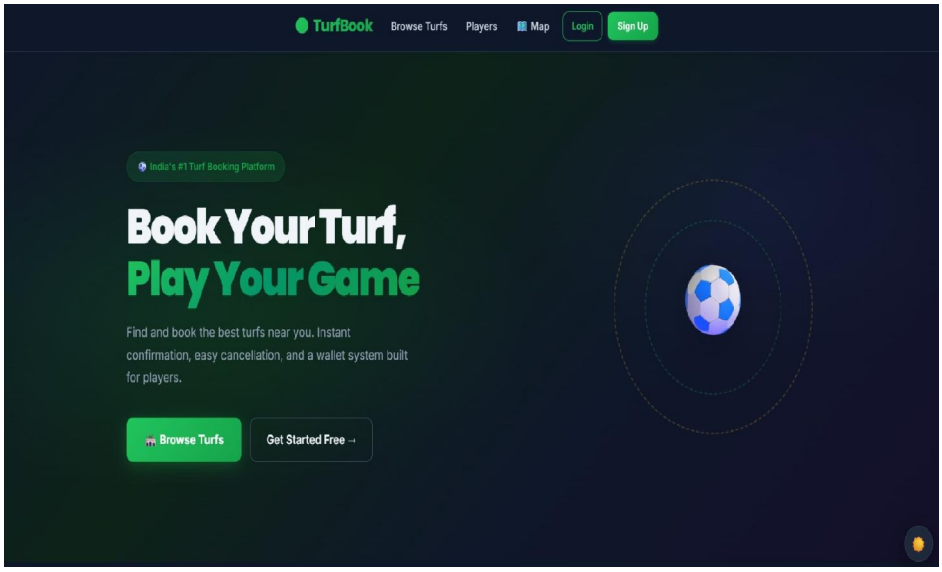

Fig.1.Main DashBoard

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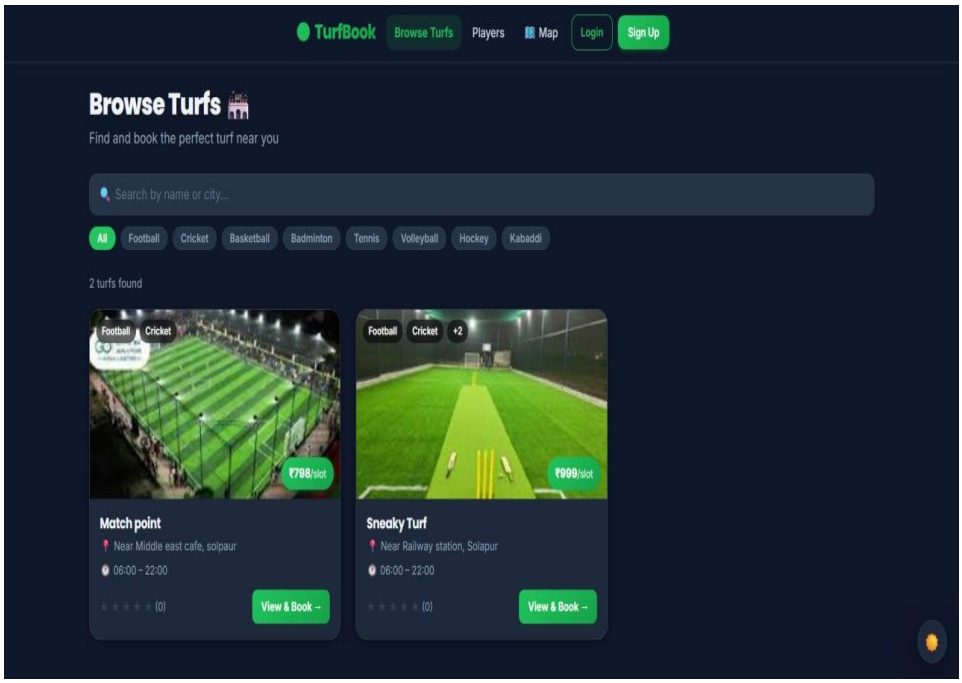

