

Abstract: In Contemporary world, mobile apps have become Ubiquitous and an integral part of mobile platform. I have chosen a gaming app as there are lots of user for gaming. The app is called breakout game. In total there are 8 pages of the app with two main gaming interfaces. The wireframe and UI/UX design has been made in figma. Few basic neural network functions will be used while developing the app. I will also be using **WebGL API** that is a JavaScript api which will provide with a highly interactive 2D graphics. The second api used is Web Speech API which is completely free of cost. Hence this app will attract youngster the most.

1.Introduction:

Breakout Game (BG) is a gaming app which I will develop in android platform. I choose android as it is used by a greater number of people as data shown in Figure 1 [1]. This app will change the gaming experience of modern-day gamer as the game difficulty level will be controlled by my Deep neural network using Convolutional neural network, a speech to text functionality for the feedback of gamers and songs that you can play. In starting of the game, you will need to enter your name and further it will lead to main gaming interface of the app that will be fully responsive page which will consists of a

- Paddle
- Bricks and ball
- Multi hit breakable blocks
- The bricks color variation
- Some indestructible bricks
- Bombs and Coins

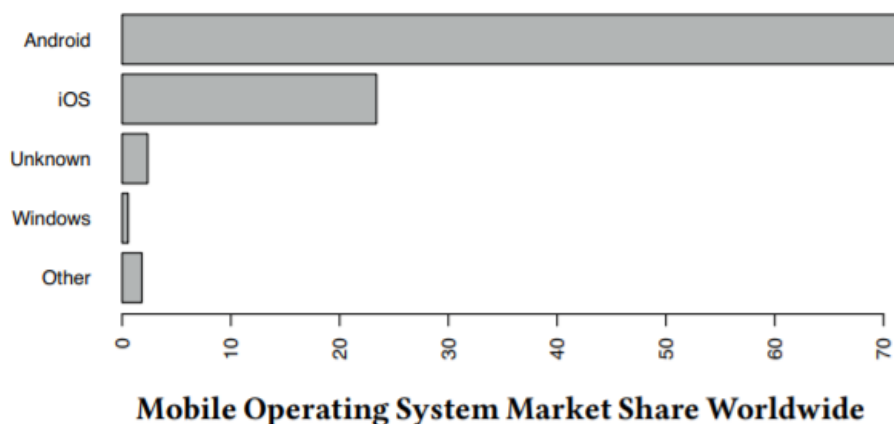
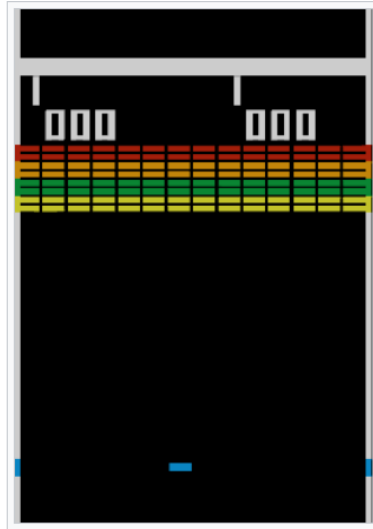


Figure 1 [1]

Gaming app has a **market value** of 60% of total revenue generated by gaming market that's comes to \$49 billion in revenue and a profit of \$16.9 billion.

Background: Breakout game was first developed Atari .Inc in 1970s and at that time they used platform Arcade, Atari 2600. With just \$700 they developed this game. Nowadays 80% of the kids between the age 15 years to 22 years play mobile app games as they have access to mobile phone. My motivation to develop this game comes as I am a gamer myself and wants to make play enjoyable games.



Arcade version (developed in 1976) [4]

Competitor Analysis

1. Brick Breaking Game

- About

Seller	Clayton Industry
Size	33Mb
Category	Brick breaking Game
Compatibility	Android 4.0 and up
Languages	English
Price	free
Customer Reviews	4.0 out of 5

- Description

It is an android game which is designed in android platform. The first page of the app is not attractive as it just has a play and review button. The playing interface is a basic model with ap paddle, ball and bricks. Show in Figure 2



Figure 1.1 (Main gaming interface)

Demerits of this app is it doesn't have a feedback option as it should be present for the developer to know the need of the customer.

2. Brick Breaker Star: Space King

- About

Seller	Spring comes
Size	22 mb
Category	gaming
Compatibility	Android 4.0 and up
Languages	English
Price	free but in-app purchases ranging from 1.29\$ to 119.99\$
Customer Reviews	4.2 out of 5

- Description

Springcomes developed this game it has a good gaming interface. The first page directly starts with a play option. It has a feedback option for the customer. The game graphics are good with inapp purchase starting from 1.29\$ to 119.99\$.



Figure 2(First page of the game)

Demerits of the app is it doesnot saves the player information as it should have and directly starts the game.

My Product summary:

- I will be using agile methodology so that I could have multiple iteration.
- It will have 10 Pages. It will have two gaming interface one with Classic mode and other survival mode
- The survival mode will have a Deep neural network which will be increase the game difficulty according to the player performance.
- The feedback page will have a speech to text functionality.
- Gaming interface will have paddle and uses guns and ball to break the brick which will add 5 points. Also, the gamer will get coins according.
- The gamer could also play songs according to his choice.

