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Rebound: Centralised Sports Data System

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***Abstract*—Systematic performance analysis in sports requires structured and accessible performance data. However, amateur athletes are not offered suitable means of efficiently recording their game statistics. This means that their performance is not well documented. The study seeks to create a centralized game logging system that is effective in analyzing performance data. The system is intended to offer a unified platform that can be used in documenting game events, recording statistics, and retrieving analysis based on aggregated data. The system is based on a mobile platform that ensures performance tracking is consistent. The study's findings highlight the need for centralized game logging in performance documentation and analysis. By integrating a mobile interface with a cloud-based data infrastructure, the platform supports consistent performance tracking and improved accessibility of sports data. The results demonstrate tcentralisedized game logging can enhance performance documentation and provide meaningful analytical insights for athletes and coaches.**

Keywords— Sports analytics; athlete performance tracking; game logging; sports data management; athlete performance analysis

I. Introduction

Data-driven analysis plays a critical role in modern sports performance evaluation. Professional sports organizations rely on analytical platforms to monitor athlete performance, evaluate strategies, and support long-term player development. These systems use structured datasets and analytical tools to generate insights for training optimization and match preparation. However, access to such advanced performance tracking technologies remains largely limited to elite sports environments.

Athletes participating in amateur or semi-professional sports often lack accessible tools to systematically document their sporting activities. Match records, player statistics, and game outcomes are frequently maintained informally or remain undocumented. The absence of structured performance records limits the ability of athletes and coaches to analyze trends, monitor improvement, and maintain a comprehensive history of athletic participation.

A. Background and Motivation

Recent digital platforms demonstrate the potential of centralized data systems to support structured sports data management. By allowing athletes and coaches to record match statistics, player contributions, and game outcomes in a unified system, fragmented records can be transformed into organized datasets suitable for analysis. Centralized game logging enables athletes to maintain detailed histories of matches, teams, and statistical contributions.

Analytical tools integrated into such platforms can further generate visual insights from recorded data. Metrics such as average points, rebounds, and assists can be presented through graphs and statistical summaries, enabling athletes and coaches to evaluate performance trends and identify areas for improvement.

B. Problem Statement

Despite the increasing importance of sports analytics, athletes outside professional ecosystems face several challenges:

- Lack of centralized platforms for recording game statistics
- Limited access to tools for evaluating athlete and team performance
- Absence of structured digital portfolios documenting athletic progress

Existing sports analytics platforms primarily target professional leagues or organized teams, leaving amateur athletes with limited options for systematic performance documentation.

C. Research Gap

Current sports performance systems typically address isolated aspects of athlete management, such as match statistics recording or social interaction features. Few platforms integrate structured game logging, performance analytics, athlete portfolio generation, and team-level analysis within a single

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accessible system. This limitation highlights the need for a unified platform capable of organizing and analyzing sports performance data.

D. Proposed Approach

To address these limitations, this work presents *Athlinix*, a centralized sports performance tracking and analytics platform designed for athletes and coaches. The system enables structured recording of game events, player statistics, and match outcomes while generating analytical insights from collected data. By integrating game logging, performance visualization, team analytics, and athlete profile management within a unified environment, Athlinix supports consistent performance tracking and documentation.

E. Contributions

The primary contributions of this work are:

- Development of a centralized platform for recording games and player statistics
- Integration of analytical tools for athlete and team performance evaluation
- Support for digital athlete portfolios documenting sporting activities
- Unified analysis of both individual and team performance metrics

II. Related Work

The increasing use of data analytics in sports has led to the development of technologies that capture and analyze athlete performance. Professional sports organizations rely on analytical systems that utilize structured datasets, statistical modeling, and player tracking technologies to evaluate performance and support strategic decision-making. These approaches highlight the importance of structured performance data in improving training outcomes and competitive strategies.

Several commercial platforms support sports performance tracking. Applications such as *Strava* focus on endurance sports by allowing users to record activities, monitor fitness metrics, and analyze performance trends. Similarly, wearable devices and mobile fitness trackers monitor physiological parameters such as heart rate, distance, and training intensity. While these platforms are effective for individual fitness monitoring, they provide limited support for structured recording of game events in team sports.

Other platforms such as *Hudl* and *GameChanger* offer tools for match statistics recording and gameplay analysis. Hudl focuses primarily on video analysis for tactical evaluation, while GameChanger provides scorekeeping and basic statistical tracking for organized teams. However, these platforms are generally designed for structured leagues and emphasize team management or video analysis rather than long-term performance tracking for individual athletes.