Fig. 2.Turf Listing Page

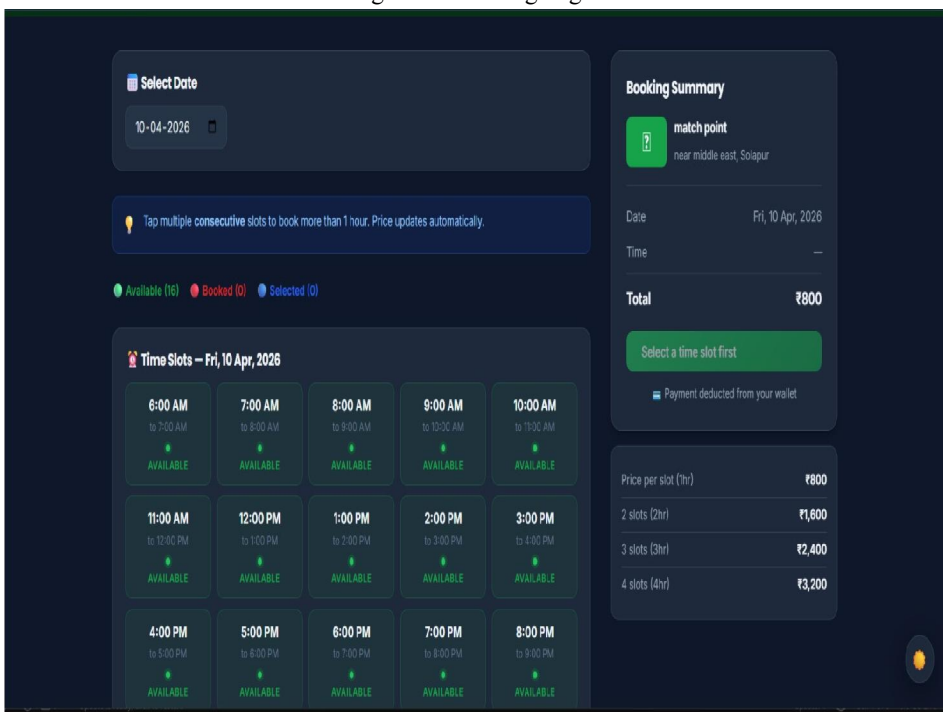

Fig.3. Booking Page

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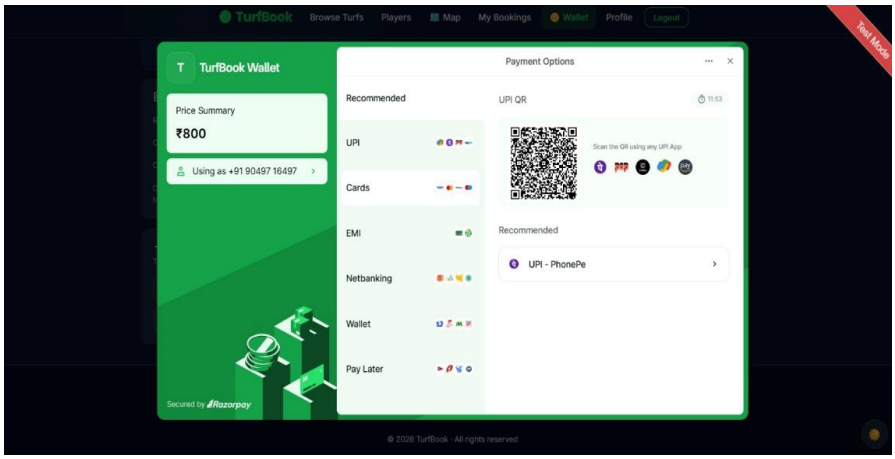

