

Physics-Based Chipmunk2D Game

Software Requirements Specification

Based on the Volere Template

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Revision History

Date	Version	Notes
October 7, 2015	1.0	Created document
October 7, 2015	1.1	Major edits in progress
October 8, 2015	1.2	Major event and reqs additions

1 Project Drivers

1.1 The Purpose of the Project

The purpose of this project is to produce a game that will be used as a demonstration for students in a third year software engineering game design course at McMaster University. The game will incorporate the [Chipmunk2D](#) physics library and highlight its capabilities.

1.2 The Stakeholders

1.2.1 The Client

The client for this project is [Dr. Spencer Smith](#) of the Computing and Software department at McMaster University.

1.2.2 The Customer

The customer for this project are students who will take the game design course in the future.

1.2.3 Other Stakeholders

Other stakeholders include future instructors of the game design course and other related courses.

2 Project Description

2.1 Game Overview

The game will follow along those lines allowing the user to play as his or her own character through multiple levels where the user levels up the more and better he plays. The user will be able to use multiple weapons to combat a variety of enemies. Experience is accumulated by defeating enemies and is used to progress the hero. As the users character progresses through the game it will become more difficult to level up as enemy difficulty is substantially increased.

The game consists of the game world, within which the hero and interact with enemies.

2.1.1 Game World

The maps, otherwise known as levels, provide an interactive way for the user to progress deeper into the game. Some maps have a beginning and end, like a 2-D Mario level, whereas certain levels are constant in their placement, however have more enemies.

The game world consists of a virtual environment in which the gameplay takes place. This environment is made up of platforms which control where the hero and enemies are permitted to, as well as blockades which limit the possible movements of the hero throughout the game. The maps have environmental hazards and objects which the user is able to interact with. Some objects, such as power ups, give the user temporary boosts while other map elements such as spikes and fire can cause damage to the user. Besides these two the user is also responsible for navigating around blockades placed on the level. This provides a challenge for the user as he navigates through the level.

2.1.2 The Hero

The hero is the protagonist of the game, and is controlled by the user. The hero is able to move left or right and to jump in order to progress through the game. The hero can interact with several objects in the game. These objects include enemies, obstacles, hazards, and items. When the hero comes into contact with an object an event is triggered. Depending on the type of object, events include:

1. If the object is an enemy the hero will lose health and be knocked back from the enemy.
2. If the object in a blockade the hero will be stopped and unable to pass.
3. If the object is an environmental hazard the hero will lose health and may be knock back depending on the type of hazard. Spikes, for example, will cause a knock-back effect, whereas fire would not.
4. If the object is an item the hero will gain some bonus or ability.

2.1.2.1 Movement

2.1.2.2 Attack

The hero is able to attack enemies using weapons. The user has certain weapons which are given to him as artillery, however there are environmental weapons that the user may use for a temporary amount of time. Weapons have certain characteristics. These include fire rate, power, distance bullets can travel, and ammunition amount. The characteristics provide certain weapons with advantages over others. Environmental weapons have these characteristics too, however they

Weapon types Weapon classes and types will update throughout game development

Weapons are divided into three classes. These are pistols, shotguns, Rifles. Each class of weapons has its own benefits and faults. Pistols are weak in terms of their power, however have infinite ammo. They are always available for the player to use. They provide a way for the user to conserve ammo in dire situations or use as a last ditch effort if ever no ammo is present in the other two classes. The second class of weapons are shotguns. Shotguns have a very short range, however they are the most powerful weapons in the game. They provide a fast way to get rid of a large amount of enemies at once. Their ammo is low in quantity. The last class of weapons are rifles. Rifles are great in terms they provide good range to hit enemies from far, they are more powerful then pistols but weaker then shotguns. They are relative good in the amount of ammo.

Weapon situation The different classes of weapons allow the user to choose which weapon will provide the ideal fit for the situation at hand. Some weapons have a higher fire rate which allows the user to attack a horde of enemies at once. The trade-off is the damage of these weapons will be lower. Certain weapons fire in a projectile range so the user can attack enemies waiting around blockades. And certain weapons have high damage, but the trade-off is these weapons have a low fire rate or long reload time. Overall, the types of weapons vary in qualities that quality of their usage depending on the situation. If ten enemies surround you may want to use a high fire weapon, however if less enemies are involved you may want to use more damage to get rid of them quickly

2.1.2.3 Statistics

The hero has a set of statistics that are . The hero

2.1.3 The Enemies

Enemies are found throughout the game and are . When an enemy is encountered during the game, combat will ensue if the hero gets within a certain range. The user may also attempt to avoid the enemy altogether.

