

Computer Science and Engineering, University of Nevada, Reno

BrainZ & GainZ

Team 14

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3/3/14

Abstract

Team 14's project will be to create a mobile game application using the Unity3D engine. BrainZ and GainZ will take place in real world cities and will be modeled accurately to reflect a realistic but apocalyptic time. The significance of the project is to create a successful mobile game that team members can use to showcase their skills to possible future employers while making some monetary gains in the process. The team plans on designing models of Reno, Las Vegas, and San Francisco for initial release and will implement all necessary player, enemy, level, and GUI controllers to create a fully functional and successful game.

Questionnaire

1. I enjoy runner based games?

- a) Yes
- b) No

2. Do you enjoy games with accelerometer controls?

- a) Yes
- b) No

3. Would you rather play a game from a first person or third person perspective?

- a) First person
- b) Third person

4. Would you rather play a mobile game that is short and quick or long and in-depth.

- a) Short and quick
- b) Long and in-depth

5. I would be more inclined to play a game if it was free.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

6. I am willing to pay for games or in-app purchases.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

7. I would be more inclined to play a game modeled on a familiar real life location.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

8. I am more willing to play a mobile game where I can connect, interact, and share with friends.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

9. I would be more inclined to play a game that is randomly generated every time.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

10. Exploring, collecting, and completing challenges is important to have in a game.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

According to four end users, they are split on enjoying runner based games. All end users though are highly influenced by free games. A majority of the end users are neutral or would rather not connect with friends in their games. The end users enjoy a variety of controls and believe that collecting, exploring, and completing challenges are essential to a game they would enjoy. They are more motivated to play a game modeled from a real life location but have no preference of the games view perspective. According to the team's external advisor, Dr. Louis, is more inclined to play free games in which you can connect with friends. He enjoys games with a variety of control inputs and perspectives. Overall Dr. Louis agrees with the overall view the team has for the game. The developers are greatly influenced to play free games in which you can connect with friends. They enjoy touch based controls and exploring, collecting, and completing challenges are important to their gaming experience. They are highly intrigued by a third person runner game that is modeled after real life locations.

Workshop Summary

Team 14's workshop met in the Evolutionary Systems Computing Lab on February 20th. All members attended the meeting to discuss the desired direction of the project and any questions a team member may have had. The meeting lasted about two hours. The topics of discussion included: gameplay, enemies, level design, and point of view. The most important topic of discussion, gameplay, was to determine if the team would commit to the original level based runner game idea. After some discussion, the team decided to steer some of the direction of the game to have some sort of exploration and collection aspect. Adding an exploration and collection aspect will allow the game to take full advantage of the realistic environments the team is creating. Adding an exploration aspect changes the original idea of the player running on a set track to now being able to run free form. The team believes that the introduction of this aspect will make the game appealing to a wider variety of players. The team also considered adding a time aspect to the level based idea to make individual runs of the game shorter but beatable still. The team believed that a majority of casual gamers like playing games that are quick versus playing a long in depth level. The team plans on utilizing the questionnaire to determine this preference of casual gamers. The team's next topic was how to integrate enemies into a runner type game. Most runner games today include obstacles but not actual enemies. The team will use data obtained from the questionnaire and alpha testing to determine if enemies will be implemented for the initial release of the game. The team's next topic was level design. The main issue was how much of the level should be static and pre planned and how much of the game should be randomly generated. Unfortunately the team has not implemented any item, obstacle, or enemy spawning systems to test but will be considered as soon as it is implemented and tested. Lastly the team talked about if a first person or third person camera would be used. The group implemented both types of views and navigated around the current model of Reno the team has created. After testing the team found the third person perspective to be more appealing, but the team will still take the considerations of alpha testing and questionnaire of possible end users. At the end of the meeting the group assigned various tasks for each member to complete such as; creating prefabs, creating new models, finding sounds, and implementing some of the core logic of the game.

