Fire Ball

Project Proposal

University of Windsor

Submitted to:
Dr. Aznam Yacoub

Customer:
Miss. Shivani Kapadia

Submitted By:

ASE Section 1 Group 5

Object:

The document underlines the development pipeline of the game Fire Ball. It denotes the scope of the projects and elucidates the technology to be used for the development supported with a market study.

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Sent to Dr. Aznam Yacoub, Miss. Simranpreet Kaur

Destinataire

ID: Document1
State: **Proposed**

Table of Contents:

Analysis of needs:

This document is a proposal for the game: Fire Balls. The planning to develop this game has been done by keeping in mind the things that were required by the customer and our analysis of how the game could help other people. The requirement of having a game in metaverse or omniverse, it was decided to make a game in Augmented Reality (AR). The game should be a stress buster for those who are not able to go out due to the pandemic, it should also involve physical activity and interaction with the outside world digitally. So, we propose to make a game that will solve all of these problems. The game will be played on windows devices and can be played solo or multiplayer and even in localhost and online. To score in the game, the user will have to dodge the fireballs and collect the in-game currency.

Market Study**:**

For a very long time, the gaming industry was sprinting towards hyper-realistic graphics for games. With massive budgets and development times crossing more than a decade, it has reached a point of diminishing returns with now the capabilities of the available hardware also being the limitation. On the contrary, it is evident from the recent releases in the gaming industry that the most important is engaging gameplay with fun graphics. The game “Fall Guys: Ultimate Knockout” is a prime example of such a phenomenon. Based on the report of firm Superdata, the game’s first-month earnings on PC was $185 million, making it the most successful launch since Overwatch [1]. The success of Among Us is also an example of such games that have seen recent success. Among Us recorded a total of 500 million monthly active players in just a month of November 2020, [2]. Since 2012, Candy Crush has been a revolution in the mobile gaming industry, setting the precedent for freemium gaming, a free-to-play game that earns its revenue through micro-transactions. Being the first to reach a billion dollars in revenue [3], Candy Crush truly set a benchmark. It is still one of the most successful games of Activision Blizzard, now owned by Microsoft, and is comparable to industry-leading games like Call of Duty and World of Warcraft.

AR has also seen a massive influx in popularity. With the inception of “Meta” as Facebook's parent company, the phrases “Metaverse” and “Omniverse” are buzzwords in the industry, and AR is at the forefront of all these conversations. With

all the major companies, including the Big 5, investing heavily in AR hardware and software, it is evident that AR will be the future of computing. The success of Pokemon Go is a benchmark for the future of AR gaming, with estimated earnings of $900 million through in-game purchases in just a year 2019 [4].

After examining the numerous existing market possibilities for customers, we discovered the following games:
Rainbow: In this game, the player's objective is to control a smiley with eyebrows. Where we lift our eyebrows to move upward, frown to move downward, and remain expressionless to keep stationary.
Wacky Face: The player's objective is to Wink eyes or open mouth to attack enemies.
Nose Zone: It uses the direction you point to your face to control a laser projected from your nose. And the player's objective is to destroy the targets by pointing at them with your nose.
Drawbacks of the above games:
Because none of the games described above use a real-time user environment, they are less appealing. Furthermore, because it is a facial-controlled game, individuals cannot play it for extended periods and it does not promote any physical movement. Interaction with other players is also limited, with no multiplayer mode. Another difference in all the above games is that they use facial landmark tracking for simple user inputs, whereas the proposed game uses facial landmark detection as the game character itself, making it much more intuitive.
Beat Saber: Beat Saber is a popular VR exclusive experience. It features the player slicing blocks representing musical beats with a pair of contrasting-colored sabers. It uses the player as a character and the hand movements of the user are recorded using VR controllers and external cameras. However, It too does not incorporate the real environment of the user and also requires specialized hardware that is expensive and inaccessible to a large section of the population.

One of the main features of our game is to integrate the game's visual and audio content with the user's environment in real-time, hence using the concept of AR. As we want to develop a game that is more engaging, interactive, and simultaneously easy to play for all age groups none of the applications mentioned above incorporate all of these features as a whole in their game.

Users can visualize their face as a new character face which makes it more interesting. By using beloved characters as “Avatars” and the user's environment in real-time it makes the player feel they are inside the game leading to more immersion during the gameplay. The “Avatars” have the potential to provide a more dramatic and fulfilling gaming experience. Furthermore, In the party mode and the online multiplayer mode, users can satisfy the need to feel connected to other people as they will compete against their favorite characters making it more fun and engaging.

