SFWRENG 4GP6: Software Design IV
Capstone Computer Game Design Project
Requirements Document

Roygbiv

Gameboys

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Contents

1   Purpose

1.1   Background

This project is a game developed as a graduation project (Capstone) under the supervision of Dr. Jacques Carette and Dan Szymczak. This team, Gameboys, has decided to take on this project to pursue such an original concept; developing a novel game.

1.2   Goals

The team is committed to developing a three-dimensional platform action/arcade game, that incorporates various fun and interactive puzzles. The main goal is to allow players to have a game that can be enjoyed daily. Through providing an adequate level of stress, and possibly frustration, within the gameplay, it is all the more rewarding upon its completion.

2   Stakeholders

- Dr. Jacques Carette - Professor of SFWR ENG 4GP6 at McMaster University who must approve this project as well as set general constraints and develop marking schemes that incorporate the different milestones integrated within this project

- Dan Szymczak - Teaching assistant of SFWR ENG 4GP6 at McMaster University who hosts weekly meetings with the teams and marks the milestones within this project while providing feedback

- Judges - Current game developers in the competitive gaming industry that will judge the final polished game through the final demonstration and provide a constructive critique

- Players - End users and essentially the target market that the final polished game ultimately targets that will determine whether the game was a success or not according to their level of interest in the game and the measure of how intriguing they find it

- Development team - Group of five individuals who are working together to develop this Capstone game throughout the academic year

3   Mandated Constraints

3.1   Solution Constraints

- The game engine to be used, enforced by Dr. Carette, is Unity3D (version 2017.1.1)

- The game must contain at least 15 minutes of gameplay

3.2   Implementation Environment of the Current System

The product will be developed and tested in Unity (version 2017.1.1). Therefore, it will be compatible on macOS and Windows operating systems. The main interaction model will be the computer keyboard for navigating through the game, as well as the mouse for utilizing the menu interface.

3.3 Collaborative Applications

- Unity 3D Engine - All constraints set by the Unity team as well as Unity3D (version 2017.1.1) must be met. A computer with at least the minimum system requirements stated in this version must be used to run the game.

- Windows 10 - All constraints set by Microsoft, as well as Windows 10 must be met. A computer with at least the minimum system requirements for Windows 10 must be used to run the game.

- Mac OS High Sierra 10.13 - All constraints set by Apple, as well as High Sierra 10.13 must be met. A computer with at least the minimum system requirements for High Sierra 10.13 OS must be used to run the game.

3.4 Off-the-Shelf Software

- Unity 3D Engine - Will be used under free licence for individual and educational purposes

3.5 Schedule Constraints

We are given eight months to develop this project. It must be completed by April of 2018 for validation and marking.

4 Naming Conventions and Terminology

- Checkpoint - Marks the positions on a level at which a players avatar may appear in its next incarnation if it should die in that level.

- Creative Commons - A non-profit organization devoted to expanding the range of creative works, such as art and music, which is available for people to legally use and build on. All licenses require that the original creator is credited in the product that borrows their work. The type of license used determines if it is legal to use commercially.

- Platformer - An avatar moves through a vertically exaggerated environment, jumping on and off platforms at different heights, while avoiding obstacles and battling enemies. The avatar has a supernatural jumping ability and can't be harmed by falling long distances.

- Product Use Case (PUC) - Clarifies a scenario, by providing an event name, trigger, preconditions, procedure, and outcome.

- Puzzle Game - Puzzle games usually provide related challenges, variations on a theme. The types of puzzles offered include recognizing patterns, making logical deductions, or understanding a process. In all cases, the puzzles give the player clues that have to be somehow unraveled or solved to meet the victory condition.

- Respawn - an instance where the character in a video game reappears after being killed.

- Three Dimensional (3D) - A set of coordinates represented in the form of (x,y,z) in a Cartesian space.

5 Relevant Facts and Assumptions

5.1 Relevant facts

- There are several online resources as well as the Unity asset store for graphics and audio that are free to use under the creative commons license

- Standard controller is supported by most games

- A platformer is a video game where the avatar moves through a vertically exaggerated environment, jumping on and off platforms at different heights, while avoiding obstacles and battling enemies

- A puzzle game revolves around strategic problem solving. This type of games provides the player with complete freedom to analyze the matters at hand before acting

5.2 Assumptions

- Graphic and audio assets that will be used will be under creative commons license

- This version of Roygbiv will not be released commercially

6 The Scope of the Work

6.1 Existing Inspirations

- Marble Blast Ultra - A three-dimensional puzzle/action game where the player is a marble, and navigates around platforms to get to the finish pad, while avoiding obstacles and utilizing power-ups. The inspirations taken from this game is how the third-person camera tracks the marble and how the player is uses the power-ups.

- Portal - A platform puzzle game that involves puzzles that have to be solved by teleporting various entities using a device that creates portals between two flat planes. The inspiration taken from this game is how the player is given ample time to think the puzzle through before acting.

- Tag - A popular playground game that involves two or more players, where one player is the tagger and chases after the others in an attempt to tag another player, making them the new tagger. The inspiration taken from this game is how the player will attempt to tag the colored spheres while following a set order on which sphere to touch.

6.2 Context of the Work

- The game is being developed as a fourth year Capstone project under Professor Dr. Jacques Carette and Teaching Assistant Dan Szymczak.

- The game does not require any further implementation than what is described.

