Unit-3 Project: Bowling Alley - Virtual Reality

Course: Software Engineering   **Course Instructor: Dr. Raghu Reddy**

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Github link:
https://github.com/Ziyadnaseem/Bowling-Alley-VR-Simulation

Name	Roll Number	Contribution
Ziyad Naseem	2021201021	Creating the whole UI (Panels, Buttons Objects, etc), Camera settings for VR, Writing C# scripts, Logic for score calculation, Sketch Sheet Added, Document Preparation
Rahul Katyal	2021201083	Logic for Top Score for last 10 games, Writing C# scripts, Background Image added, Sketch Sheet Added, Pins Image, Document Preparation
Swarnali Dey	2021201088	Writing C# scripts, Flowchart, Sequence Diagram, Sketch Sheet Added, Document Preparation
Ravi Teja Reddy	2021201008	Writing C# scripts, Sketch Sheet Added, Document Preparation
Vinaya Gopi	2021204017	Sketch Sheet Added, Document Preparation

Total number of hours: 80

1. Overview

We have simulated a Bowling Alley in Unity with a ball and 10 pins. The first scene loaded when we start our project is the main menu which contains the following options - Enter game, High score and Quit. We start the game by pressing Enter. Then the game loads which contains a bowling alley, a ball at one end of the alley and 10 pins on the other end of the alley.

We first have to grab the ball using a controller and throw the ball down the alley. When this ball collides with pins we can hear a collision sound which has been added as an audio effect. We would be getting a score corresponding to the number of pins hit by the ball. In case the ball misses the pins we would get a zero score.

We have set an image as the background for Bowling Alley. Also, a background music is being played since the start of the game. We are maintaining a scoreboard on the top right of the bowling alley which includes 10 attempts of the participant. After each attempt, the score would be updated in the corresponding cell of the scoreboard. After each game ends, the score is displayed in a separate panel and the scoreboard is reset for the next game.

There is a Game Menu option available on the left side of the bowling alley. The Game Menu contains Main Menu, Restart Game and Quit as options available to the user. We can view the top score details for the last ten games by a participant via the Main Menu (present inside the Game Menu). Options to enter & exit from the game are also provided from the main menu.
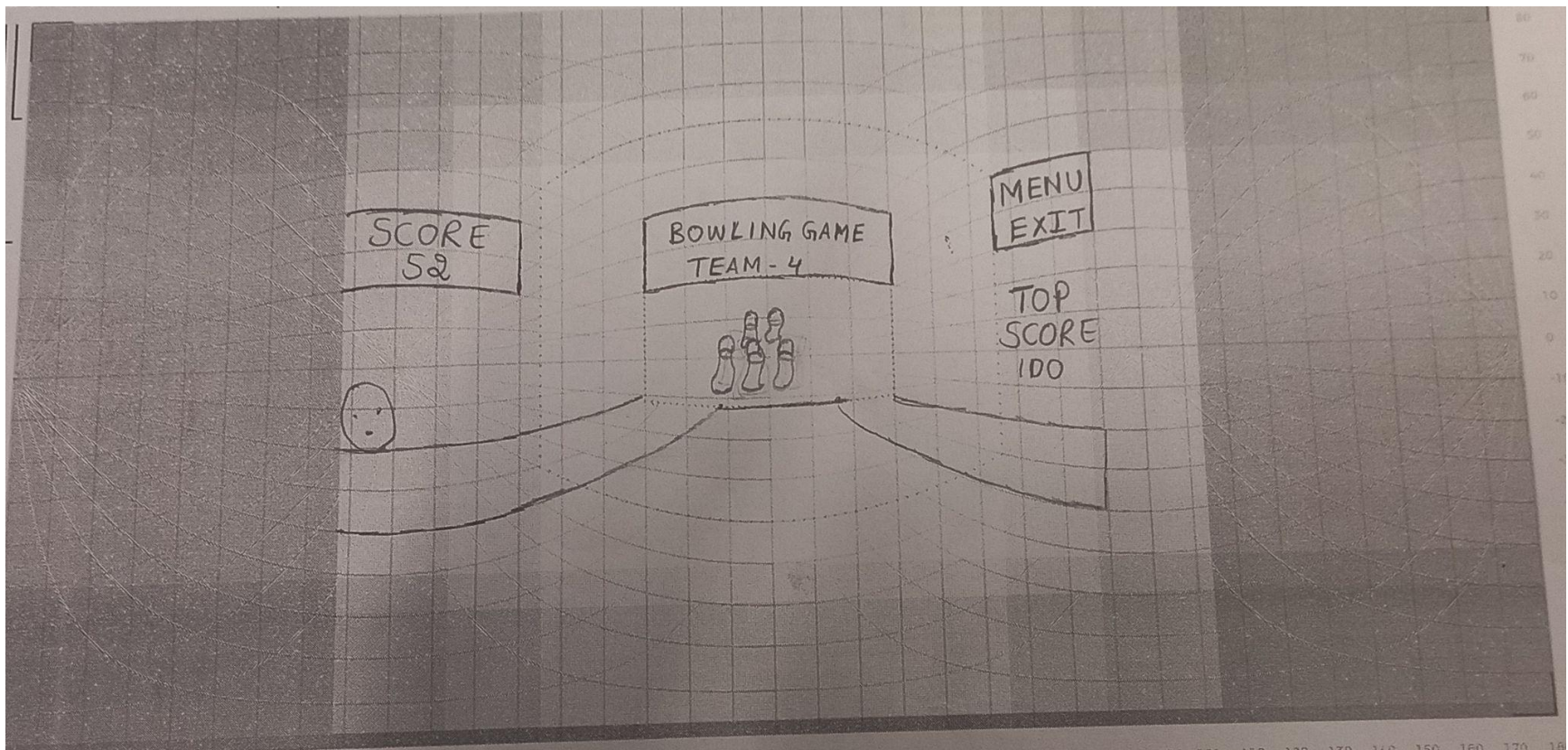
2. Features

- A bowling alley simulation in VR that can be visualized using Oculus headsets and controllers.

- A main menu having options like enter game, show high score and quit.

- A bowling alley with ball at one end of alley and 10 pins on the other end.

- Ball can be grabbed using controllers and thrown down the alley to knock down pins.

- Number of pins knocked down is used to calculate score, which is maintained in the scoreboard on the right hand side of the scene.

- Each game must have 10 attempts and scores are maintained for all 10 attempts in the scoreboard. After 10 attempts, the score is displayed in a separate panel and the scoreboard is reset for the next game.

- Left hand side contains the game menu having options like restart game, go to main menu and quit.

- The show high score functionality shows the top score details for the last ten games by a participant.