The gameplay is suitable for any user, regardless of skill level or available free time due to the format of the game. As the players collect more in-game currency, they can buy our favorite character, giving the opportunity of monetization.

Project Scope and Definitions:

The purpose and idea of this project are to develop a game where the players can have physical movement and play in competition with their friends. Following are the development scopes and definitions involved with the project.

1. **Room**: It is defined as a virtual session where at most 2 people can connect using a single 6-digit code. The code must be generated by one of the game participants and the room code must be communicated to other game participants explicitly.

2. **Action Reflection**: When the players are in a room, their score and body movement will be reflected on each game participant’s screen.

3. **Avatars**: For the detected body in the video feed, the face can have a filter from a given list of filters already provided by the game. Each individual face filter is termed an Avatar. The number of avatars is limited to 10.

4. The game will provide three modes of play:

    a. **Single Player**: This mode is defined as one person playing the game standing inside the bounds of the camera frame.

b. **Multi-Player (Online)**: This mode is defined with a maximum of 2 people joining into 1 room and playing together. Action Reflection will perpetuate to all the participants.

c. **Party Mode (Local Multiplayer)**: This mode is defined with a maximum of 2 people standing within the camera frame and playing the game together.

d. **Multi-Player (Random)**: This mode is defined by the pairing of a user with another user randomly online.

5. **Menu**: The menu of the game is defined as the options visible to the user where he can navigate to choose the **game mode, create a room, see the high score, choose an avatar.**

Main Features and Elements of the game:

1. **Game Environment and Application:** Fire Ball is a free-to-play game that will be launched on Windows PC and ported to iOS and Android in later stages of the development. It works in an Augmented Reality setting.
2. **Pick your Look and Customize your character:** Players enjoy having a say in how they look, and this is something that can be seen in this game. Players have the option of selecting their favorite character as an “Avatar”. The player can use their in-game currency to unlock/purchase their favorite character, which can be a fun way to spend money on something they truly desire.
3. **Promotes physical Health:** This game is a simple and inexpensive technique to encourage physical activity, Players can manage their stress in a better way and can enjoy the game.
4. **Helps to socialize while self-isolating:** This game serves as a potent opportunity for players to socialize with new friends.
5. **Language and framework used:** This game will be created in Unity using the C# programming language.
6. **Target users:** Fireball will be played by users of all age groups.
7. **Levels of the game:** The game is an endless genre game. The difficulty gradually increases with the player's score.
8. **Start camera:** The game can be accessed through the camera, which can be the webcam or the front camera, depending on the user's device.

Functional Requirements:

1. The game must include a component of “metaverse” or “Omniverse”.
2. It must allow users to interact with the real world.
3. It must have the functionality to interact with other players.
4. It should be able to access a live video feed of the user’s environment using a webcam or camera for the AR component.
5. It should allow and encourage users to move around in their environment.
6. It should be fun and engaging.

Non-functional Requirements:

1. **Performance:** The game should function smoothly without any errors, meeting the demands of the majority of users, and the processes will be monitored to maximize performance.
2. **Compatibility:** Initially, the game will be a PC standalone version and later followed by mobile platforms like iOS, Android. Updates will be issued on a regular basis, and compatibility with the majority of versions will be ensured.
3. **Quality:** The application must deploy all the features listed in the game menu without latency or glitches, and it must be extensively tested by the testing team.
4. **Availability:** We don't require any specialized, expensive, or difficult-to-acquire devices for this game, so users may play it simply on a PC or a mobile phone.
5. **Usability:** This game is very easy to learn and doesn’t create any difficulty in using this game, all age groups can use this game without any issues.

Technical Constraints: We are a group of six engineers that will be working on this game for eight weeks, putting 500 hours altogether on the project. Any adjustments or requirement changes that go beyond this document will take a longer time.

Prototype:

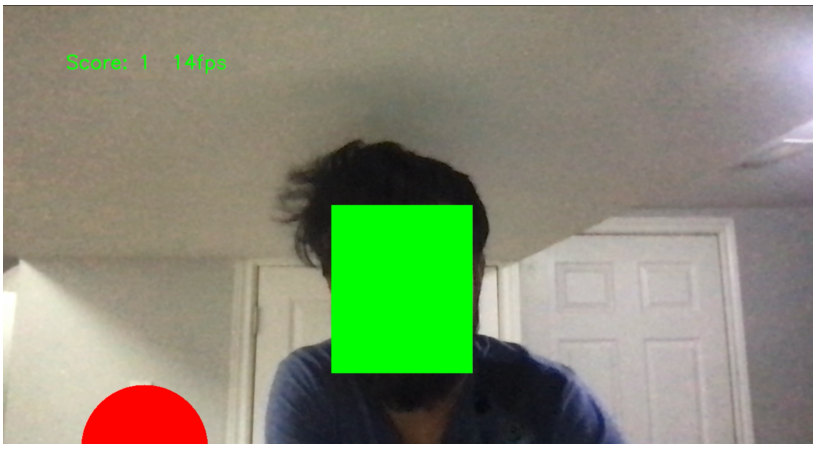
Prototype for selecting the Avatar

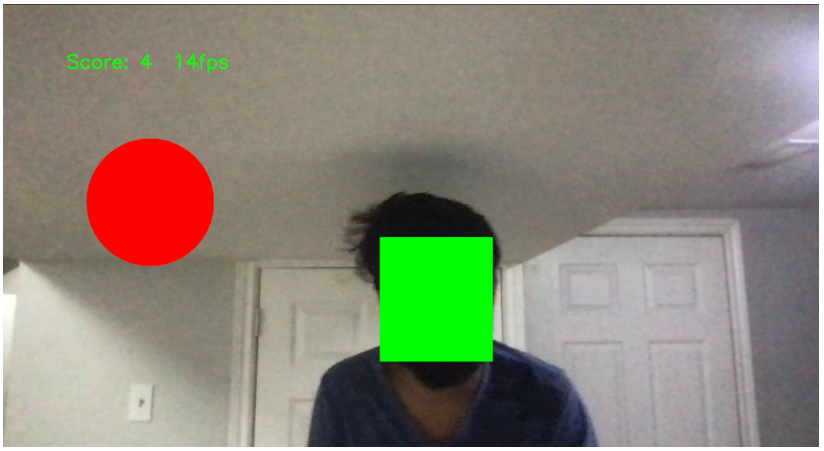
We propose to use Deep Learning-based Face mesh to detect facial landmarks of the player and overlay 2D and 3D filters.

As the game progresses and the player collects more in-game currency, they can unlock more such filters as their avatars.

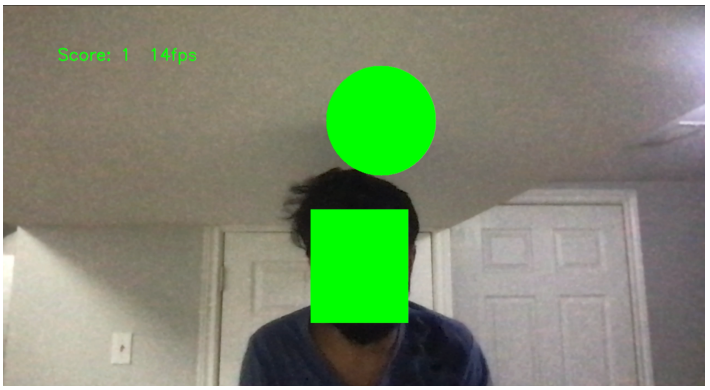
Prototype for Gameplay

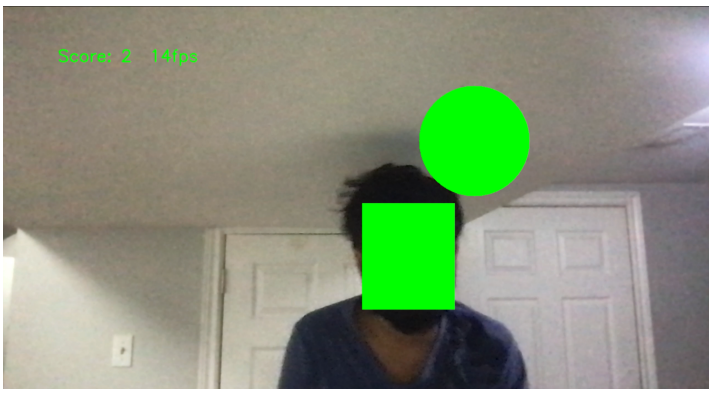
The game has perpetually falling objects. The green rectangle in the screenshots below depicts the “Avatar” chosen by the player. During the game, the face of the player is replaced with a filter of their chosen character. These are both “good” and “bad” objects. The red balls in the screenshots below depict the “bad” objects, e.g. the fireball, that the players must dodge and protect their “Avatar” from by making appropriate movements using their head and body.