- The final demonstration of the game will be shown to the Professor, Teaching Assistant, and local game developers.

- The major motivating factors in the development of this game revolves around the quality of the work produced. There are two end goals. One is to earn the highest grade in the Capstone course, while the other is to develop a game that its players cannot leave without finishing.

7 The Scope of the Product

7.1 Product Boundary
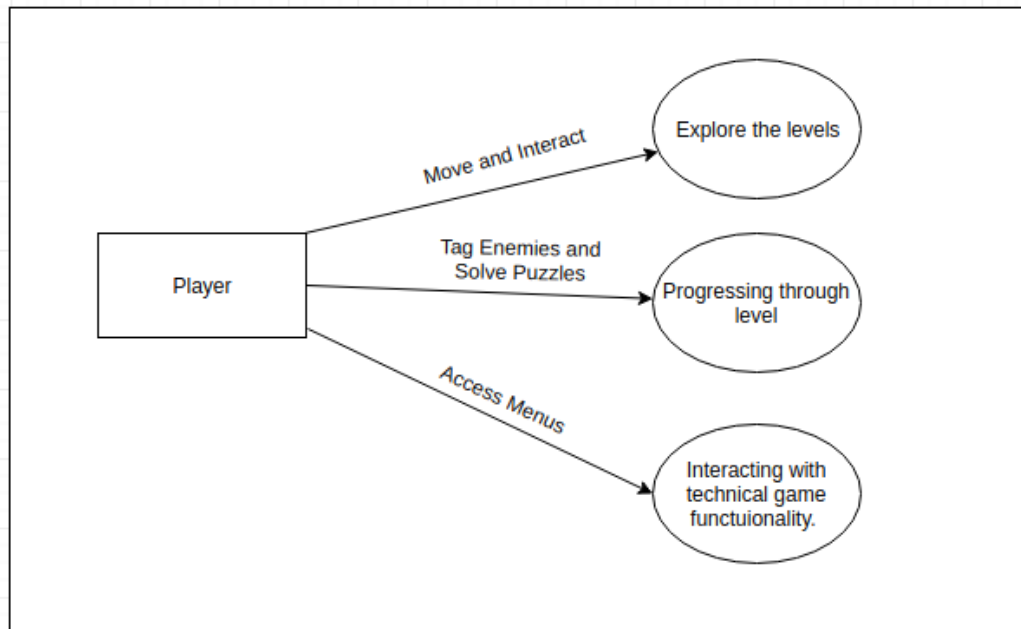
7.2 Product Use Case (PUC) Table

PUC	PUC Name	Actor(s)	Input/Output
1	Moving Camera	Player	3D position vector (IN/OUT)
2	Moving in the Level	Player	3D velocity vector(IN), 3D position vector (OUT)
3	Interacting with Objects	Player	3D position vector(IN), Interaction command (IN), Object action (OUT)
4	Interacting with NPC(s)	Player	3D position vector(IN), Interaction command (IN), NPC action (OUT)
5	Viewing the Map	Player	Key Input(IN), Level Map(OUT)
6	Starting New Game	Player	Key Input (IN), Starting game conditions(OUT)
7	Saving the Game	Player	Key Input(IN), Success boolean(OUT)
8	Loading Saved Game	Player	Key Input (IN), Exiting game conditions(OUT)
9	Pausing the game	Player	Key Input(IN)
10	Resuming the game	Player	Key Input(IN)
11	Displaying Game settings	Player	Key Input(IN), Current game settings(OUT)
12	Changing Game settings	Player	Key Input(IN), Update game settings(OUT), Apply boolean (OUT)
13	Display player Respawn Menu	Player	Key Input(IN), Select boolean (OUT)
14	Player Dies	Player	Respawn message(OUT)
15	Using Power-ups	Player	Key Input(IN)
16	Selecting a Level in Level Menu	Player	Key Input(IN), Select boolean (OUT)
17	Displaying a Level Menu	Player	Key Input(IN)
18	Exiting the Level	Player	Key Input(IN)
19	Exiting the Game	Player	Key Input(IN)
20	Completing a Level	Player	Completion message (OUT)
21	Player Respawn	Player	3D position vector(OUT)
22	Completing the game	Player	Completion message(OUT)

7.3 Individual Product Use Cases

PUC No. 1	Event: Moving Camera
Trigger	Player indicates a direction to view.
Preconditions	The player is in control of the character, while in a level.
Procedure	1. Obtain viewing angle and direction. 2. Rotate the camera until no more input is given.
Outcome	The viewing angle of the main camera in the game is changed.

PUC No. 2	Event: Moving in the Level
Trigger	Player indicates a direction to move.
Preconditions	The player is in control of the character, while in a level.
Procedure	1. Obtain current position. 2. Determine the direction the player wants to move in. 3. Determine the speed the player wants to move at. 4. Move the character until no more input is given.
Outcome	The character is moved from an initial starting position to a position determined by the player at a speed determined by the player.

PUC No. 3	Event: Interacting with Objects
Trigger	Player collides with object.
Preconditions	The player is in control of the character, while in a level.
Procedure	1. Detect if the the character is within collision range of an object. 2. Activate the function of the object.
Outcome	The character interacts with an object and activates its intended function.

