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SPORTIX - SPORTS OPERATIONS & REAL-TIME INTEGRATED EXPERIENCE USING CI&CD PIPELINE

***Rajapu Pravallika, Karthikeyan Srinivas, Alla Ganesh, Ravada Jhansi**

CSE-AI&DS, GMR Institute of Technology, Rajam.

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***Corresponding Author: Rajapu Pravallika**
CSE-AI&DS, GMR Institute of Technology, Rajam.

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ABSTRACT

SPORTIX (Sports Operations & Real-Time Integrated Experience) is a web-based sports tournament and arena management system designed to simplify and improve the organization of sports activities. Traditional sports management often involves manual scheduling, disconnected information, and difficulties in coordinating teams, officials, venues, and tournaments. SPORTIX addresses these challenges through a centralized platform that integrates sports management activities into a unified system. The proposed system provides features such as tournament creation, team registration, venue management, fixture scheduling, match tracking, and role-based access control. It incorporates Artificial Intelligence (AI) capabilities, including an AI Fixture Generator and AI Referee Assignment, to assist organizers in generating schedules and assigning suitable officials. The system is developed using React and TypeScript for the frontend, Spring Boot for backend services, and MongoDB for database management. Docker, GitHub Actions, Kubernetes, Prometheus, and Grafana support deployment, automation, monitoring, and operational management. SPORTIX aims to provide a reliable, scalable, and efficient solution for modern sports tournament management.

KEYWORDS: SPORTIX, Sports Management, Tournament Management, Artificial Intelligence, Fixture Generation, Referee Assignment, Spring Boot, MongoDB, Real-Time Integration.

INTRODUCTION

Sports tournaments require effective coordination between organizers, teams, players, officials, and arena managers. Managing these activities manually can lead to scheduling

conflicts, communication delays, inefficient resource utilization, and difficulties in maintaining accurate tournament information. As sports competitions become increasingly complex, the need for an integrated digital management platform has grown significantly.
SPORTIX is proposed as a centralized sports tournament and arena management system that provides a structured environment for managing sports-related operations. The system combines tournament administration, team management, fixture generation, venue coordination, and match-related activities within a single platform.

The platform incorporates Artificial Intelligence to support important decision-making activities. The AI Fixture Generator assists in creating match schedules based on tournament requirements and scheduling constraints. Similarly, the AI Referee Assignment module supports the selection of suitable officials according to match requirements and availability.

SPORTIX follows a modular architecture in which different functional components operate within a unified backend system. This approach improves maintainability, supports future enhancements, and enables efficient communication between application modules. The system is designed to provide a user-friendly interface and role-based access for different participants.

The primary goal of SPORTIX is to transform conventional sports management into an organized, technology-driven process that improves coordination, operational efficiency, and the overall tournament experience.

What is SPORTIX?

SPORTIX stands for Sports Operations & Real-Time Integrated Experience. It is a centralized digital platform developed to manage sports tournaments, teams, players, arenas, matches, and officials. The system integrates multiple sports management activities into a single application, enabling users to access relevant information according to their roles and permissions.

SPORTIX combines tournament administration, team registration, venue management, fixture scheduling, and official assignment into an integrated environment. The platform uses AI-assisted features to simplify scheduling and assignment activities while maintaining administrative control. It provides a structured and efficient approach to sports management by reducing manual operations and improving coordination between different participants. It

provides an integrated platform for managing sports activities and sharing updated tournament information among authorized users.

What is the Use of SPORTIX?

The purpose of SPORTIX is to simplify sports tournament management, improve coordination, and support efficient organization of sporting activities. It helps organizers manage tournaments, teams, venues, matches, and officials through a centralized platform. The system reduces manual scheduling effort, minimizes potential conflicts, and improves the accessibility of tournament information. It also supports players, team managers, arena managers, officials, and spectators by providing role-specific functionalities. Through AI-based fixture generation and referee assignment, SPORTIX assists organizers in making efficient scheduling and allocation decisions.

METHODOLOGY

As technology advances, sports tournament management is shifting from manual administration to automated and intelligent digital platforms. SPORTIX follows a modular development methodology that integrates frontend interfaces, backend services, database management, and AI-assisted functionalities.

The system is developed using React and TypeScript for frontend development and Spring Boot for backend processing. MongoDB is used to store tournament-related information, including teams, players, venues, matches, and officials. The application follows a modular architecture in which different functionalities are organized into logical components.