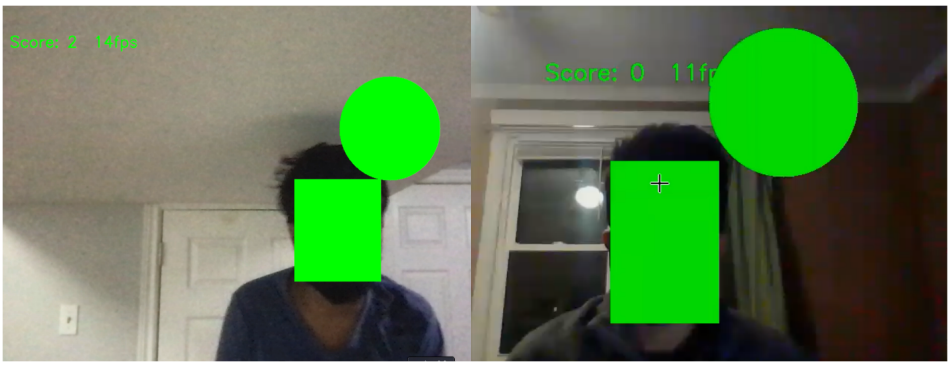
The green balls depict the “good” objects that users can collect. These can be the in-game currency that can be collected in the game and used to unlock more avatars.





Prototype for Multiplayer

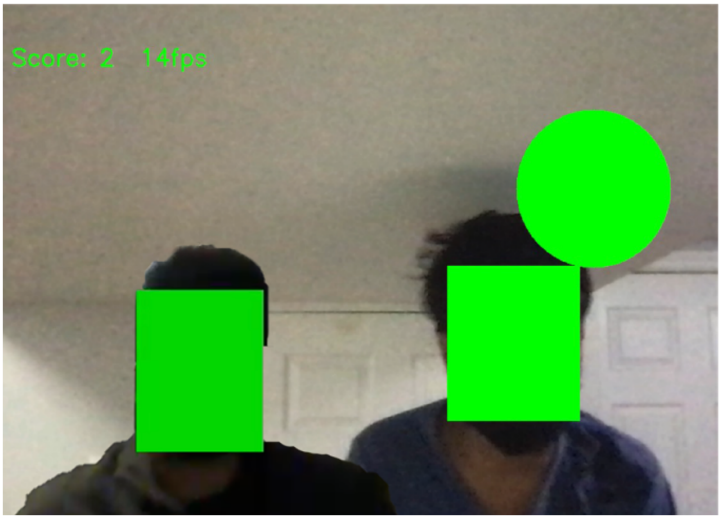
We propose a split-screen multiplayer format, allowing players to match up and play against each other in a 1v1 setup.



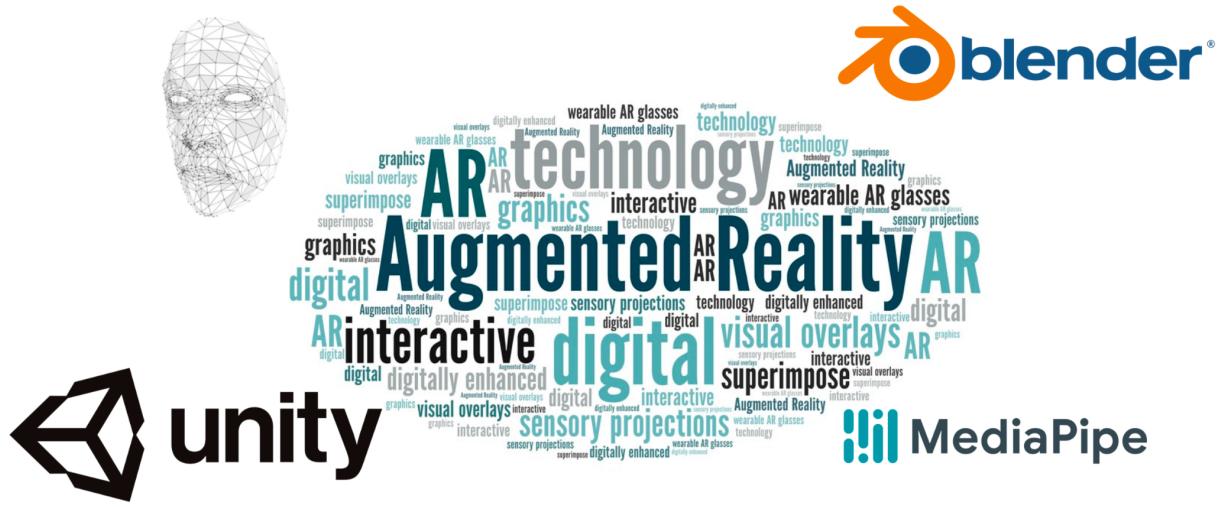
This gives players the ability to meet new people and provides a virtual hangout session.