PUC No. 4	Event: Interacting with NPC(s)
Trigger	Player collides with NPC(s).
Preconditions	The player is in control of the character, while in a level.
Procedure	1. Detect if the the character is within collision range of an NPC. 2. Activate the function of the NPC.
Outcome	The character interacts with an object and activates its intended function.

PUC No. 5	Event: Viewing the Map
Trigger	Player opens the level map.
Preconditions	The player is in control of the character, while in a level.
Procedure	1. Display character position on level map. 2. Display level layout of the map.
Outcome	The player can now see where the character is on a map.

PUC No. 6	Event: Starting a New Game
Trigger	The player selects the "New Game" option.
Preconditions	The player is in the main menu screen.
Procedure	1. Load the first level. 2. Play the introduction.
Outcome	The player is loaded into the first level of the game, and has control of the character.

PUC No. 7	Event: Saving the Game
Trigger	The player completes a level, or reaches a checkpoint.
Preconditions	The player is no longer in control of the character and has reached the end of the level. Or the player is in control of the character and has reached a checkpoint.
Procedure	1. Determine level state of the game. 2. Determine if the level is completed. 3. If the level isn't completed, determine the checkpoint state of the level. 4. Save the level state of the game, and save the checkpoint state of the level.
Outcome	The player's progress has been saved up until their latest level completion or checkpoint.

PUC No. 8	Event: Loading Saved Game
Trigger	The player selects a saved game in the "Load Game" menu.
Preconditions	The player selected "Load Game" in the main menu.
Procedure	1. Get the player selection. 2. Load the level state of the game and checkpoint state of the level into the game state.
Outcome	The current game state is set to the game state of the loaded game's save file.

PUC No. 9	Event: Pausing the Game
Trigger	The player pauses the game by pressing the pause button.
Preconditions	The player is in control of the character, while in a level and the game state is not paused.
Procedure	1. Stop all real-time play. 2. Set the game state to paused. 3. Enable the resume option. 4. Display the "Pause Menu" screen.
Outcome	The game is now frozen in the game state prior to the pause button being pressed.

PUC No. 10	Event: Resuming the Game
Trigger	The player resumes the game by pressing the pause button while in the Pause Menu" or selecting "Resume Game" in the "Pause Menu".
Preconditions	The player is in control of the character, while in a level and the game state is paused.
Procedure	1. Resume the paused game state of the game. 2. Set the game state to resumed.
Outcome	The game is now unfrozen from the state it was paused at.

PUC No. 11	Event: Displaying Game Settings
Trigger	The player selects options menu from main menu or pause menu.
Preconditions	The player is in main menu or in pause menu.
Procedure	1. Find and display current game settings.
Outcome	Current game settings are displayed to player.

PUC No. 12	Event: Changing the Game Settings
Trigger	The player selects desired game setting and alters it.
Preconditions	The player is viewing game settings menu.
Procedure	1. Find new value of selected setting. 2. Change setting to new value. 3. Display the selected game setting's new value.
Outcome	The selected game setting's value has changed.

PUC No. 13	Event: Display player Respawn Menu
Trigger	The player has died in game world.
Preconditions	The player was alive in game world.
Procedure	1. Display "Respawn Menu".
Outcome	The "Respawn Menu" is displayed to the player.

PUC No. 14	Event: Player Dies
Trigger	The player is sent to the "Respawn Menu".
Preconditions	The player was alive in the game world.
Procedure	1. Display "Respawn Menu".
Outcome	The "Respawn Menu" is displayed to the player.

PUC No. 15	Event: Using power-ups
Trigger	The player interacts with an object that is a power-up.
Preconditions	The player is in control of the character, while in a level.
Procedure	1. Detect if the player is allowed to use the power-up. 2. If they are allowed, then apply the power-up to the player.
Outcome	The player experiences a power-up.

PUC No. 16	Event: Selecting a Level in Level Menu
Trigger	The player selects a level and tries to load in to level.
Preconditions	The player is viewing the level menu.
Procedure	1. Player selects a level. 2. The game determines if player has met the right criteria to play level. 3. If player has met the criteria the game loads the level, if not the game gives error message.
Outcome	The player loads in to the level.

PUC No. 17	Event: Displaying a Level Menu
Trigger	The player selects the level menu from main menu.
Preconditions	The player is viewing the main menu.
Procedure	1. Display all levels, levels that don't have criteria met are locked to player.
Outcome	All playable and locked levels are displayed to user.

PUC No. 18	Event: Exiting the Level
Trigger	The player selects the "Quit to Menu" option from pause menu.
Preconditions	The player is in control of the character that is in the level. The pause menu is open
Procedure	1. Confirm with player their desired action. 2. Return player to main menu.
Outcome	The player is returned to main menu.

PUC No. 19	Exiting the game
Trigger	The player selects the Quit Game option from main menu.
Preconditions	The player is currently not in a active game session, and is idle in main menu.
Procedure	1. Confirm with player their desired action. 2. Exit the game
Outcome	The game closes.

PUC No. 20	Event: Completing a Level
Trigger	The player reaches the end of a level.
Preconditions	The player is in control of the character, while in a level.
Procedure	1. Save the current game state to the save file. 2. Load the next level.
Outcome	The game saves the player's progress and sends them to the next level of the game.

