Deadline: 6.12.2024 (end of day)

Key Deliverables:

1. **Implementing Modifications to the Original Game.**

2. **Revised Models** (after implemented changes):

   o **Use Case (Model):** Drawing and writing the updated model (not just the diagram).

   o **Domain (Model):** Drawing and writing the updated model (not just the diagram).

   o **Design (Model):** Drawing and writing the updated model (not just the diagram).

   o **State (Model):** Drawing and writing the updated model (not just the diagram).

3. **Implementation Plan for Changes:**

Modifications to the Original Game

1. Full Volleyball Rules

1.1 Ball Hits

- **1v1 Mode:**

   o Each player can hit the ball up to three times before sending it back over the net.

   o If the ball is not sent back after three touches, the opponent scores a point.

- **2v2 Mode:**

   o Teams are allowed a maximum of three touches on their side before returning the ball.

   o A single player cannot touch the ball twice consecutively, except:

      ▪ Player 1 hits the ball first and third in the same rally (e.g., Player 1 passes to Player 2, and Player 2 sets it for Player 1 to hit back).

   o Violation of these rules results in a point for the opposing team.

1.2 Serving

- **Randomized First Serve:**

   o At the start of the game, the first serve is randomly assigned to one player (or team in 2v2).

- **Who Serves Next:**

   o The player (or team) that scores the point serves next.

   o In 2v2, teammates alternate serves after every point scored by their team.

- **Positioning:**
  - The ball's starting position changes dynamically based on the server's location.
- **Serve Mechanic:**
  - Players initiate their serve by pressing a serve key, with aiming mechanics to adjust the ball's direction.
  - Optional hold-and-release mechanic adds power control.
  - A serving indicator (e.g., arrow) provides visual feedback for direction.

1.3 Scoring

- **First to 21 Points:**
  - The first player/team to reach 21 points wins.
- **Win-by-2 Rule:**
  - To win, a player/team must lead by at least 2 points.
  - Example: If the score is 20-21, the game continues until a 2-point margin is achieved (e.g., 22-24, 23-25).
- **Score Display:**
  - Real-time score updates are displayed on the screen throughout the match.

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2. Adding a Menu

- A **main menu** is introduced when the game launches, allowing the player to:
  - Choose between 1v1 or 2v2 modes.
  - Start a new game or exit.
  - View instructions for controls and rules.
- **Change from Original Version:**
  - In the original version, the game starts immediately when the software runs, and the ball falls immediately.
  - **Modification:** The ball won't fall until the player presses any key. A message will appear at the start of the game and after each score:
    - *"Hit any key to start."*
- Access the menu and pause the game by pressing a key. Options in the menu include:
  - Starting a new game.

- o   Ending the current game.

- o   Returning to the start menu.

- o   Changing the number of players.

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3. Adding Comments

- Use **Doxygen-style comments** to explain and improve code readability.

4. Improve Controls

- Enhance the existing control system for better gameplay experience.

Secondary Changes *(Only do after finishing main changes):*

1.   Adding an option for extra players (4 players in total, controlled by users).

- o   Options: 1v1 or 2v2 modes.

Gameplay Scenario Example

Setup:

- **Mode:** 1v1.

- **Winning Conditions:** First to 21 points, must win by 2.

- **Initial Serve:** Randomized (Player B serves first).

Gameplay:

1.   **Initial Serve:**

- o   Player B serves the ball, aiming for the left side of Player A's court.

- o   The ball lands in Player A's court.

- o   Player A receives the ball and hits it back after two touches.

- o   Player B fails to return the ball.

- o   **Score:** Player A 1 - Player B 0.

2.   **Mid-Game Rally:**

- o   Player A serves next, aiming for the middle of Player B's court.

- o   After a long rally, Player B spikes the ball, scoring a point.

- o   **Score:** Player A 10 - Player B 10.

3. **Match Point:**

    o The game reaches 20-20. Both players are one point away from winning the set but need a 2-point lead.

    o Player A serves, targeting the far right corner.

    o Player B defends aggressively and scores the next two points with a spike and a block.

    o **Score:** Player A 20 - Player B 22.

Outcome:

- Player B wins the game with a 2-point lead.

- The game ends with a celebratory sound and a win message:

    o *"Player B Wins! Final Score: 22-20."*

Priority Tasks for Implementation

1. **Core Volleyball Rules:**

    o Implement ball handling rules (3 touches, no consecutive hits by the same player).

    o Ensure scoring logic adheres to the win-by-2 rule.

2. **Serving Rules:**

    o Add randomized first serve and alternate serving mechanics.

    o Implement dynamic ball positioning for serves.

3. **Menu System:**

    o Include game mode selection (1v1 or 2v2).

    o Add options for starting, exiting, and viewing instructions.

    o Add a pause key mid-game to open the menu and pause the game.

    o Display a *"Press any key to begin"* message when starting the game from the menu.

    o Default mode: **1v1**.