Fig. 4. Payment Page

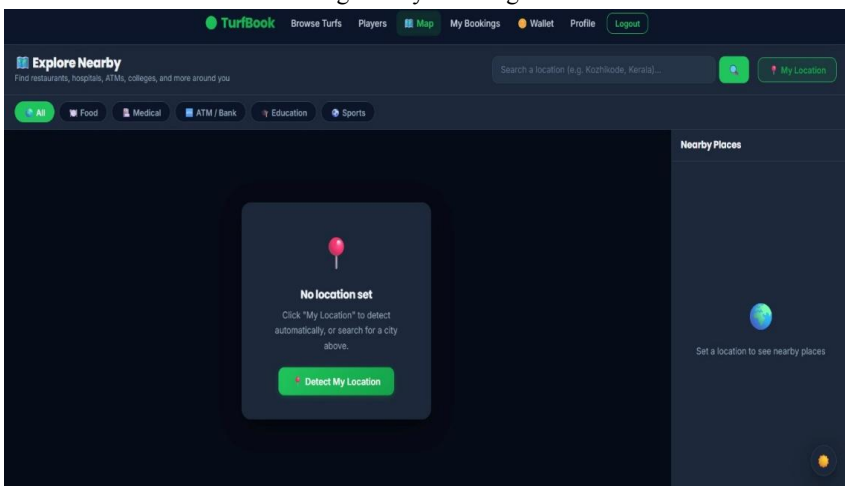

Fig.5. Map View

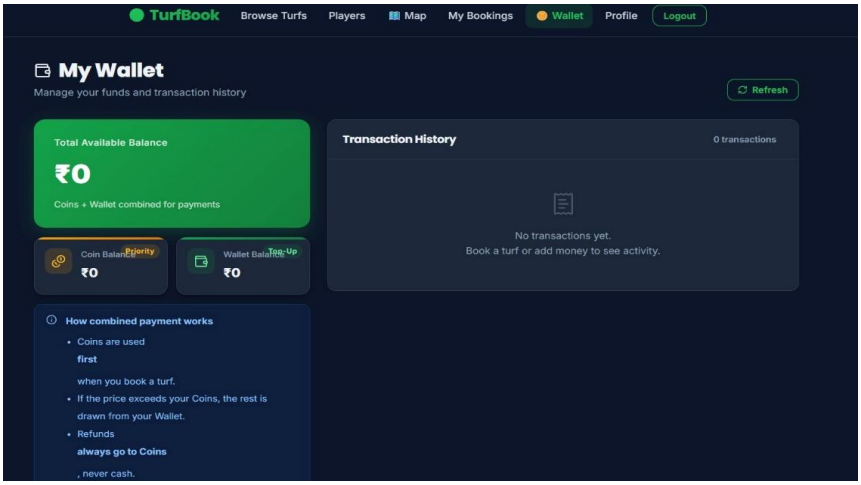

Fig. 6. Wallet Page

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V. RESULTS AND DISCUSSION

The developed BookMyTurf system successfully provides real-time visibility of turf availability and enables instant booking confirmations, significantly reducing the time and effort required compared to traditional manual methods. Users can efficiently search for turfs using an interactive map, select suitable time slots, complete payments through Razorpay or wallet, and receive immediate booking receipts. The wallet system proved particularly effective in handling refunds during cancellations, offering users greater flexibility and convenience. Performance evaluation showed smooth real-time synchronization and responsive interface behavior across devices.

Discussion of the results reveals that the Firebase-based serverless architecture delivers excellent scalability and low latency for real-time features, making the system suitable for concurrent users. The inclusion of community features and review mechanisms has the potential to increase user engagement and trust in the platform. However, the system's heavy reliance on internet connectivity and possible limitations of Firebase's free tier for large-scale deployment were noted as areas for consideration. Overall, BookMyTurf demonstrates clear improvements in convenience, transparency, and operational efficiency over conventional turf booking approaches.

VI. CONCLUSION AND FUTURE WORK

In conclusion, the BookMyTurf project successfully delivers a robust and user-friendly online turf booking platform by effectively leveraging React.js, Firebase, and Razorpay technologies. The system addresses key challenges in sports facility management through real-time data handling, secure payment integration, digital wallet functionality, and additional community features, thereby providing significant value to both players and turf owners. Its responsive design and seamless booking experience position it as a practical solution for modern sports infrastructure needs in growing cities.

Future work on this project includes the development of a cross-platform mobile application using React Native to further enhance accessibility for users on the go. Additional enhancements may involve creating a dedicated admin dashboard for turf owners to manage listings and analytics, implementing artificial intelligence-based turf recommendations, and adding support for multiple languages and push notifications. Exploring advanced analytics for booking trends and integrating more payment gateways could also strengthen the system's capabilities and commercial viability.

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