PUC No. 21	Event: Player Respawn
Trigger	The player selects "Respawn Menu" option or the character has just died.
Preconditions	The player is viewing the "Respawn Menu."
Procedure	1. Prompt player to respawn from last checkpoint, restart level, or return to main menu. 2. Game responds to player's desired action.
Outcome	Depending on the player's desired action, the game respawns player to last checkpoint, restarts level deleting all checkpoints, or returns the player to main menu while saving player's last checkpoint.

PUC No. 22	Event: Completing the game
Trigger	The player reaches the end of level 7.
Preconditions	The player is in control of the character, while in level 7.
Procedure	1. Display congratulatory message. 2. Prompt player to chose to go to main menu or terminate program.
Outcome	The player is returned to the main menu, or the program is terminated, respectfully.

8   Functional Requirements

ID: F-1	Type: Functional
PUC: 1	Originator: Viraj Patel
Description	The player must be able to change the camera view angle
Rationale	If the player can't change the camera angle, then navigation through the level is less intuitive and more difficult which would make the experience less enjoyable.
Fit Criterion	The camera moves after the player inputs camera control command (key stroke).
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-2	Type: Functional
PUC: 2	Originator: Viraj Patel
Description	The player must be able to move their character around the game world.
Rationale	The player needs the ability to move to complete the levels and play the game.
Fit Criterion	The character moves after the player inputs movement control command (key stroke).
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-3	Type: Functional
PUC: 3,4	Originator: Viraj Patel
Description	The player must be able to interact with objects and NPCs.
Rationale	Players need to interact with objects to progress through levels.
Fit Criterion	When a player approaches an object, they will be able to interact with it. The only way to interact with an object is through collision.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-4	Type: Functional
PUC: 3,4	Originator: Viraj Patel
Description	The system must provide the correct response to the player's interaction.
Rationale	The system needs to react according to the player's input or else there won't be an appropriate response.
Fit Criterion	The system takes in the player input and provides the appropriate reaction based on game logic associated with what the player interacted with.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-5	Type: Functional
PUC: 5	Originator: Viraj Patel
Description	The system must update the map.
Rationale	The map is not useful to the player if it doesn't have the latest information so the system must update it whenever something change e.g. (player movement, objective completion etc.)
Fit Criterion	Whenever the position or state of an object/NPC changes, the system updates the map.
	Priority: High
Conflicts: N/A	Supporting Material: N/A

ID: F-6	Type: Functional
PUC: 5	Originator: Viraj Patel
Description	The player must be able to view the map.
Rationale	The player needs to see the map to view their objectives and see where they are in the game world.
Fit Criterion	The map opens from player input (a keystroke).
	Priority: High
Conflicts: N/A	Supporting Material: N/A

ID: F-7	Type: Functional
PUC: 6	Originator: Viraj Patel
Description	The player must be able to start a new game.
Rationale	If it's the player's first time or if they want to restart, then they need an option to be able to create a new game.
Fit Criterion	There must be an option in the main menu to create a new game.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-8	Type: Functional
PUC: 7	Originator: Viraj Patel
Description	The system must be able to create a new game.
Rationale	The system needs to know if the player is creating a new game so that it can change where the game is being saved and reset the states of the game back to it's original.
Fit Criterion	The system must reset all the information in the game and create a new area where the game can be saved.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-9	Type: Functional
PUC: 7	Originator: Viraj Patel
Description	The player must be able to save the game.
Rationale	In order to retain progress, the player has to have the ability to save their progress, in this case it would be a save state.
Fit Criterion	There must be an option in the pause menu to save the game.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-10	Type: Functional
PUC: 7	Originator: Viraj Patel
Description	The player must be able to select a slot in which to save the game.
Rationale	The player could be experimenting/creating a new game and not want to lose progress they've made, so multiple save slots is necessary.
Fit Criterion	There must be different save slots to choose from when the player selects to save the game.
	Priority: High
Conflicts: N/A	Supporting Material: N/A

ID: F-11	Type: Functional
PUC: 8	Originator: Viraj Patel
Description	The player must be able to load the game from the chosen save state.
Rationale	There is no point to saving the game if the player cannot access and load the game that they've saved.
Fit Criterion	The player must be provided the option to load a game in the main menu and pause menu.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-12	Type: Functional
PUC: 8	Originator: Viraj Patel
Description	The system must be able to load the game.
Rationale	There is no point to the save system if the save states cannot be loaded, so the system needs to be able to load the save when it is selected.
Fit Criterion	The system must load from the save state that the player selects.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-13	Type: Functional
PUC: 9	Originator: Viraj Patel
Description	The player must be able to pause the game while the game is in play.
Rationale	There is no definite amount of time that the game will run so when the player requires a break the option to pause the game will be there.
Fit Criterion	The player will be able to pause the game through a keystroke.
	Priority: High
Conflicts: N/A	Supporting Material: N/A

