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Ping Pong 3D

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ABSTRACT

Ping Pong 3D is an innovative and immersive game, designed to deliver a fun, competitive, and highly engaging experience. The game supports both local and online multiplayer, allowing players to challenge friends or compete with opponents around the world in casual or ranked matches. It introduces exciting gameplay elements such as power-ups, ball spin mechanics, paddle and ball size modifiers, and special abilities that add variety and unpredictability to each match. Multiple game modes including Time Attack, Tournament, Survival, and Obstacle Mode offer players a range of challenges and playstyles. Players can also personalize their in-game avatars with custom skins and accessories, enhancing immersion and self-expression. A robust progression system with leaderboards, achievements, and daily missions keeps players motivated, while seasonal events and tournaments provide ongoing excitement and rewards. Overall, Ping Pong 3D blends classic gameplay with modern enhancements to create a dynamic and immersive table tennis experience for players of all skill levels.

1-INTRODUCTION

The game introduces a variety of exciting new features, including power-ups and special abilities such as speed boosts, ball size control, and paddle size enhancements, adding unpredictability and strategic depth. Several game modes, including Time Attack, Tournament Mode, Survival Mode, and Obstacle Mode, offer diverse challenges. The game also supports multiplayer and an online multiplayer system, allowing players to compete with friends over the internet.

Existing System

Traditional ping pong games primarily focus on simple gameplay mechanics, offering a straightforward paddle-and-ball interaction without significant variations. Most of these games follow a basic structure, where players compete in a standard one-on-one match with minimal additional features. Multiplayer options are often limited, and many games lack an engaging online connectivity system. Additionally, character customization is either non-existent or very restricted, leading to a repetitive and generic gaming experience.

2-REQUIREMENT ANALYSIS

Functional Requirements

These are the requirements that the end user specifically demands as basic facilities that the system should offer. All these functionalities need to be necessarily incorporated into the system as a part of the contract.

Player

- Register
- Login
- Select Game Mode
- Join Multiplayer
- Customize Avatars
- View Leaderboards
- Claim Powerups
- Logout

Admin

- Login
- Manage and Edit Game Features

- Track User achievements
- Add new Features
- Logout

Non-Functional Requirements

These are the quality constraints that the system must satisfy according to the project contract. The priority or extent to which these factors are implemented varies from one project to another. They are also called non-behavioural requirements.

- Performance: The system should be capable of handling multiple simultaneous users without delays, providing quick response times during gameplay sessions.
- Security: Implement robust security measures to protect user data and prevent unauthorized access.
- Usability: The game's interface is intuitive and user-friendly, allowing players of all experience levels to navigate easily.
- Scalability: The system is designed to scale efficiently, allowing it to accommodate an increasing number of concurrent players as the game's popularity grows.
- Extensibility: The game is designed to be extensible, allowing for easy integration of new features such as additional game modes or avatar customization options without disrupting existing functionality.

Hardware requirements:

The most common set of requirements defined by any operating system or software application is the physical computer resources, also known as hardware.

- Processor: Intel i3 with 2 GHz Quad-Core.
- RAM: 8 GB
- Storage: 256 GB SSD

Software Requirements:

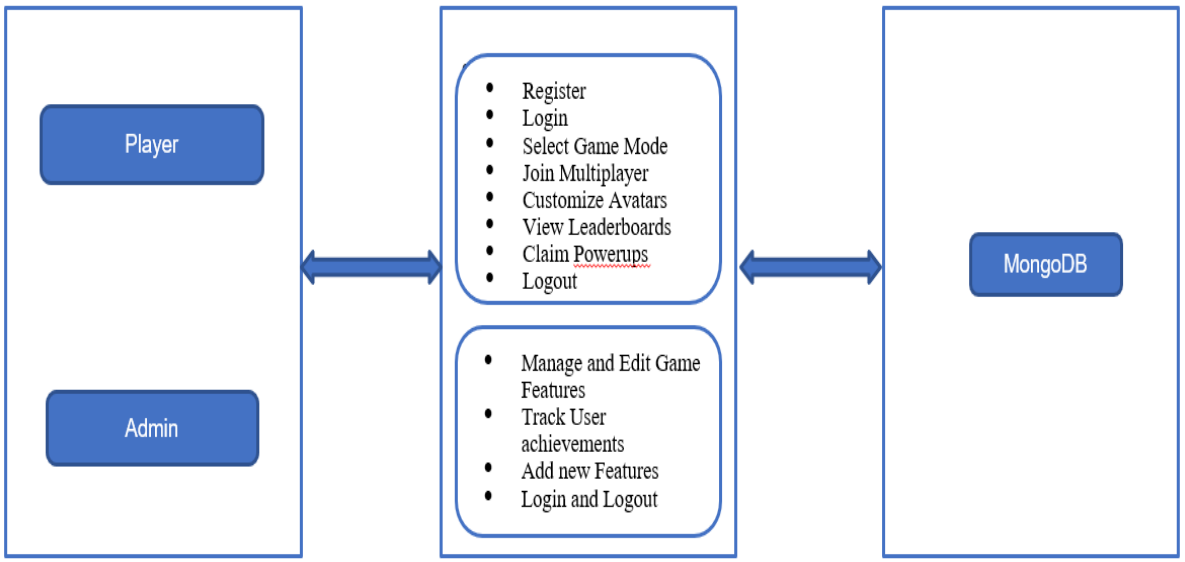
Software requirements for a system are the description of what the system should do, the service or services that it provides and the constraints on its operation.

