

BOWLING ALLEY (VIRTUAL REALITY)

The existing Bowling Simulation application is to be made as a VR based application - a game application that can be played in Virtual Reality through Oculus. The team has been tasked to rebuild the existing project in UNITY which is used for developing VR and Web 3D Products.

We are supposed to design and develop a virtual reality scene which includes the following two processes:

1. *Design Process* includes each member of the team using VR Sketch sheets to design the overall layout of a VR Scene individually and later collate these ideas to finalize the overall design of the VR Scene.
2. *Development Process* involved use of assets related to our VR Scenes from the UNITY Asset store and develop the end-to-end scene and backend.

➤ Team-15 Members:

Name	Roll Number	Role
Arpit Maheshwari (20-24 hrs)	2020201078	Backend, Score Calculation, Integration.
Sushant Kumar (20-24 hrs)	2020201003	UI, Score Calculation, Testing.
Sandeep Deva Misra (28-30 hrs)	2021202026	UI, Backend, Score Board, Top Score, Home Menu, Integration.
Param Dubey (20-24 hrs)	2021204013	UI, Asset Management, Testing.
Ashish Chauhan (20-24 hrs)	2021201044	Audio Effects, Asset Management, Documentation.

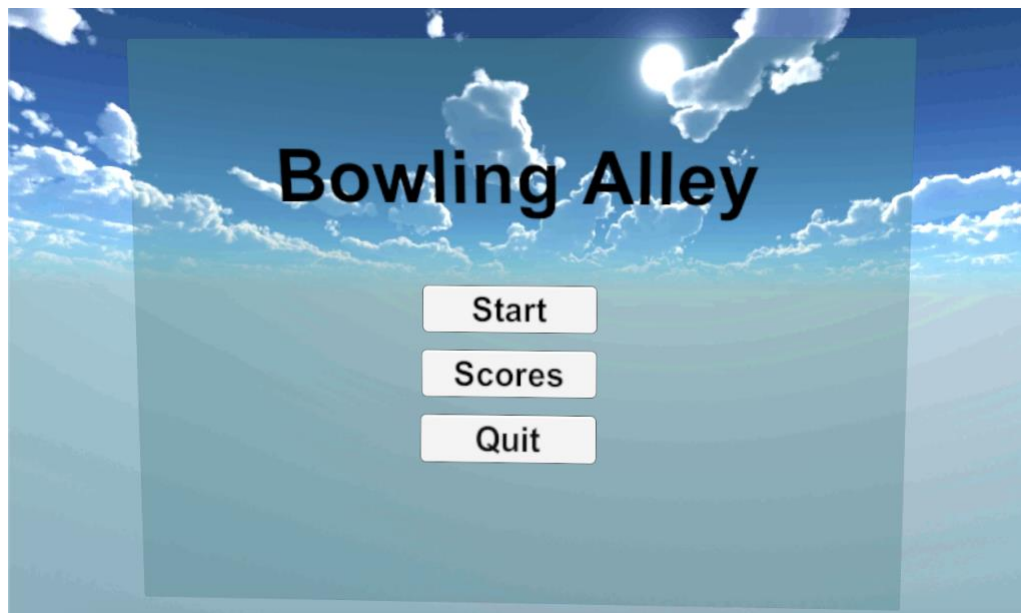
- Date of Submission :April 23rd, 2022
- Repo Link – [Bowling Alley](#)

1. DESCRIPTION

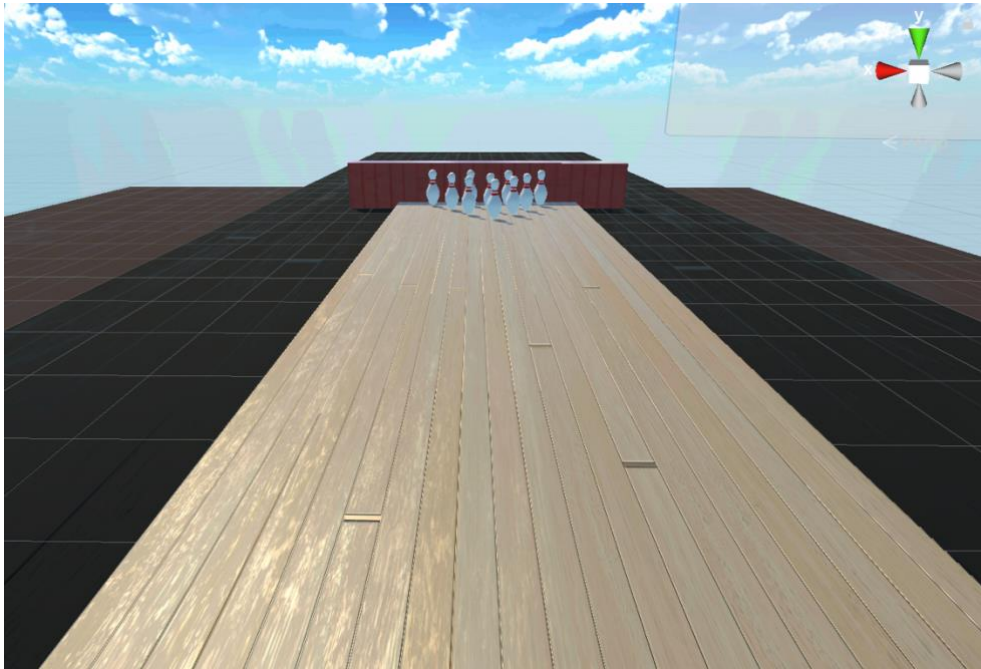
- The final product created is a VR based application(game) of the Bowling Alley Simulation. It is being produced as a game for single user which can be played through Oculus. Wherein it can be played as a first-person bowling VR game.
- The game has been created using UNITY, creating a virtual reality environment. Several assets have been included in the project to make it more interactive and playable for the user/player.