ID: F-14	Type: Functional
PUC: 9	Originator: Viraj Patel
Description	The system must be able to pause the game.
Rationale	When the player needs a break, the system will be able to pause gameplay to allow the player a break.
Fit Criterion	The system will pause all runtime elements of the game which will pause the game.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-15	Type: Functional
PUC: 9	Originator: Viraj Patel
Description	The system must display the pause menu to the player when the game is paused.
Rationale	There has to be some indication to when the game as paused, plus the pause menu can give more functionality.
Fit Criterion	When the player pauses the game, the system will display the pause menu to the player which contains various options for the player to select.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-16	Type: Functional
PUC: 10	Originator: Viraj Patel
Description	The player must be able to resume the game.
Rationale	With the ability to pause there must also be the ability to resume.
Fit Criterion	When the player presses the pause key while the game is paused, the game will resume.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-17	Type: Functional
PUC: 10	Originator: Viraj Patel
Description	The system must be able to resume the game.
Rationale	With the ability to pause, the system must also be able to resume the game when the player requests it.
Fit Criterion	The system will resume all paused gameplay when the player indicates they want to resume the game.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-18	Type: Functional
PUC: 11	Originator: Viraj Patel
Description	The player must be able to select to change game settings.
Rationale	As with most games, the option to change game settings to the player's personal preference will be included.
Fit Criterion	The player will be able to select to change the game settings from the main menu and the pause menu.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-19	Type: Functional
PUC: 11	Originator: Viraj Patel
Description	The system must display the game settings menu when the player requests it.
Rationale	The game settings menu allows the player to easily see the different settings they can change for the game.
Fit Criterion	The system will display a list of different elements of the game that the player can modify.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-20	Type: Functional
PUC: 12	Originator: Viraj Patel
Description	The player will be able to change game settings.
Rationale	The ability to change game settings has been an important part of games and it allows the player to change how the game feels to suit their preferences.
Fit Criterion	The game settings will change based on what the player selects.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-21	Type: Functional
PUC: 12	Originator: Viraj Patel
Description	The system must save the game settings.
Rationale	Saving the settings lets the player enjoy the game immediately after starting it up again instead of having to tweak the game settings every time they play.
Fit Criterion	The system will save the game settings whenever the user is finished changing the game settings in the menu.
	Priority: High
Conflicts: N/A	Supporting Material: N/A

ID: F-22	Type: Functional
PUC: 13	Originator: Viraj Patel
Description	The player must be allowed to respawn.
Rationale	Not everyone is perfect, and the respawn mechanic allows players to enjoy the game instead of being frustrated every time their character dies.
Fit Criterion	The player can select to respawn at the most recent checkpoint in the respawn menu.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-23	Type: Functional
PUC: 13	Originator: Viraj Patel
Description	The system must be able to load the game from the previous checkpoint.
Rationale	Loading from a checkpoint is an important part of the game, so the system needs to be able to recall the state of the game from when the player was at the designated checkpoint.
Fit Criterion	The system will load the game as it was at the last checkpoint the player visited.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-24	Type: Functional
PUC: 14	Originator: Viraj Patel
Description	A message and menu must appear once the player dies.
Rationale	Notifying when the player has failed is an important part of the death mechanic and it allows the player to take further action.
Fit Criterion	A message must appear saying that the player has failed/died and a menu that gives them the option to continue from a checkpoint or exit the game.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-25	Type: Functional
PUC: 14	Originator: Viraj Patel
Description	The player must be able to select from the failure menu.
Rationale	The failure menu would allow players to continue playing if they so wished or to exit the game.
Fit Criterion	Allow the player to select from the different options on the menu and perform the action that they select.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-26	Type: Functional
PUC: 14	Originator: Viraj Patel
Description	The system must respond to the players input in the death menu.
Rationale	The system needs the info from the player so it can load up the necessary data.
Fit Criterion	The system must load all data necessary for the option that the player chooses (e.g. respawn from checkpoint, exit game, etc.)
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-27	Type: Functional
PUC: 15	Originator: Viraj Patel
Description	The player must be able to use power-ups.
Rationale	power-ups are a core game mechanic that provides the player with some sort of assistance or advantage for completing the level.
Fit Criterion	When the power-up command is issued (keystroke) the power-up is consumed and applies to the character.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-28	Type: Functional
PUC: 16	Originator: Viraj Patel
Description	The player must be able to select a level from the level menu.
Rationale	A level selector will allow the player to come back to levels they've enjoyed, which would increase the replayability of the game.
Fit Criterion	The level that the player selected will load from the current save that the player is on.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-29	Type: Functional
PUC: 17	Originator: Viraj Patel
Description	The system must display a level menu to the player.
Rationale	A level menu is necessary for the player if they want to revisit past levels or try to beat their score.
Fit Criterion	When the level menu is selected in the main menu, the level menu opens.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-30	Type: Functional
PUC: 18	Originator: Viraj Patel
Description	The player must be able to leave the level.
Rationale	The ability to properly exit a level would prevent complications with the save files and data of the levels.
Fit Criterion	When the player selects to leave the level in the pause menu, the game will unload the level and exit to the main menu.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-31	Type: Functional
PUC: 19	Originator: Viraj Patel
Description	The player must be able to exit the game.
Rationale	The ability to close the game in a controlled way is important to prevent memory leaks and other complications.
Fit Criterion	When the player selects to close the game from within the main menu or the pause menu, the game unloads everything and ends the application.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-32	Type: Functional
PUC: 20	Originator: Viraj Patel
Description	The system must display a level completion message and menu when the player completes a level.
Rationale	For the same reason as the death menu, the level completion menu would allow players to decide if they wish to keep playing or exit to the main menu.
Fit Criterion	When the player completes a level, a message will appear and then a menu which would allow the player to select to continue to the next level or back to the main menu.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-33	Type: Functional
PUC: 21	Originator: Viraj Patel
Description	The system must respawn the player at the most recent checkpoint when the player dies and selects respawn from the respawn menu.
Rationale	Death must be penalizing but not experience ruining, so respawning at designated checkpoints is a good compromise.
Fit Criterion	The system will load the state of the game as it was when the player arrived at the most recent checkpoint and respawn the player there.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-34	Type: Functional
PUC: 13	Originator: Puru Jetly
Description	The system must allow the player to select exit to main menu from respawn menu.
Rationale	If the player would like to exit to main menu to quit game or change a game setting.
Fit Criterion	The system will load into the main menu.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-35	Type: Functional
PUC: 21	Originator: Viraj Patel
Description	The system must go into the win-game screen when the player completes all the levels.
Rationale	The player should have a sense of satisfaction when they complete the game so a win screen is neccessary.
Fit Criterion	After the game detects that all levels have been completed, it will display the win-game-screen.
	Priority: High
Conflicts: N/A	Supporting Material: N/A

