Unit 3:
VR Bowling Alley with Unity

Software Engineering(Team 16)

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GitLab Link

Submitted by:

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Roles & Effort:

Name	Effort(in hrs)	Role
Sailee Shingane	15	Worked on the scoring logic part in the backend, drew mock screens, and worked on the documentation.
Akshay Choudhary	15	Worked on the scoring logic part in the backend and the documentation.
Shreyash Agrawal	25	Added audio effects in the bowling scene, and worked on the main menu, high score interface and worked on the documentation.
Padigala Lakshman Sai	25	Worked on UI, backend with view through the scenes, multiple attempts, end prompt screen and worked on the documentation.
Husen Kagdi	15	Worked on UI, wrote the backend logic, drew mock screens, and worked on the documentation.

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Overview

In this project, we have designed and developed a virtual reality scene of Bowling Alley using Unity. We have used various assets for the Bowling Alley VR scene from the Asset store. We have tried to keep the interaction between the game player and the system as simple as possible.
For the design process we have used Virtual Reality Sketch sheets to design the overall layout of a VR Scene. For the development process, we have used assets related to our VR Scene from the UNITY Asset store and developed the end-to-end scene.
The current version of our VR Bowling Alley is a single player game where the player is in a bowling lane with the bowling ball kept on the table beside the lane. The user has to try to get all 10 pins knocked to the ground. The scene also includes a Score Board that displays the score for the player after each chance.

Features

Single player Bowling Alley

- The VR Bowling Alley game currently supports a single player interface.
- The player will get an almost real bowling experience.
- The player will see a single bowling lane, ten bowling pins and a single ball in their line of sight.
- The player can use the oculus to grab the ball and throw it on the bowling lane towards the pins.
- Once the ball hits the pins and halts, the scene will be restored to its original setting once the score is calculated.
- The player can then make another attempt to hit all the pins until the attempts are exhausted.

Multiple Attempts

- The game provides the player with 10 attempts to maximise their score.
- Each attempt or turn consists of two chances. Once the ball hits the pins, the score will be calculated based on the number of pins that fell.
- If all the 10 pins have fallen on the first chance, the second chance will be skipped. Otherwise the player will get two chances to hit all the 10 pins.

Scoreboard

- The game scene also consists of a Scoreboard using which the player can keep track of their score during the entire game.
- The Scoreboard will display the score after each chance.
- The scores will be automatically updated on the scoreboard after each attempt of the player is completed.

High Score

- The top 10 scores from the previous games will also be visible to the player.
- These scores can be reset to start the top score log again.

Home Menu

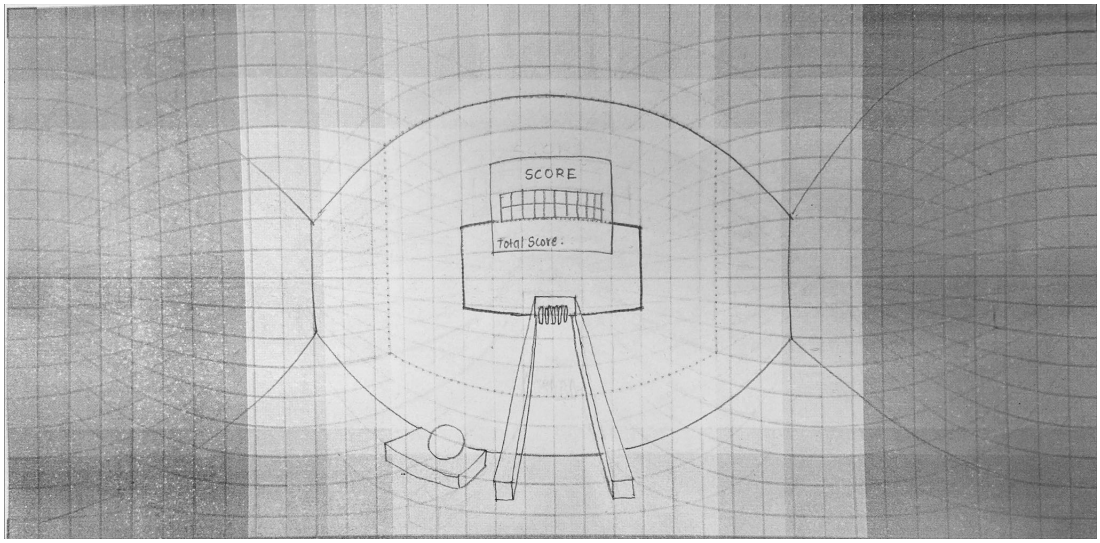
- The Home Menu will provide the player with an interface to start a new game, exit the ongoing game and view the high scores.
- It will be used by the player to navigate through the game.