Two major intelligent components are employed: AI Fixture Generator and AI Referee Assignment. The fixture generator assists in preparing tournament schedules by considering teams, venues, and scheduling constraints, while the referee assignment module recommends suitable officials based on availability and match requirements. Docker, GitHub Actions, Kubernetes, Prometheus, and Grafana support deployment automation, orchestration, and monitoring.

How Does SPORTIX Work?

SPORTIX works by providing a centralized platform through which users can perform sports management activities according to their assigned roles. Administrators create tournaments, organizers manage competitions, team managers register teams and players, and arena managers coordinate venue-related activities. Officials are assigned to matches, while spectators can access relevant tournament information.

The system processes user requests through backend services and stores the corresponding information in MongoDB. The AI Fixture Generator assists in creating match schedules, while the AI Referee Assignment module supports official allocation. When authorized users update tournament or match information, the application synchronizes the information across relevant modules so that users can access updated data.

Typical Work Activities in SPORTIX

- Creating and managing sports tournaments.
- Registering teams and players.
- Managing arenas and venue availability.
- Assigning suitable referees and officials.
- Maintaining match schedules and tournament information.
- Managing user permissions and role-based access.
- Coordinating activities among organizers, teams, and officials.

AI Fixture Generator

The AI Fixture Generator is an intelligent module designed to assist tournament organizers in creating match schedules automatically. Fixture generation is an important activity in sports competitions because it involves arranging matches while considering teams, venues, match durations, and scheduling constraints. Manual fixture preparation can become complex when tournaments involve multiple teams and arenas.

The AI Fixture Generator processes tournament information such as participating teams, tournament format, available venues, match duration, and scheduling requirements. Based on these inputs, the system generates proposed match schedules and organizes matches into suitable time slots. It can assist in identifying potential scheduling conflicts and provide structured fixture recommendations. This module reduces manual effort and improves scheduling efficiency while allowing organizers to review and approve the generated fixtures.

AI Referee Assignment

The AI Referee Assignment module is designed to assist organizers in assigning suitable referees and officials to scheduled matches. Official assignment is an important part of tournament management because it requires consideration of referee availability, qualifications, sport specialization, and match requirements.

The module evaluates relevant information about officials and scheduled matches to recommend suitable assignments. It helps identify potential conflicts, supports balanced

allocation of officials, and improves coordination between tournament organizers and referees. The system provides assignment recommendations that can be reviewed and approved by authorized users. Officials can be added to the platform only by SUPER_ADMIN or SPONSOR users, ensuring controlled official management.

OBJECTIVES

1. To develop a centralized sports tournament and arena management platform.
2. To simplify tournament creation, team registration, and player management.
3. To improve coordination among organizers, teams, players, and officials.
4. To maintain tournament and match information in a centralized database.
5. To support application deployment and monitoring using DevOps technologies.
6. To provide a user-friendly and integrated sports management experience.