2. FEATURES/REQUIREMENTS

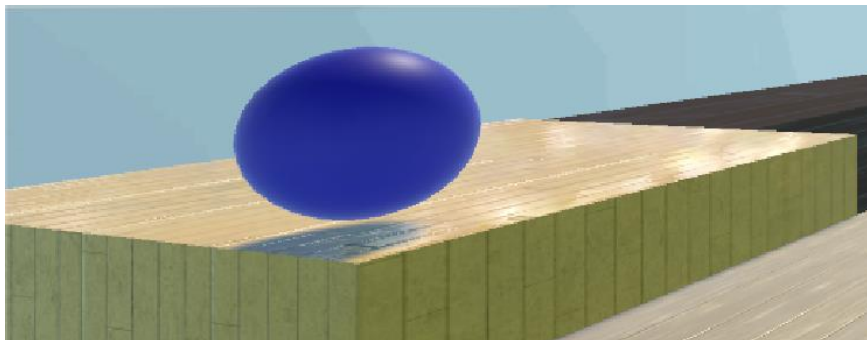
- The application initially allows a person/player to choose amongst the three options provided in the Home Menu. This is the first screen the player lands on and proceeds to three different routes depending on the choice made.
 - *Start* – This transports the player to another scene where the entire game resides.
 - *Scores* – Displays a panel showing the top 10 scores.
 - *Quit* – Exit from the game scene.



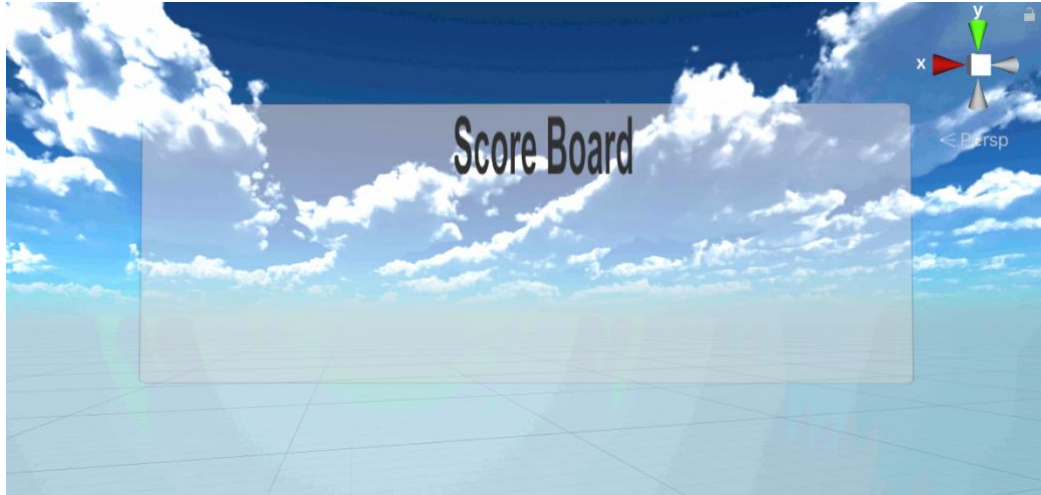
- Once the player chooses to play, he is then transported to the world of bowling where he can see a single lane with upstanding pins in front of him.



