System Requirement Specifications

for

SportZ

Written by:
Chee Zi Hoe
Hermes Lim HongJun
Lin Zixing
Fabian Wong
Chia Songcheng
Lim Sheng Zhe
Chew Poshi

Version 1.1
10 April 2022

Table of Contents

1 Problem Statement

The majority in Singapore adolescents do not get enough physical activity, with a widening gap between boys and girls from 2001 to 2016, according to the results of a new World Health Organization (WHO) study [1]. Moreover, with Covid-19, it has greatly impacted the sporting lives of youths in Singapore. This is greatly a result of restrictions that are put in place by the government due to safety measures in tackling the pandemic. As a result, there are fewer opportunities for youths to engage in sports in Singapore. Sporting campaigns such as "Get Active! Singapore" and "Let's Get Moving Singapore" are introduced to pique the interest of the younger generation in the area of sports. However, such campaigns are not able to be held physically and in big groups due to the restrictions imposed by the government, making it not as effective as intended. As such, more initiatives should be rolled out to encourage the youths to participate in sporting activities in Singapore.

2 Background

About 76 per cent of Singapore adolescents aged between 11 and 17 years old do not get at least one hour of moderate-to-vigorous activity every day. Furthermore, based on survey data that were conducted by WHO, it has been discovered that more than three-quarters of Singapore adolescents did not meet the guideline of at least one hour of physical activity a day.

With the digitalisation of today's world, it is important for us to utilize the digital world to our advantage and leverage on attracting and invoking interest in sports to the younger generation of Singapore.

3 Introduction

3.1 Product Scope

SportZ is a 2D endless runner game with sports as the main theme. The objective of the game is to run across an endless stream of platforms from left to right and attempt to stay alive to obtain the highest score possible.

In-game mechanics such as jumping onto platforms and attacking enemies along the way are included as well to add complexity to the game. Power ups and character abilities are in the game as well to provide dynamism in the game. Progression can be felt gradually by the players as they earn more upgrades after multiple runs which will make subsequent runs even easier, achieving a higher score.

Document Conventions

- **BOLD -** Game Title: **SportZ**
- (*ITALIC*) - In-game mechanics
- **BOLD** - Genre
- **BOLD** - Unique Selling point

3.2 Intended Audience and Reading Suggestions

- Producer
    - Recommended Sequence:
        - Introduction
        - Overall Description
        - Constraints
        - External Interface Requirements
        - System Features

- Technical Director
    - Recommended Sequence:
        - External Interface Requirements
        - System Features

- Lead Designer
    - Recommended Sequence:
        - Introduction
        - Overall Description

- ■ External Interface Requirements

- ● Product & Test Manager
  - ○ Recommended Sequence:
    - ■ Constraints
    - ■ External Interface Requirements
    - ■ System Features

4 Overall Description

4.1 Product Perspective

Sportz is inspired by endless running games such as Flappy bird. It is a single player 2D side-scroller game where player goal is to survive as long as possible in order to earn more points. The theme of the game is sport, where player can control characters who are designed as athletes from various sports. The levels are filled with random obstacles and zombie enemies related to various sports, making the game exciting and unpredictable. Players must rely on their quick reflex to jump over obstacles or launch attack moves on the enemies. Outside of the levels, players have the freedom to customize their characters' appearance and even upgrade their abilities with points earned from the game levels.

Sportz is suitable for players from all ages as its controls are simple and easy to master. Just like any endless runner game, Sportz is expected to be an addictive game and cater for players looking to spend a short burst of time to play games on their devices.

Sportz will be released on the PC initially and is expected to release on other platforms such as Android and Apple mobile devices.

4.2 Product Functions

Player Function
- ● Player Action
  - ○ Player can jump to survive or collect coin
  - ○ Player can attack game enemy to survive
- ● Player Death
  - ○ Player dies when player falls from platform or life points depletes
- ● Power Up
  - ○ Player can collect power ups object that spawn randomly in game

- - Power ups object enable a temporarily advantages to player after collecting

Enemy Functions:
- Move
  - Enemy to move left and right to collide with the player which depletes a player health bar
- Enemy death
  - Enemy dies when player attacks it

Obstacle Functions:
- Obstruct
  - Stationery and moving obstacles will obstruct players and will deplete player health on collision

Other functions:
- Shop
  - Player can purchase enhancements using coin that they collected in the game
  - Purchased enhancement effects to be permanent and applied to every new playthrough

4.3 Assumptions and Dependencies

Assumptions
1. As this application is developed for desktop operating systems, Windows or Mac OS, are the required platforms to be used for executing this application.
2. Users must be proficient in the English language, as the application interface and the contents are of the English language.
3. Users have a computer that meets the minimum hardware requirements of running the application smoothly.
4. Users can understand basic instruction from the game