Audio Effect

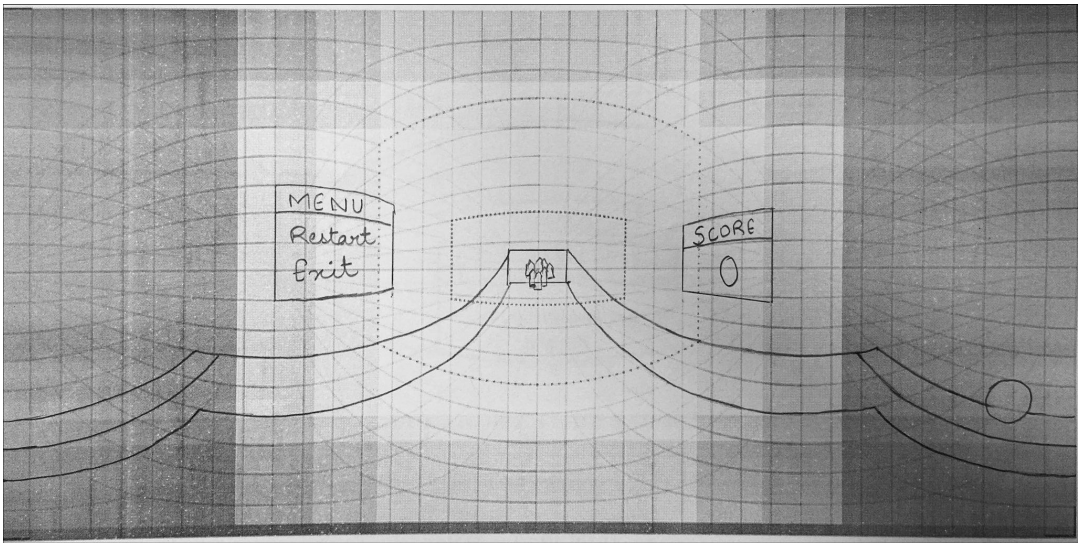
- The game has audio effects added to enhance the player experience.
- Once the ball hits the pins, an audio event will be triggered which would provide the illusion of the actual ball hitting the pins.