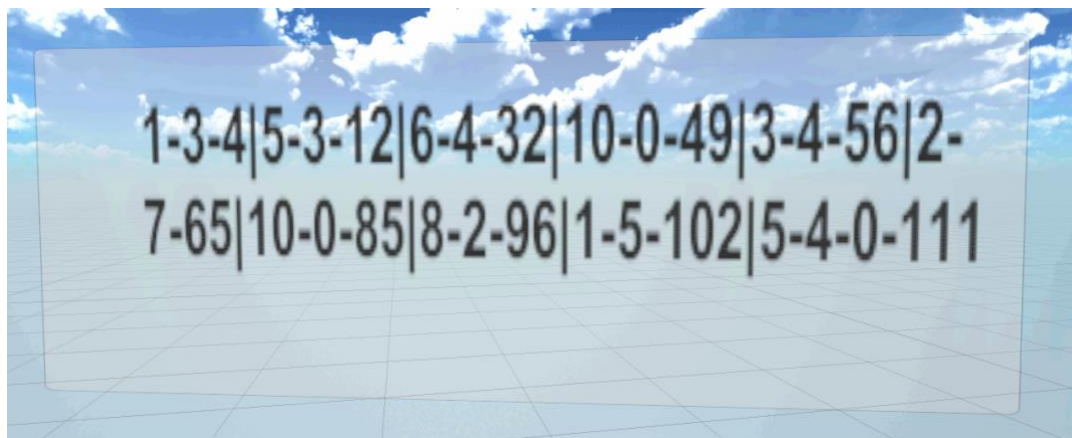
- The player can now choose to play - pick up the ball kept on his left there for him and make a throw. Depending on the angle and force used by the player pins on lane will be hit and fall accordingly. Here is the ball kept for the player.



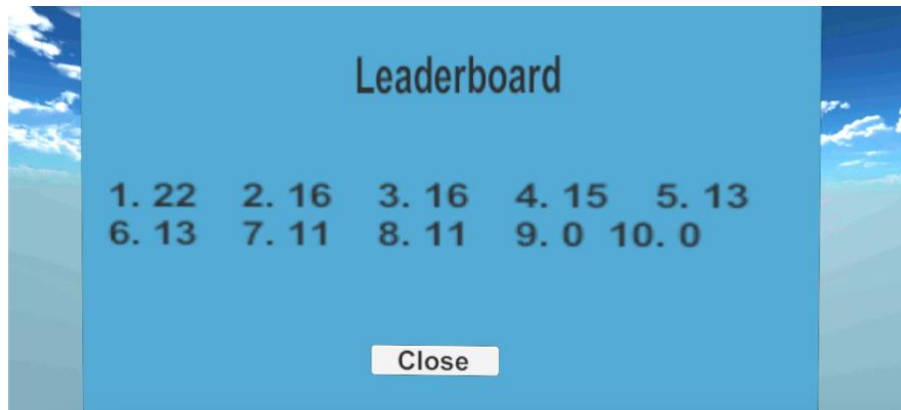
- After each throw, when ball hits the pins, player gets to hear the audio effect put in. Depending on how many and which pins player manage to hit and make them fall, the score of that throw is calculated and updated.



- The score of the throw made and the scores of current sets of throws can be viewed by the player on his right. A table – Scoreboard, is maintained of the scores which are being calculated dynamically on each throw.



- Each player is provided with 10 frames before his turn ends and the total score of that game is stored in a database. As soon as the player finishes 10 frames, the Home Menu appears, where he can choose to view the Top 10 scores of games played. The leaderboard displays the scores in descending order.



- An additional menu is provided in the game scenes with the following routes:
 - *Restart* – To restart the game at any point of time while playing the game.
 - *Main Menu* – To view the Home Menu
 - *Quit* – Exit from the game scene



➤ Scoring Logic :