Dependencies
1. Third-party dependencies
   a. Unity Game Engine
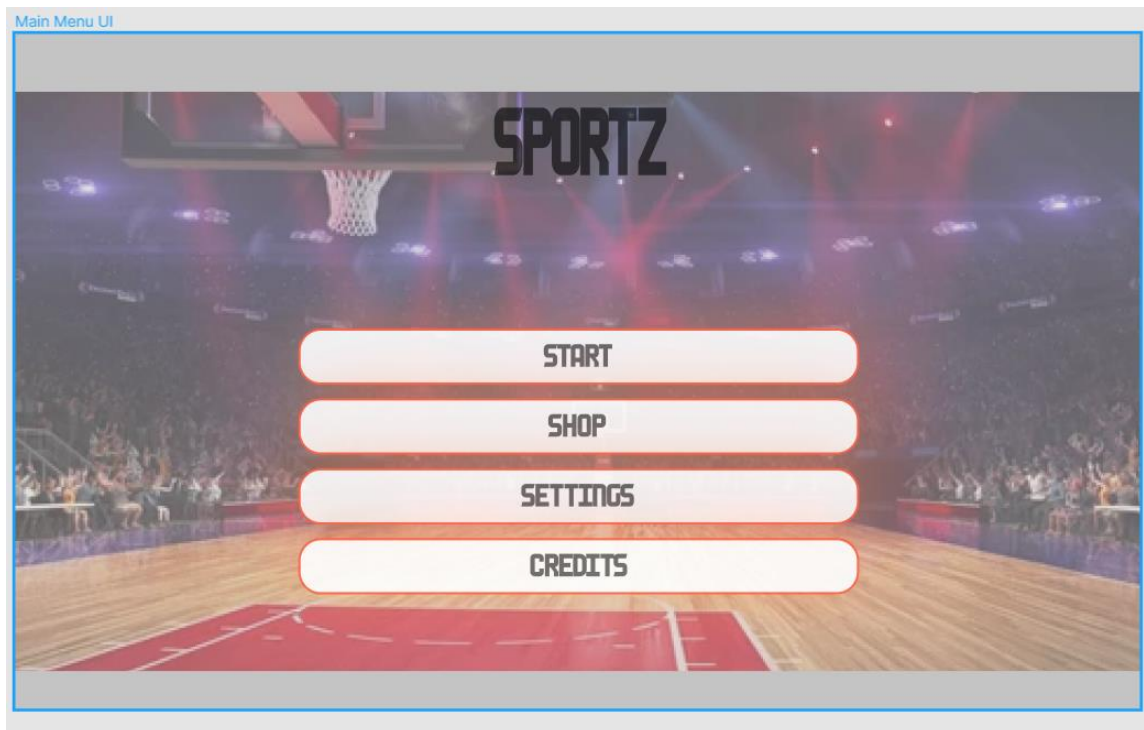   b. Visual or audio art from open source

5 Constraints

1. The application shall be developed using Unity
2. The application shall be flexible to add new features
3. Visual or audio arts used in the game has to be open source or self-designed to avoid copyright infringement

6 External Interface Requirements

6.1 User Interfaces

6.1.1 Main Menu UI

Feature Description and Priority
Description: Main Menu User Interface displayed when user selects the application
Overall Priority: **HIGH**

Stimulus/Response Sequences
Stimulus: Player selects Play button in the main menu
Response: The Game UI is opened, and the game is run

Stimulus: Player selects Credits button in the main menu
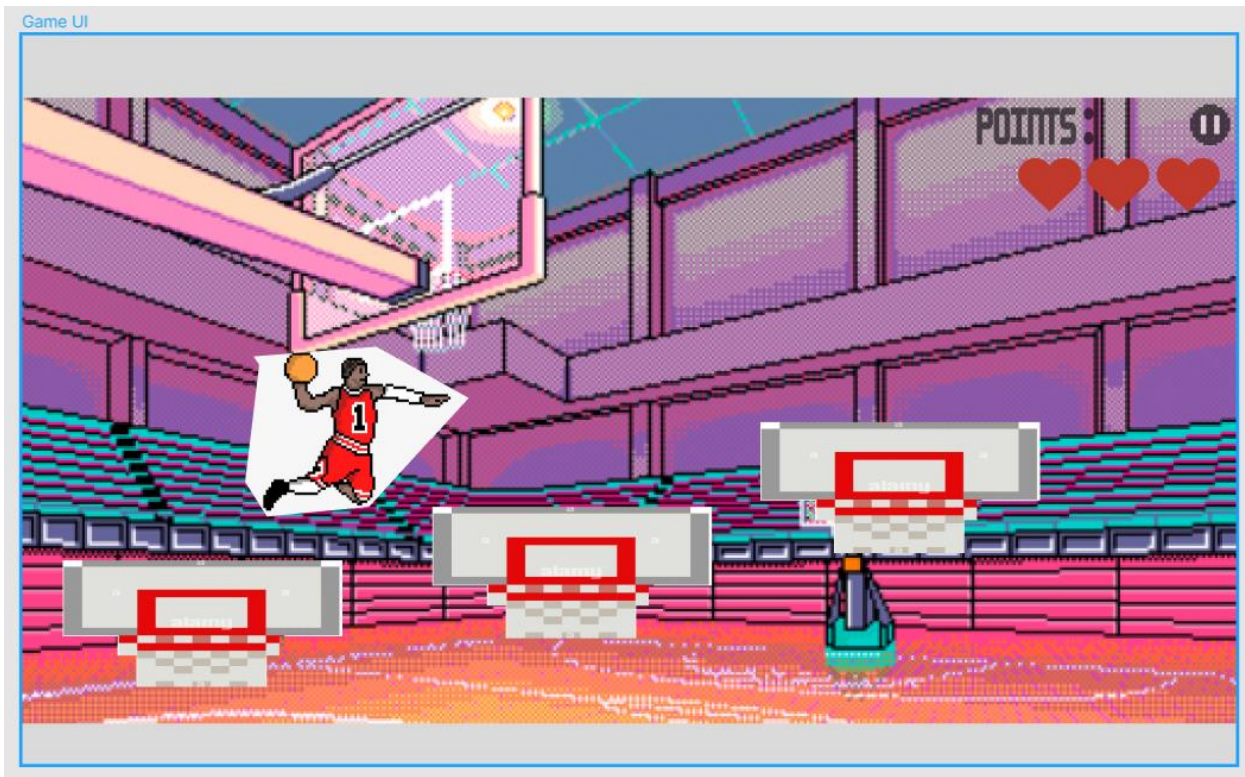Response: The credit UI is opened, and the credit is displayed

