



Team 12

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Geometry Adventure

Software Requirements Specification (SRS)

Version: 1.12

Configuration Identifier: SRS

Revision History

Sl. No.	Prepared/ Modified by	E-mail	Version	Date	Approved by	Descriptions/ Remarks
1.	Ahmad Khaled	enrev91@gmail.com	1.1	10/3/2018	TBD	Modified the template to our project.
2	Ahmad Khaled	enrev91@gmail.com	1.12	9/4/2018	TBD	Fixed a few errors in the dependability matrix, table numbers, and removed a non-functional requirement for being unverifiable (NF1.2 in version 1.1).

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Distribution list

Name	E-mail	Notes
Computer Engineering Department TA's	NA	Commentary and decision on project needed.

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Software Requirements Specification

1. Introduction

1.1 Purpose

Geometry Adventure is an action-adventure top-down game in which the player fights their way through action-filled levels. The game should be enjoyable and should support a variety of play styles (stealth vs. fast-paced), there should be an assortment of different enemy and weapon types (see functional requirements). The game is designed for Android phones and should run quickly enough on most modern (Android 4+) phones. (see non-functional requirements).

1.2 Scope

The requirements specified in this document will be referred to on designing all the art, code, and documentation of Geometry Adventure. It'll also be used

1.3 Definitions, Acronyms and Abbreviations

Android: Google's open operating system for smartphones.

Top-down shooter games: A subgenre of shooters in which the player controls their character from above and can usually see large portions of the main map.

Google Play Store: Android's main store for applications.

FPS: Frames per Second.

1.4 References

On Hotline Miami:

Eurogamer, "The creators of Hotline Miami on inspiration, storytelling and upcoming DLC", Jeffrey Matulef, 16/11/2012.

Wikipedia, "Hotline Miami", 7 March 2018 version.

On Geometry Dash:

Wikipedia, "Geometry Dash", 7 March 2018 version.

Wikia, "Geometry Dash", 7 March 2018 version.

1.5 Overview

This section contains an overview of the SRS. The second section contains information about previous similar projects. The third section is a (very rough) cost estimate. The fourth section is a small feasibility study. The fifth section is perhaps the most important, because it contains the actual requirements up to the current version of the requirements document.

2. Market Survey

Our game is primarily influenced by two other games: Hotline Miami & Geometry Dash. We could not arrange an interview with the creators of these games, but we nevertheless include a brief overview of these games.

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2.1 Hotline Miami

2.1.1 Project Description

Hotline Miami is a top-down shooter created by Dennaton Games and released on 23 October 2012 for the Microsoft Windows platform. The game revolves around an unnamed silent protagonist who commits massacres against the local Russian mafia. The game blends top-down perspectives with stealth, extreme violence, and surreal storytelling.

2.1.2 Functional Specifications

1. Graphics & Main Scenes
 1. 2D top-down: the user should be able to see a properly-lit level from above, and the camera should clearly follow the user's character.
 2. Retro art, bright colors: the game's art has a clear, distinctive style reminiscent of early Arcade games.
 3. Main menu: a simple main menu whose purpose is to quickly guide the user into level selection, options, or quitting the game.
 4. Score menu: a menu showing the user's score at the end of each level. The score is determined on the basis on the number of combos achieved by the user, the total number of enemies killed, the time the user took to finish the level, and how many times the user died in the process.
2. Motion & Mechanics
 1. The user is able to move using the WASD keyboard keys.
 2. The user can change the orientation of their character by changing where the mouse is: the character is always oriented towards the current mouse position.
 3. The user can grab or throw weapons using the Mouse's right click, and can shoot using weapons using the left click.
 4. The user can kill enemies by hitting them directly with handheld weapons or by shooting them with guns or rifles. The user can temporarily disarm enemies by throwing weapons at them, and can subsequently kill them by hitting them while they're disarmed.
 5. The user can open doors or close them and can peak ahead using the SHIFT key.
 6. At the beginning of every level, the user can select a mask which his or her character would wear. Every mask gives the player different abilities (for example, quicker motion). Masks are unlocked on reaching high scores.
3. Artificial Intelligence & Enemy Behavior
 1. There are three kinds of enemies, each of which can hold either guns or knives. The three kinds differ in how difficult it is to kill any of them.
 2. Enemies patrol the levels in known patterns, but on seeing the player react by running to the player and trying to hit him or her (if they have knives) or shooting him or her if they have a gun.
 3. Enemies will move to player location if they detect gunshots fired within some area around them.
4. Other Effects & Music
 1. The music must have a retro, noir feel to it and must be somewhat relevant to the action atmosphere of the game.

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2. Sound Effects are played whenever someone is hit, bullets are shot, glass is broken, doors are opened, etc.
3. The player has the ability to save and export his save game files for later use from another computer.

