Ludo Legend

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***Abstract*—This project explores the development and implementation of Ludo games using WebGL (Web Graphics Library) technology. Ludo, a popular board game enjoyed by people of all ages, has undergone a transformation with the advent of WebGL, enabling the creation of immersive and visually appealing digital versions. This project investigates the process of leveraging WebGL to enhance the gameplay experience, bringing the traditional board game to life in a web browser environment. The project examines the technical aspects of WebGL-based Ludo games, their visual and interactive features, and the impact of this technology on player engagement and enjoyment. The findings contribute to the understanding of WebGL's capabilities in creating compelling digital adaptations of classic board games and provide insights into the potential of WebGL as a platform for future game development.**

***Index Terms*—Ludo games, WebGL, three.js, board games, technical implementation, visual features, interactive features, user engagement, and game development.**

I. Introduction

Ludo is a classic board game that has been enjoyed by people of all ages for centuries. In recent years, Ludo has become increasingly popular as a web game, thanks to the development of WebGL. WebGL is a JavaScript API that allows developers to create interactive 3D graphics in the browser. This has made it possible to create realistic and immersive Ludo games that can be played by people all over the world.

Ludo has evolved over the years, adapting to different formats and platforms. While the traditional board game remains popular, digital versions and mobile apps have made it accessible to a wider audience. These digital adaptations often include additional features, such as multiplayer modes, online leaderboards, and customizable board designs. [4]

The motivation behind developing a Ludo game with WebGL lies in the desire to reimagine and modernize a classic game that has entertained people for generations. By utilizing the power of WebGL, it becomes possible to bring the Ludo game to life with rich and dynamic graphics, creating a visually engaging and captivating experience for players. Additionally, developing the game for the web platform allows for easy accessibility, enabling players to enjoy the game across various devices without the need for installation or specific hardware requirements. [7]

- **Realistic graphics:** WebGL allows developers to create realistic 3D graphics that can make Ludo games more immersive and engaging. So, it can be said that it had
  Smooth gameplay: WebGL games can be rendered smoothly even on low-end devices, making them accessible to a wider range of players.
  Cross-platform compatibility: WebGL games can be played on any device that has a web browser, making them truly global.

It is mainly a classic game of strategy, luck, and competition, which can be played by two to four players. The objective of Ludo is to move all your tokens from the starting point to the center of the board, known as the home before your opponents do. To play Ludo, players take turns rolling a dice and moving their tokens accordingly. The number rolled on the dice determines how many squares a player's token can advance. Players must strategically navigate their tokens around the board, avoiding obstacles and capturing opponents' tokens when they land on the same square. The game incorporates elements of strategy, as players can choose to focus on advancing their own tokens or hindering their opponents' progress.

II. Related/Existing Work

- **Ludo King:** Ludo King is one of the most popular Ludo games in the world. It has been downloaded over 1 billion times and is available on both Android and iOS devices. The game uses WebGL to render the graphics, which makes it look and feel more realistic. [4] [3]

- **Parchis Star:** Parchis Star is another popular Ludo game that is available on both Android and iOS devices. It has been downloaded over 100 million times. [4] The game uses WebGL to render the graphics, which makes it look and feel more realistic

- **Ludo Rush:** Ludo Rush is a WebGL-based Ludo game that can be played in the browser. [5] It is a fast-paced and challenging game that is perfect for players of all skill levels.

- **Ludo Parchisi:** Ludo Parchisi is a WebGL-based Ludo game that features a variety of different boards and themes. The game is available to play in both single-player and multiplayer modes. [6]

III. Proposed Methodology

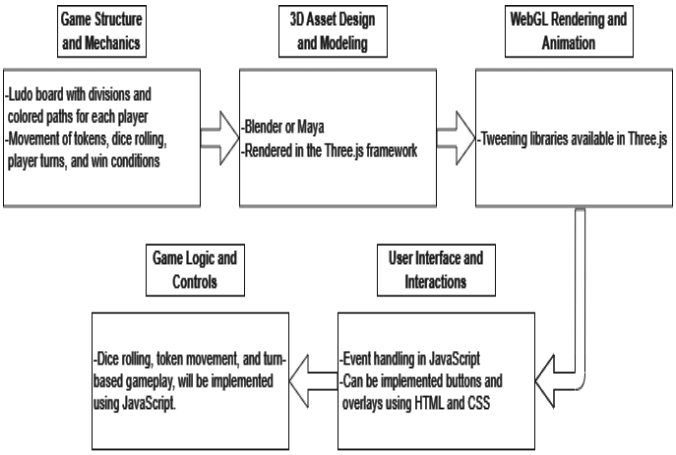

Fig. 1. Proposed Methodology Diagram.

Three.js is a popular JavaScript library used for creating 3D graphics and interactive applications in web browsers. Implement a Ludo game using Three.js, here are some features and implementation procedures: [8] [4]

1) **Board Setup:**
   - Create a 3D board using Three.js with appropriate dimensions and layout.
   - Use different sections of the board, such as the home zones, starting zones, and paths. And position the board in the scene and adjust the camera to provide an optimal view. [2]
2) **Player Tokens:**
   - Design and model 3D player tokens representing different colors or themes.
   - Implement user interactivity to allow players to select and move their tokens.
   - Add animations to tokens for smooth movement across the board. Keep track of token positions and update the state accordingly.
3) **Dice Rolling:**
   - Create a 3D model of a die using geometries and textures. Implement a random number generator to simulate dice rolls.
   - Add physics-based animations to the die, such as rolling and bouncing. Use event handling to capture the result of the dice roll and trigger appropriate actions. [1]
4) **Game Logic:**
   - Implement the core game logic of Ludo, including rules for moving tokens, entering home zones, and winning conditions.
   - Create functions to handle token movement, token selection, and token collision detection.
   - Keep track of the game state, such as the current player and their turn.
5) **User Interface:**
   - Add buttons or controls for rolling the dice. Use CSS and HTML overlays to integrate the UI with the Three.js canvas.
6) **Multiplayer Support:**
   - Implement multiplayer functionality to allow multiple users to play the game simultaneously
   - Sync game states across clients, handle turn-based gameplay, and ensure consistent experiences.

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