Despite these developments, accessible systems that enable athletes to record and analyze structured game statistics across multiple matches remain limited. The system proposed in this study addresses this gap by introducing a centralized game logging platform that integrates statistical tracking, performance analytics, and athlete portfolio generation within a unified framework.

III. System Architecture

The proposed platform enables athletes and coaches to record match information and player statistics through a mobile application. Users can create teams, log games, and access analytical summaries derived from stored performance data. The backend maintains a centralized repository containing athlete profiles, team information, game records, and statistical metrics.

The architecture ensures that performance data entered through the mobile interface is stored in a centralized database and processed to generate analytical insights.

A. User Interface Layer

The user interface layer provides access to the system through a mobile application. Athletes and coaches can create profiles, record match information, log player statistics, and view analytical dashboards. The interface supports features such as game logging, team management, performance visualization, and athlete profile management.

B. Application Logic Layer

The application logic layer manages core system functionality. It processes user inputs, validates data, and coordinates interactions between the mobile interface and backend services. Key operations include creating game records, updating player statistics, and retrieving historical performance data for analysis.

C. Data Management Layer

The data management layer stores information related to athletes, teams, games, and player statistics in a centralized cloud database. Entities include user profiles, teams, game logs, and player performance records. These structured relationships allow the system to track athlete performance across multiple matches and support efficient retrieval of historical data.

D. Analytics and Visualization Module

The analytics module converts recorded game statistics into performance insights for athletes and teams. Statistical computations are applied to structured game logs to generate key performance indicators (KPIs), which are visualized through dashboards and graphical summaries.

1) Athlete Performance Metrics: Athlete-level analytics evaluate performance trends across multiple games. A player impact score is calculated to represent overall contribution in a match:

$$ImpactScore = Points + Rebounds + Assists + Steals - Fouls \quad (1)$$

This metric allows the system to identify standout performances and analyze long-term player development.

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2) Team Performance Metrics: Team-level analytics evaluate collective performance using scoring statistics and match outcomes. Performance consistency is measured using the standard deviation of point differentials across games:

$$\sigma = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(Diff_i - \mu)^2} \tag{2}$$

A team stability score is derived from this variation:

$$Stability = \max(0, \min(100, 100 - 3\sigma)) \tag{3}$$

These metrics allow the system to evaluate team consistency and performance trends across multiple matches.

IV. Database Design

The system uses a relational database architecture to manage structured sports data related to athletes, teams, games, and player performance statistics. The schema follows a normalized model to ensure data integrity, maintain clear entity relationships, and support efficient querying for performance analytics.

Fig. 1. Relational Database Schema for the Proposed Sports Data Management System

A. Core Entities

The database consists of several primary entities including *Users*, *Athlete Profiles*, *Coach Profiles*, *Teams*, *Team Memberships*, *Games*, and *Player Game Statistics*.

The *Users* table stores core identity information such as username, email, and role. Athlete and coach profiles extend the user entity with role-specific attributes such as playing position and experience. The *Teams* entity represents sports teams, while *Team Memberships* models the many-to-many relationship between users and teams. The *Games* entity stores match-level information including participating teams and match results, and *Player Game Statistics* records individual athlete performance for each game.

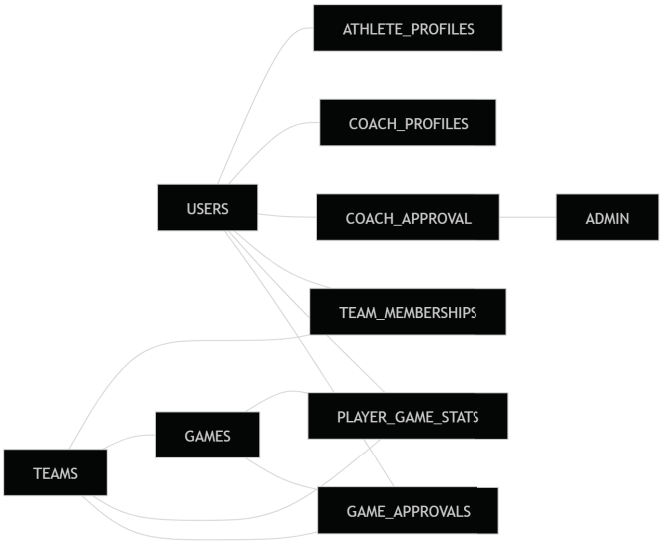

Fig. 2. High-level entity relationship diagram of the Rebound database architecture

B. Entity Relationships

The database structure supports performance tracking across multiple games. Users may have either an athlete or coach profile depending on their role. Users and teams are connected through the *team_memberships* table, while each game links two teams and multiple player statistics records. This structure enables the system to maintain match histories and track athlete performance over time.