- While finishing the game a rank will be provided based on the score.
- To develop a mobile game app usually it takes around \$200K but I will be creating a MVP (minimum viable product) that will be available in google play.

2.Features

2.1 Asset list

I will be using android studio IDE, code will be in java where the minimum SDK version will be 22 and Target version will be 28. The code will be integrated with RESTful web services which will help to write data in the file.

When the play button is hit it will go to main gaming screen where game will be played, then the score will be simultaneously added further from the file database it will get the username and points and display in the page 1.

I will use **Native app development** method with no monetization strategy as I want it to be accessible and free for everyone. I will be using a free game development engine

I will use **jMonkeyEngine (jME)** as this game engine will provide me with modern 2D development kit and is easily supported by android SDK. It has a total of eight pages all of them are dynamic with two gaming interface pages which will be fully interactive through touch.

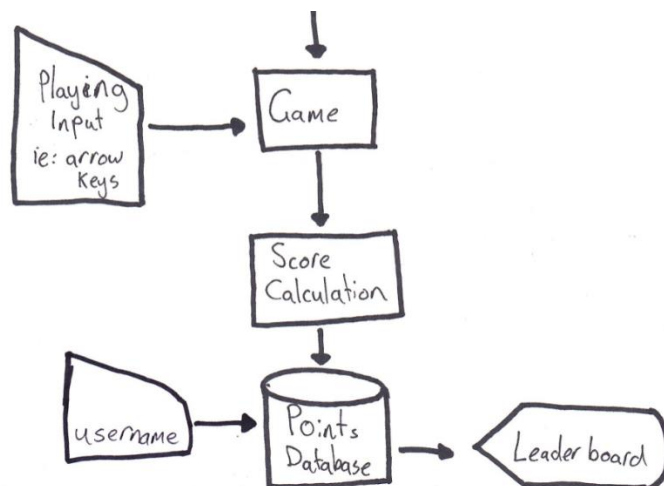
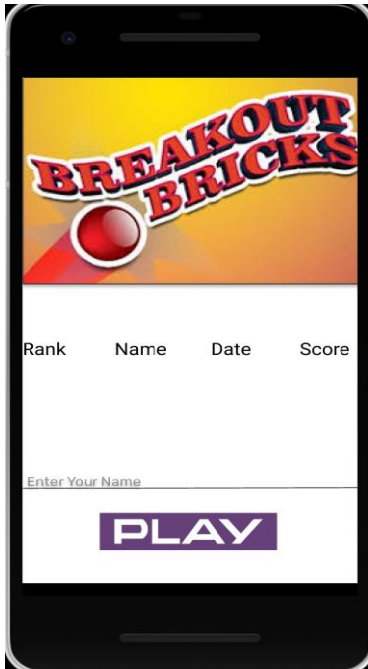
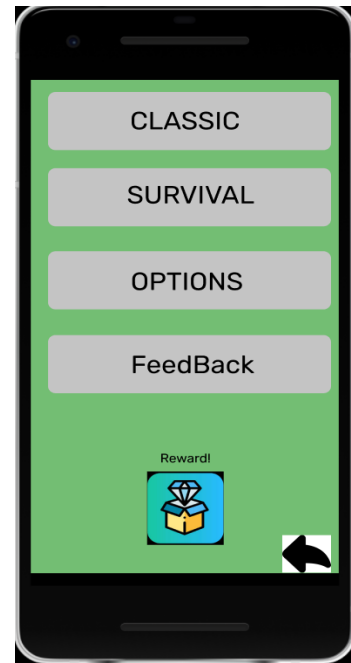


Figure 3 (Basic flow of the game)

- **Page 1** has a button with a text “Play” having RGB #800080
- A TextInputEditText with the text saying “Enter Your Name” which will save the detail in a text file.
- Once you have finished the game your Rank, Name, Date and Score will be displayed in this page.



Page 1 of the app



Page 2 of the app

- **Page 2** has four buttons with first two button have a Classic mode and Survival mode RGB value #C4C4C4. After clicking it will lead to the main gaming interface. A reward function will automatically add points to gamer every day.
- Main gaming interface has JavaScript object for paddle, ball and bricks. The paddle will require least CPU cycle as compared to others.
- My Api call will be using JavaScript, java.
- Development language will be used is java, Node JS, HTML5, React
- My main Data source will be from Mock API

The required support of application minimum knowledge of Git, NPM is required. The frame per second of the game will be 60 fps. Java has fast rendering speed as compared to kotlin.

2.2 Product Purpose

Target audience and impact of app on them

- Our game will be played by age group of teenagers and adult both as the game is easy to play.
- Also, it depends on the geographic location of the user as the most densely populated area like China and India will have a greater number of users.
- So main aim would be to do marketing of my product in that area for maximum number of users.
- My main target audience will be the age group of 14 to 22 years and 25 to 34 years old.
- My app would appeal to both the genders male and female as the app is not gender specific
- This app will appeal to them because of its highly designed animation using jMonkeyEngine.
- The continuous playing of music in the app will make it more appealing.