Stimulus: Player selects Settings button in the main menu
Response: The Settings UI is opened, and the settings are displayed

Stimulus: Player selects Shop button in the main menu
Response: The Shop UI is opened, and the list of available upgrades is displayed

6.1.2. Game UI

Feature Description and Priority
Description: Game User Interface displayed when user selects Play button from the main menu
Overall Priority: **HIGH**

Stimulus/Response Sequences
Stimulus: Player clicks on the Play button in the main menu
Response: The Game UI is displayed
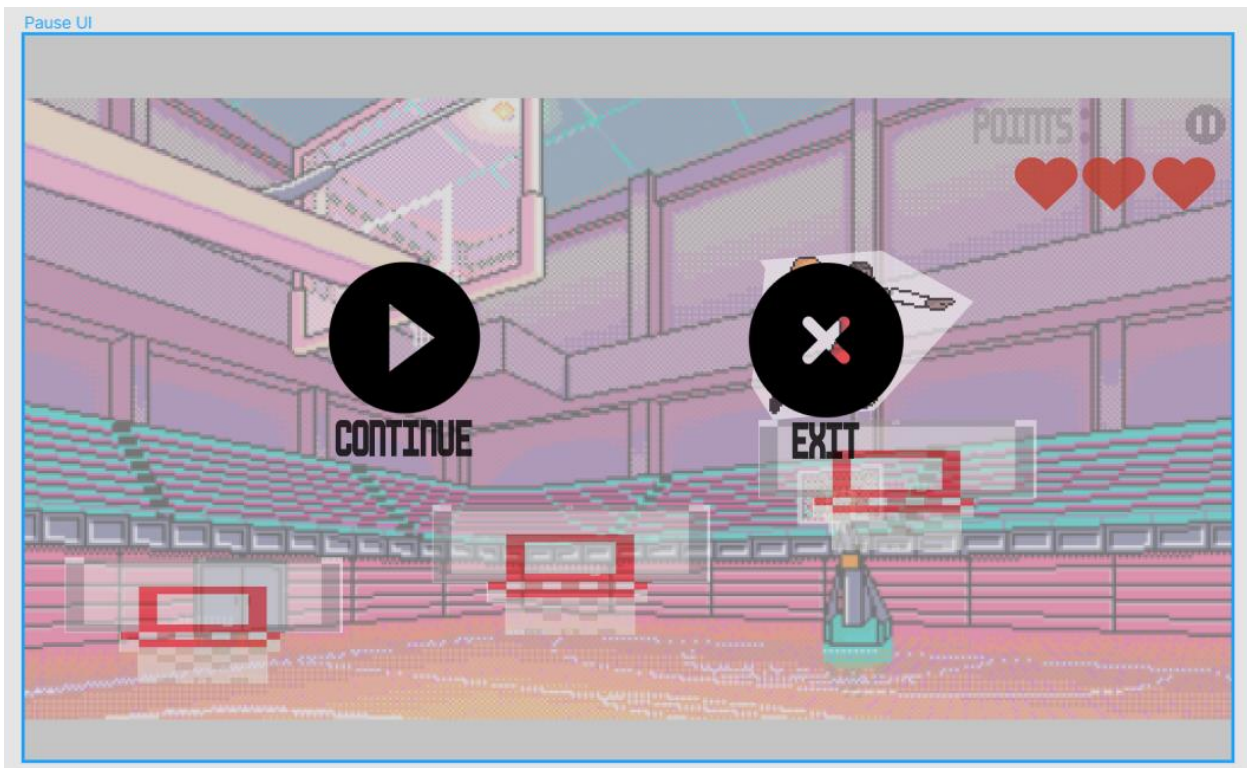
Stimulus: Player clicks on the screen
Response: Game session will start running

Functional Requirements
F01_01: The game must be accessible from the main menu (HIGH)
F01_02: Score must be displayed and constantly updated as a game session progresses (HIGH)

6.1.3 Pause UI

Feature Description and Priority
Description: Pause User Interface displayed when user selects Pause button while the game is running
Overall Priority: **HIGH**

Stimulus/Response Sequences
Stimulus: Player clicks on the Pause button while game is in session
Response: The Pause UI is opened and the game session is halted