Functional Requirements

R#	Lvl.	Requirement	Subsystem
R01	[1]	BrainZ & GainZ shall include a short instruction screen.	GUI Controller
R02	[1]	BrainZ & GainZ shall include a clean and intuitive player interface.	GUI Controller
R03	[1]	BrainZ & GainZ shall contain background music and sounds.	Game Controller
R04	[1]	BrainZ & GainZ shall include enemy AI and spawning.	Enemy Controller
R05	[1]	BrainZ & GainZ shall be able to load multiple levels.	Environment Controller
R06	[1]	BrainZ & GainZ shall include three massive environments.	Environment Controller
R07	[1]	BrainZ & GainZ shall include interactable obstacles.	Environment Controller
R08	[1]	BrainZ & GainZ shall include in game power-ups and items.	Environment Controller
R09	[1]	BrainZ & GainZ shall include realistic lighting and shadowing.	Light Controller
R10	[1]	BrainZ & GainZ shall track local player highscores.	Game Controller
R11	[1]	BrainZ & GainZ shall have seamless scene and loading transitions.	GUI & Light Controller
R12	[2]	BrainZ & GainZ shall have account creation and management.	Game Controller
R13	[2]	BrainZ & GainZ shall include a unique boss for each level.	Enemy Controller
R14	[2]	BrainZ & GainZ shall include in game achievements.	Game Controller
R15	[2]	BrainZ & GainZ shall have unlockable rewards for players.	Game Controller
R16	[2]	BrainZ & GainZ shall support friends list and global leaderboards.	Game Controller
R17	[3]	BrainZ & GainZ shall support replay saves.	Game Controller
R18	[3]	BrainZ & GainZ shall support free weekly levels.	Environment Controller
R19	[3]	BrainZ & GainZ shall include daily challenges for the player.	Game Controller
R20	[3]	BrainZ & GainZ shall include in-app purchases.	All Controllers