AGE DISTRIBUTION OF MOBILE GAMERS

■ age (group) ■ 16-24 ■ 25 to 34 ■ 35 to 44 ■ 45 to 54 ■ 55 to 64

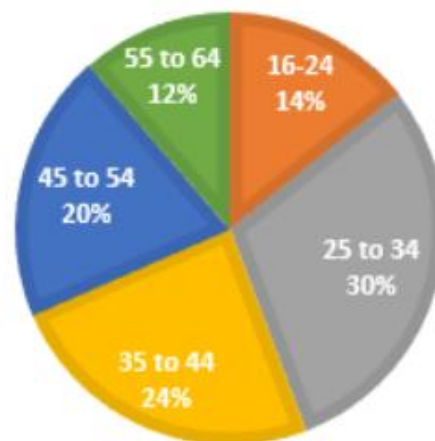


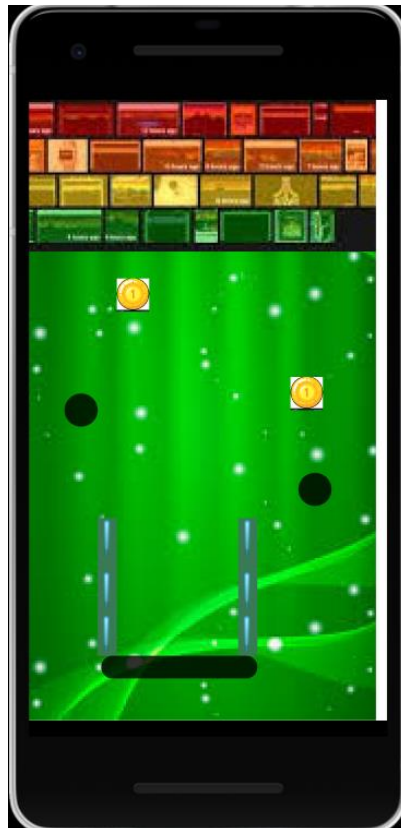
Figure 4 [2]

Creativity in my design

- My main gaming interface where the game will be played will be connected with a deep neural network
- My deep neural network will be given input of the current score of the game.
- Hence using the score as input the game will increase or decrease the difficulty level.
- The paddle will be given guns, breaking a brick will generate a coin
- The music will be played at the back continuously which will be totally selected by the user
- In the feedback section I have introduced a speech to text functionality which will just take the user input as a voice and convert it into text some basic key word is “the game is good”, “the game needs improvement” [3].

2.3 Three complex components

1) Main gaming screen



This is my main gaming screen which will be fully interactive and consists of paddle, bricks, balls, coins and shooting guns. Where its basic functionality is when the game starts the ball will hit the paddle(it is a frictionless) then the ball will go upward and hit a brick(points will be added) and as the laws of physics work the ball will come down due to gravity and again we have to hit the ball moving the paddle.

The estimation is done using planning poker approach

User Stories	Acceptance Criteria	Estimation	Priority
1)As a User, when I click on the screen anywhere the game should start and the ball should initially go upward and hit a brick, Using the paddle I can hit back the ball and vice versa.	1)The paddle must be frictionless 2)The ball when hit the paddle should go up 3)When ball hit a brick it should break down 4) coins should be displayed when certain bricks are hit	Story point: 10	High Priority:1
2)As a User, when I play the game the difficulty level should increase as my points are increasing. The ball should get double and paddle size should get small	1) The Convolution neural network should take the points as input 2) after every 20 points added the game difficulty should increase 3)once the ball hit the ground the game should stop	Story point :8	High Priority:1

The logic module is show in Figure 5 when ever a collision is detected two main rendering function will be called (rendering of bricks and rendering of ball) and the ball changes the direction and bricks gets decreased [5].