Stimulus: Player clicks Abort button in Pause UI
Response: Main Menu UI will be displayed, Saved gameplay data will be deleted
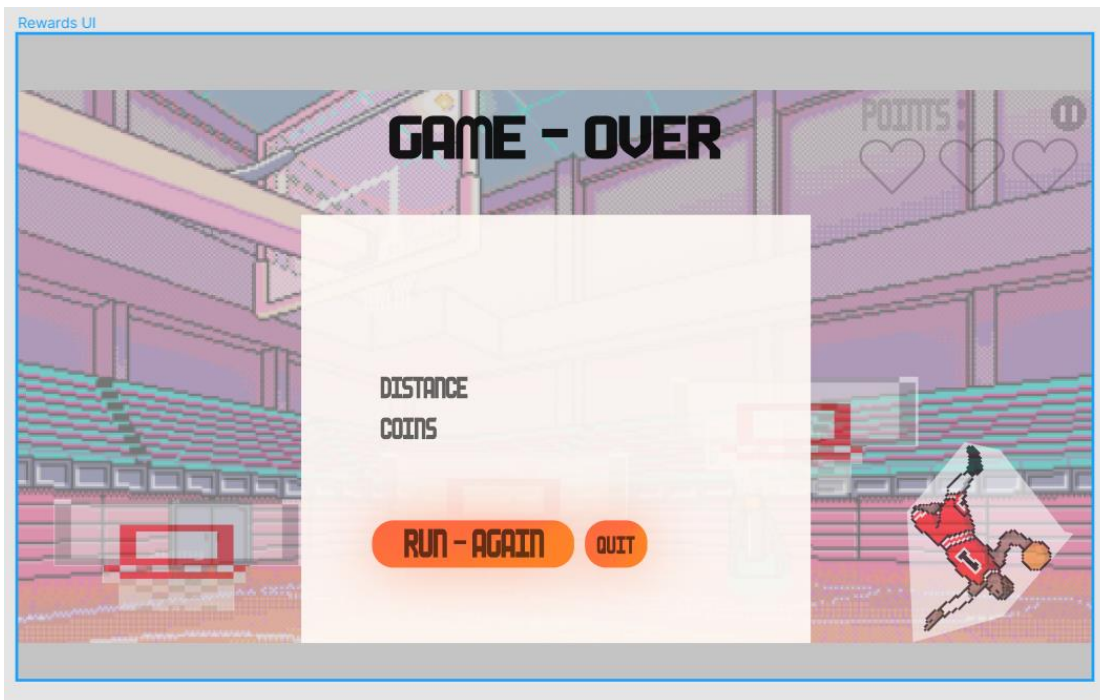
Stimulus: Player clicks Continue button in Pause UI
Response: Saved gameplay data must be loaded. Game UI will be displayed.

Functional Requirements
F03_01: Gameplay data at the current point must be saved when pause button is clicked (HIGH)

6.1.4 Reward UI

Feature Description and Priority
Description: Reward User Interface displayed when Player loses all his life points or falls down the platform
Overall Priority: **HIGH**

Stimulus/Response Sequences
Stimulus: Player falls off platform
Response: The Rewards UI will be displayed

Stimulus: Player loses all life points
Response: The Rewards UI will be displayed

Stimulus: Player clicks Continue button
Response: Game UI will be displayed, a new game session will run

Stimulus: Player clicks Quit button
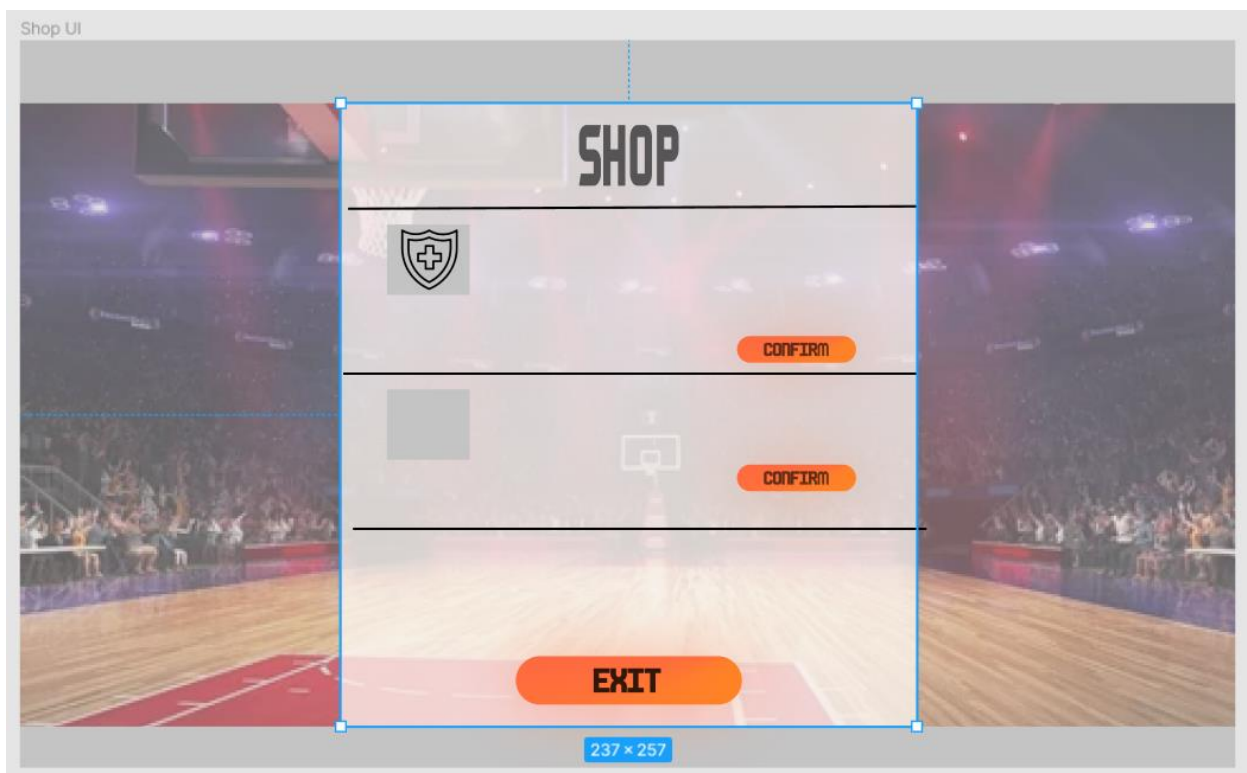Response: Main Menu UI will be displayed