Mock-up Designs

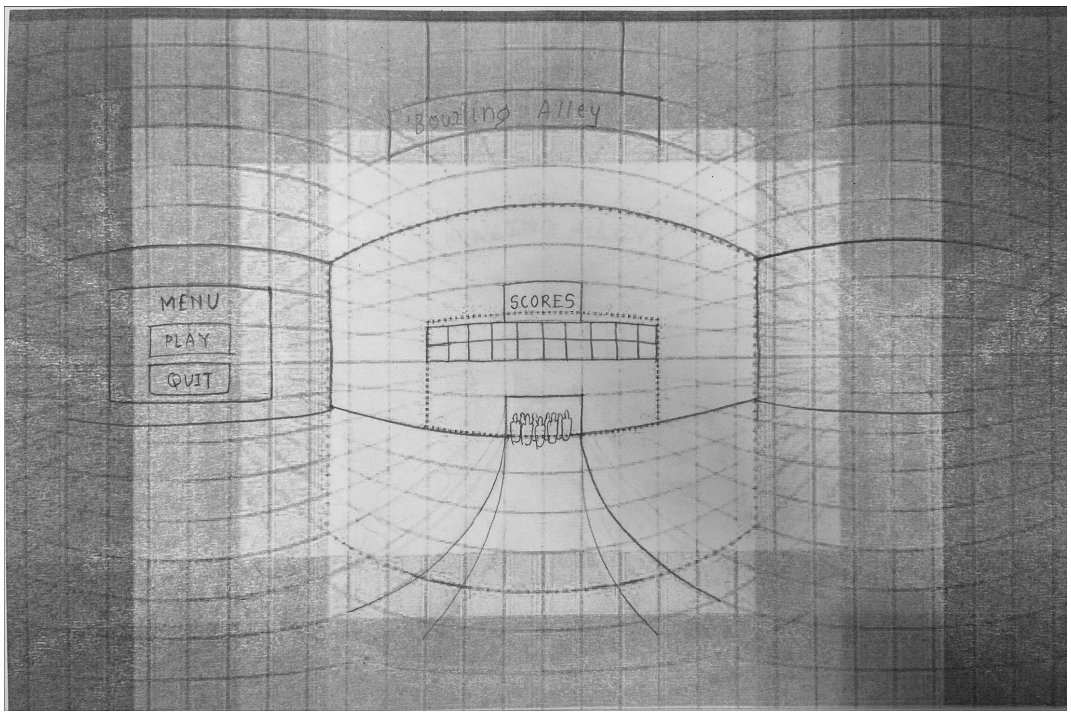
At the initial stage, multiple design ideas were taken into consideration. Following are the mock-up screen designs that were suggested,



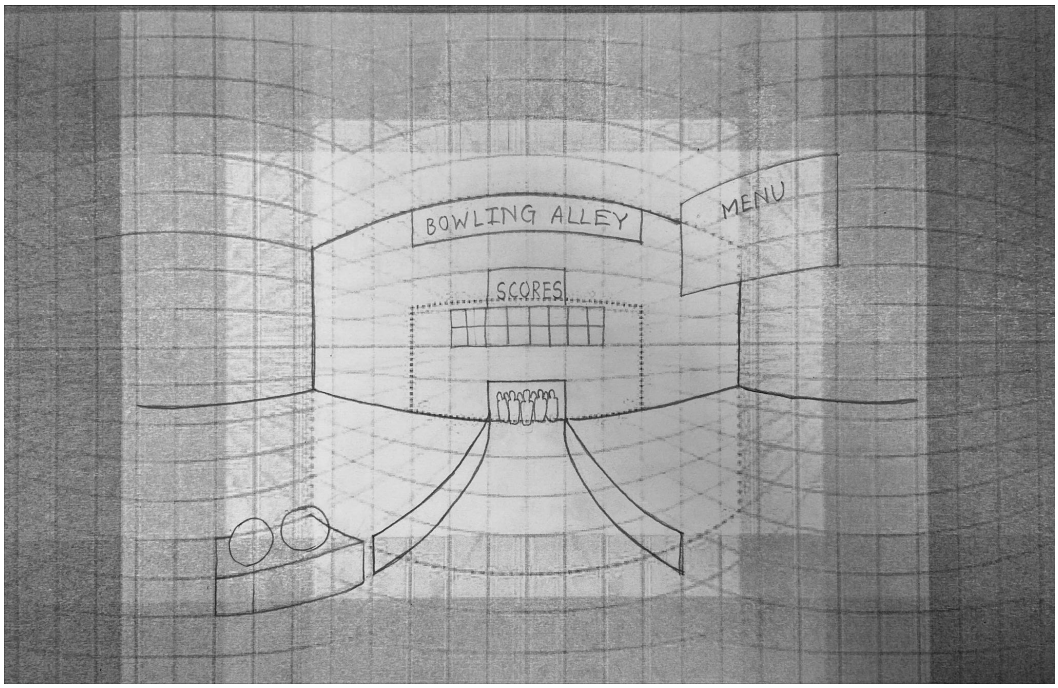
Design#1 (**Final Design**)