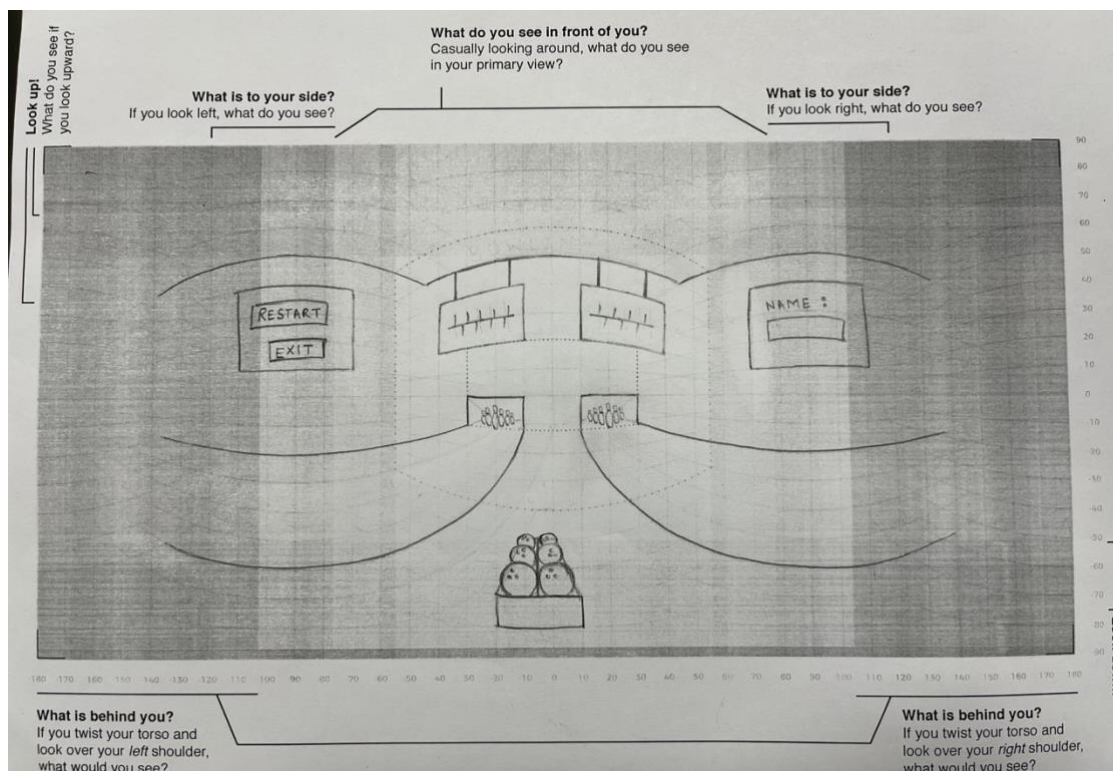
In the Bowling game, we used the standard 10 frames system of score calculation. Following point clearly describe how we have implemented the scoring logic for the game.

- Each player gets to bowl twice in each round, except in the tenth frame, where they must knock all the pins down in the first two attempts to get an extra attempt.
- Each player will be allowed to bowl a maximum of 21 times every game. The maximum score a participant can get in the bowling system is 300.
- For every roll, pins down are added directly to the score. In special cases like strike, means all 10 pins down in first attempt of a round, a bonus score is given of next two rolls.
- On the other hand, in case of spare, means all 10 pins down in a round using both attempts, the bonus score is added of next one attempt.
- In the final frame, in case bowler rolls a strike or spare then an extra chance is provided as bonus.

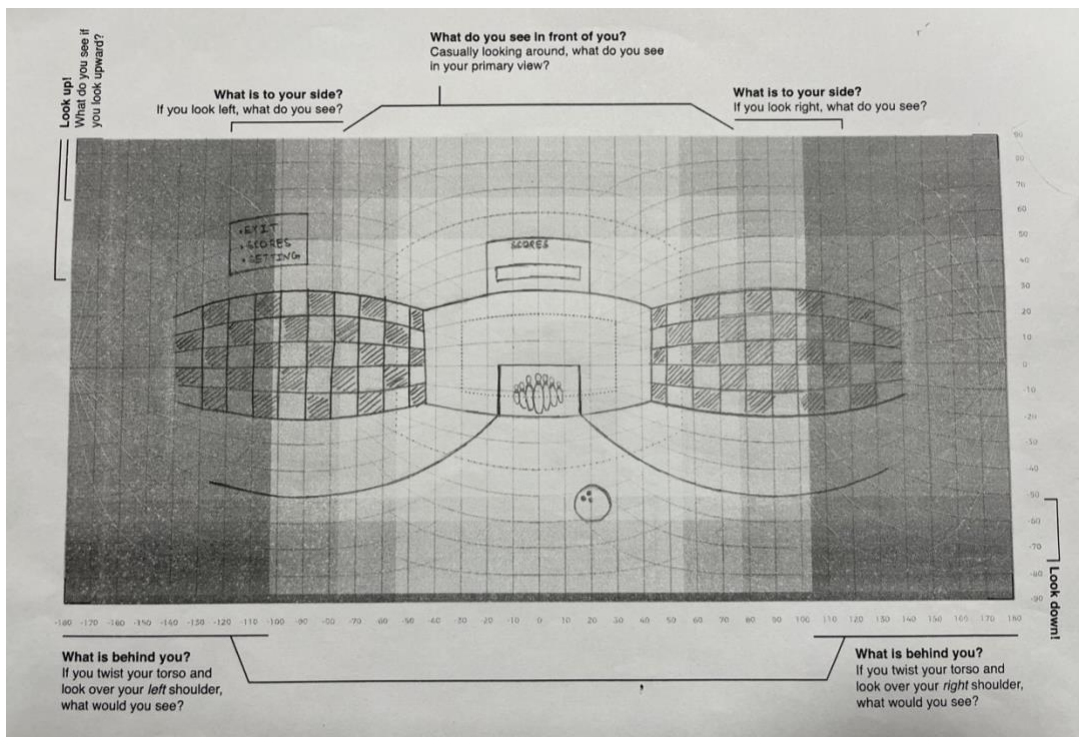
3. VR SCENES

To end up at one VR Scene for the final product, all the members of the team build one VR Mockup Scene on VR Sheets. Following are the