Functional Requirements
F04_01: Reward UI must display total in game units traveled for that game session
(HIGH)
F04_02: Reward UI must show how much coins has been gathered for that session
(HIGH)
F04_03: Reward UI must show how much coins has been gathered in total (HIGH)

6.1.5 Shop UI

Feature Description and Priority
Description: Shop User Interface displayed when Player clicks on Shop button
Overall Priority: **HIGH**

Stimulus/Response Sequences

Stimulus: Player clicks on the Shop button in the main menu
Response: The Shop UI is opened displaying the list of available upgrades

Stimulus: Player purchases an item from the shop while having more than enough coins for the purchase
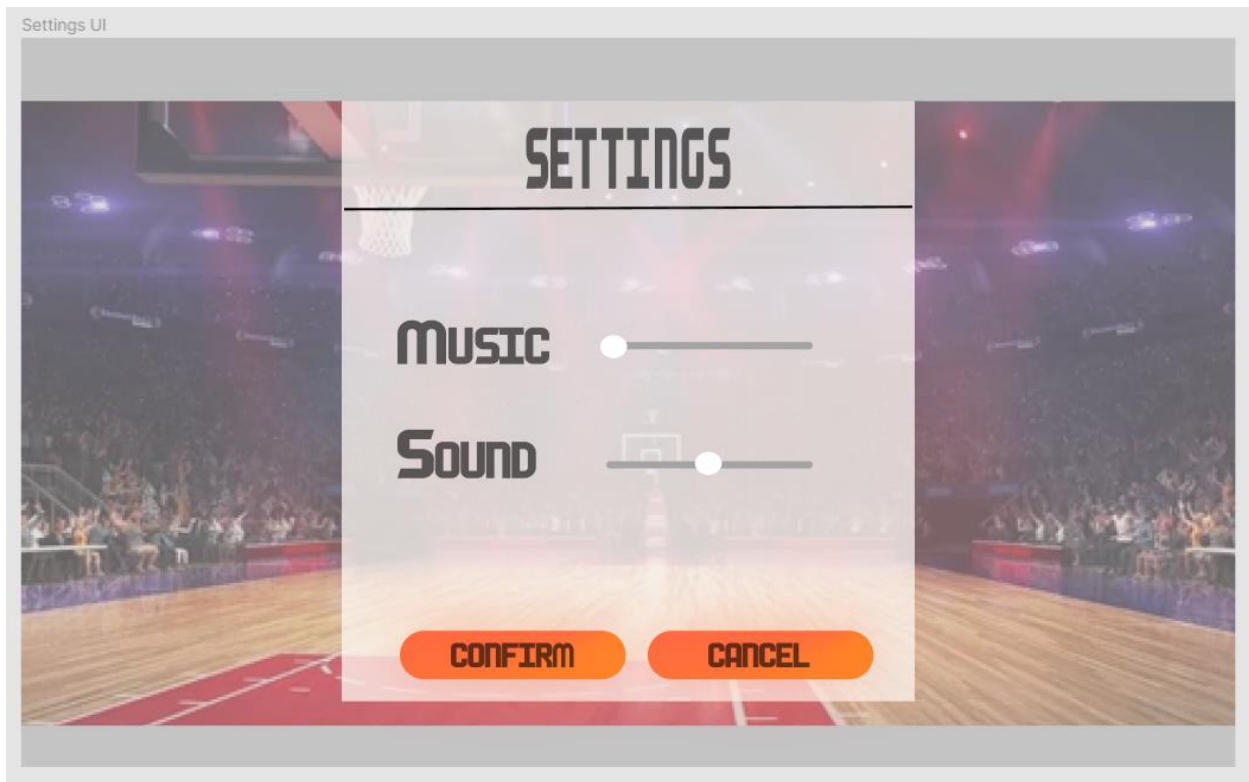Response: The upgrade is applied for future runs of the game and the player's total coin count is reduced by the amount required for the purchase.

Functional Requirements
F05_01: The shop must be accessible from the main menu (HIGH)
F05_02: The shop must contain upgrades that can be purchased using collected coins (HIGH).