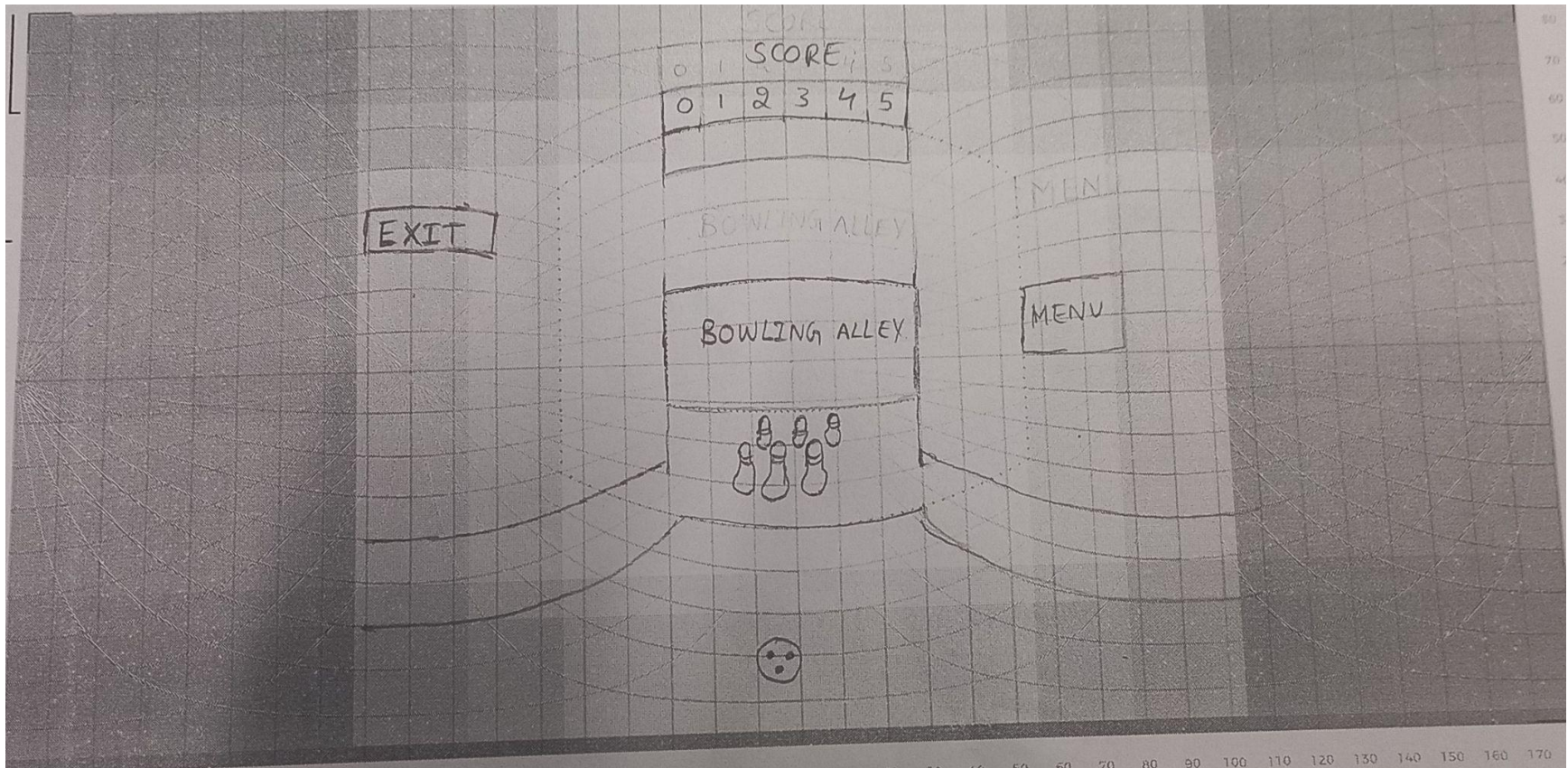- Enter and exit game functionalities are provided in the main menu.
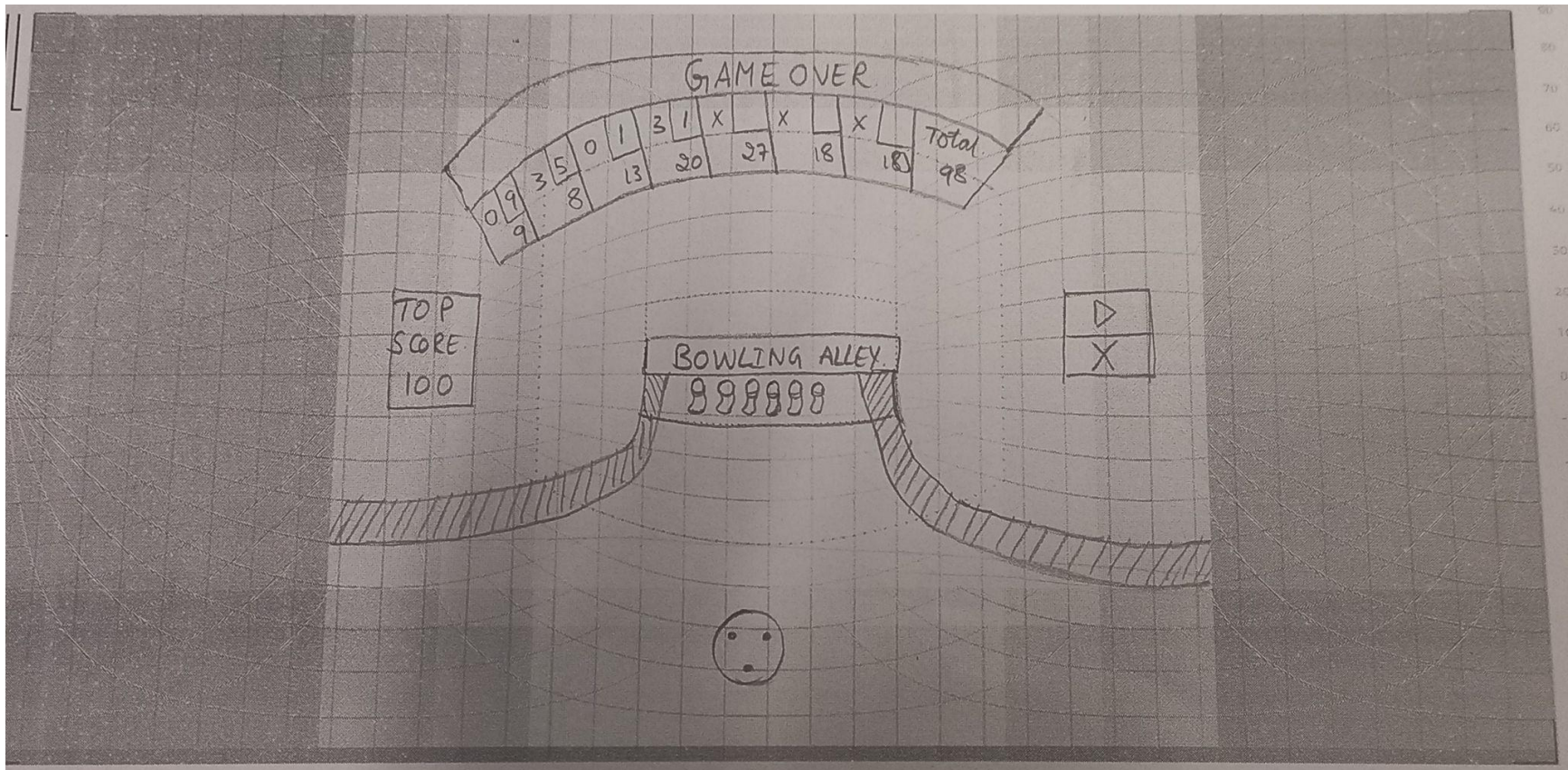