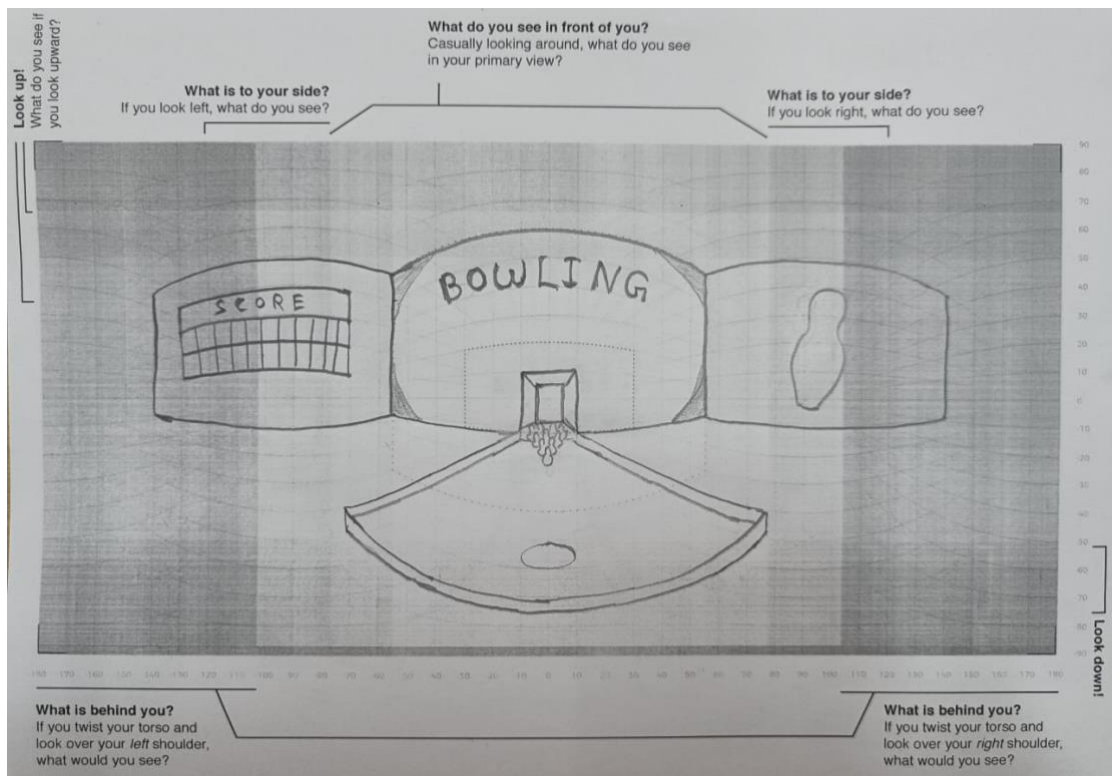
i. Sandeep Misra



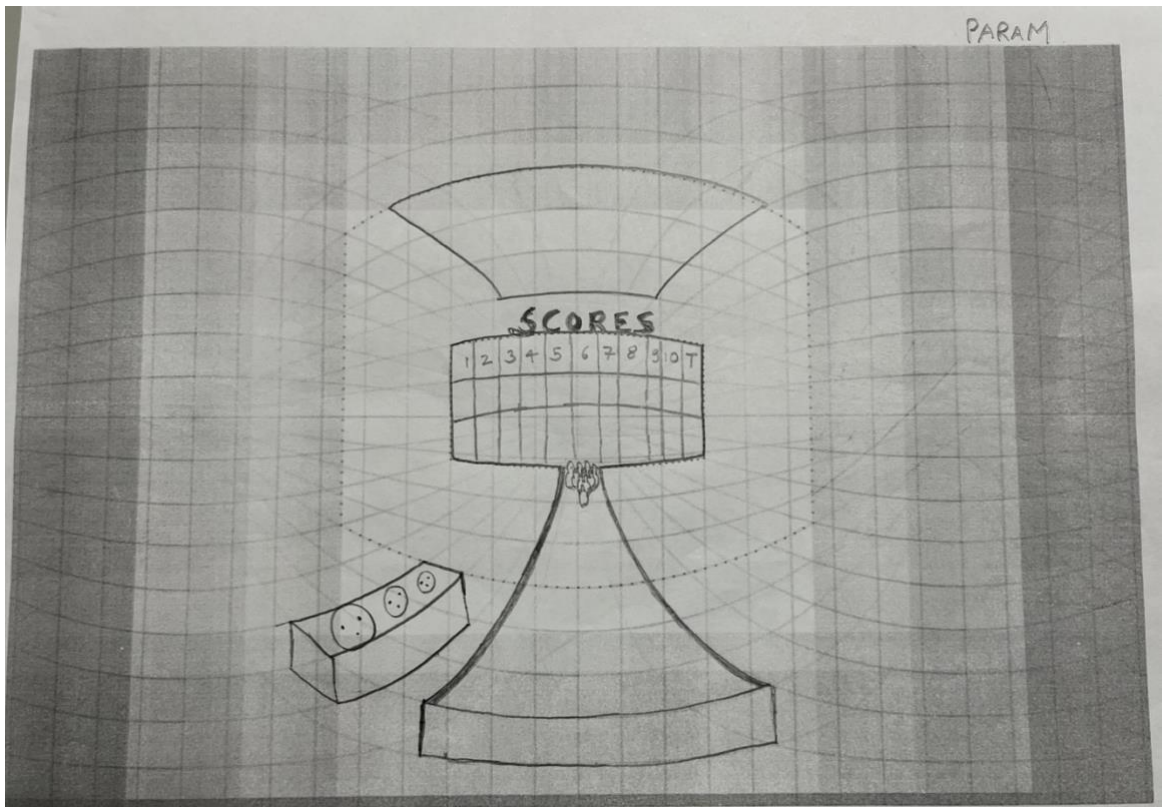
ii. Ashish Chauhan



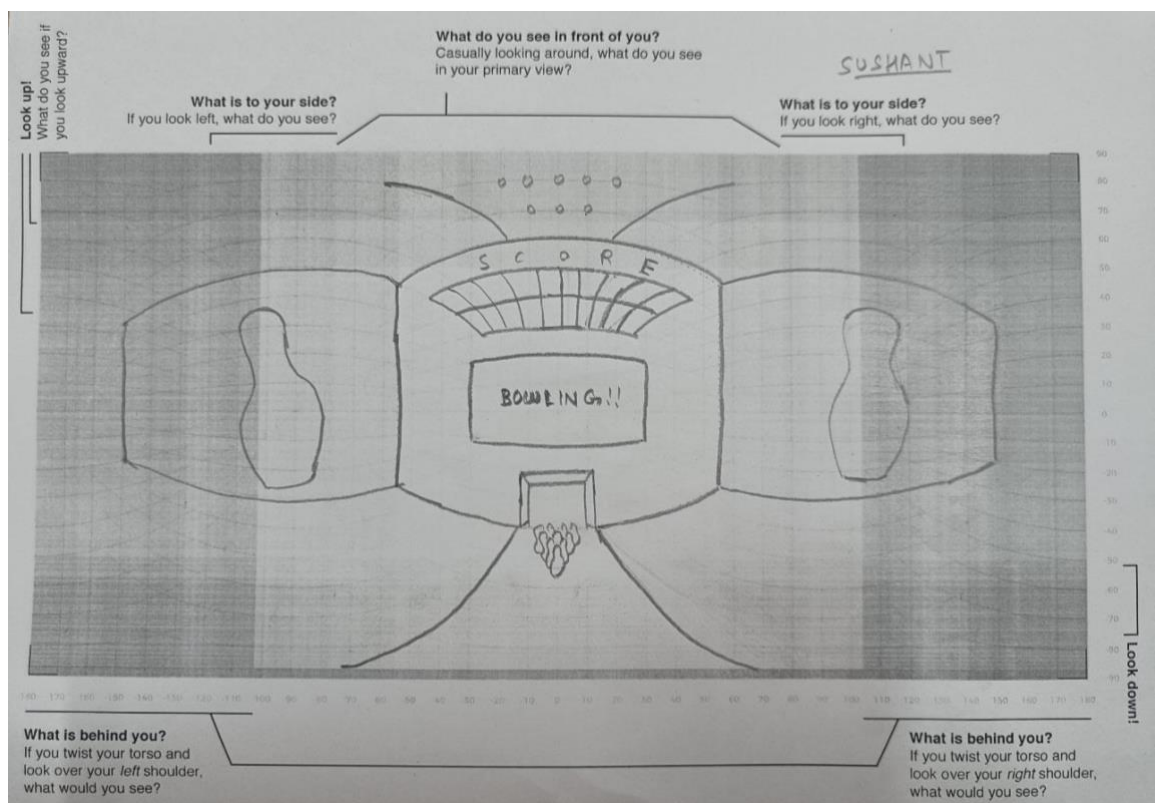
iii. Arpit Maheshwari