- Game engine : Unity
- Game Frontend: Unity (C# language)
- Backend and Game logic: Python - Flask framework
- Database: MongoDB
- Multiplayer Networking: Python (Websockets)
- API: Python – FastAPI

3-DESIGN

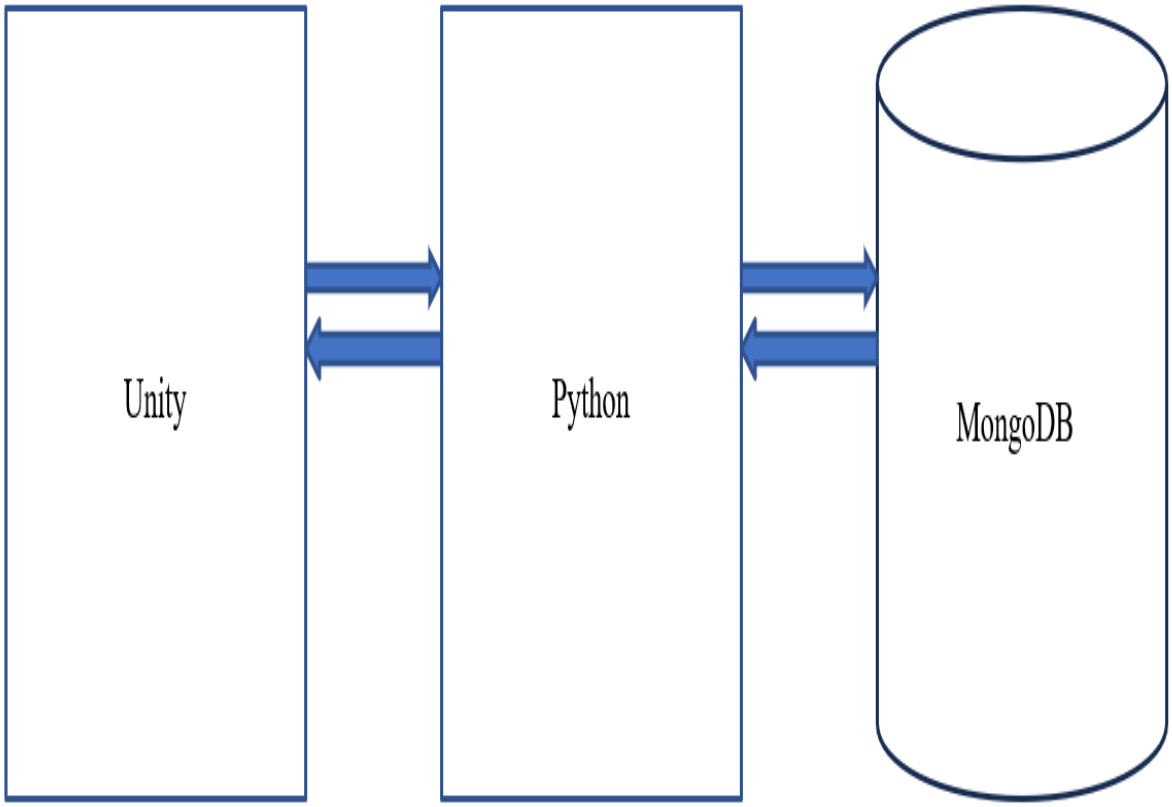
Software Architecture

Software architecture is the set of structures needed to reason about a software system and the discipline of creating such structures and systems.