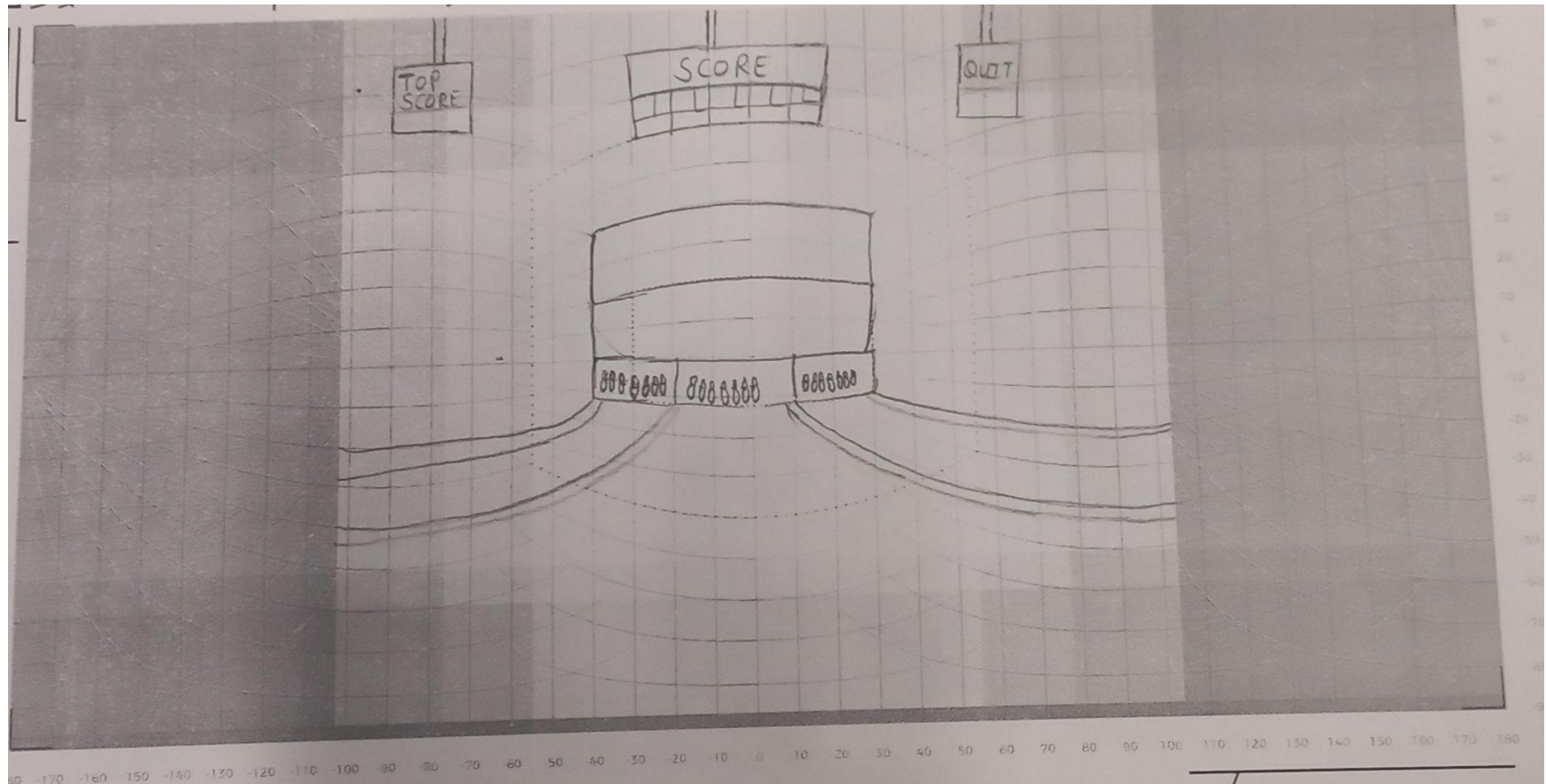# 3. Mockup screens
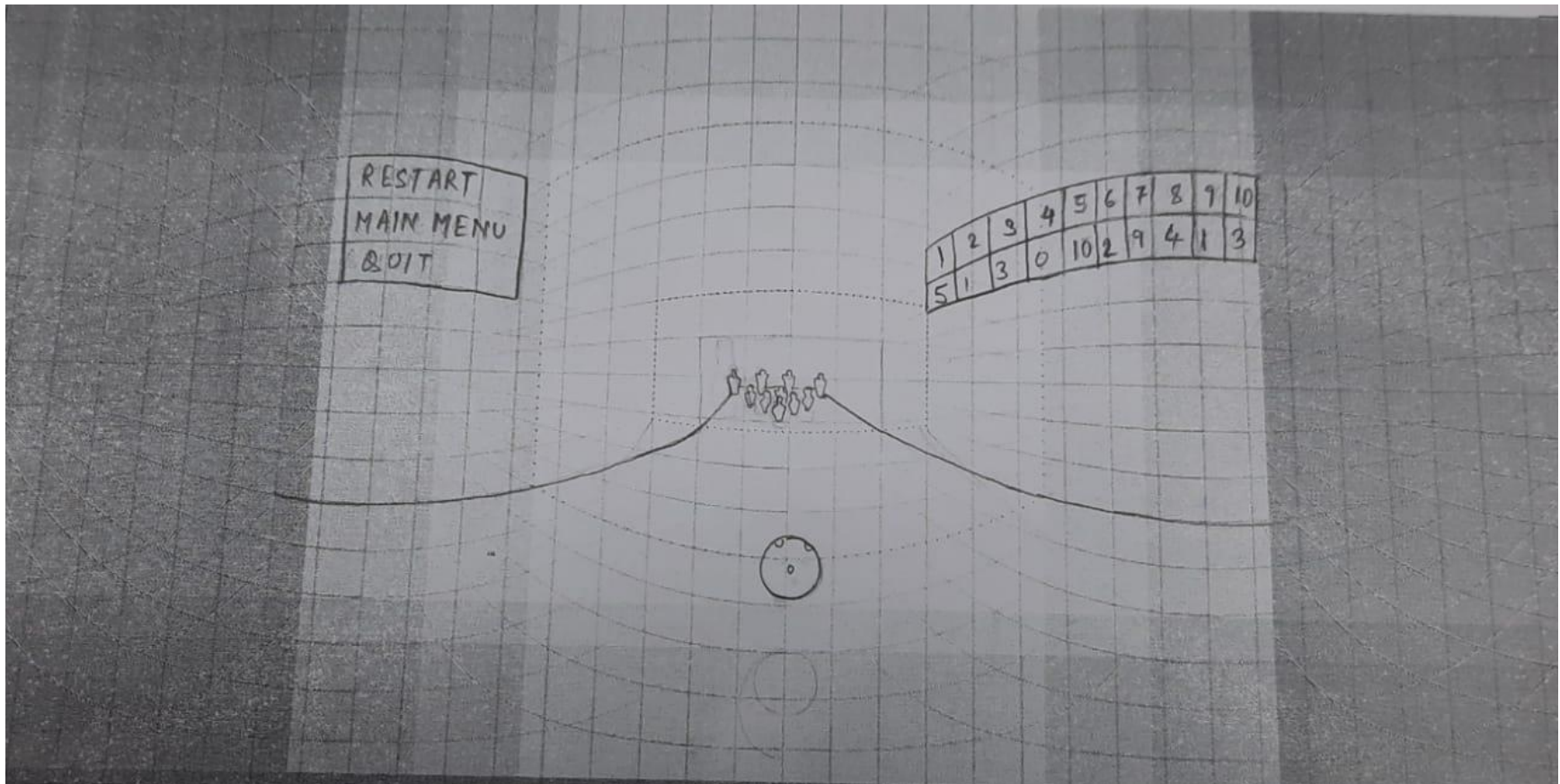
→ **Mockup Screen 1**