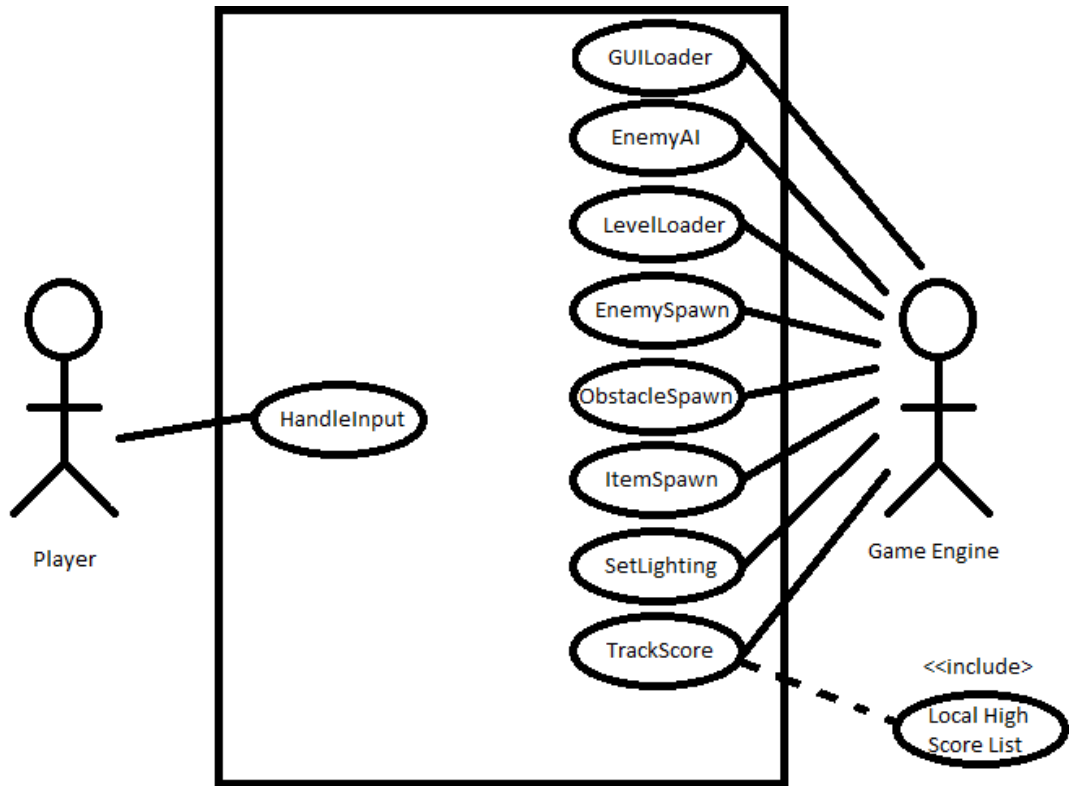
Non-Functional Requirements

T#	Lvl	Requirement	Subsystem
T01	[1]	BrainZ & GainZ shall be intuitive and easy to play.	All Controllers
T02	[1]	BrainZ & GainZ shall shall utilize the Unity physics game engine.	All Controllers
T03	[1]	BrainZ & GainZ shall be implemented using the Unity game engine.	All Controllers
T04	[1]	BrainZ & GainZ shall shall be implemented in C#.	All Controllers
T05	[1]	BrainZ & GainZ shall be portable to Android OS and iOS.	All Controllers
T06	[1]	BrainZ & GainZ shall utilize phone/tablet touch controls.	Player Controller
T07	[2]	BrainZ & GainZ shall include Facebook integration.	Game Controller
T08	[2]	BrainZ & GainZ shall support cheating detection.	Game Controller
T09	[2]	BrainZ & GainZ shall utilize phone/tablet accelerometer controls.	Player Controller
T10	[3]	BrainZ & GainZ shall support Xbox Kinect portability.	Player Controller

Individual requirements

Team Member	Subsystems/Parts Responsible For
Albert Wohletz	Game Controller, Enemy Controller, Level Design, and Networking
Brian Catudan	GUI Controller, Environmental Controller, Sounds, and Modeling
Collin Sorkin	Light Controller, Player Controller, Textures, and Animation

Use Case Diagram



Detailed Use Cases

UC#	Use Case	Description
UC01	GUILoader	The game engine will provide a clean and intuitive interface for the player. The interface will be used to navigate through menus and play the game.
UC02	HandleInput	The player's swipe motions and touch input are all registered and sent to the corresponding controller for processing.
UC03	EnemyAI	The game engine will control enemy physics through AI and path control techniques.
UC04	LevelLoader	The game engine will list levels the player has purchased or unlocked for loading. The current available levels for that player will be obtained through other controllers.
UC05	EnemySpawn	The game engine will spawn enemies based on data from other controllers, such as, total number of enemies and current game difficulty.
UC06	ObstacleSpawn	The game engine will spawn obstacles based on data from other controllers, such as, current progression through the level and current game difficulty.
UC07	ItemSpawn	The game engine will spawn items based on chance percentage. Increased item spawning chances can be influenced by current game difficulty.
UC08	SetLighting	The game engine will light the scene based on time of day as well as casting shadows accordingly.
UC09	TrackScore	The game engine will contact other controllers to inform the player of their current score in relation to all local high scores.

	Use Case: LevelLoader
Use Case ID	UC04
Actor	Game Engine
Pre-condition(s)	1. "Select Level" selected in main menu.
Flow of Events	<ol style="list-style-type: none"> 1. The use case starts when the player is brought to the select level screen. 2. The user selects the level. 3. If the user hasn't unlocked or purchased the level. <ol style="list-style-type: none"> 3.1 Don't load the level. 3.2 Offer level purchase to the user. 4 If the user has the level unlocked. <ol style="list-style-type: none"> 4.1 Load the level
Post-condition(s)	1. The level is loaded.

	Use Case: TrackScore
Use Case ID	UC09
Actor	Game Engine
Pre-condition(s)	1. The players current game has ended.
Flow of Events	<ol style="list-style-type: none"> 1. The use case starts as soon as the players current game ends. 2. The data for the current score is sent to the Game and GUI controller for processing and display.
Post-condition(s)	<ol style="list-style-type: none"> 1. The users score is compared to the local high scores in the Game Controller. <ol style="list-style-type: none"> 1.1 The users score makes it within the top 5 scores and the user will be shown a congratulatory message. 1.2 The user will be shown a list of the current 5 top high scores.

	Use Case: HandleInput
Use Case ID	UC02
Actor	Player
Pre-condition(s)	1. The application has been opened.
Flow of Events	<p>1. The use case starts when the player opens the application and is brought to the main menu.</p> <p>2. User input is sent to the correct controller for processing.</p> <p style="padding-left: 20px;">2.1 If the input is pertaining to menu selections then the input will be processed by the GUI Controller.</p> <p style="padding-left: 20px;">2.2 If the input is pertaining to player input then the input will be processed by the Player Controller.</p>
Post-condition(s)	<p>1. The corresponding input action is executed.</p> <p style="padding-left: 20px;">1.1 If the input was relating to the GUI Controller then the appropriate menu scene will be loaded.</p> <p style="padding-left: 20px;">1.2 If the input was relating to the Player Controller action on the player will update the players physics.</p>

Requirement Traceability Matrix

	UC01	UC02	UC03	UC04	UC05	UC06	UC07	UC08	UC09
R01	x	x							
R02	x	x							
R03				x					
R04				x					
R05				x					
R06				x					
R07						x			
R08							x		
R09								x	
R10									x
R12	x							x	
R13			x		x				
R14									x
R15									x
R16									x
R17									x
R18									x
R19									x
R20	x			x					

Glossary

Accelerometer - A built-in electronic component in mobile devices that measures tilt and motion. It is also able to detect rotation and motion gestures such as swinging or shaking.