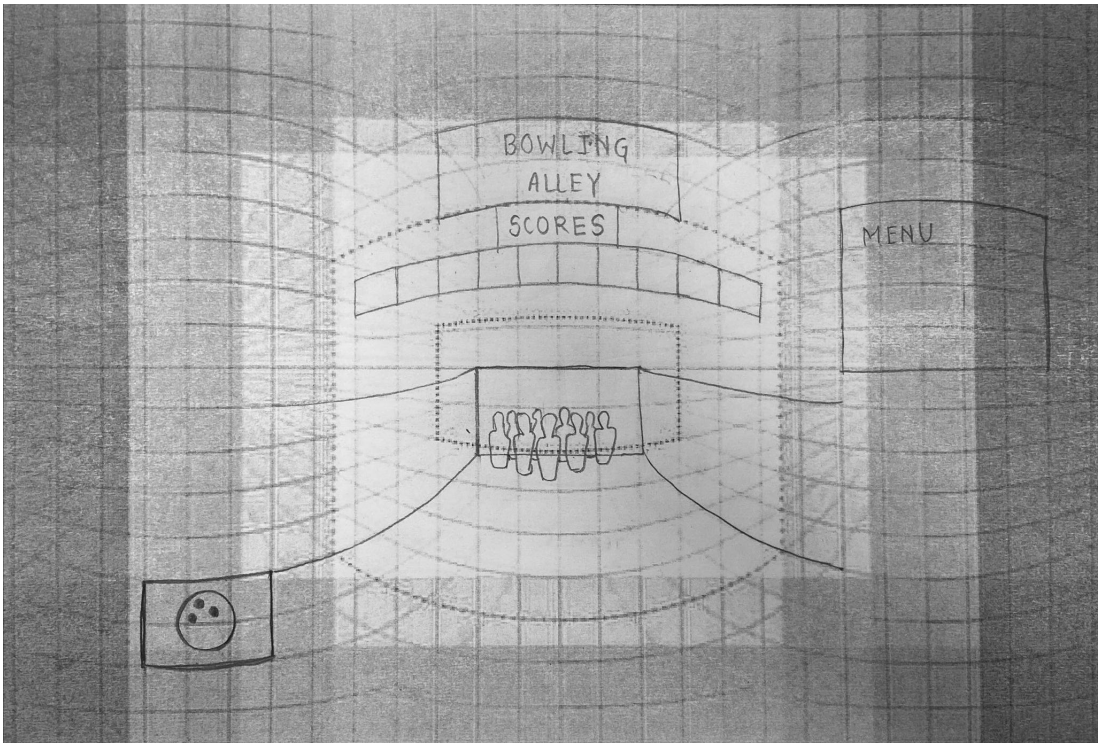
Design#2


Bowling Alley
MENU
PLAY
QUIT
SCORES

Design#3


BOWLING ALLEY
MENU
SCORES

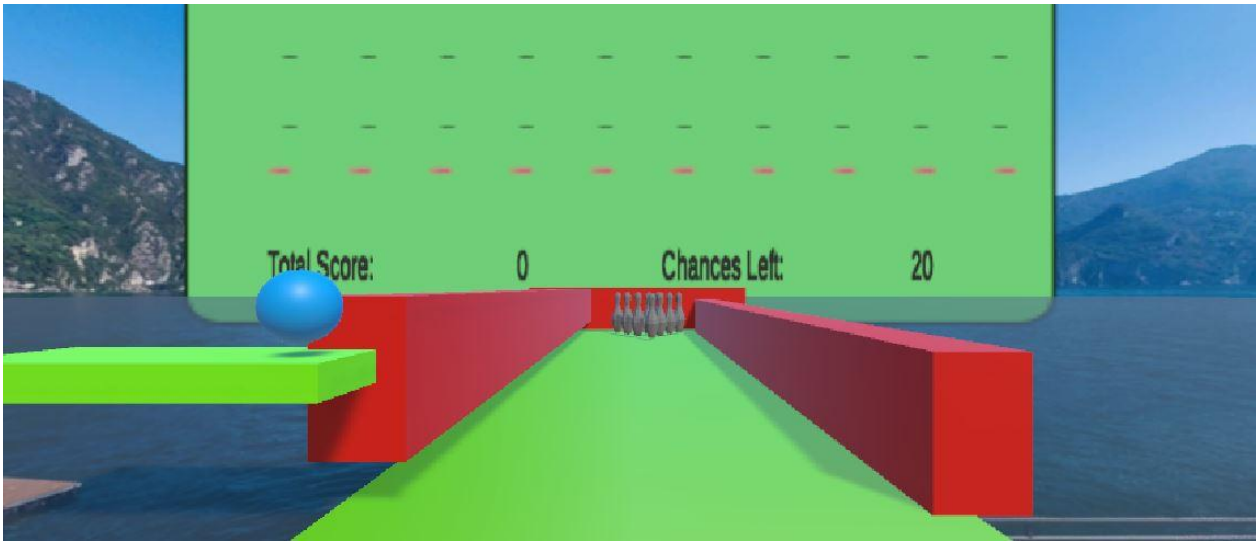
Design#4



Design#5

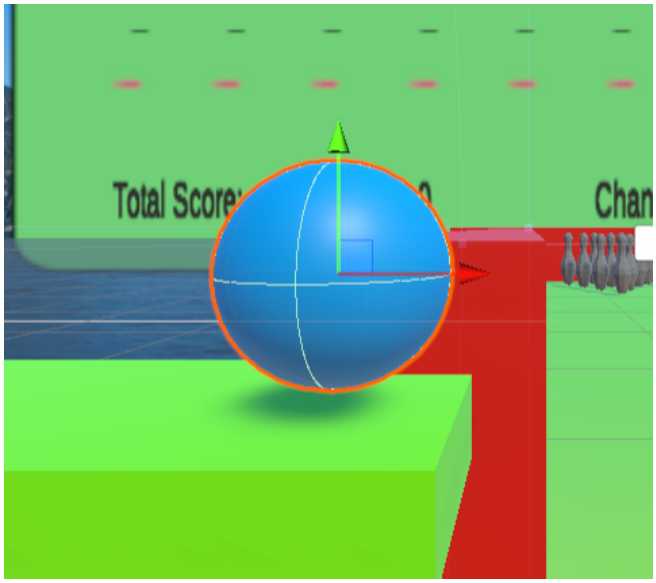
Game Play

Environment



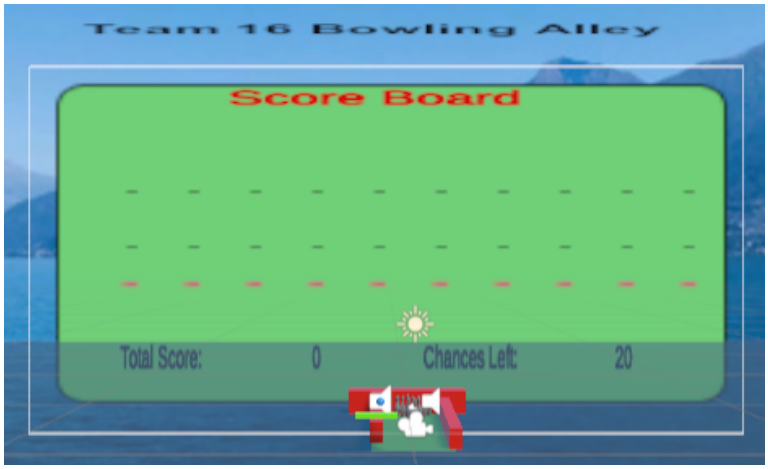
The user has to try to get the bowling ball to the end of the ramp and get the highest amount of pins knocked down. Once the user has thrown the ball and has knocked as many pins down as possible, their score is displayed and the game resets automatically. On reset, the position of the ball is set back on the table and all the pins are back on their respective positions.
Initially, the lane and ball objects are floating in the air, this was done intentionally to display the effect of gravity when the game starts.