2.1.3 **Non-Functional Specifications**

1. Performance
 1. The game is expected to run on most modern computers with modest requirements for RAM and space.
2. Platform
 1. The game is expected to run on Microsoft Windows 7 and later versions, with updates or patches added for future compatibility.

2.1.4 **Limitations**

The game's availability for only one platform limited its popularity. More graphic scenes of violence also discouraged potential players who would enjoy the gameplay mechanics but not the gore.

2.2 **Geometry Dash**

Geometry Dash is a 2013 mobile and Steam game developed by Sweden-based developer Robert Topala, and published by his company, RobTop Games. It is a rhythm-based platformer game which currently has 21 official levels and has more than 40 million online levels made by players. Each level features unique background music. Other features include a level editor, map packs, user-created levels, secret coins, and a variety of icons and game modes, as well as user coins, three shops and three secret vaults in the latest versions.

2.2.1 **Functional Specifications**

1. Graphics and Main screens
 1. 2D side scroller.
 2. Game art is mainly based on colorful, geometrical shapes. The art looks
 3. Fancy yet simple.
 4. The player takes the form of different entities with unique mechanics such as a cube, a ball or a UFO.
 5. A simple main menu inspired by geometry.
 6. The game has no score menu. The Player's score is measured instead by how far he progressed in the level. The game also keeps track of the number of attempts the player made to pass a certain level.
2. Motion and Mechanics
 1. Geometry dash uses a simple tapping/clicking to control different vehicles that react when a player presses anywhere on the touch screen.
 2. The player has no control on his orientation.
 3. The player must try to navigate through a series of interactive obstacles, movement-shifting transporters and behavior-manipulating portals to reach the end of levels without crashing
 4. The player chooses the main theme. All levels (with the exception of the three "demon" rated levels in the full version) are unlocked from the start, so they can be played out of order. Along the way, the player can collect up to three secret

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coins in each official level, which are scattered in either hidden or challenging areas (or both).

3. Artificial intelligence & Enemy behavior
 1. The game is based on fixed obstacles. There's no element of artificial intelligence it.
4. Other effects and Music
 1. Exciting music tracks along the way. Each level has its own music track is relevant to the atmosphere of the level and how hard it is.
 2. Sound effects are played when the player crashes into obstacles.
 3. As most levels are accessible by the player, the game saves the highest progress in each level he played.

2.2.2 **Non-Functional Specifications**

1. Performance
 1. The device on which the game is played (Android, iOS or PC) is required to have enough space and RAM as the main requirement in the game is speed.
2. Platform
 1. The game is available on Android, iOS and also as a Desktop game. A lite version is available for mobile devices with fewer features.

2.2.3 **Additional features**

1. Level Editor

The Level Editor is a feature of Geometry Dash. It allows the player to create their own levels which can be shared online with other people, with the ability to build levels and share them with other players through an organized online system.
2. Icon kit

The Icon Kit is a feature that allows players to change their appearance. A series of icon designs can be selected for each form as well as corresponding primary and secondary colors, although these are applied to all forms and cannot be selected individually. In addition, trail and death effects can be selected, although none of these have any physical effects on gameplay. More option in the Icon kit are unlocked by making more achievements in the game.

2.3 **Summary**

2.3.1 **Functional Specifications**

2.3.1.1 **Essential Specifications**

1. *Main Menu.*
2. *2D Graphics.*
3. *Score System.*
4. *Obstacles or Enemies.*

2.3.1.2 **Non-Essential Specifications**

1. *Connection to Social Networks.*
2. *Appropriate music.*

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2.3.2 Non-Functional Specifications

2.3.2.1 Essential Specifications

1. *High performance on low-end devices.*
2. *Simple, intuitive UI.*

2.3.2.2 Non-Essential Specifications

1. *Availability on a wide variety of platforms.*

3. Cost Estimate

Please note that some of the costs are conditional on finding proper funding sources (for example, from showing prototypes to possible publishers).

Item	Estimated Cost	
	US Dollars	L.E.
1. Development Cost		
1.1. Software Engineers	0	0
1.2. Artists & Content Creation	11-23	200-400
Total	11-23	200-400
2. Deployment Cost		
1.1. Google Play Store Registration Fees	25	441
1.2. Social Media Advertisements	10-20	176-352
Total	35-45	617-793
Total Estimated Cost	46-68	817-1163

Table 1: Cost Estimate

In the event of not being able to find a publisher, open-source alternatives for art and other content will be considered.