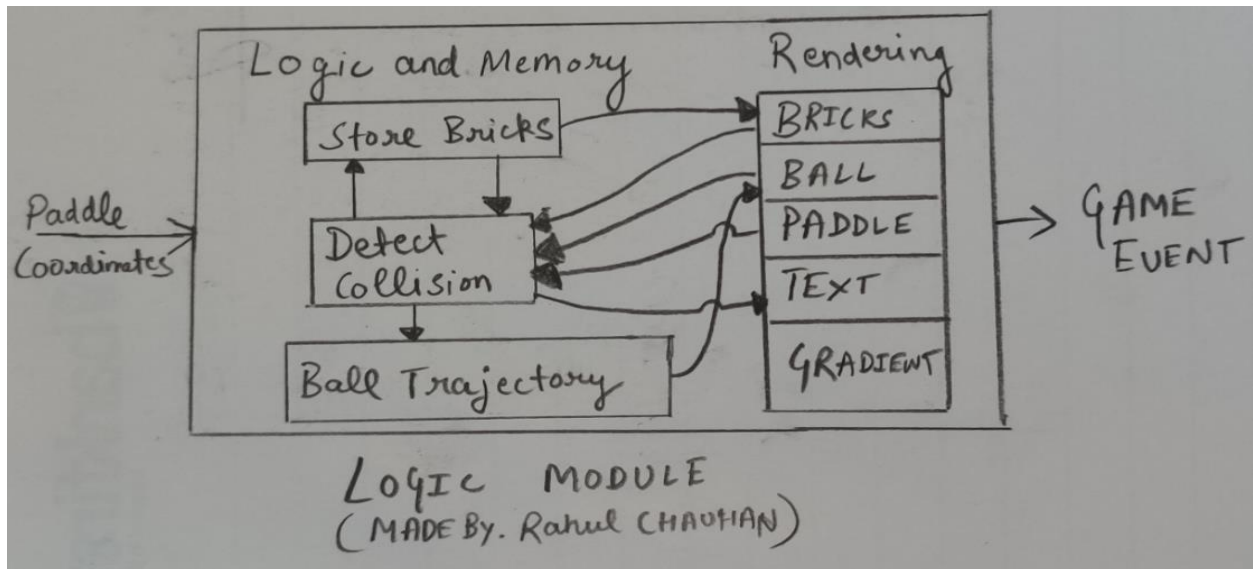


Figure 5

Design Color used:

Background color: #00ff00

Paddle color and ball: #000000

Coin color : #d4af37

Bricks : #ff0000, #FFFF00

Main function includes:

```
public void createPaddle();
public void checkCollisionWithBrick();
public void checkCollisionWithPaddle();
public void neuralNetwork(Score);
```

Pseudo code when ball hit the Brick

```
Public void checkCollisionWithBrick ()
    // check for left side collision
    If(ball.getdirectionX() && brick.width() && ball.Height()<=brick.length())
    {
        Brick get destroyed
        Ball changes the direction;
        Score+=brickScore
    }
```

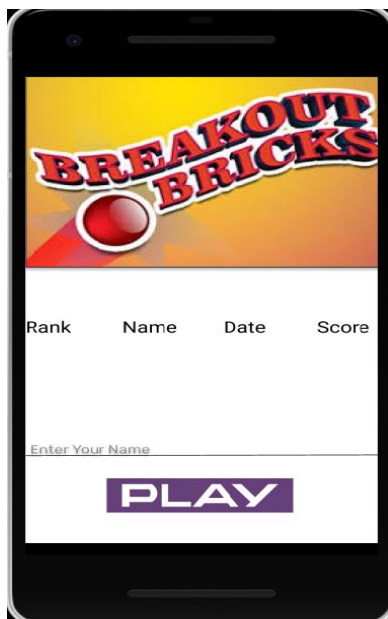
Pseudo code when points more than 20

```
public void neuralNetwork(Score);  
    x=20;  
    if points more than x  
        Score is fed into CNN network  
        DecreasePaddleSize();  
        IncreaseBallSpeed();  
        X+=20  
    Else  
        Keep playing
```

Pseudo code when ball hit the ground

```
If ball is on the paddle  
    Then reverse direction;  
Else  
    End Game;  
End If
```

2) First Page of the app



First Page of App

Rank	Name	Date	Score
Item 0			
Item 1			
Item 2			
Item 3			
Item 4			
Item 5			
Item 6			
Item 7			
Item 8			
Item 9			

Item Displayed in each row

This page has Three main functionalities the Play button (Material Button), items displayed (Rank, Name, Date, Score) and the name saved option (Enter Your Name).

This Page displays CRUD operation as it updates the name and Display the result after user has played the game. The Play button navigate to the next page. Initially the Rank, Name, Date, Score is empty fields. Once you enter your name it saves in a file. After you have played the game it displays your Rank, Name, Date, Score. Items are stored in a dictionary as item0, item1, item 2 and so on [4].

User Stories	Acceptance Criteria	Estimation	Priority
1)As a User, I want to enter my name and start the game using play button	1)Starting of game the field Rank, Name, Date, Score should be empty 2) The text field enter your name should be empty 3) The play button should navigate to the next page	Story point: 8	High Priority:1
2)As a User, when I finish the game I want to see my result that is Rank, Name, Date, Score	1)The item stored in the dictionary should be displayed.	Story point :6	Medium Priority:2

Design color and Font used:

Button color: #800080

Font color: #000000

Text style: italic

Pseudo code for entering the name

```

Public void onClick();
    If string equals " "
        Please enter the name
    Else
        txtInput.getText()
        write the text into file
        Save()

```

3) Options Page (newly added component – speech to text)