Enemies in their own capacity are capable of engaging in contact with the players. The enemies may use weapons or just come in contact with the player to instantiate damage. If the enemy weapons or the enemy itself come in contact with the user then the player loses health relative to the type of enemy it is. Different enemies deal different levels of damage. The stronger enemies may deal more damage, however are slower, whereas the weaker ones attack at a higher frequency but with less damage. The goal of the enemies is to completely make the user's health reach zero.

2.1.3.1 Movement

Enemy movement is controlled by the game AI. When the hero is within a certain range of an enemy, the game AI will respond by moving the enemy in a manner defined by the AI code.

2.1.3.2 Attack

Enemy attacks are also controlled by the game AI. When the hero is within a certain range of an enemy, the game AI will respond by . Unlike the hero, the enemies do not use weapons, but instead have depending on the enemy type.

2.1.3.3 Statistics

Enemy statistics are similar to hero statistics and affect
Maps:

2.2 Mandated Constraints

The project is subject to the following mandated constraints:

Table 1: List of terminology

Term	Definition
Bounds	The boundaries inside which game play occurs
Enemy	Hostile character; attacks hero if hero is in range
Hero	The main character of the game controlled by the user
Weapon	Any

Table 2: List of Events

Event Name	Inputs and Outputs	Summary
1. New Game		

1. The game must make significant use of the Chipmunk2D physics library.
2. The game must support all major PC operating systems.
3. Project milestones must be completed by the dates given in the CS 4ZP6 syllabus.
4. The project must be fully completed by April 1, 2015.

2.3 Naming Conventions and Terminology

The terminology used in this project is given in [Table 1](#).

3 Functional Requirements

3.1 The Scope of the Work

3.2 The Scope of the Product

The flow diagram in [Figure 1](#) gives a rough representation of the operation of the envisioned game. Ovals represent user interfaces and rectangles represent events. The user interfaces include a main menu as well as an in-game menu, and an in-game interface in which all game play takes place.