ID: F-36	Type: Functional
PUC: 11	Originator: Puru Jetly
Description	The system must display the option to change the resolution of the game.
Rationale	The player must be able to see which resolution the game can output at.
Fit Criterion	The system displays list of different resolutions for game.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-37	Type: Functional
PUC: 11	Originator: Puru Jetly
Description	The system must display the option to change the graphics quality of the game.
Rationale	The player must be able to see which graphics quality the game can output at.
Fit Criterion	The system displays list of different graphic qualities for game.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-38	Type: Functional
PUC: 11	Originator: Puru Jetly
Description	The system must display the option to change camera inversion for the game.
Rationale	The player must be able to see which camera inversion is applied.
Fit Criterion	The system displays if camera is inverted.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-39	Type: Functional
PUC: 12	Originator: Puru Jetly
Description	The player must be able to change the resolution of the game.
Rationale	The player may want to reduce resolution to increase performance or increase resolution for higher graphical fidelity.
Fit Criterion	The resolution will be changed based on what the player selects.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-40	Type: Functional
PUC: 12	Originator: Puru Jetly
Description	The player must be able to change the graphical quality of the game.
Rationale	The player may want to reduce graphical quality to increase performance or increase graphical quality for higher graphical fidelity.
Fit Criterion	The graphical quality will be changed based on what the player selects.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-41	Type: Functional
PUC: 12	Originator: Puru Jetly
Description	The player must be able to change the inversion of the camera.
Rationale	The player may want to invert the camera input to better suit their game style.
Fit Criterion	Camera inversion will be changed based on what the player selects.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-42	Type: Functional
PUC: 15	Originator: Puru Jetly
Description	There is only one power-up in the game and that is the shield power-up. Only one is available in a level. It re-spawns after player re-spawns. It gives the player the ability to hit one colored ball that they were not supposed to hit.
Rationale	This power-up is in the game to make levels a bit easier for the player.
Fit Criterion	Player is able to hit one colored ball not in their sequence.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-43	Type: Functional
PUC: 2	Originator: Rehan Theiveehathasan
Description	The player must be able to control the character's movement in 3D space by being able to move in the x-axis and the z-axis via running or walking.
Rationale	This movement is required to be able to complete all levels.
Fit Criterion	Player has four directional inputs to move on the x and z axes
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-44	Type: Functional
PUC: 2	Originator: Rehan Theiveehathasan
Description	The player must be able to control the character's movement in 3D space in the y-axis via jumping
Rationale	This movement is required to be able to complete all levels.
Fit Criterion	Player has directional input to move by a fixed amount in the y-axis.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-45	Type: Functional
PUC: 2, 14, 21	Originator: Rehan Theiveehathasan
Description	The player must not be able to remain out of a specified level area boundary, that is determined per level.
Rationale	A platforming game without a defined playable area will cause the player confusion about their current objectives, as it expands the decision space of where they can move to by a non-trivial amount.
Fit Criterion	The player is warped within a defined level boundary, or is presented with a loss / defeat when leaving a level boundary.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: F-46	Type: Functional
PUC: 3, 4, 21	Originator: Rehan Theiveehathasan
Description	The player must follow the correct order of touching the coloured spheres in every level to complete the level, else they are presented with a loss - with the only exception being they are currently wielding the shield power-up.
Rationale	The core formula of the game must stay consistent throughout the entirety of the game to not confuse the player with unfair rules.
Fit Criterion	The player is presented with a loss when touching a coloured ball out of order when they do not have a shield.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

9 Look and Feel Requirements

9.1 Appearance Requirements

ID: NF-1	Type: Non-functional (Look and feel - Appearance)
PUC: 5,9,11,13,17	Originator: Puru Jetly
Description	The game must follow standards set for platformer games.
Rationale	The player must feel at ease when looking at and using the user interface.
Fit Criterion	- The game will have a main menu. - The game will have an options menu, level select menu, pause menu, and respawn menu. - The game will have have a map.
	Priority: High
Conflicts: N/A	Supporting Material: N/A

ID: NF-2	Type: Non-functional (Look and feel - Appearance)
PUC: N/A	Originator: Puru Jetly
Description	The game models must be of cartoon form.
Rationale	Children must enjoy graphics in the game as target market is in the age group of 10 and up.
Fit Criterion	A sample of users must find the models in game visually appealing.
	Priority: Low
Conflicts: N/A	Supporting Material: Roygbiv High Concept Document