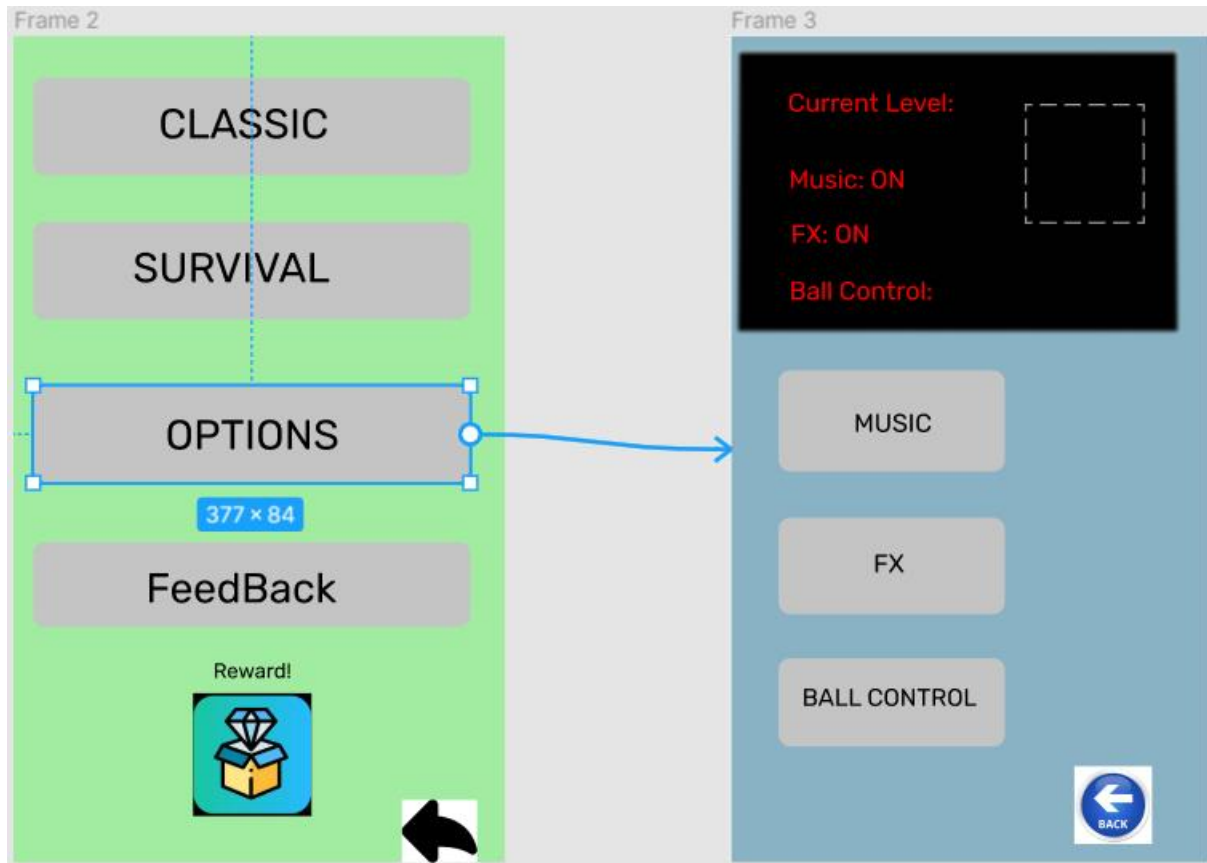


Figure 6

Once you click the option button it will navigate to the option screen where you will have the option to change music, FX and control the ball. The music button will open another window and similarly FX you can switch on or off.

I have given ball control a speech to text functionality where once you click the button “BALL CONTROL” you can just say increase or decrease the speed of ball through my free **Web Speech API** functionality.

This Web Speech API has SpeechRecognition interface which will recognize the voice and respond to it directly. Hence it will directly increase/decrease the ball speed or increase the number of balls you can do that to. While the music button opens a new page hence we can change the song in it.

User Stories	Acceptance Criteria	Estimation	Priority
1)As a User, I want to click option button and navigate to next screen	1)The button should navigate to the next page	Story point: 6	Low Priority:3
2)As a User, when I click BALL CONTROL, I would be able to say increase or decrease hence resulting in increase or decrease of ball speed.	1)The BALL CONTROL button should ask for speech and further it should change the speed of the ball. 2)Once the button is released the size of the ball should change	Story point :10	High Priority:1
3)As a user when I click music button a new page should open with I	1)The button should navigate to the next page that has list of music	Story point :6	Low Priority:3

Pseudo code Ball control button

```

Public void ballControl();
    If onclick.true()
        Onclick run WebSpeechAPI;
        Use Get method for getting the text
        Call function changeballSpeed(text)