Bowling Ball



The player has to pick the ball from the table by pressing the oculus button. The ball is released from the hands of the player when the button is released. The user can control how high the ball should be released as well as the horizontal positioning and velocity of the ball.

Score Board



The Score Board displays the number of pins knocked down by the player in every turn. The score is updated automatically after each turn. One turn comprises two chances

wherein the player gets to throw the ball twice in order to knock down as many pins as possible.

Player Interfaces

Home Menu

The Home Menu provides an interface to the player to enter/exit the game. It included three buttons as displayed in the figure above,

Start Game: The player can start the game by pressing this button. On start, the score board will be empty with 10 turns available for the player. The ball and pins would be present at their initial positions.

High Score: On pressing this button, the High Score interface will be opened.

Exit Game: The game exits on pressing this button. On exit, the player will leave the entire game play.

Final Score Display

Once the player has completed all the 10 turns, the Final Score display will pop up showing the total score of the player through the entire game.
The interface also consists of the Home Menu button and the Restart Button.
Main Menu: This button will navigate the player back to the Home Menu where he can start a new game, view high scores or exit the game.
Restart: The Restart button will reset the game to the beginning. The current total score will be reset to zero and the number of chances will be reset to 10.

High Score Display

The High Score Interface displays the top 10 scores of all the games played before reset. It also has buttons to navigate back to the Main Menu interface.

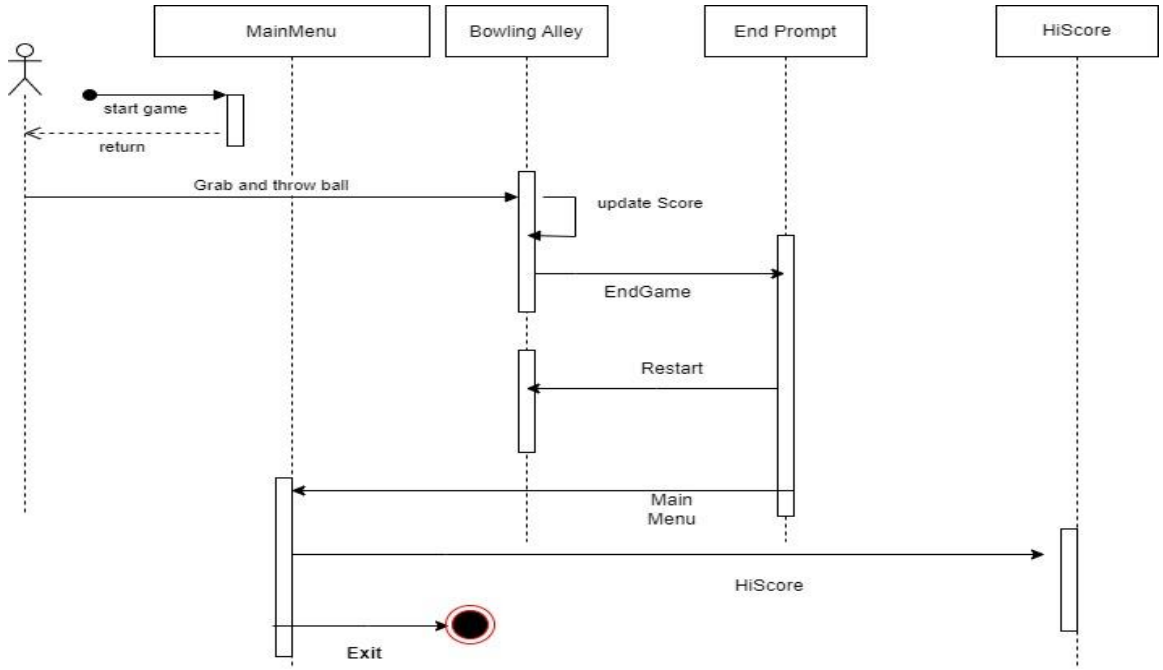
Reset Score: This button will reset the high scores, i.e. a new set of top scores would be recorded on pressing this button. The older high scores would be lost forever.