Prototype for Party Mode

Party mode is a local multiplayer mode where two players can play together as a team. It provides a way to improve mental health by promoting teamwork and shared activities. It allows players to partake in physical activity together in the post-pandemic era.



Technology Used:



AR is the future of gaming and media. Therefore, we propose the use of AR for the development of this game. The AR environment provides a more immersive experience and so, it overshadows virtual reality as the main interface for metaverse and would also replace the current popular interfaces like smartphones and computers.

For the development of the proposed game, we would use Unity Engine. Unity is a versatile game development platform that provides the appropriate tools to work with Augmented Reality. One of the most successful AR games, i.e. Pokemon Go was also developed using Unity. It allows for the port of the game to PC, android, and iOS, which comprises the top three gaming platforms.

Furthermore, we would use Blender for the 3D modeling of in-game objects. Unity provides a native option of importing blender objects and also is an open-source and versatile tool for 3D and AR applications.

The game involves Facial Landmark detection for the “Avatar” of the player. To achieve this, we plan to use Mediapipe for Unity or Barracuda for achieving the same.

Cost Analysis:

	UNITS	COST PER UNIT	TOTAL
Engineering Cost			
6 engineers	6	100000	600000
Documentation	2	30000	60000
Software Licensing			
Unity (20 users license)	12	4000	48000
Database Digital ocean (24 months)	24	480	504
AWS requests (1$ a month for 3 million requests)	24	1	24
Apple Developers Enterprise License (for 2 years, 99$ per user per year)	12	99	1188
Windows Developer license (for 2 years, 99$ per user per year)	12	99	1188
Google Developers license	6	25	150
Capital Equipment			
Apple Development Machines	6	1800	10800
Windows Development Machines	6	1800	10800
Operational costs	6	2000	12000
ART Assets copyrights (from marvel/disney etc)			
per asset	5	50000	250000

Project Timeline:

Start Date: 31st January 2022

End Date: 10th April 2022

Deployment ready: 12th April 2022

Tentative Sprint Planning:

31st January to 13th February Sprint 1 - Development

- Single Player mode
- Fireballs and other 3D in-game objects.
- Reward display
- Customer review on basic game design
- Research and learning on multiplayer online game development.

14th February to 6th March Sprint 2 (19th to 27th is a reading holiday)

- Party mode
- 3 Avatars
- Room Creation for multiplayer online mode
- Customer review on Single-player and multiplayer local mode.

7th March to 27th March Sprint 3

- Multiplayer online mode
- 4 Avatars

- Multiplayer random online mode

28th March to 10th April Sprint 4

- Final Integration
- Game navigation menu
- 3 Avatars
- Component checks
- Final Checks
- Performance testing

Quality Assurance Plan:

Software Development Life Cycle:
For our project, we use the Agile methodology and the team decided to run about 4 Sprints of 14 working days each. SCRUM is a software development method that teams use to complete specific products faster. Break each section of your project into smaller parts that can be completed in less time. term. SCRUM performs the following roles:
1. SCRUM Master - A SCRUM Master is an expert who leads a team on a specific project. It uses an agile methodology. He/she also promotes communication and collaboration.
2. Product Owner. Product owners help maximize the value of the products created. Development Team. He focuses on anticipating clients and prioritizing what's important. Necessity and evaluation of the progress of each sprint.
3. The development team is a major entity in the SCRUM process. From conception to deployment it is responsible for the entire process.

Why SCRUM?

1. It helps to create smaller development cycles and can adapt to changes.
2. It helps in faster testing and validation.

3. It focuses on creating deliverables rather than extensive documentation.
4. The customer will have a testable subsystem in their environment at the end of each iteration.

Design Assurance: Quality Assurance Plan is used to make sure that the design is made specific to the customer's needs. The design assurance will take into consideration that all the use cases and scenarios are validated at each stage of the iteration. All the implementation

Process Assurance: The process will include doing unit testing and integrating testing at each stage. If the program will pass the unit test then only the code will be pushed to GitHub. The code will be reviewed by two developers for any bugs before merging. Linting of the entire code will be done while committing.

Goal Assurance: The user/ customer will be shown the demo in a decided period and all the goals that are listed by the user will be checked out. If any fixes or changes to the done work will be needed, then it will be carried out.

- All the tasks of the team members will be listed in JIRA.
- All the SCRUM meets will be scheduled on teams.
- Daily the scrum team will review the sprint goals and handle backlogs progress if any.

Team Members:

Rohan Aswani
Manak Agarwal
Aneerban Chakraborty
Rakshana Bagavathi
Anirudh Reddy
Aishwarya Reddy

All the members will be involved in each and individual process of scrum master, testing, and development.

References:

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