AI - Artificial intelligence is the intelligence exhibited by machines or software.

Alpha testing - Testing or actual operation by potential end users. Alpha testing is often employed for off the shelf software as a form of acceptance testing before being released to a wider audience for testing.

Android OS - A Linux-based operating system developed by Android, Inc. primarily used for touchscreen mobile devices.

Animation - A sequence of successive states or positions of a game object to create the illusion of movement.

C# - A syntax and semantics built off of C++ and commonly used in coding Unity game objects.

Controller - A subsystem that manages all aspects pertaining to one area of emphasis.

First person - A graphical perspective from the viewpoint of the player.

Game object - A base class for all entities in Unity scenes.

GUI - A graphical user interface which allows users to interact with devices or software.

IDE - An integrated development environment software that usually consists of source code editors and build automation tools. IDE's are used by computer programmers for software development.

iOS - Apple's mobile operating system used to run Apple products such as the iPhone and iPad.

Porting - Adapting software to be used by different computing environments it was originally designed for.

Prefab - a reusable game object in Unity that can be inserted into any number of scenes as many times as desired.

Third person - A graphical perspective from a fixed distance away from the player.

Scene - The game space in Unity in which objects can be placed. Scenes are commonly used in Unity to implement individual levels or menus.

Texture - The feel, appearance, or consistency given to a surface or game object.

Unity - A cross-platform game engine developed by Unity Technologies with built-in IDE for video games and simulations.

Resources

Gauthier, Jean-Marc. "Gaming: Back to the Basics." *ACM SIGGRAPH ASIA 2008*. No. 10. (2008): n. page. Web. 28 Feb. 2014.

"Gaming: Back to the Basics" helped the group understand the psychology of a player while they play game. The paper discussed that games must not be simple or too complicated for the gamer as it may cause a negative effect on the player's gaming experience. The paper dives deeper into various elements that may affect a player's gaming experience. The team will take in considerations these small nuances to create an enjoyable and fun game for the player.

Granic, Isabela, Adam Lobel, and Rutger C. M. E. Engels. "The Benefits Of Playing Video Games." *American Psychologist* 69.1 (2014): 66-78. *PsycARTICLES*. Web. 28 Feb. 2014.

"The Benefits Of Playing Video Games" was able to put societies interaction and view on video games. The paper showed that a vast majority of Americans play video games for at least one hour a day. The paper talks about the positive and negative feedback video games have received but focuses more on the positive side of playing video games. The paper explains the real-world psychological benefits to playing video games which helps reinforce the teams contribution to society for creating a video game.

Randazzo, Gary. *The Manager's Guide to Building a Successful Business*. New York: Business Expert Press, 2013. eBook.

The Manager's Guide to Building a Successful Business is the teams main problem-domain book. The team has little expertise and knowledge of business and business practices. The book will be used to help create a company to protect our assets. In addition the book explains management techniques and how to they are critical in executing successful marketing strategies.

Vlasak, Erin, and Michelle Ranaldo. "VIDEO GAMES." *The Exceptional Parent (Online)* 06 2012: 36-8. *ProQuest*. Web. 28 Feb. 2014.

“VIDEO GAMES” is able to reinforce our project’s contribution to society. Video games are often labeled for pure entertainment purposes only. This paper shows that video games can be another tool for people to learn how to problem solve, delegate responsibility, and promote teamwork. The paper shows that various games are created for all age groups proving that video games and our project can be a benefit to society.

Contribution of team members

Albert Wohletz - Detailed Use Cases, Glossary, Software Requirements, and Use Case Diagram.

Brian Catudan - Abstract, Glossary, Requirement Traceability Matrix, References, and Software Requirements.

Collin Sorkin - Glossary, Internal Workshop Summary, Interview Findings, References, and Software Requirements.