9.2 Style Requirements

ID: NF-3	Type: Non-functional (Look and feel - Style)
PUC: N/A	Originator: Puru Jetly
Description	The game must have a science-fiction feel.
Rationale	The game is set in space and levels are accessed by going to different planets.
Fit Criterion	• The game world is set in distant future. Levels will have futuristic backgrounds and objects.
	Priority: High
Conflicts: N/A	Supporting Material: N/A

ID: NF-4	Type: Non-functional (Look and feel - Style)
PUC: 5,9,11,13,17	Originator: Puru Jetly
Description	The user interface must be easy to use.
Rationale	The player must be able to use the user interface with little to no training.
Fit Criterion	• The game's menus must have icons that are easy to interpret.
	Priority: High
Conflicts: N/A	Supporting Material: N/A

9.3 Requisite Assets

9.3.1 Audio

Asset Type	Number Required	Rationale
Background Music	8	There will be 7 unique levels that will each require unique background music, and one background theme for the main menu.
Win/Loss Music	2	1 audio clip will play upon defeat of any kind. 1 audio clip that plays upon completing a level.
Power-up collection	1	There will be a short audio output to inform the user when they have picked up a power-up.
Ball collision	1	There will be a short audio output to inform the user when they have collided with another ball.

9.3.2 Visual

Asset Type	Number Required	Rationale
Power-up item sprites	Number will vary	Each power-up and collectible item will require a unique sprite so the player can easily tell them apart.
Main Menu Title	1	The game's logo will be shown on the main menu screen.

10 Usability and Humanity Requirements

10.1 Ease of Use Requirements

ID: NF-5	Type: Non-functional - Usability and Humanity
PUC: 2,3,4,5,15	Originator: Victoria Graff
Description	The user must be able to understand and play the game within a short period of time.
Rationale	Fast learning allows for users to become immersed in the game quickly, and will be more enjoyable to them.
Fit Criterion	User will be able to know how to play the game after reading the instructions and completing the first level once. Testers have been able to continue through the game after completing these steps with no issues. To gauge the ability of players to understand the game, a usability survey will be given to players on how well the tutorial helped them. At least 80% of users should report the game being easy to understand for this requirement to be successful.
	Priority: High
Conflicts: N/A	Supporting Material: N/A

10.2 Personalization Requirements

ID: NF-6	Type: Non-functional - Usability and Humanity
PUC: 11,12	Originator: Victoria Graff
Description	The player must be able to change to game settings.
Rationale	Allows the player to change how the game feels to suit their preferences that results in a better experience for them.
Fit Criterion	The player will be able to change to game settings.
	Priority: Medium
Conflicts: N/A	Supporting Material: N/A

10.3   Learning Requirements

ID: NF-7	Type: Non-functional - Usability and Humanity
PUC: 2,3,4,5,15	Originator: Victoria Graff
Description	This game will be easily playable to users of all skill levels.
Rationale	Allows for the largest audience possible.
Fit Criterion	Users of all skill levels will be able to play after reading the instructions and completing the first level once.
	Priority: Medium
Conflicts: N/A	Supporting Material: N/A

10.4   Understandability and Politeness Requirements

ID: NF-8	Type: Non-functional - Usability and Humanity
PUC: 3,4,5,15	Originator: Victoria Graff
Description	This game will use language and symbols that are common and familiar to all casual gamers.
Rationale	Unfamiliar words and symbols would cause confusion in the game.
Fit Criterion	Users will be understand all words and symbols in the game without having to refer to a second party resource.
	Priority: Medium
Conflicts: N/A	Supporting Material: N/A

10.5   Accessibility Requirements

This project will not have any accessibility requirements.

11   Performance Requirements

11.1   Speed and Latency Requirements

ID: NF-9	Type: Non-functional - Performance
PUC: 2	Originator: Victoria Graff
Description	The protagonists movement must be updated in real time
Rationale	A delay between the characters movement and the user input would make it difficult for the user to play.
Fit Criterion	The protagonists movement will adjust in real time in response to the user input.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: NF-10	Type: Non-functional - Performance
PUC: 1	Originator: Victoria Graff
Description	The camera angle must be updated in real time.
Rationale	A delay between the camera angle and the protagonists movement would make it difficult for the user to play.
Fit Criterion	The camera angle will adjust in real time in response to the protagonists movement.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: NF-11	Type: Non-functional - Performance
PUC: 16	Originator: Victoria Graff
Description	A level must load quickly.
Rationale	If it takes a long time to load a level, the user will lose immersion and interest in the game.
Fit Criterion	A level will load within a time frame that will allow the player to stay immersed and interested in the game, and not cause annoyance. To gauge the time frame that players are immersed in the game, a usability survey will be given to players on how much annoyance they felt due to load times. At least 75 percent of users should report the load time to be bare able for this requirement to be successful.
	Priority: Medium
Conflicts: N/A	Supporting Material: N/A

11.2 Precision or Accuracy Requirements

This project will not have any Precision or Accuracy requirements.

11.3 Reliability and Availability Requirements

This project will not have any Reliability and Availability requirements.

11.4 Robustness or Fault Tolerance Requirements

This project will not have any Robustness or Fault Tolerance requirements because there will not be any instances of inconsistent inputs.

11.5 Capacity Requirements

This project will not have any Capacity requirements.

11.6 Scalability and Extensibility Requirements

This project will not have any Scalability and Extensibility requirements.