```

2.4 System working cohesive as a whole

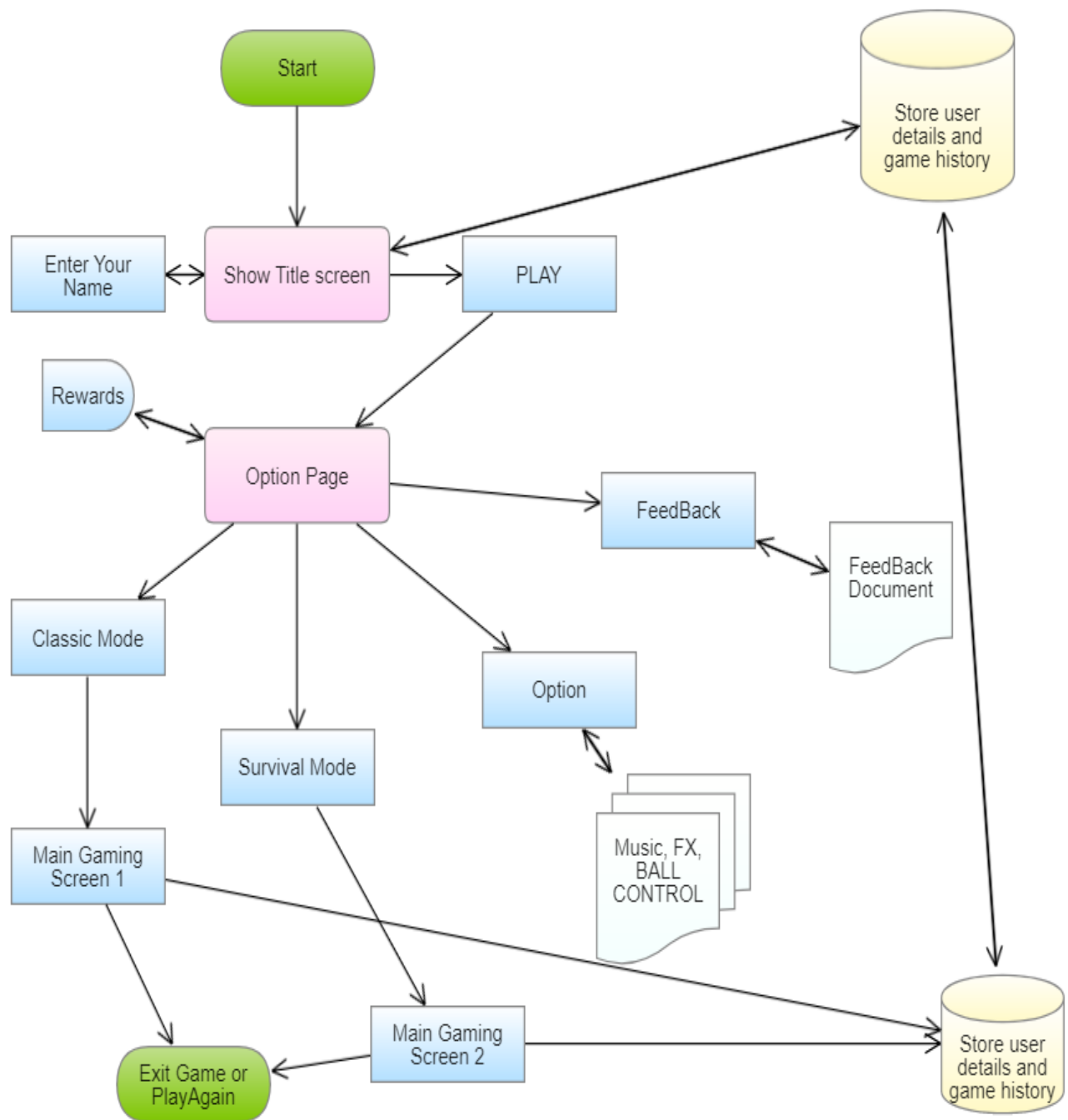


Figure 7 (Basic working of the app as a whole)

In total there will be 8 pages

- Page 1 will ask your name and then you click on PLAY button
- Option page will open where you can select between Classic mode or Survival mode. After clicking it will land to your main gaming interface Where you can play your game.
- Option page also has reward section which will give rewards once a certain point is achieved.
- Option page has Option button which will navigate to another page which will have options to control Music, FX and Ball control. The ball control option has speech to text functionality.
- The Feedback page has few questions which once you filled will be given to the developer for further enhancing the project.
- From the music page you can select the music from the list give and that music will be played throughout the game
- The main gaming interface user has to touch the screen and move the paddle as the ball comes down and hit maximum number of bricks
- After playing the game a new screen will popup and a dialogue box will open asking the user to play again or Exit.

3.Milestone of the project

Release 1

Description	Actual man hours	Estimated hours
User Interface <ul style="list-style-type: none">• Landing page with image of “brick breakout” And adding PLAY button.• Creating game page layout for both the Classic mode and survival mode• Dialogue box creating after finishing the game	10 hours	20 hours
Data base creation <ul style="list-style-type: none">• Create table to store player name and Game summary (Rank, Score)• Make a connection Db and interface	4 hours	6 hours
Logic of the game <ul style="list-style-type: none">• Create a paddle, ball, bricks• onClick start the game, give paddle the touch sensitivity• Code to add points when breaking the brick• Code for moving the ball when it hit a paddle and when it hit a brick• Identify the drag option when opening the music list	16 hours	32 hours
Navigating through app <ul style="list-style-type: none">• In First page clicking Play will navigate To option page• Option page can route the user to play the game in classic or survival mode• Route from options to feedback page and change music, FX, ball control	3 hours	6 hours

Release 2

Description	Actual man hours	Estimated hours
User Interface <ul style="list-style-type: none">• The music page creation and loading of list of music in the page• Creating feedback textField, adding the emoticon, writing text for asking of thinking of app• Adding reward icon and making frontend of it• Adding Rank, Name, Date ,Score column in the first page	10 hours	20 hours
Logic of the game <ul style="list-style-type: none">• Adding neural network to main gaming interface as this will increase and decrease the difficulty• Adding speech to text functionality to the ball control option• When the game finish adding the score, rank, name to the first page list• Changes made in option window should reflect in main game page	15 hours	30 hours
Navigating through app <ul style="list-style-type: none">• Route from the last page to the first with the list of current score, ranks• Route from gaming interface to the dialogue box• Dependency: first page should be ready with data list when the game is played gain	10 hours	20 hours