6.1.6 Settings UI

Feature Description and Priority
Description: Settings User Interface displayed when Player clicks on Settings button
Overall Priority: **HIGH**

Stimulus/Response Sequences
Stimulus: Player clicks on the Settings button in the main menu

Response: The Settings UI is opened displaying the list of settings that can be adjusted

Stimulus: Player clicks on the Confirm button in the settings
Response: The game configuration changed will be updated. Main menu UI will be displayed

Stimulus: Player clicks on the Cancel button in the main menu
Response: The game configuration changed will not be updated. Main menu UI will be displayed

Functional Requirements
F06_01: Settings UI changes must be saved after the user after user selects confirm (HIGH)
F06_02: Settings UI changes must be reflected after the user exits Settings UI(HIGH)

6.1.7 Credits UI
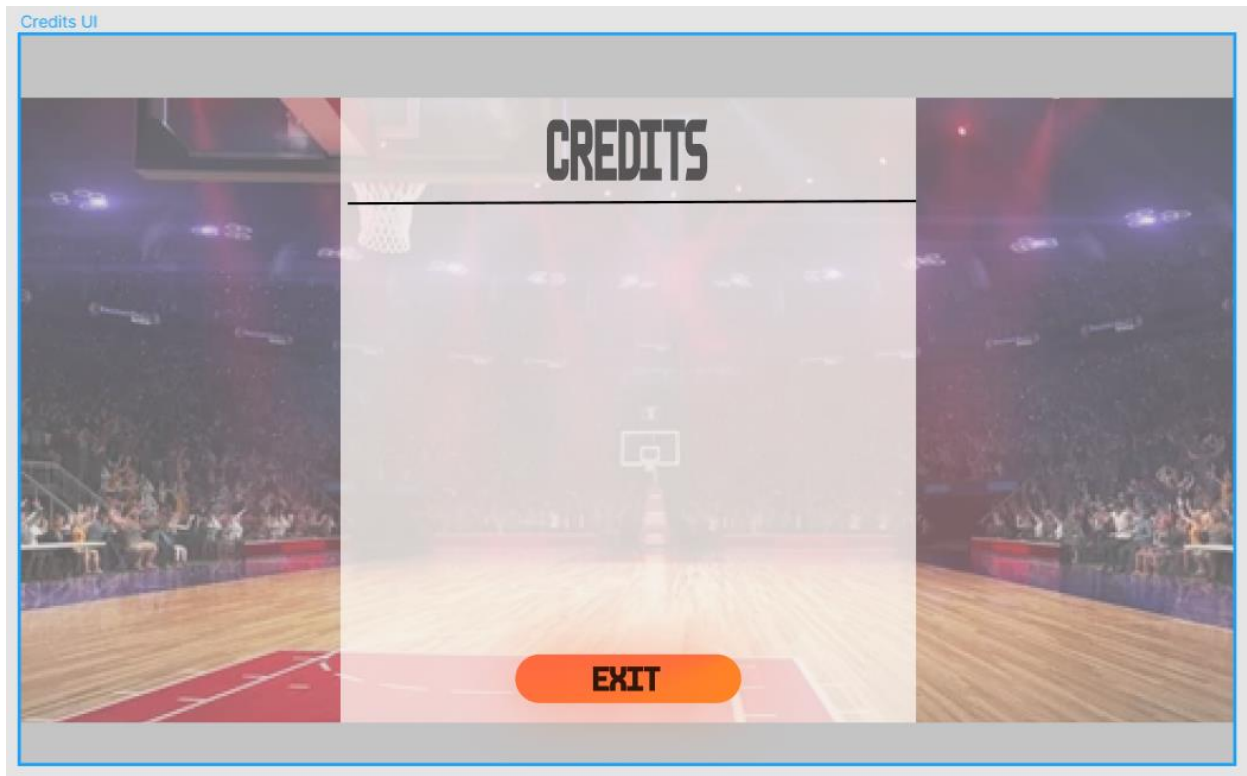
Feature Description and Priority
Description: Credits User Interface displayed when Player clicks on Credits button
Overall Priority: **HIGH**

Stimulus/Response Sequences
Stimulus: Player clicks on the Credits button in the main menu
Response: The Credits UI is opened displaying credits

Stimulus: Player clicks on the back button in the Credits UI
Response: Main Menu UI will be displayed

7 System Features

7.1 Platform Generation System

Feature Description and Priority
Description: Game to generate endless platforms before the player to jump and run on.
Overall Priority: **HIGH**

Stimulus/Response Sequences
Stimulus: Player jumps from platform to platform
Response: More platforms to be generated as the player moves to ensure there will always be a platform to jump on.

Functional Requirements
F01_01: Each generated platform must be reachable by the player (HIGH)

7.2 Obstacle Generation System

Feature Description and Priority
Description: Game to generate obstacles at random intervals to obstruct the player. Obstacles are categorized into static obstacles (not moving) and moving obstacles. Obstacles cannot be destroyed by the player and collision with the player reduces the player's life points (see Life System section).
Overall Priority: **HIGH**

Stimulus/Response Sequences
Stimulus: Player runs and collides with a static obstacle
Response: Player loses 1 life point

Functional Requirements and Priority
F02_01: Static obstacles must spawn above platforms (HIGH)
F02_02: Only a maximum of 2 obstacles can spawn on the same platform (HIGH)

F02_03: Upon player collision with the obstacle, the player life points must be reduced unless a power up prevents life points from being reduced (see Shop and Upgrade, Power-up and Collectible System sections) (HIGH)

F02_04: Obstacles cannot be destroyed by player attacks. (See Player Movement and Attack System section) (HIGH)

F02_03: There must be two types of obstacles, static obstacles and moving obstacles. (HIGH)

7.3 Enemy Generation System

Feature Description and Priority
Description: Game to generate enemies at random intervals to obstruct the player. Enemies can be defeated by player attacks and collision with the player reduces the player's life points (see Life System section).
Overall Priority: **MEDIUM**

Stimulus/Response Sequences
Stimulus: Player collides with an enemy
Response: Player loses 1 life point

Stimulus: Player attacks and the projectile hits the enemy.
Response: Enemy plays death animation and disappears.