→ **Mockup Screen 2**

→ **Mockup Screen 3**

GAME OVER

0 9 9	3 5 8	0	1	3 1	X	X	X	Total
			13	20	27	18	18	98

TOP
SCORE
100

BOWLING ALLEY.
8 8 8 8 8 8

▷
X

→ Mockup Screen 4

RESTART
MAIN MENU
QUIT

1	2	3	4	5	6	7	8	9	10
5	1	3	0	10	2	9	4	1	3

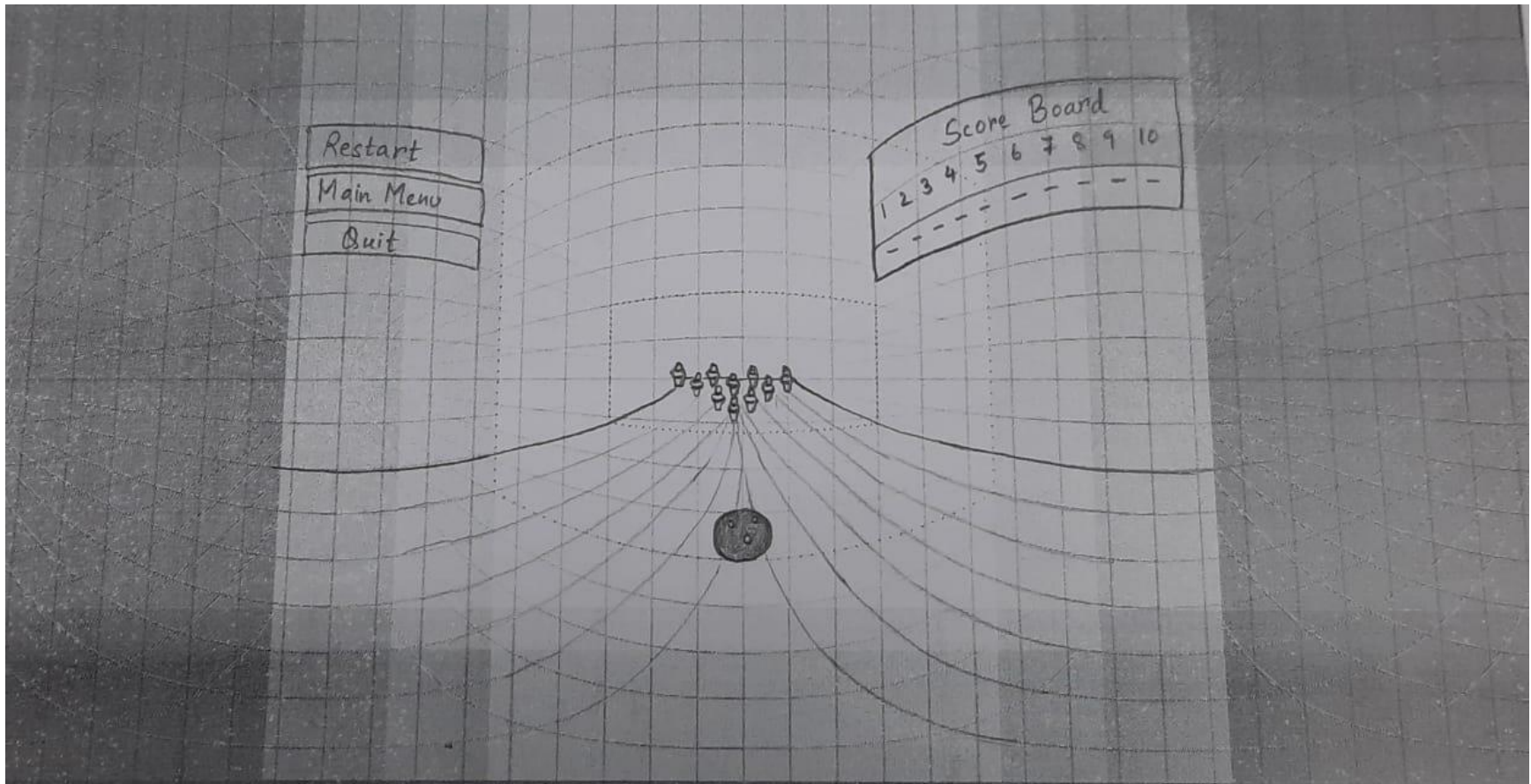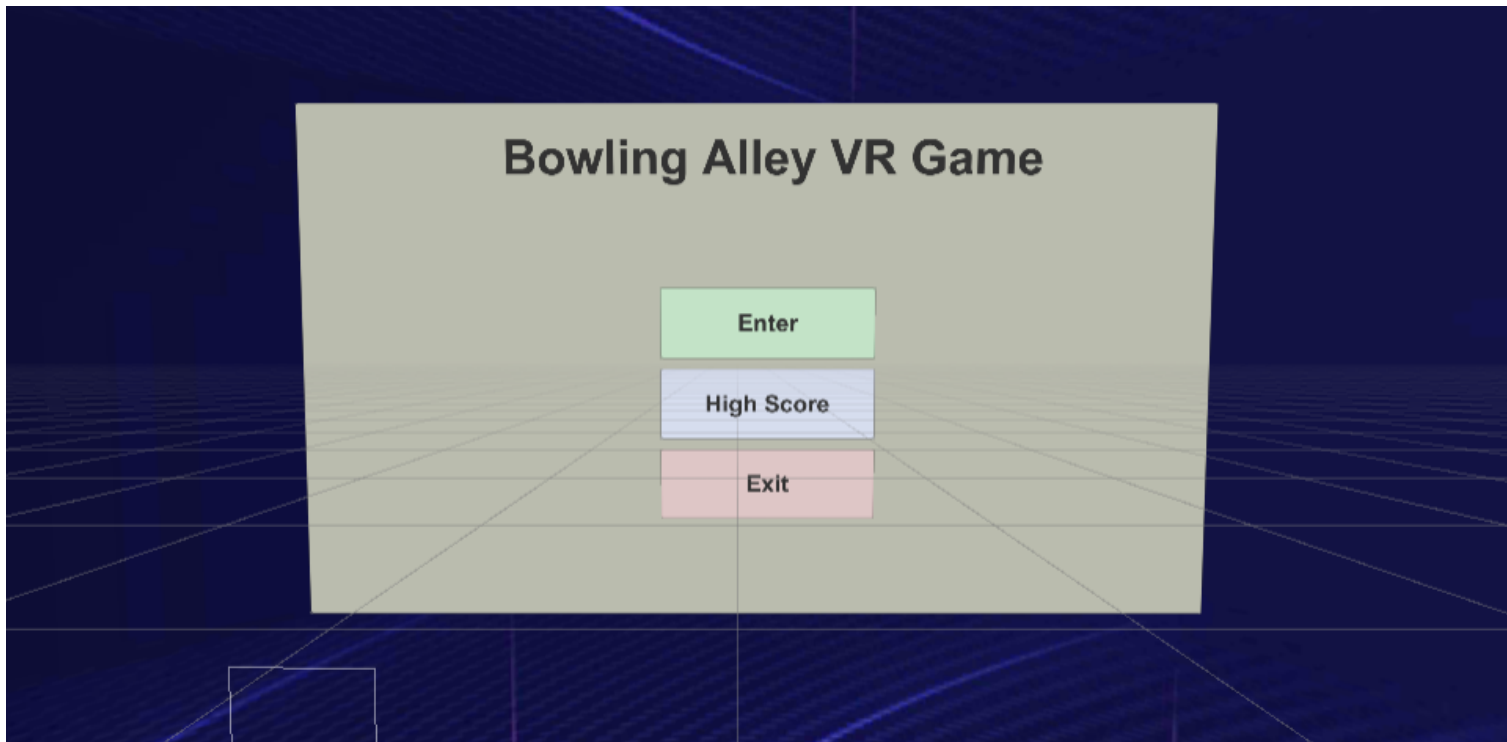**→ Final Mockup Screen**
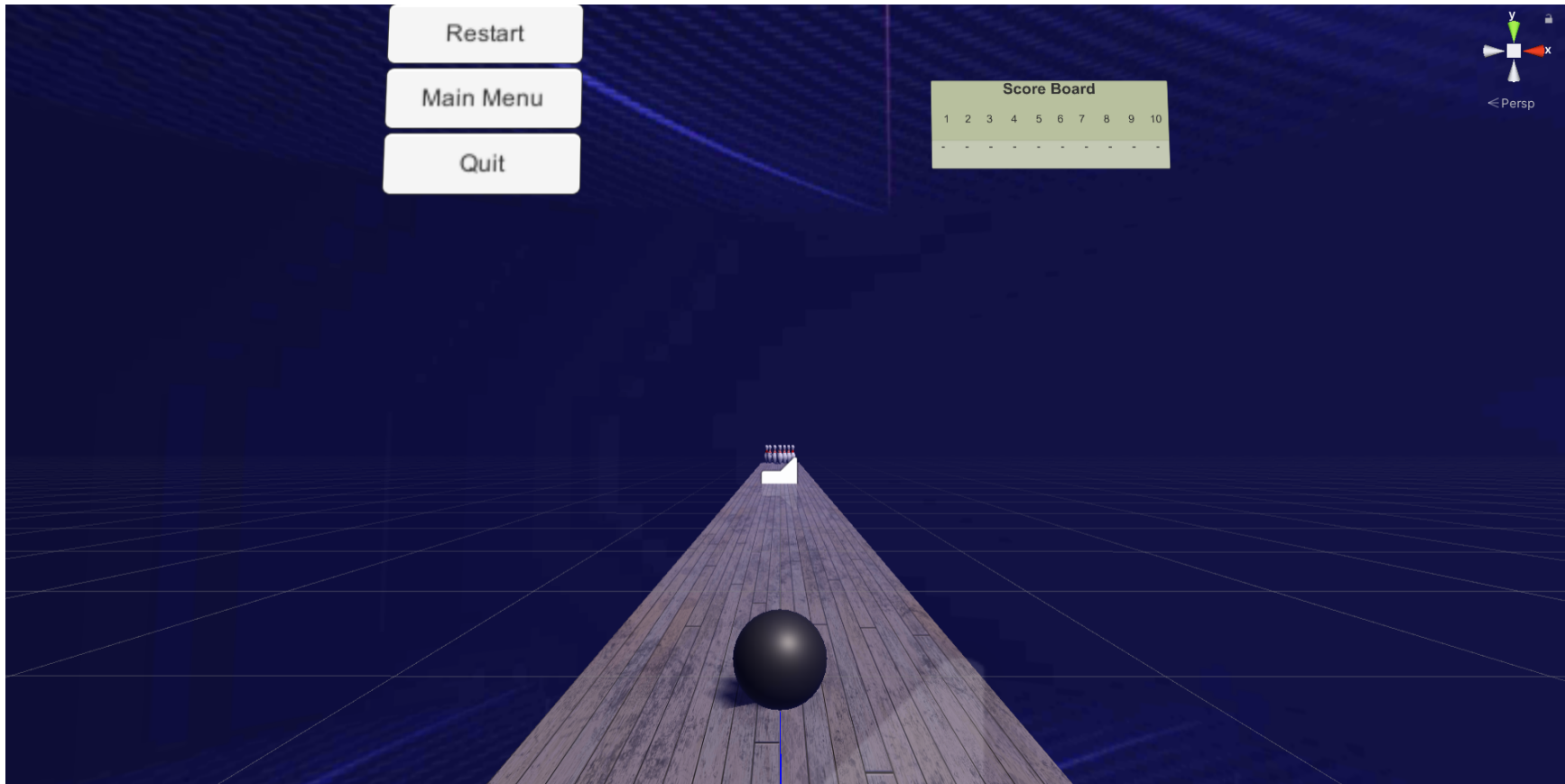
4. Game Screenshots