RESULTS

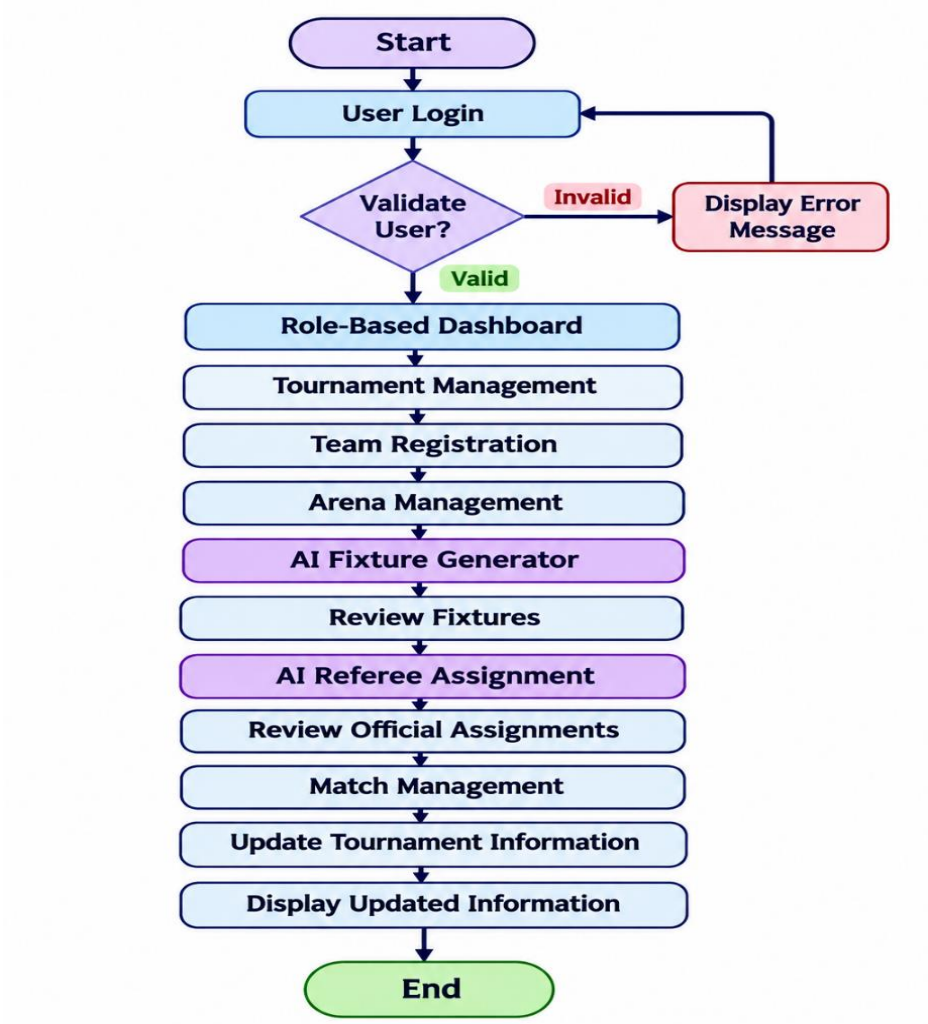
The SPORTIX system provides a centralized environment for managing sports tournaments, teams, venues, matches, and officials. The modular architecture integrates different sports management activities into a unified platform, reducing the complexity of managing information across separate systems.

The AI Fixture Generator assists in preparing match schedules by considering tournament requirements and scheduling constraints. It helps organizers identify potential conflicts and review proposed fixtures before final confirmation. The AI Referee Assignment module supports the allocation of officials by evaluating relevant match and referee information, improving the organization of assignment activities.

Role-based access control ensures that users can perform activities according to their assigned permissions. MongoDB supports centralized storage and retrieval of tournament-related information, while the frontend provides interfaces for different user categories.

The integration of Docker, GitHub Actions, Kubernetes, Prometheus, and Grafana provides a foundation for application deployment, automation, and monitoring. Overall, SPORTIX demonstrates the potential of web technologies and AI-assisted functionalities to improve sports tournament administration and coordination.

FLOWCHART



Implementation

The implementation of SPORTIX involves a structured development process consisting of frontend development, backend development, database integration, AI-assisted modules, and deployment management.

1. Frontend Development

React and TypeScript are used to develop interactive user interfaces. The frontend provides dashboards and functionalities for administrators, organizers, arena managers, team managers, players, officials, and spectators.

2. Backend Development

Spring Boot is used to implement backend services, business logic, authentication, authorization, tournament management, fixture management, and referee assignment functionalities.

3. Database Integration

MongoDB is used to store application information such as users, tournaments, teams, players, arenas, matches, and officials. The database supports efficient storage and retrieval of tournament information.

4. AI Fixture Generation

Tournament inputs and scheduling constraints are processed to generate proposed match schedules. The generated fixtures are reviewed by organizers before final confirmation.

5. AI Referee Assignment

Match requirements and official availability are considered to recommend suitable referees. Authorized users review the assignments before final allocation.

6. Deployment and Monitoring

Docker is used for containerization, GitHub Actions supports automated workflows, Kubernetes manages container deployment, and Prometheus with Grafana provides application monitoring and visualization.

CONCLUSION

This research focuses on developing SPORTIX, an integrated sports tournament and arena management system that combines centralized management with AI-assisted functionalities. The proposed system integrates tournament creation, team registration, arena management, fixture generation, and referee assignment into a unified application.

The system utilizes React and TypeScript for frontend development, Spring Boot for backend services, and MongoDB for data storage. The AI Fixture Generator assists in preparing tournament schedules, while AI Referee Assignment supports suitable official allocation. Role-based access control provides secure and organized interaction among different user categories.

In conclusion, SPORTIX provides an intelligent and organized approach to sports tournament management. It aims to reduce manual effort, improve coordination, and enhance tournament administration. Future work can focus on live score tracking, mobile application development, advanced sports analytics, automated notifications, and real-time match monitoring.

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