Functional Requirements
F03_01: Enemies must spawn above platforms (HIGH)
F03_02: Only a maximum of 1 enemy can spawn on the same platform (HIGH)
F03_03: Enemies must move left and right on the platform (HIGH)
F03_04: Upon player collision with the enemy, the player life points must be reduced unless a power up prevents life points from being reduced (see Shop and Upgrade, Power-up System sections) (HIGH)
F03_05: Enemies must be eliminated by player attacks. (HIGH)
F03_06: Upon elimination, the enemy disappears. (MED)

7.4 Shop and Upgrade System

Feature Description and Priority
Description: Game to provide a shop system where players can purchase upgrades to improve their future gameplay experiences using earned currency. This shop can be accessed from the Main Menu.
Overall Priority: **MEDIUM**

Stimulus/Response Sequences
Stimulus: Player clicks on the Shop button in the main menu
Response: The shop UI is opened displaying the list of available upgrades

Stimulus: Player purchases an item from the shop while having more than enough coins for the purchase
Response: The upgrade is applied for future runs of the game and the player's total coin count is reduced by the amount required for the purchase.

Functional Requirements
F04_01: The shop must be accessible from the main menu (HIGH)
F04_02: The shop must contain upgrades that can be purchased using collected coins (see Power-up and Collectibles System) (HIGH). Upgrades to be included are:
   A. Immortality: The player is granted temporary immunity after taking damage. (HIGH)
   B. Coin Master: Increase coin yield at the end of a run by a multiplier. (HIGH)
   C. Arcade Expert: All power up boosts will have a longer duration. (MEDIUM)

7.5 Power-up and Collectibles System

Feature Description and Priority
Description: Game to generate power-ups at uncommon or rare intervals to provide a temporary boost to the player. Game to generate collectible coins at common intervals to be used as a spendable currency at the end of the run.
Overall Priority: **MEDIUM**

Stimulus/Response Sequences
Stimulus: The player runs over the Coin Magnet power up
Response: The player obtains the coin magnet ability for a period of time

Stimulus: The player runs over a coin
Response: The coin count of the player increases by 1

Stimulus: The player collected 100 coins and loses a run
Response: The 100 coins is added to the total coin count the player has

Functional Requirements
F05_01: A power up has a probability of 10% to spawn on every platform generated. (HIGH)
F05_02: Power ups to include:

A. Coin Magnet: When acquired, coins within 20 meters of the player will be sucked in. (HIGH)
B. Invincibility: Players are immune to damage from enemies and penalties from hitting any obstacles. (HIGH)

F05_03: Power ups and collectibles must be generated in a location that can be reached by the player, either by running or jumping. (HIGH)

F05_04: Every platform must have a 75% chance of generating coins and a 10% chance of generating power-ups in its vertical area. (MEDIUM)

F05_05: Coin collectibles must be added to total count at the end of each run

7.6 Score System

Feature Description and Priority
Description: Game to calculate the player score based on the lifetime of the player, the longer the player lives, the higher the score.
Overall Priority: HIGH

Functional Requirements
F06_01: The player must gain 1 point for every second the player survived (HIGH)
F06_02: Score must be displayed and constantly updated as a game session progresses

7.7 Life and Game Over System

Feature Description and Priority
Description: Game to include a life system for the player, which indicates the number of collisions with an obstacle or enemy can be accepted before game over.
Overall Priority: MEDIUM

Stimulus/Response Sequences
Stimulus: Player collides with an obstacle while having more than 1 life point
Response: 1 life point is reduced from the player

Stimulus: Player collides with an obstacle while having exactly 1 life point
Response: Game over is activated and the player dies

Functional Requirements
F07_01: The player life points must be displayed in a game session. (HIGH)
F07_02: The player must start with 3 life points in every game session (MEDIUM)
F07_03: Life points must be reduced by 1 upon collision with an obstacle or enemy. (HIGH)

F07_04: Upon reaching 0 life points, the player will die and game over is activated. (HIGH)

F07_05: Falling off a platform must immediately activate game over. (HIGH)

7.8 Player Movement and Attack System

Feature Description and Priority
Description: The player controls a character that automatically runs rightwards constantly. The player must be able to control the character by jumping and attacking.
Overall Priority: HIGH

Stimulus/Response Sequences
Stimulus: Player presses the attack button
Response: Player shoots a projectile before him

Stimulus: Player presses the jump button while standing on a platform
Response: Player character jumps upwards

Stimulus: Player presses the jump button while in the air
Response: Nothing happens

Functional Requirements
F08_01: The player must be constantly running rightwards (HIGH)
F08_02: The player must be running at a constant speed (HIGH)
F08_03: The player must be able to jump when the jump button is pressed while standing on top of a platform, providing a burst of vertical motion (HIGH)
F08_04: The player must be able to attack when the attack button is pressed, shooting a projectile forward (HIGH)
F08_05: The player projectiles must eliminate enemies upon contact. (HIGH)

7.9 Sports Theme System

Feature Description and Priority
Description: The game revolves around multiple sports themes throughout gameplay. Each sports theme will influence the overall game aesthetic, the player character actions and types of obstacles and enemies. The theme will rotate upon surviving for 30 seconds in the game.