- **Main Menu**

This is the first scene that loads when we start our application. We have three buttons here, viz., 'Enter', 'High Score', and 'Exit', to enter the game, view the top 10 high scores, and exit the game, respectively.

- **Game Scene**

  This is the game scene where the participant can take 10 attempts.
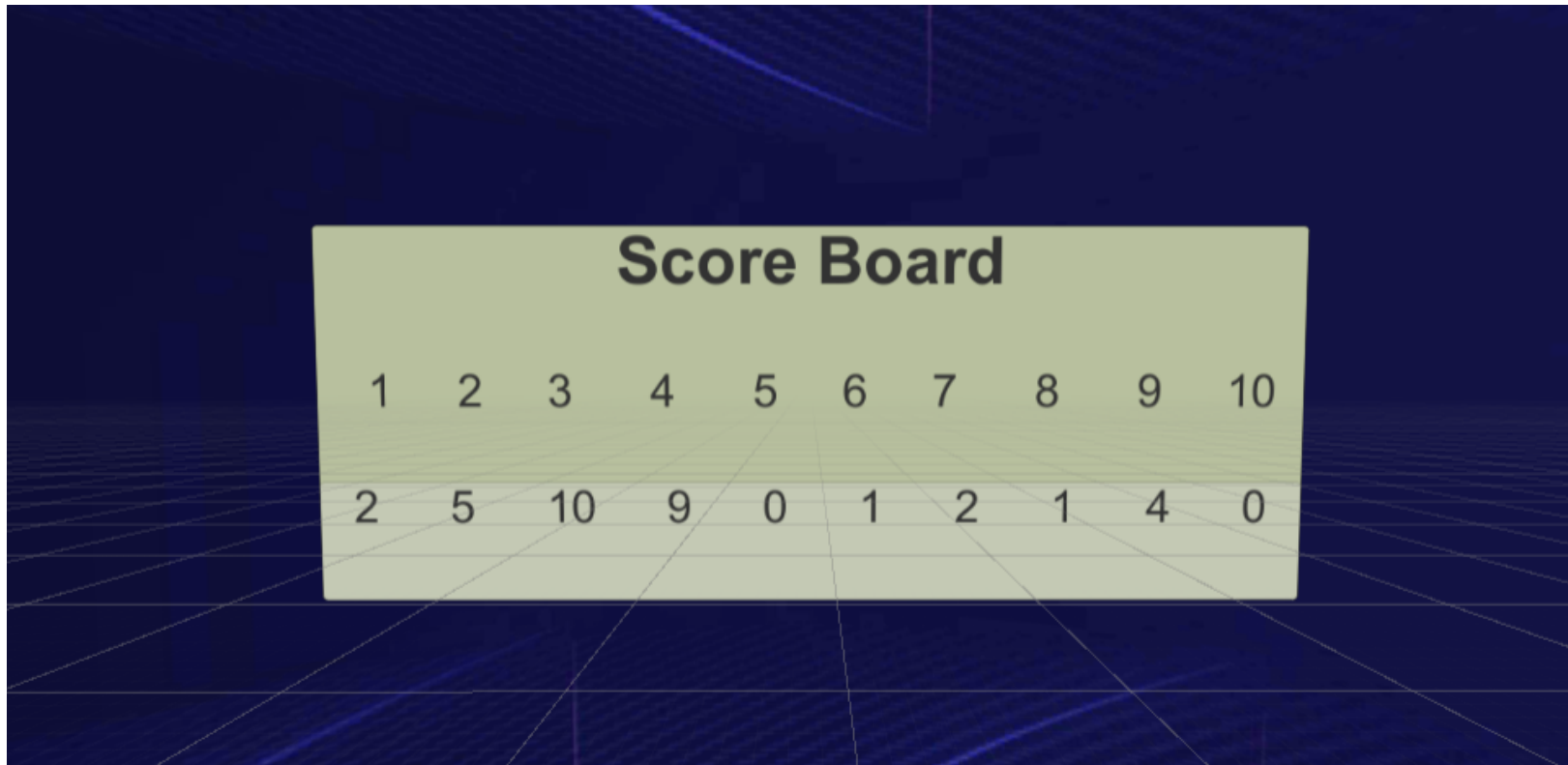
- **Game Menu**

  This is the game menu that is displayed on the top left of the game scene. It has three buttons, viz., 'Restart', 'Menu', and 'Exit', that helps participant to restart the game, go to the main menu, and exit the game, respectively.
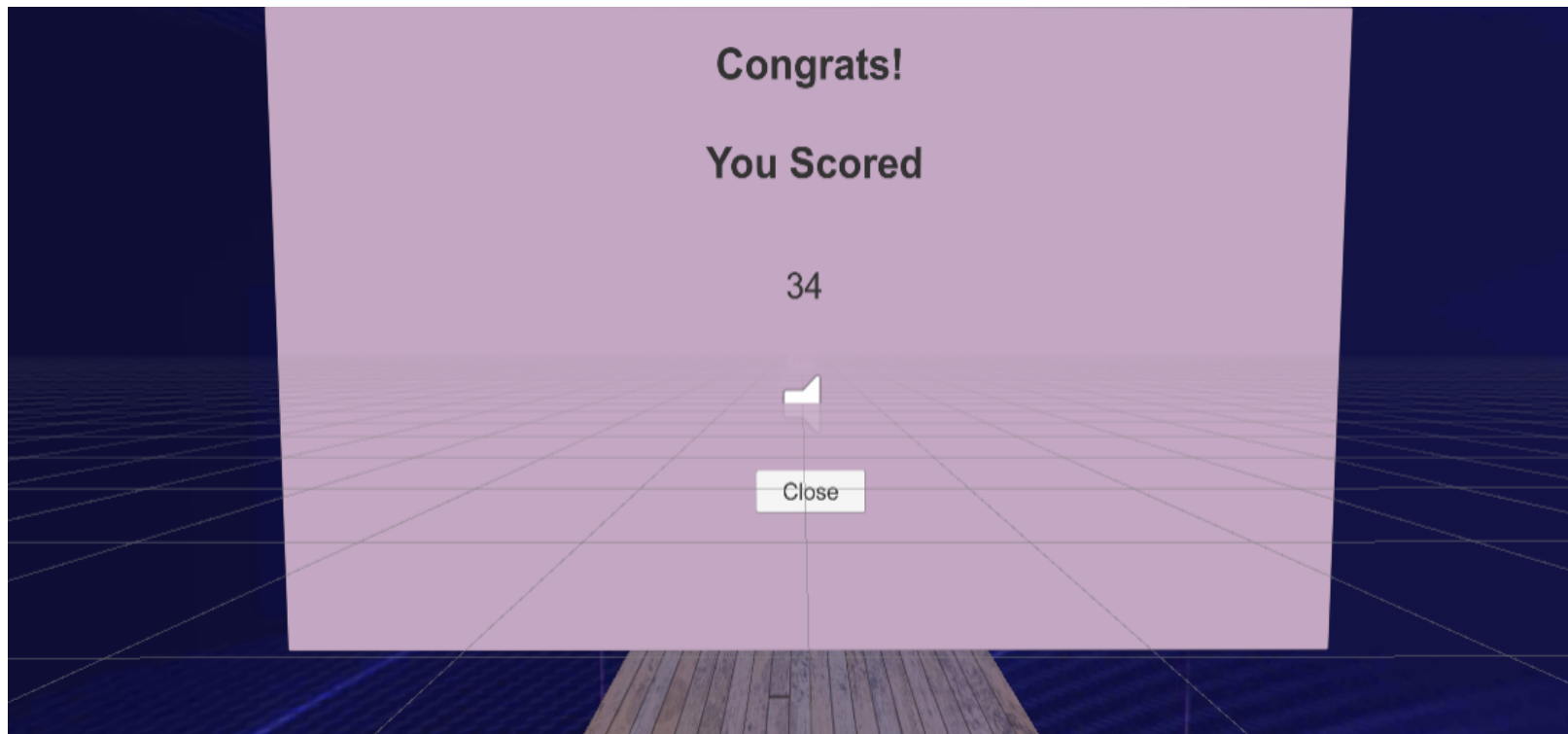