C. Analytical Data Support

To support performance analysis, the system utilizes database views and materialized views that aggregate player and team statistics. These structures enable efficient retrieval of metrics for dashboards and analytical queries. Foreign key constraints and indexing ensure referential integrity, prevent duplicate records, and maintain consistency across game logs and player statistics.

V. Results and Analysis

The proposed centralized game logging system was evaluated by recording and analyzing basketball game statistics within the platform. The obtained data was applied to determine how the system could keep the structured records of the performance, as well as produce analytical information based on the acquired game logs.

A. Structured Game Documentation

The use of centralized game logs helped in the systematic storage of match details such as teams involved in the matches, match result, and the performance of individual players. Each recorded game generated a structured dataset linking athletes, teams, and statistical contributions within a single match record. This structure allowed the system to maintain a complete match history for athletes across multiple games.

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The central repository of the game logs helped to improve consistency of the performance records as compared to informal forms of tracking the performance and ensured that the statistical data were arranged into a coherent and easily accessible form.

B. Athlete Performance Analysis

Using the recorded player statistics, the system generated analytical metrics that summarized individual athlete performance over time. Key performance indicators such as **average points per game, rebounds, assists, and shooting performance** were computed from aggregated game statistics.

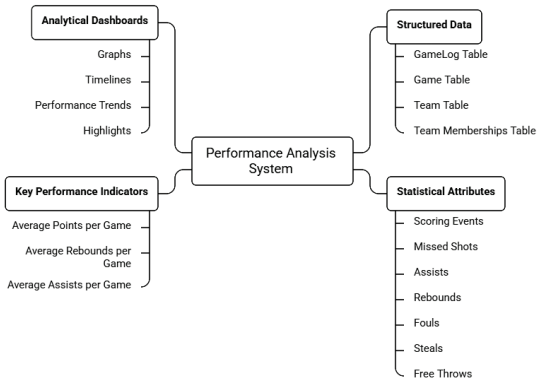

Fig. 3. Athlete Performance Analysis System

These metrics were visualized through analytical dashboards that displayed performance trends across multiple matches. The graphical representation of statistical data allowed users to identify patterns such as improvements in scoring efficiency or consistency in specific performance metrics.

C. Team-Level Insights

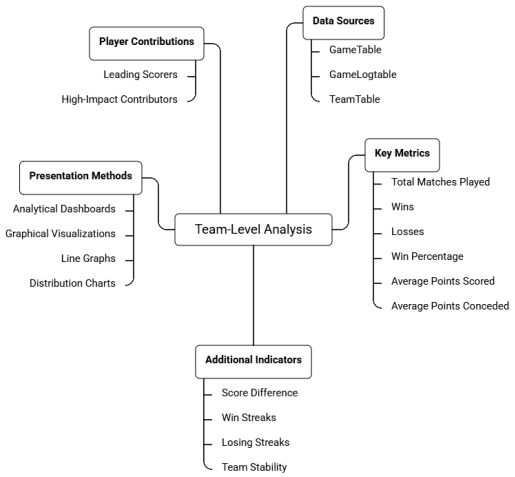

Fig. 4. Team-Level Analysis in Sports Analytics

In addition to individual analysis, the system aggregated player statistics to generate team-level insights. The analysis enabled the identification of top-performing players within teams, most valuable players in specific matches, and standout individual game performances. These insights provided additional context to individual performance metrics and contributed to a broader understanding of team dynamics.

D. System Effectiveness

The results demonstrate that centralized game logging enables efficient organization of performance data and supports analytical evaluation of athlete contributions. By maintaining structured datasets and generating automated performance metrics, the system simplifies the process of tracking athlete development across multiple games.

Overall, the evaluation indicates that centralized sports data management can significantly improve performance documentation and enable meaningful analysis for athletes and coaches operating in amateur sports environments.

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