Hardware Architecture

Hardware architecture refers to the identification of a system's physical components and their interrelationships.



4-IMPLEMENTATION

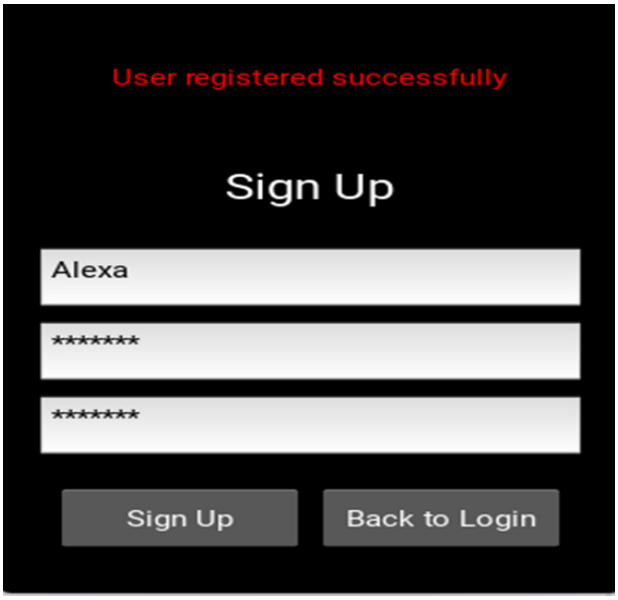
Python

- Unity with C# is a powerful and widely-used game engine that enables the development of high-performance 2D and 3D games across multiple

platforms, including PC, mobile, and web. Unity provides a rich set of tools for physics, rendering, animation, and input handling, while C# offers a robust, object-oriented programming language that is easy to learn and ideal for game development.

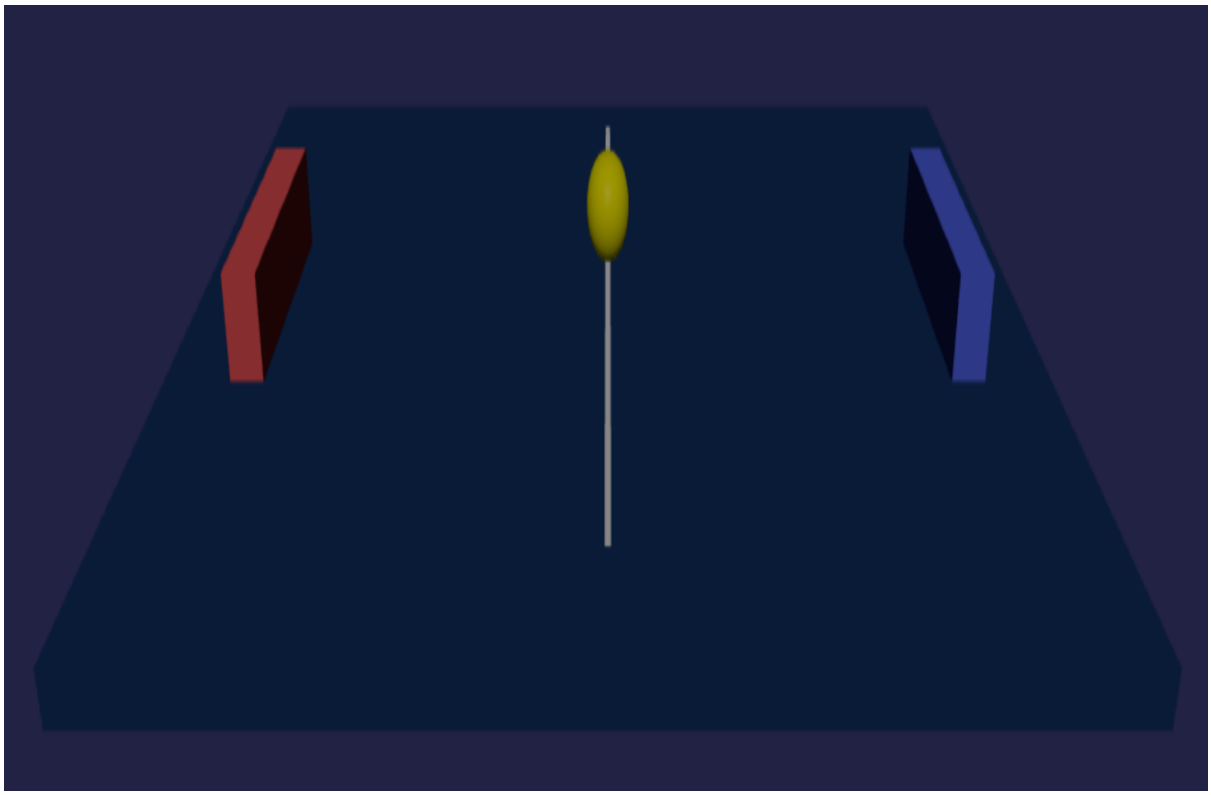
- Python with Flask is a lightweight web framework designed for building scalable and maintainable backend services. In this project, Flask is used to implement core game logic, handle user sessions, and manage server-side operations efficiently.
- Python with FastAPI is a modern, fast (high-performance) web framework used for building APIs with Python based on standard Python type hints. FastAPI is used in Ping Pong 3D to create and manage RESTful APIs that support real-time interactions, leaderboard updates, authentication, and other backend services.
- Python with WebSockets is used to implement real-time multiplayer networking. By enabling bi-directional communication between the client and server, WebSockets support instant game data synchronization, ensuring a smooth and responsive multiplayer experience.
- MongoDB is a NoSQL, document-oriented database known for its scalability and flexibility. It is used to store player data, match history, leaderboard stats, achievements, and customization preferences. Its schema-less design is ideal for managing dynamic game-related content.