- **Scoreboard**

This is a scoreboard that maintains the scores of the 10 attempts. It is displayed on the top right of the game scene. It refreshes after 10 attempts are completed.
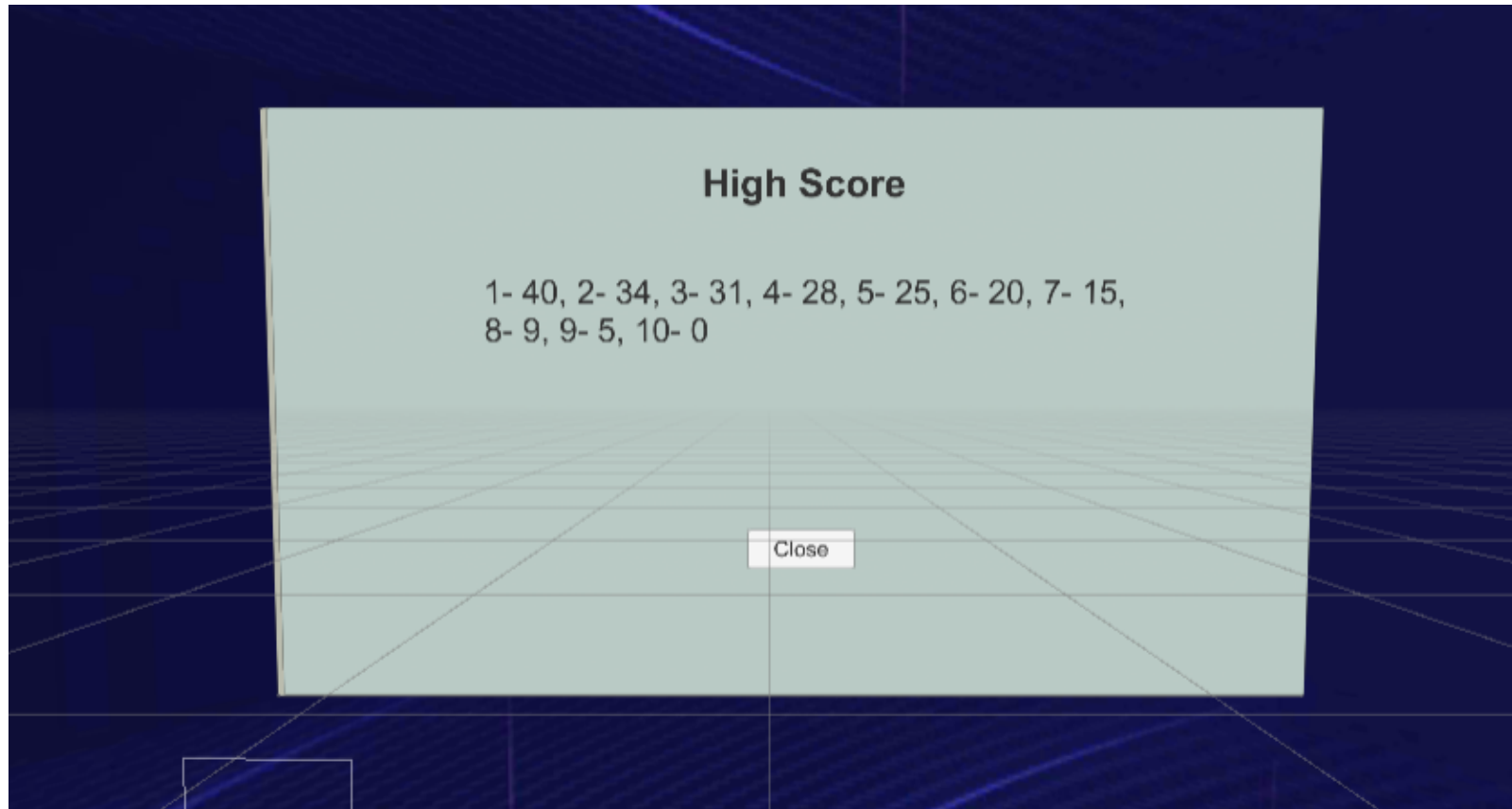
- **Score Panel**

  After taking 10 attempts, the score is displayed on a different panel. There's a 'Close' button attached to the panel that directs to the main menu.
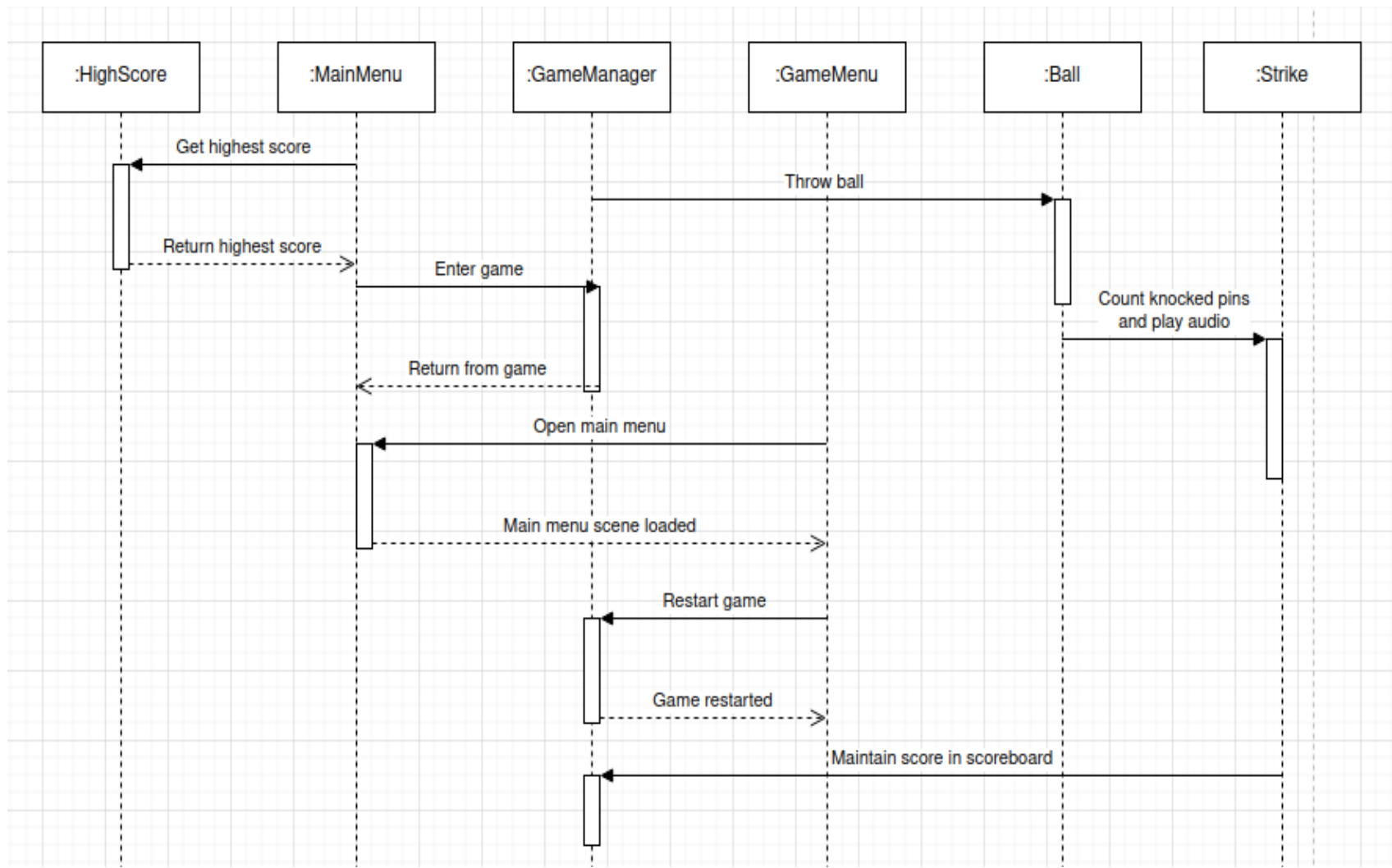

● **High Score**

The high score panel displays the top 10 scores scored so far by the participant.