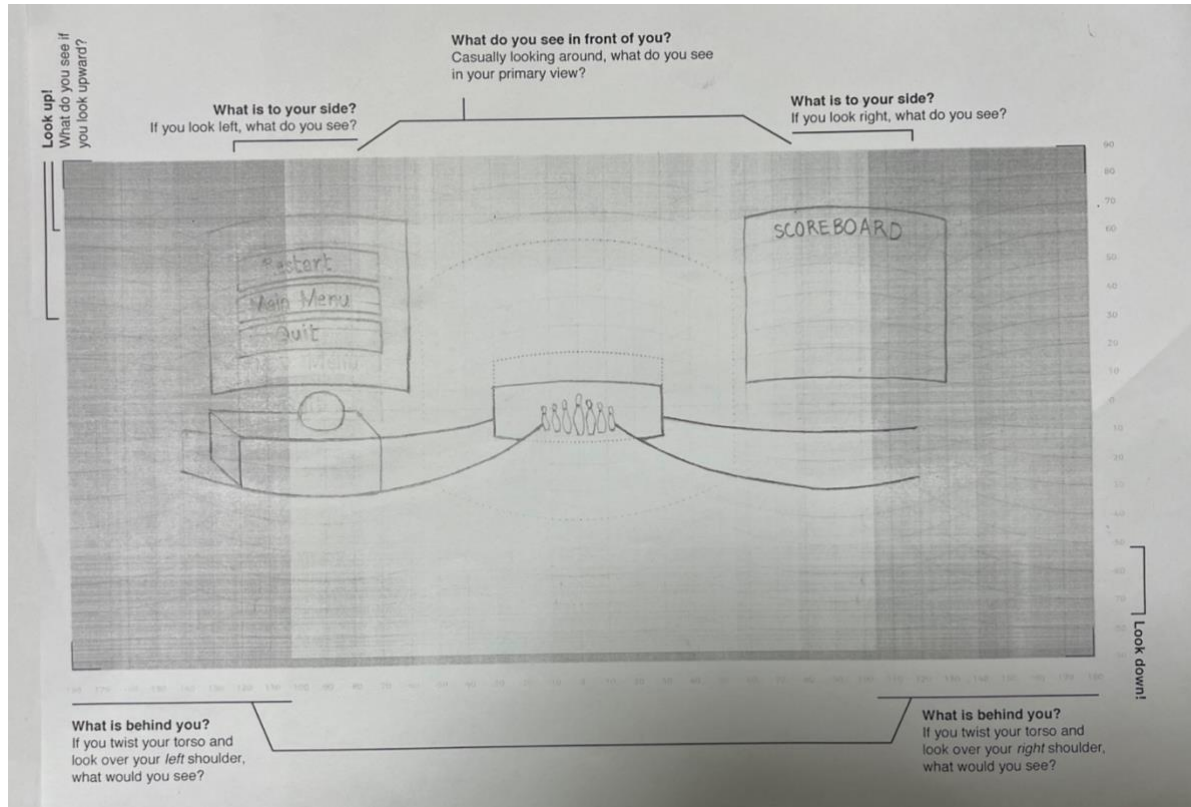
iv. Param Dubey



v. Sushant Kumar



- ❖ After collating the ideas and creativity of all the team members we landed on the *Final VR Scene* as depicted in the following. Availability of assets and User Interaction also played a key role.



4. CHARACTERISTICS OF VR SCENE

➤ Static Characteristics:

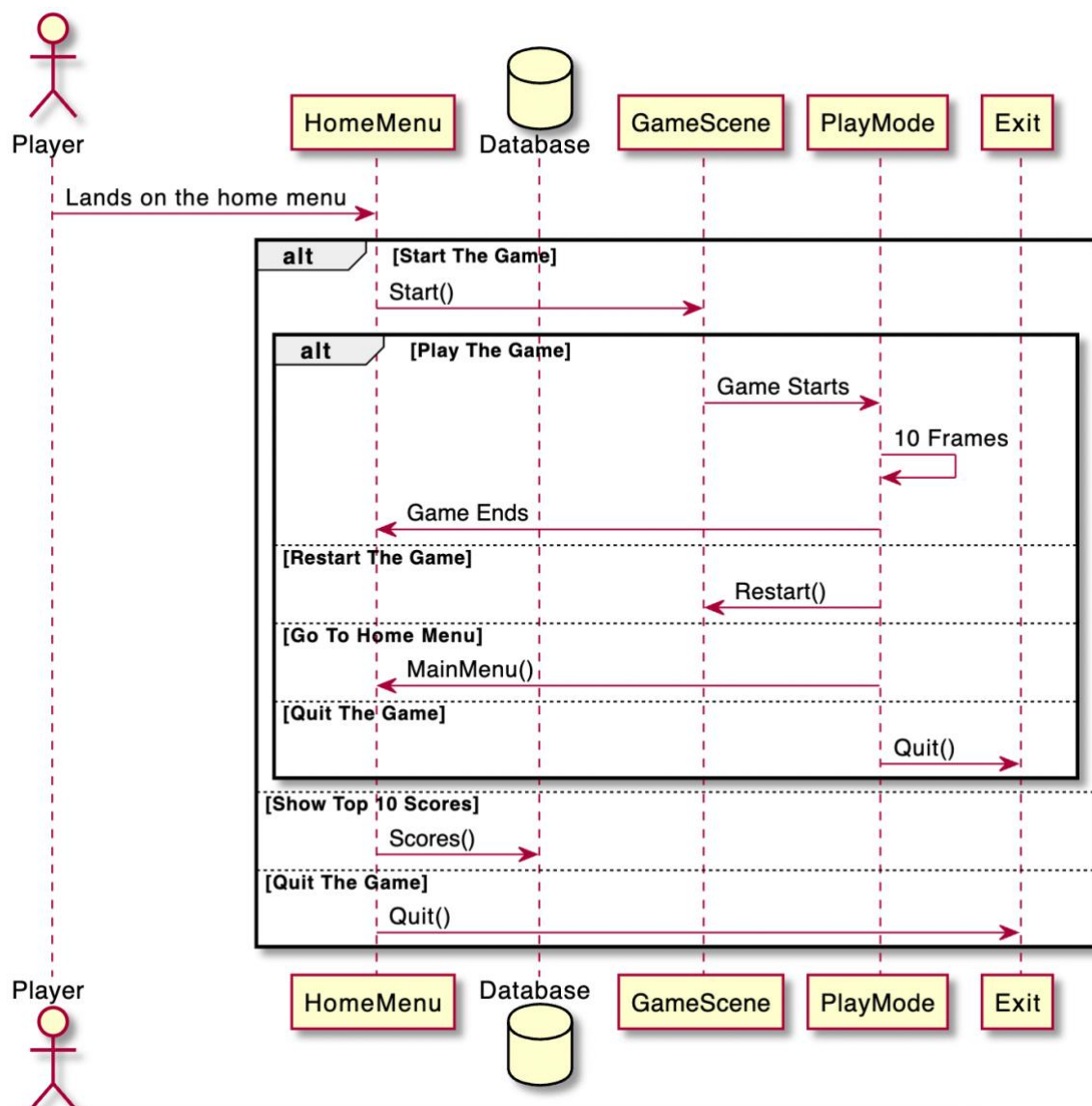
- *Home Menu* – The home menu of the game, landing point, enables user to choose from three options. He can choose to play a new game, look at top 10 scores so far or exit the game.
- *Game Menu* – VR Scene consists of a menu wherein a player can choose to restart the game, go back to the main menu, or quit the game.
- *Planes* – We have made use of two different planes to imitate the lane of the bowling alley and the ground. Also, a platform is made available where the ball is kept.
- *Scenes* – There are two scenes, one for the home menu, which is the landing scene. The other is for the game itself.

➤ Dynamic Characteristics:

- *Scoreboard* – When a player rolls a ball, his score is updated dynamically based on pins he hit. The scoreboard can be seen updating continuously on the right side of the player.
- *Ball* – The ball is the moving object in the game which we can hold and throw at our whim. It gets respawned to a specific location after every throw.
- *Pins* – The pins when hit by the ball falls. Upon 1 complete attempt (consisting of 10 frames) by the user all the pins are again respawned back to the place and position they were in.

5. SEQUENCE DIAGRAM

To explain the complete flow of events, all the actions to be performed by the participant and all the related actions performed at the backend, a sequence diagram has been created.



6. UNDERSTANDING THE FLOW

EVENT	ACTION TO BE PERFORMED
HOME MENU	On entering the game, the player will land on the Home Menu where he will be provided with three options to choose from:
1. START	Upon starting the game, Player again has four options provided in Game Menu –
	<ul style="list-style-type: none"> <i>a. Play:</i> Player can begin a new game and can play the game for 10 frames after which Home Menu pops up. <i>b. Restart:</i> In case the player chooses this option, the game screen will be reloaded and new game will start afresh. <i>c. Go back to Home Menu:</i> This option will take the user back to the Home Menu. <i>d. Exit:</i> Choosing this option will exit the game scene.
2. VIEW LEADERBOARD	This option helps the player to look at the top 10 scores of all the previous game. Here a leaderboard is maintained which keeps record of top 10 game scores.
3. EXIT	This option helps the player to exit from the game.