4.UI/UX Design and High-Level Wireframes

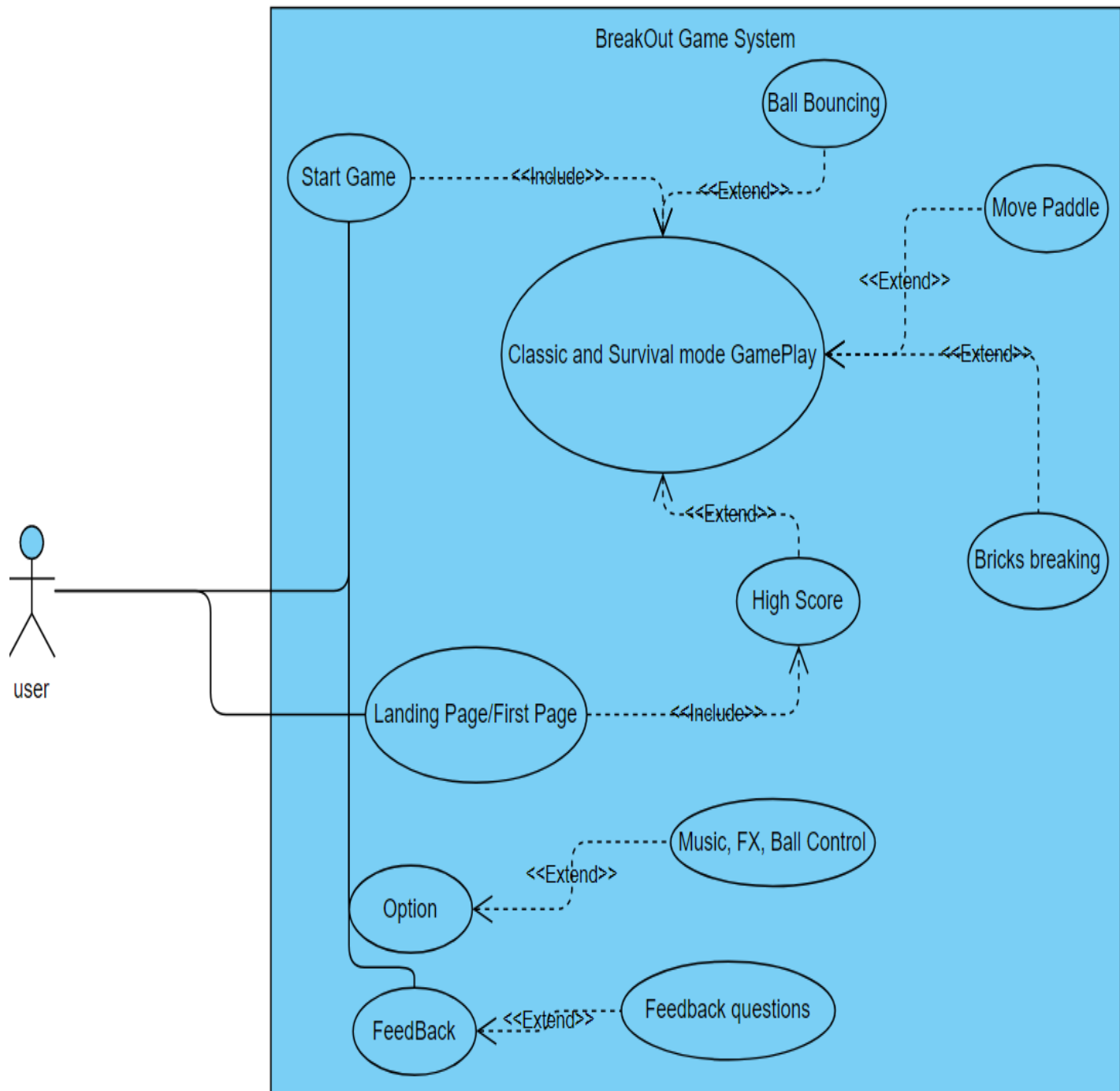
URL-

https://www.figma.com/proto/JKCmG9oTY4NrWnSJzoaiFf/Breakout_Game_App3?node-id=6%3A0&scaling=scale-down

User stories:

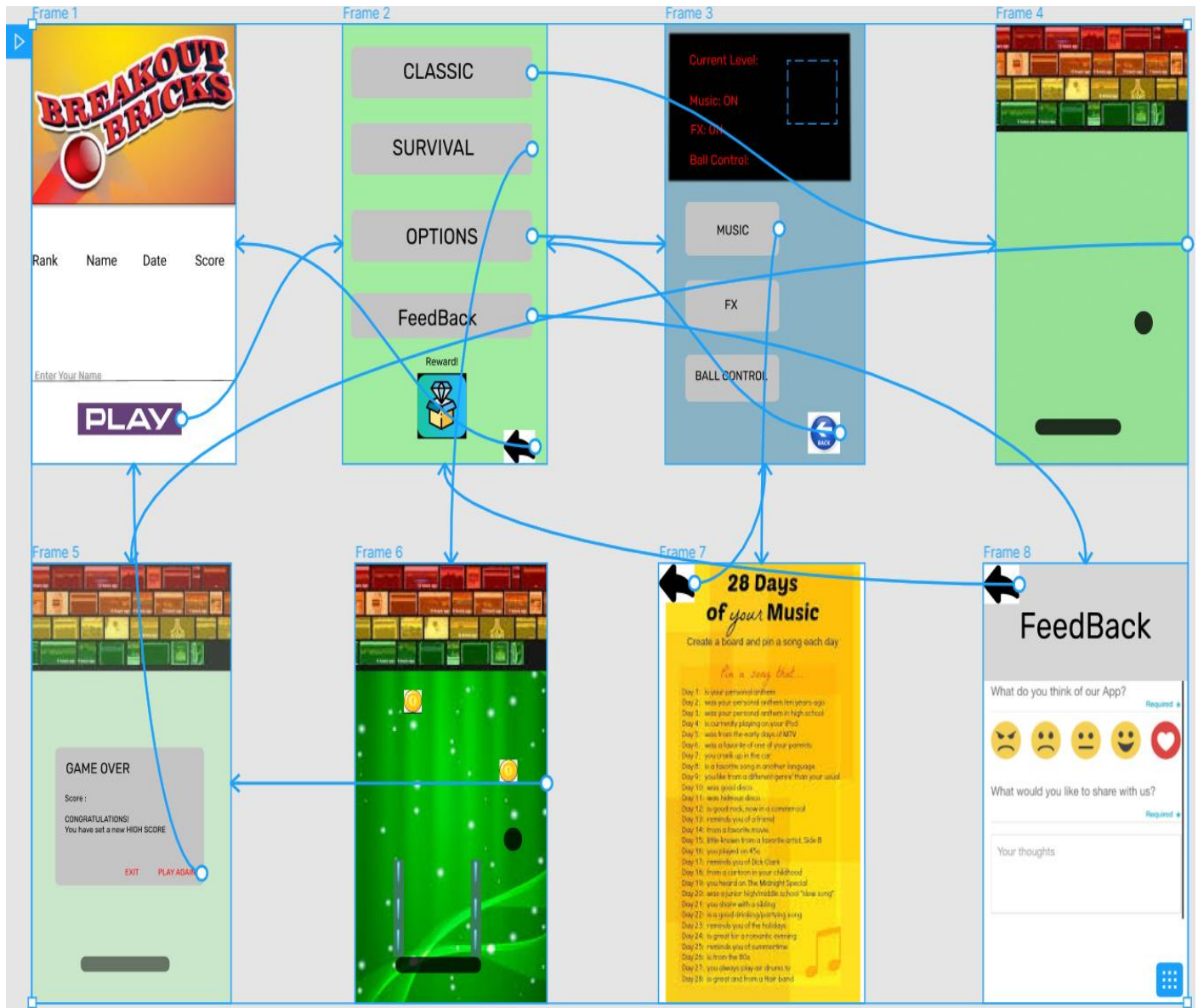
User Stories	Acceptance Criteria	Estimation	Priority
1)As a User, I want to select music from the list give in the music page	1)The selected list should play the song as the song is selected	Story point: 4	Low Priority:3
2)As a User, I want the paddle to be touch sensitive	1) While playing the game the paddle should move when the touch is done	Story point :8	High Priority:1
3)As a user when I finish the game, I want to see my score	1)A dialogue box should open when the game is finished	Story point :6	Low Priority:3
4)As a user feedback page should be displayed	1)The page should be able to write text in textfield. 2) This text should be store in database for further review.	Story point :5	Low Priority:3

Use Cases:



High Level Wireframes:

I have used figma for creating high level wireframes, in total there are 8 pages and the blue line display the connection of the app. The starting of the app is from frame 1.



High Level Wireframes

5.API

I have used two main api one is for graphic and other is for speech to text. Both of these api are free of cost.

- Web Speech API- The main interface has *SpeechRecognition* function which take the speech and return a text. Also this function will be fed Grammar for our game which will be in function `SpeechGrammarList()`.
- WebGL API- is a JavaScript API for rendering highly interactive 2D graphic without the use of any plugin. This directly interact with user hardware of the phone and get the accelerated graphic.

6.Resources Required

In my gaming app the main feature is the paddle, ball, bricks, coins and gun. It also have different background so the resources will be taken from pixaby site(only those photos will be taken which will be open license and can be used commercially)

References:

1. R. Nunkesser, "Beyond Web/Native/Hybrid: A New Taxonomy for Mobile App Development," 2018 IEEE/ACM 5th International Conference on Mobile Software Engineering and Systems (MOBILESoft), Gothenburg, 2018, pp. 214-218.
2. MMA. 2020. Myth Busting: Mobile Gaming Demographics. [online] Available at: <<https://www.mmaglobal.com/research/myth-busting-mobile-gaming-demographics>> [Accessed 11 April 2020].
3. Jangir, G. and Kumar, R., 2017. Windowing-based threshold technique to play the simple breakout game at neutral attention level. *International Journal of System of Systems Engineering*, 8(2), p.147.
4. En.wikipedia.org. 2020. Breakout (Video Game). [online] Available at: <[https://en.wikipedia.org/wiki/Breakout_\(video_game\)](https://en.wikipedia.org/wiki/Breakout_(video_game))> [Accessed 11 April 2020].
5. Patel, D., Hazan, H., Saunders, D., Siegelmann, H. and Kozma, R., 2019. Improved robustness of reinforcement learning policies upon conversion to spiking neuronal network platforms applied to Atari Breakout game. *Neural Networks*, 120, pp.108-115.