5. Sequence Diagram

A sequence diagram with the following lifelines and messages:

Lifelines: :HighScore, :MainMenu, :GameManager, :GameMenu, :Ball, :Strike

- :MainMenu → :HighScore — Get highest score
- :GameManager → :Ball — Throw ball
- :HighScore ⇢ :MainMenu — Return highest score
- :MainMenu → :GameManager — Enter game
- :Ball → :Strike — Count knocked pins and play audio
- :GameManager ⇢ :MainMenu — Return from game
- :GameMenu → :MainMenu — Open main menu
- :MainMenu ⇢ :GameMenu — Main menu scene loaded
- :GameMenu → :GameManager — Restart game
- :GameManager ⇢ :GameMenu — Game restarted
- :Strike → :GameManager — Maintain score in scoreboard
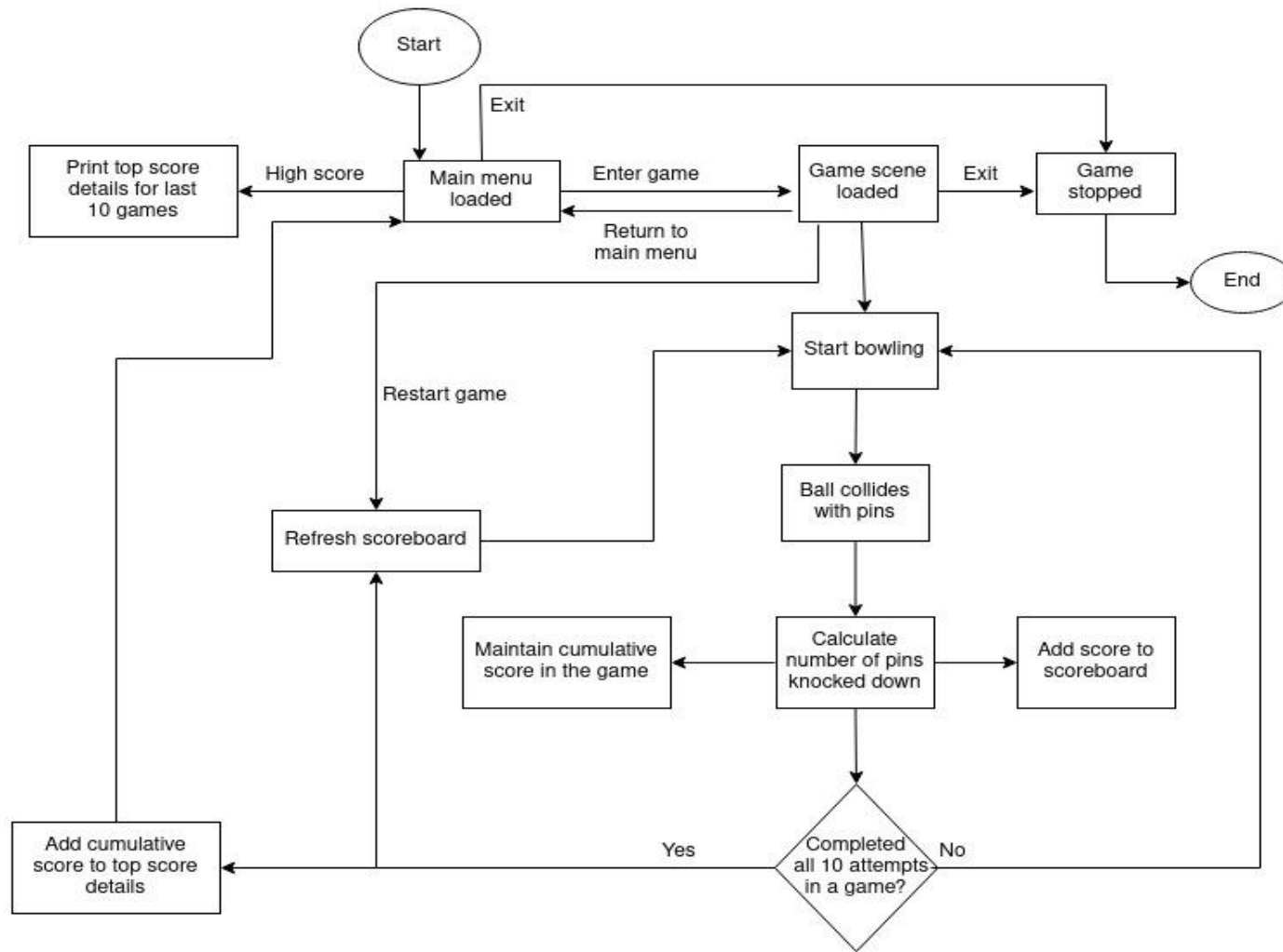
6. Flowchart of Actions Performed

7. Order of Actions Performed

1.	The main menu is loaded first. To enter the game, we have to choose the "Enter" option from the main menu.
2.	On choosing the "Enter" option from the main menu, the Bowling Alley game is loaded with the alley, ball and pins in the center, scoreboard on the right and game menu on the left.
3.	We can start bowling by grabbing the ball and throwing it down the alley. The number of pins knocked down will be counted as the score of that throw.
4.	Scores for all 10 throws will be maintained on the scoreboard.
5.	The top 10 high scores by a participant will be available in the "High Score" section.
6.	We can restart the game at any point of time by clicking on the restart button in the game menu.
7.	We can quit from the game by clicking "Quit" in the game menu.
8.	We can visit the main menu from the game scene using the "Main Menu" button.
9.	After 10 attempts, the final score will be displayed in a panel.
10.	Two audio effects have been included in our bowling alley game - i) a background music which keeps on playing from the time we enter the game ii) colliding sound of pins with ball on strike

8. Characteristics

→ **Static Characteristics**

1. **Bowling alley -** This is the area where participants throw the ball for it to hit the pins and make a score.
2. **Scoreboard -** This contains the scores of all 10 attempts in a single game.
3. **GameMenu -** This contains the following options - Restart, Main Menu & Quit.
4. **Main Menu -** This contains the following options - Enter, Highest Score & Exit.
5. **Background Image -** The bowling alley scene is loaded with an image as the background.
6. **Background Music -** The background music keeps playing once the bowling alley scene is loaded.

→ **Dynamic Characteristics**

1. **Ball -** The ball to be thrown is dynamic as it can roll and collide with the pins.
2. **Pins -** The pins are dynamic as they are initially standing and then after collision with the ball, they are knocked down.
3. **Score Calculation -** The score calculation is dynamic as it happens at runtime.
4. **Top Score for last 10 games -** The top score is updated at runtime, when the score of a new game becomes higher than the scores of existing 10 games we get new top score for 10 games.
5. **Collision audio -** An audio effect was added to demonstrate the collision of the ball with pins.