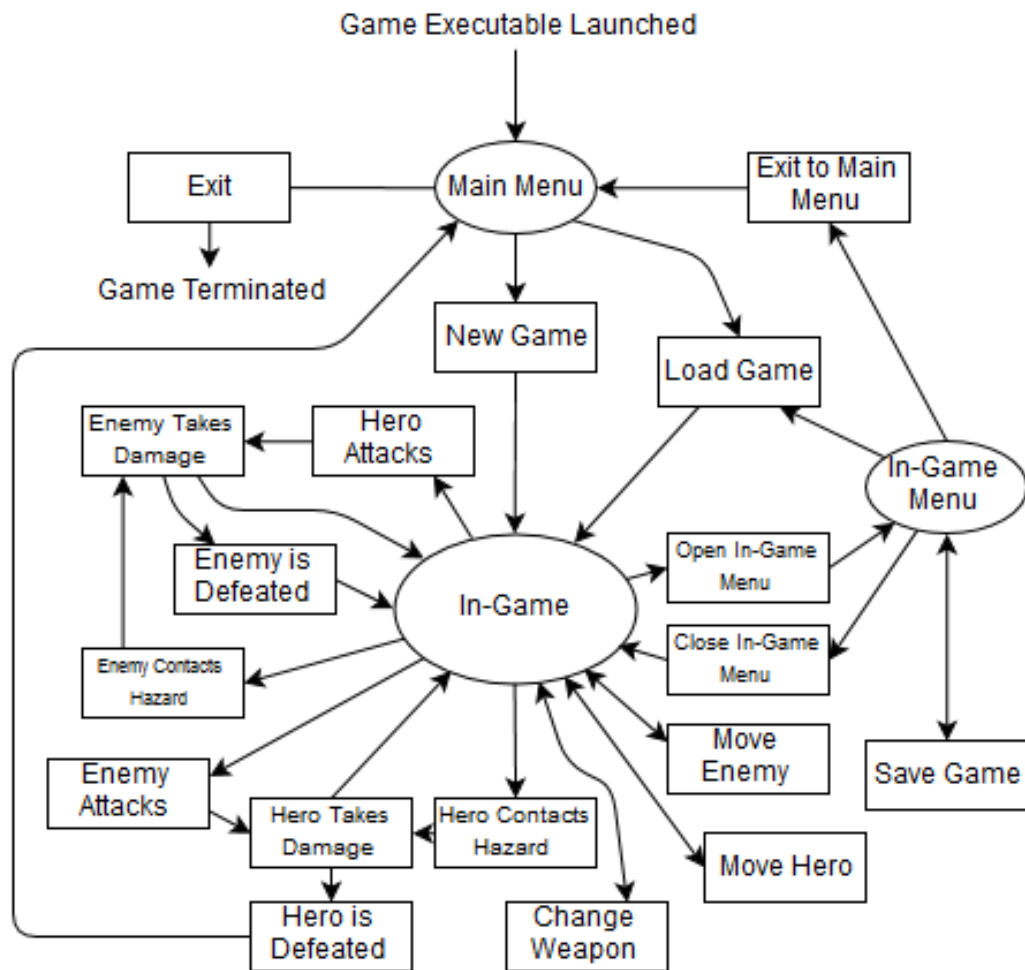


Figure 1: Flow diagram of the game.

Event #: 1

Name: New Game
Trigger: The user selects to start a new game
Precondition: The main menu is open
Postcondition: A new game commences

Event #: 2

Name: Load Game
Trigger: The user selects to load a game
Precondition: The main menu or in-game menu is open
Postcondition: A saved game state is loaded and the game commences from that point

Event #: 3

Name: Save Game
Trigger: The user selects to save a game
Precondition: The in-game menu is open
Postcondition: A saved game state is created

Event #: 4

Name: Exit to Main Menu
Trigger: The user selects exit game
Precondition: The in-game menu is open
Postcondition: Current game is ended and main menu is opened

Event #: 5

Name:	Move Hero
Trigger:	Inputs from user related to controlling the hero movement
Precondition:	In-game
Postcondition:	Hero moves according to input

Event #: 6

Name:	Hero Attack
Trigger:	Inputs from user related to hero attack
Precondition:	In-game
Postcondition:	Hero's currently selected attack is activated

Event #: 7

Name:	Change Weapon
Trigger:	Input from user related to hero weapon (hotkeys)
Precondition:	In-game
Postcondition:	Hero's currently active weapon is switched according to input

Event #: 8

Name:	User Contacts Hazard
Trigger:	User comes into contact with hazard
Precondition:	In-game
Postcondition:	User is affected by the hazard

Event #: 9

Name:	Hero Takes Damage
Trigger:	Enemy contacts hazard or enemy is attacked by hero
Precondition:	In-game
Postcondition:	Enemy hit points are reduced

Event #: 10

Name:	Hero is Defeated
Trigger:	Hero hit points reach zero
Precondition:	In-game
Postcondition:	Current game is ended and main menu is opened

Event #: 11

Name:	Move Enemy
Trigger:	Hero comes within specific distance of enemy
Precondition:	In-game
Postcondition:	Enemy moves according to game AI

Event #: 12

Name:	Enemy Attack
Trigger:	Hero comes within specific distance of enemy
Precondition:	In-game
Postcondition:	Enemy attack is activated according to game AI

Event #: 13

Name:	Enemy Contacts Hazard
Trigger:	Enemy comes into contact with hazard
Precondition:	In-game
Postcondition:	Enemy is damaged by the hazard

Event #: 14

Name: Enemy Takes Damage
Trigger: Enemy contacts hazard or enemy is attacked by hero
Precondition: In-game
Postcondition: Enemy hit points are reduced

Event #: 15

Name: Enemy is Defeated
Trigger: Enemy hit points reach zero
Precondition: In-game
Postcondition: Enemy is removed from the game

Event #: 16

Name: Open In-game Menu
Trigger: User input (hotkey)
Precondition: In-game
Postcondition: The in-game menu is opened

Event #: 17

Name: Close In-game Menu
Trigger: User selects close menu option
Precondition: In-game
Postcondition: The in-game menu is opened

Event #: 18

Name:	Exit Game
Trigger:	The user selects exit game
Precondition:	The main menu is open
Postcondition:	The application is terminated