5-SCREENSHOTS

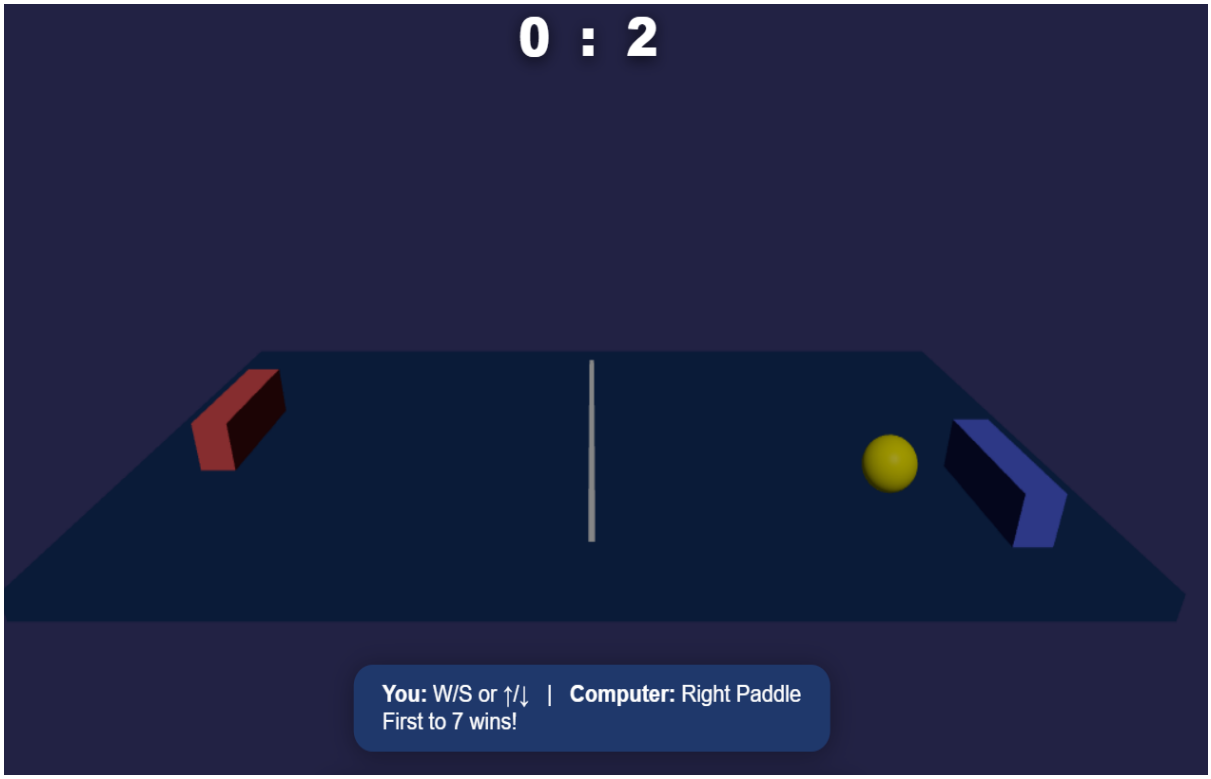


1 User Registration Successfully

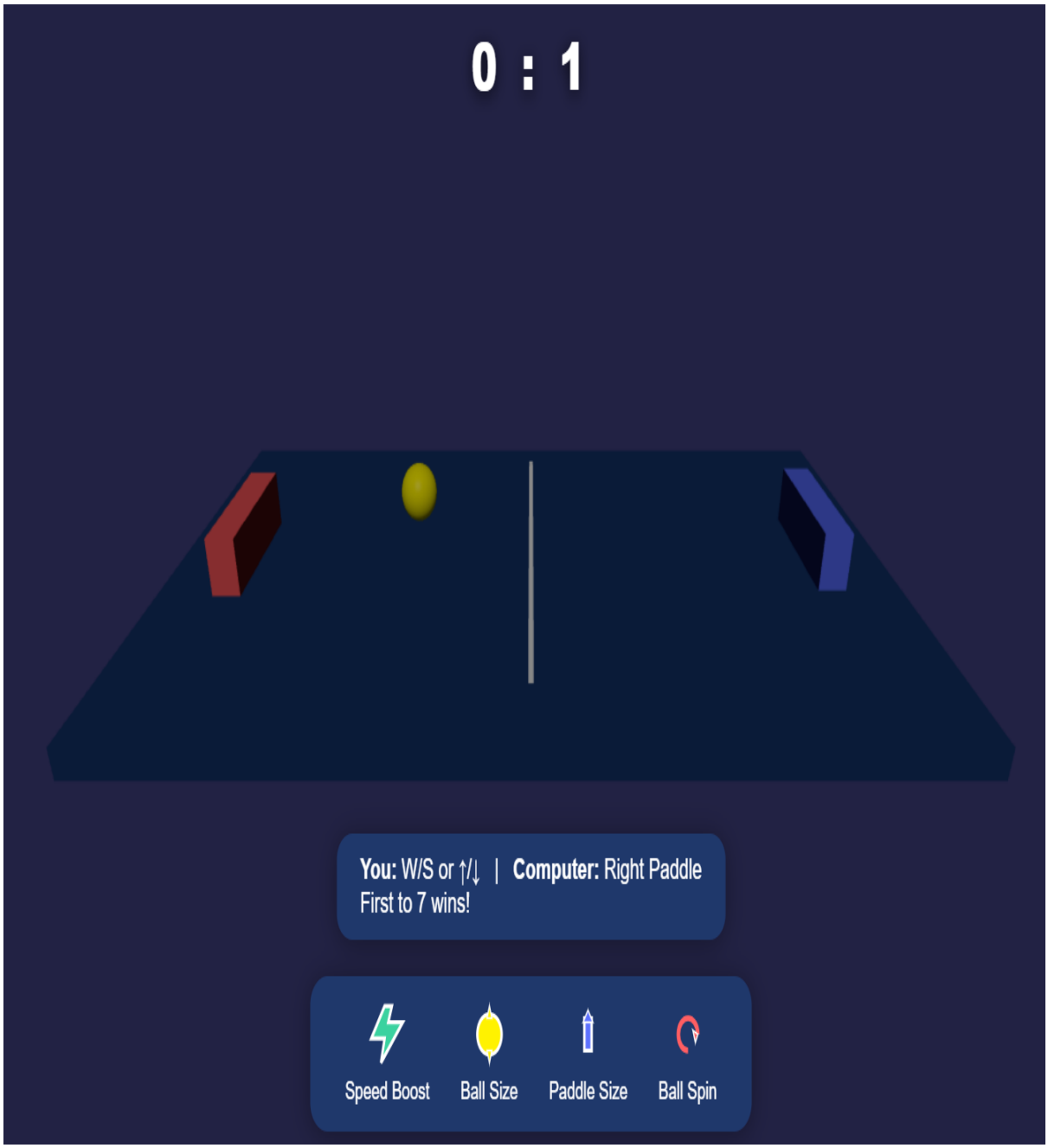
2 Choose Game Mode



3 Initial Game Setup Interface

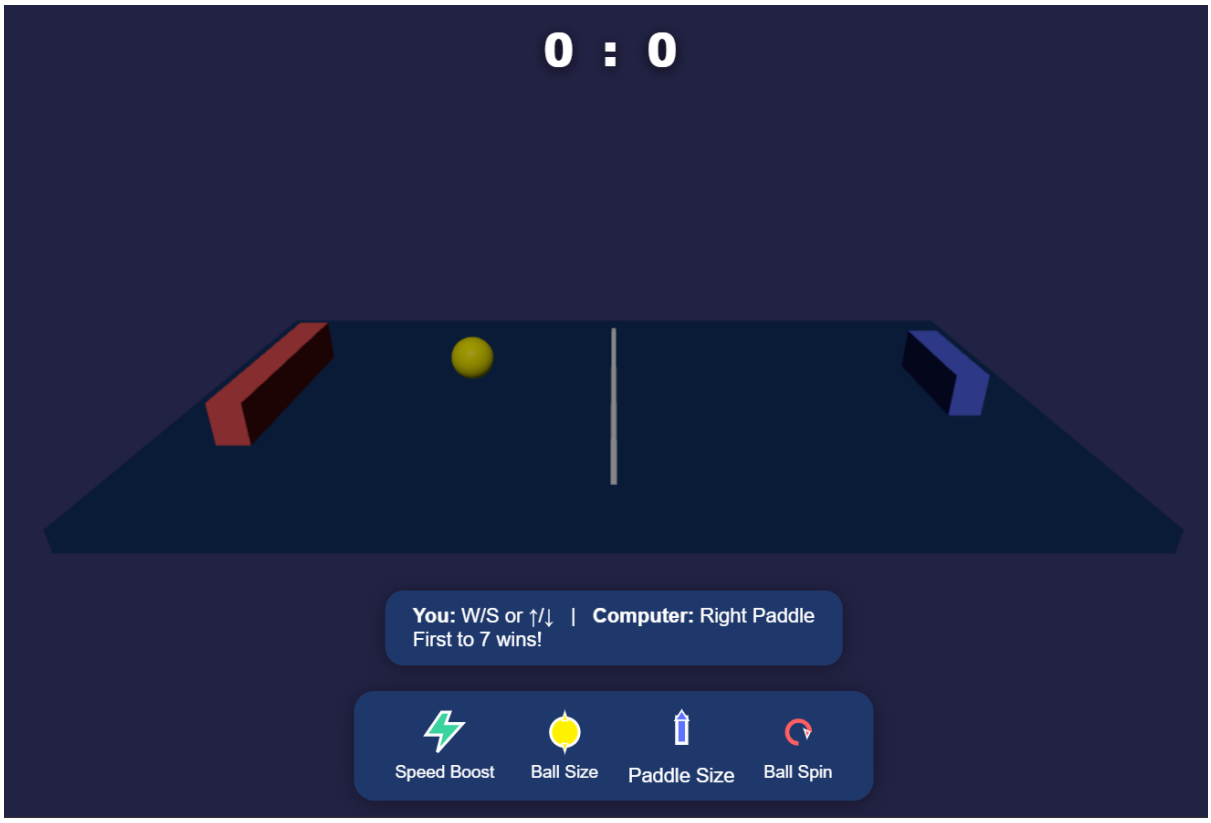


4 Start of the game

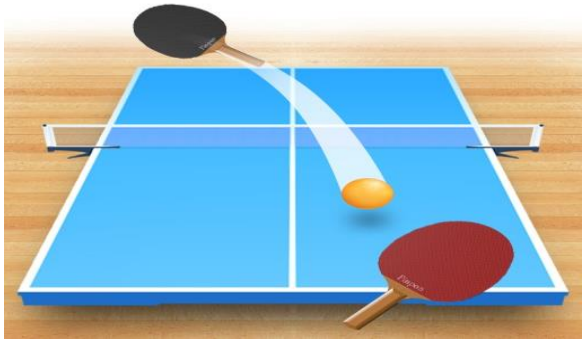


5.Power-Ups Unlocked with the Game Progression

6-Ball Size Power-Up Activated

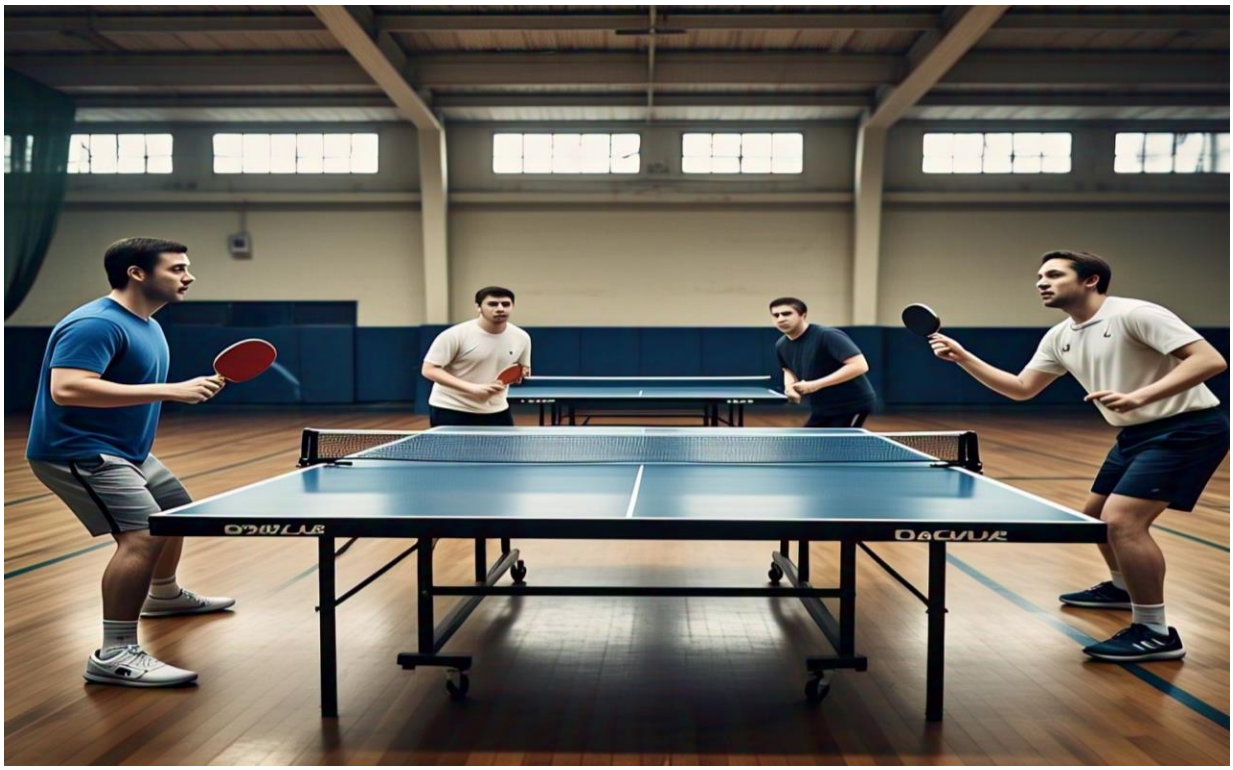


7 Paddle Size Increase Power-Up in Action



8 Customization - Paddle, Table, and Color Upgrades

9 Avatar Customization - Skins and Accessories



10 Multiplayer Mode

6- CONCLUSION & FUTURE SCOPE

CONCLUSION

The proposed system significantly enhances the traditional ping pong gaming experience by introducing diverse game modes, advanced customization, and robust multiplayer options. By allowing players to personalize their avatars and compete in various engaging challenges, the game fosters greater player attachment and long-term engagement. The inclusion of local and online multiplayer connectivity strengthens social interaction, making the game more immersive and competitive.

FUTURE SCOPE

1. Cross-Platform Support: Expand compatibility to platforms such as iOS, macOS, and WebGL, enabling players to enjoy the game on a wider range of devices.
2. Advanced AI Opponents: Introduce adaptive AI using machine learning techniques to challenge players with varying skill levels and play styles.
3. Online Tournaments and eSports Features: Host global tournaments with ranking systems, rewards, live brackets, and support for spectators and streamers.
4. Power-Up Expansion and Customization: Develop new and strategic power-ups with player-customizable loadouts and unlockable abilities.
5. Customization and Personalization: Enable extensive player customization, including table styles, paddle skins, avatar features, and UI themes.

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