Overall Priority: HIGH
Stimulus/Response Sequences
Stimulus: Player travels survive exactly 30 seconds
Response: The sports theme changes

Functional Requirements
F09_01: The game must rotate themes every 30 seconds (HIGH)
F09_02: The game must include a basketball theme (HIGH)
F09_03: The game must include a badminton theme (HIGH)

8 Input Requirements

User knowledge and possession of the "Mouse" peripheral device:

Player is required to have the knowledge for using a "Mouse" peripheral device as it is used to navigate through the game user interface. All buttons in the game require the user to click with the "Mouse" peripheral.

User knowledge and possession of the "Keyboard" peripheral device:

Player is required to have the knowledge for using a "Keyboard" peripheral device as it is required for controlling the player character in game for jumping. The "Spacebar" key is used for character jumping.

9 Hardware and Software requirements

Hardware Requirements:

Personal computer:
Windows desktop or laptop
Recommended Specification:
- 4 GHz Processor eg. Ryzen 5/ Intel Core i5
- Direct X 11.0 eg. GTX 1060/ AMD Radeon 5000-Series
- RAM 8 GB

Peripherals:
Mouse and Keyboard

Software Requirements:

Operating System:
Windows 10 64-bit

Software:
SportZ game application

References

[1] R. Guthold, "Global Trends in insufficient physical activity among adolescents: a pooled analysis of 298 population - based surveys with 1.6 million participants," The Lancet, vol. 4, issue 1, pp. 23-25, January 2020.
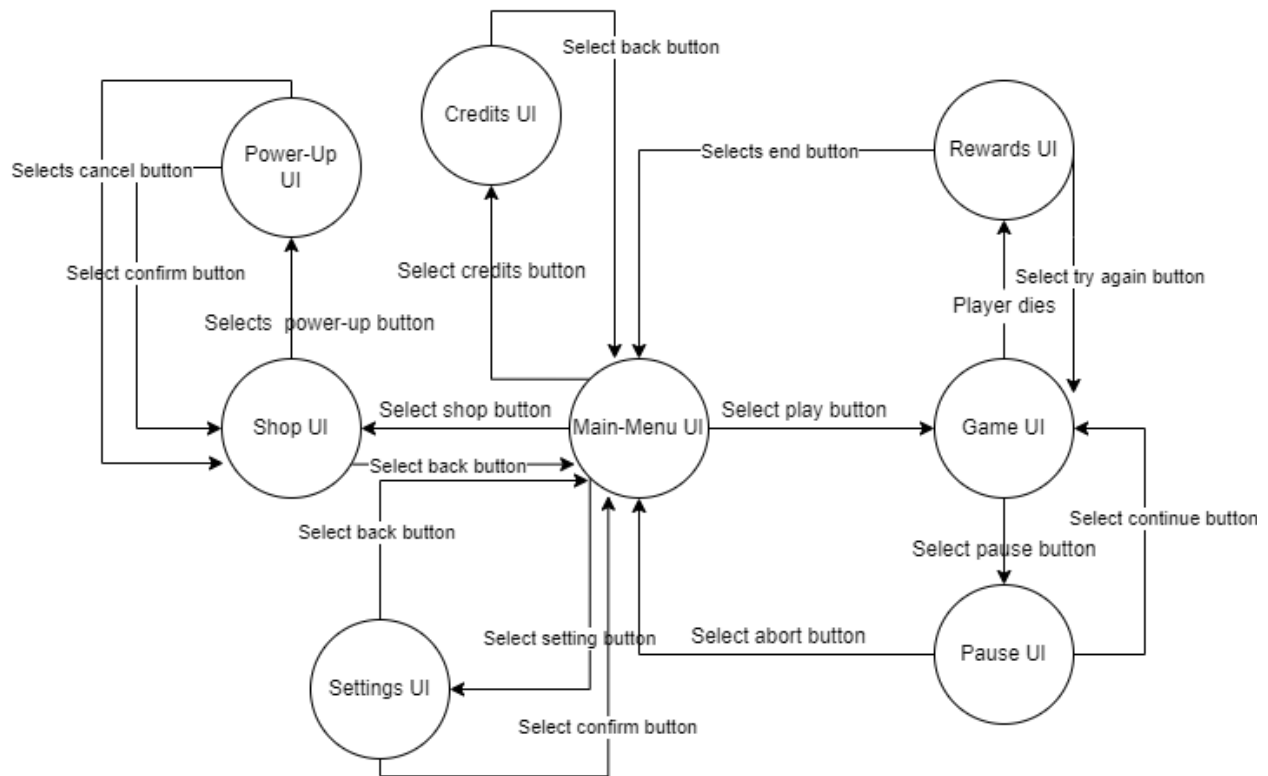
Appendix: Analysis Models

State Transition Diagram

Figure 1. StateTransition Diagram