3.3 Functional Requirements

Requirement #:	1	Requirement Type:	3.3	Event:	1
Description:	The user shall have the ability to start a new game				
Rationale:	The user must be able to start a new game in order to play the game				
Fit Criterion:	A new game is able to be started				
Cust. Satisfaction:	1	Cust. Dissatisfaction:	5		
Priority:	High	Conflicts:	None		
Supporting Materials:	None				
History:	Created October 7, 2015				

Requirement #:	2	Requirement Type:	3.3	Event:	2
Description:	The user shall have the ability to load a saved game state				
Rationale:	The user must be able to load his or her saved progress to continue the game				
Fit Criterion:	Saved game state is successfully loaded				
Cust. Satisfaction:	1	Cust. Dissatisfaction:	5		
Priority:	High	Conflicts:	None		
Supporting Materials:	None				
History:	Created October 7, 2015				

Requirement #: 3 **Requirement Type:** 3.3 **Event:** 4

Description: The **user** shall have the ability to save the current game state

Rationale: The **user** must be able to save his or her progress

Fit Criterion: Game state is successfully saved

Cust. Satisfaction: 1 **Cust. Dissatisfaction:** 5
Priority: High **Conflicts:** None

Supporting Materials: None

History: Created October 8, 2015

Requirement #: 4 **Requirement Type:** 3.3 **Event:** 5

Description: The user shall be able to move the **hero** to the left and right

Rationale: The **hero** must be able to be moved left and right to navigate the game

Fit Criterion: The **hero** moves left and right correctly based on specific user inputs

Cust. Satisfaction: 3 **Cust. Dissatisfaction:** 5
Priority: High **Conflicts:** None

Supporting Materials: None

History: Created October 8, 2015

Requirement #: 5 **Requirement Type:** 3.3 **Event:** 5

Description: The user shall be able to make the **hero** jump

Rationale: The **hero** must be able to jump to reach the intended areas of the game

Fit Criterion: The **hero** is able to jump based on a specific user input

Cust. Satisfaction:	3	Cust. Dissatisfaction:	5
Priority:	High	Conflicts:	None
Supporting Materials:	None		
History:	Created October 8, 2015		

Requirement #: 6 Requirement Type: 3.3 Event: 5

Description: The **hero** shall remain in **bounds**

Rationale: The **hero** must remain in the intended boundaries of play for the game to function properly

Fit Criterion: **Hero** is unable to pass through walls and other obstacles

Cust. Satisfaction:	2	Cust. Dissatisfaction:	5
Priority:	High	Conflicts:	None
Supporting Materials:	None		
History:	Created October 7, 2015		

Requirement #: 7 Requirement Type: 3.3 Event: 6

Description: An attack upon an enemy by the **hero** shall cause the enemy's hit points to decrease

Rationale: The **hero** must be able to damage enemies

Fit Criterion: **Enemy** loses hit points upon being attacked

Cust. Satisfaction:	3	Cust. Dissatisfaction:	5
Priority:	High	Conflicts:	None
Supporting Materials:	None		
History:	Created October 8, 2015		

Requirement #: 8 **Requirement Type:** 3.3 **Event:** 6

Description: When an enemy's hit points reach zero due to

Rationale: The hero must be able to damage enemies

Fit Criterion: Enemy loses hit points upon being attacked

Cust. Satisfaction: 3 **Cust. Dissatisfaction:** 5

Priority: High **Conflicts:** None

Supporting Materials: None

History: Created October 8, 2015

Requirement #: 9 **Requirement Type:** 3.3 **Event:** 16

Description: The user shall be able to open the in-game menu while in-game

Rationale: The in-game menu must be accessible to allow user to save/load games and exit to the main menu

Fit Criterion: The user is able to open the in-game menu

Cust. Satisfaction: 1 **Cust. Dissatisfaction:** 5

Priority: High **Conflicts:** None

Supporting Materials: None

History: Created October 8, 2015

Requirement #: 10 **Requirement Type:** 3.3 **Event:** 17

Description: The user shall be able to close the in-game menu

Rationale: The in-game menu must have a way of being closed to resume game play

Fit Criterion: The user is able to close the in-game menu

Cust. Satisfaction:	1	Cust. Dissatisfaction:	5
Priority:	High	Conflicts:	None
Supporting Materials:	None		
History:	Created October 8, 2015		