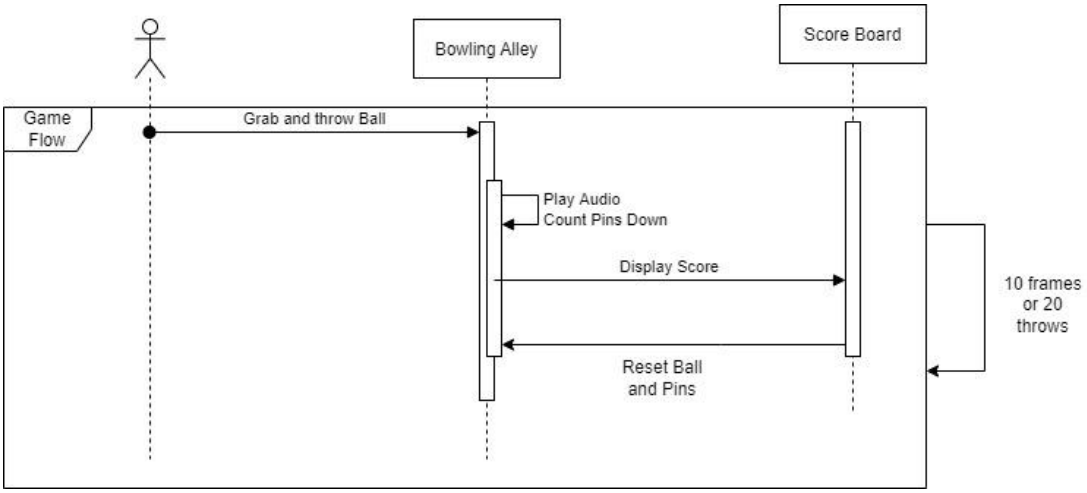
Flow of Events

1. The Main Menu will be visible to the player. Following options will be displayed on the menu,
    a. Start Game
    b. High Score
    c. Exit Game

2.
    a. At the start game the player will see the bowling alley scene. The player has to pick the ball and throw it using oculus. Further once the ball hits the pins and halts, score will be calculated. The game will reset once the score is calculated and the player can once again grab the ball and throw it.
    b. The high score screen will display the top 10 scores from previous games.
    c. On exit, the score will be reset to zero and the player will exit the game play.

Sequence Diagrams





VR Scene

Static Characteristics

- Bowling alley consisting of plane and side walls for the same.
- Scoreboard in the Bowling alley scene for displaying ball to ball update and total score at every stage.
- Mainmenu at the start of the application.
- Endgame Prompt after completion of the game.
- Highscore board which displays the top 10 high scores.

Dynamic Characteristics

- Bowling ball
- Pins

Scripts

Main Menu

The script contains three functions which control their respective buttons' actions. This script allows user to shift to either game scene, HiScore scene or quit game.

Throw Ball

Script is attached to the collider object which is placed on pins to detect the collision and play the audio accordingly.

Score Calculator

Script attached to the ball object. We placed an collider on the pins to detect the collision of ball with pins and after detecting the collision we started a coroutine for 10 seconds and in the 10 seconds time we can get to a stationary state for the pins and ball, then we start counting number of pins are hit with the ball basing on the rotation of the pins as compared to the original rotation and update the score board, then reset the positions of the ball and pins accordingly.

File handling

This script reads the scores stored in "PlayerScore" file made by the game, and display the highest ten scores onto the scene.

End Game

Script attached to the XR canvas in the end game prompt scene, after completion of the game in the bowling scene we are directed to the end prompt scene where we can restart the game or go to the main menu of the application.