11.7 Longevity Requirements

ID: NF-12	Type: Non-functional - Performance
PUC: N/A	Originator: Victoria Graff
Description	The game must be playable for at least 15 minutes.
Rationale	The final game will be demonstrated for 15 minutes to be graded.
Fit Criterion	There will be 7 unique levels, and a final level that will consist of 7 dungeons the player will need to complete.
	Priority: High
Conflicts: N/A	Supporting Material: N/A

12   Operational and Environmental Requirements

12.1   Release Requirements

ID: NF-13	Type: Non-functional - Operational and Environmental
PUC: N/A	Originator: Victoria Graff
Description	This game will be released once upon completion.
Rationale	As a part of this course, a final demonstration of the completed game will be marked and shown to a private set of stakeholders.
Fit Criterion	This game will be released in April of 2018 to set of stakeholders provided by Dr. Jacques Carette.
	Priority: Medium
Conflicts: N/A	Supporting Material: N/A

12.2   Expected Physical Environment

This project will have no expected physical environment requirements.

13   Maintainability and Support Requirements

13.1   Maintenance Requirements

This project will not have any maintenance requirements. After the final showing of this game, there will be no further updates of this game.

13.2   Supportability Requirements

This project will not have any supportability requirements.

13.3   Adaptability Requirements

This project will not have any adaptability requirements. It will only be run in Unity3D 2017.1.1.

14   Security Requirements

This project will not have any security requirements. There will be no personal information needed from the user.

15   Cultural Requirements

This project will not have any cultural requirements.

16   Legal Requirements

16.1   Compliance Requirements

ID: NF-14	Type: Non-functional - Legal
PUC: N/A	Originator: Victoria Graff
Description	The game must not use any copyrighted assets.
Rationale	To prevent any legal issues.
Fit Criterion	No copyrighted assets will be used.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: NF-15	Type: Non-functional - Legal
PUC: N/A	Originator: Victoria Graff
Description	The game must adhere to McMaster University's Academic Integrity regulations.
Rationale	McMaster University's Academic Integrity regulations must be followed as according to the course description.
Fit Criterion	McMaster University's Academic Integrity regulations will be followed.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

ID: NF-16	Type: Non-functional - Legal
PUC: N/A	Originator: Victoria Graff
Description	The game must adhere to Unity's licensing agreements.
Rationale	Unity's licensing agreements must be followed as according to our agreement to use their engine.
Fit Criterion	Unity's licensing agreements will be followed.
	Priority: Very High
Conflicts: N/A	Supporting Material: N/A

16.2   Standards Requirements

ID: NF-17	Type: Non-functional - Legal
PUC: N/A	Originator: Victoria Graff
Description	This game will follow all standards set by the professor of the course, Dr. Jacques Carette.
Rationale	The professor has standards for the developed game that will affect the course grade.
Fit Criterion	This game will follow all standards set by Dr. Jacques Carette.
	Priority: High
Conflicts: N/A	Supporting Material: N/A

17 Project Schedule

Tasks	Date Required
High Concept Document Rev 0	September 26, 2017
Sales Pitch Demonstration	October 17, 2017
Game Requirements Rev 0	October 17, 2017
First Demonstration	October 19, 2017
Verification and Validation Rev 0	November 6, 2017
Art Assets	November 16, 2017
Implementation Rev 0	December 7, 2017
Running game complete	December 22, 2017
Design Document Rev 0	January 26, 2018
High-Concept Document Rev 1	March 5, 2018
Game Requirements Rev 1	March 5, 2018
Have all issues and suggestions fixed on Git	March 1, 2018
Have menus and instructions complete	March 10, 2018
Fully complete game done	March 25, 2018
Verification and Validation Rev 1	March 9, 2018
Implementation Rev 1	March 25, 2018
Final Demonstration	To Be Determined

18 Risks

There are risks regarding the team's grades which depend on the timely deliverance of the milestones along with their quality. However, the team is committed to providing products of highest grade and on time, thus avoiding such risks. In addition, there are risks with regards to securing a more in-depth understanding of Unity's more complex features, such as spotlights, animated skyboxes and proper tiling, which are used throughout the game.

19 Costs

There are no financial costs associated with this project. It will be developed using a free development application (Unity3D 2017.1.1). The project will take 8 months to develop, due to its given deadline.

20 User Documentation and Training

20.1 User Documentation Requirements

The main source knowledge is the instructions page offered through the main menu of the game. This is the only required documentation for the game.

20.2 Training Requirements

It is strongly recommended that the user reads the available instructions page to gain an understanding of the challenge at hand. Such training is sufficient for the user as the remaining uncertainties lies within the strategies that the user will develop through experience.

21   Waiting Room

There could potentially be more than one type of collectible. Currently that type is a shield that protects the player from one incorrect collision. If time permits, there will also be a collectible type that immediately boosts the player's stamina to the maximum and another that increases the player's speed for an extended amount of time.

Another feature is a dynamic level selection menu in which the player is placed in an arena with seven elements, each representing one level. The player must then move towards and tag one of the elements to proceed to that level.

22   Ideas for Solutions

- The sphere material must easily distinguish between similar colored spheres.

- Loading screens are a useful way to tell player that the game is not frozen. A loading screen will appear when the game is trying to load a level.

- A point scoring system will help keep fairness in the game. As players will be awarded points based on how hard they tag each of the spheres. And a minimum amount of points will be required to advance to the next level.This will disable the player from tagging the spheres very lightly and causing them not to move.