Requirement #: 11 **Requirement Type:** 3.3 **Event:** 16, 17

Description: All gameplay shall be paused when the in-game menu is open

Rationale: The hero should be safe from harm while accessing the in-game menu

Fit Criterion: The game is paused when the in-game menu is opened and resumed when closed

Cust. Satisfaction:	1	Cust. Dissatisfaction:	5
Priority:	High	Conflicts:	None
Supporting Materials:	None		
History:	Created October 8, 2015		

Requirement #: 12 **Requirement Type:** 3.3 **Event:** 18

Description: The user shall have the ability to exit the application

Rationale: The user must be able to terminate the game when done playing

Fit Criterion: User is able to successfully terminate application

Cust. Satisfaction:	1	Cust. Dissatisfaction:	2
Priority:	Medium	Conflicts:	None
Supporting Materials:	None		
History:	Created October 8, 2015		

4 Non-functional Requirements

4.1 Look and Feel Requirements

Requirement #: 13		Requirement Type: 4.1	Event: N/A
Description:	The game shall use 2-D graphics		
Rationale:	The game is intended to be a 2-D game		
Fit Criterion:	2-D graphics are used for the game		
Cust. Satisfaction:	5	Cust. Dissatisfaction:	5
Priority:	High	Conflicts:	None
Supporting Materials:	None		
History:	Created October 8, 2015		

4.2 Usability and Humanity Requirements

Requirement #: 14		Requirement Type: 4.2	Event: N/A
Description:	The game shall be entertaining		
Rationale:	A game should be fun		
Fit Criterion:	The game should be ranked at least 7/10 for entertainment based on a usability study		
Cust. Satisfaction:	2	Cust. Dissatisfaction:	5
Priority:	High	Conflicts:	None
Supporting Materials:	None		
History:	Created October 7, 2015		

4.3 Performance Requirements

Requirement #: 15		Requirement Type: 4.3	Event: N/A
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Description:	The game shall maintain an average framerate of at least 30 fps		
Rationale:	A framerate of 30 fps or greater will ensure smooth animation		
Fit Criterion:	The game runs at		
Cust. Satisfaction:	2	Cust. Dissatisfaction:	5
Priority:	High	Conflicts:	None
Supporting Materials:	None		
History:	Created October 7, 2015		

4.4 Operational and Environmental Requirements

There are no operational and environmental requirements related to this project.

4.5 Maintainability and Support Requirements

Requirement #:	16	Requirement Type:	4.5	Event:	N/A
Description:	The game shall support Windows, Linux, and OS X operating systems				
Rationale:	Students use a variety of operating systems				
Fit Criterion:	The game compiles and runs on each operating system				
Cust. Satisfaction:	3	Cust. Dissatisfaction:	3		
Priority:	High	Conflicts:	None		
Supporting Materials:	None				
History:	Created October 7, 2015				

4.6 Security Requirements

There are no security requirements related to this project.

4.7 Cultural Requirements

Requirement #: 17		Requirement Type: 4.7		Event: N/A	
Description:		The game shall use the English language			
Rationale:		Students at McMaster University are expected to speak English			
Fit Criterion:		The game uses proper English free of spelling and grammar errors			
Cust. Satisfaction:		1	Cust. Dissatisfaction:		3
Priority:		Medium	Conflicts:		None
Supporting Materials:		None			
History:		Created October 7, 2015			

4.8 Legal Requirements

There are no legal requirements related to this project.

5 Project Issues

5.1 Open Issues

There are no open issues at this time. This section will be updated as required.

5.2 Off-the-Shelf Solutions

There are no off-the-shelf solutions.

5.3 New Problems

No new problems are expected to arise as a result of this project.

5.4 Tasks

5.5 Migration to the New Product

There is no product being replaced, and thus no migration is required.

5.6 Risks

There are no risks associated with this project.

5.7 Costs

There are no costs associated with this project.

5.8 User Documentation and Training

User documentation will be created as per the CS 4ZP6 guidelines. Training will be provided via built-in tutorials throughout the game.

5.9 Waiting Room

At this point in the project timeline, there are no backlogged requirements. This section will be updated as required.

5.10 Ideas for Solutions

There are no ideas for solutions at this time. This section will be updated as required.