4. Feasibility Study

- Business justification: there are very few games combining the action and gameplay mechanics of Hotline Miami with the graphics of Geometry Dash for Android. This leads us to believe that there is a possible market for our game to exploit, especially if the game is regularly updated and expanded.
- Engineering considerations: implementing the game will have challenges of making proper, enjoyable control systems for the Android operating system and using Touch Screens only, but we expect to be able to overcome them. Otherwise, most of the systems we wish to implement are industry standard and will pose few significant challenges.
- Integration: we aim to design easily extendable and modular software that can be extended to run on other platforms (for example, Apple's iOS) with few modifications.

5. Requirements Specifications

5.1 User Stories

5.1.1 *US1.1: The player can open main menu, choose one of the levels, see his previous score and*

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time on each of the levels before choosing to play it. User can also choose to quit from the main menu. The option to turn off music and/or sound effects should also be available. Priority: high.

5.1.2 US1.2: On choosing a level, the screen should switch to the level in landscape view. The player should be able to see a properly lit level with the camera pivoted on his character. Priority: high.

5.1.3 US2.1: Players can move their character by moving their figures across one half of the screen, and can hit using weapons by pressing buttons on the other side of the screen. Priority: high.

5.1.4 US2.2: Players can kill enemy characters by hitting them, shooting them, or throwing weapons at them. On killing an enemy character, the player's score should increase. Multiple enemies in short periods of time raise the score even further. Priority: high.

5.1.5 US2.3: Enemies patrol the level and the goal of the player is to kill all of them. If an enemy sees the player, the enemy attacks the player at a distance (if the enemy's type allows distance attacks) or runs up to the player and kills him (if the enemy can only kill manually). If the player shoots using a weapon, its sound will alter nearby enemies. Priority: high.

5.1.6 US2.4: There are at least two types of enemies. Type A enemies are quick, agile, and can only hit the player directly. Type B enemies are slower to react, but can hit at a distance using some sort of shooting weapon. More enemy types should be added in further updates. Priority: high.

5.1.7 US2.5: If the player goes through a door or a portal, he can be taken to another part of the same level. Portals in one part of the level work only after the player has killed all the enemies in said level. Priority: medium.

5.1.8 US2.6: On killing an enemy, the player can change the current weapon they have to the weapon of the killed enemy by standing over them and tapping twice. Priority: medium.

5.1.9 U2.7: A brief story before every level should be shown before the player, and a storyline connecting all the levels should be made. The story is open by design, so as to allow many further levels. Priority: low

5.1.10 US3.1: Different sound effects play on different actions: shooting, hitting, going through doors, and being killed all entail different sound effects. Priority: medium.

5.1.11 US3.2: Background music should play during the level, and can be turned off from the options part of the main menu. Priority: medium.

5.1.12 US3.3: The player should feel a consistency to the art style, but the art style need not be complex. The player's focus should be on the mechanics and action of the game rather than the art style. Priority: medium.

5.1.13 US3.4: At the end of each level, the player's score on that level should be displayed, with an additional message indicating a high score if one was achieved. Priority: high.

5.1.14 US3.5: At the release of the game, players can expect to play at least one fully featured level containing all of the aforementioned mechanics. Priority: high.

5.1.15 US3.6: Players should be able to share their high scores on social media. Priority: low.

*5.1.16 US3.7: The average and high score of all players on a certain level should be displayed on the level selection and score screens, so as to encourage competitiveness. Priority: very low. **Optional.***

5.1.17 US4.1: The game should be available on smartphones running Android.

5.2 System Requirements

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5.2.1 Main Menu

Identifier UC1.1

Preconditions

1. Phone & OS are correctly working. Application is opened by the OS.

Basic Course

1. Player opens the game, is shown a loading screen (if needed) and then sees the main menu.
2. The screen must switch to landscape view.
3. Player can choose between there options: start, options, and quit.
4. In the options screen the Player can turn off music and/or sound effects.
5. Pressing start will take the player to the level selection screen, where they can see what levels are available and choose to play one of them. They can see their previous high score in the level.
6. Pressing quit will exit the game.

Post conditions

One of the following Post-conditions shall occur:

1. The player chooses a level and starts playing it.
2. The player chooses the options and changes some of them.
3. The player quits the game.

Map to: US1.1, US1.2

5.2.2 Basic Motion Mechanics

Identifier UC1.2

Preconditions

1. Player has chosen a level and it has loaded.

Basic Course

1. Level opens to the player with the camera centered about them.
2. Player can move in the level by altering his finger position in the right side of the screen.
3. Player can attack using the current weapon by pressing a button on the left side of the screen.
4. Pressing back pauses the game and opens a menu from which the player can quit to the main menu.
5. On the player's death, the player is returned to the beginning of the region they were in.

Map to: US1.2, US2.1

5.2.3 Enemy Mechanics

Identifier UC2.1

Preconditions

1. Player is playing a level.

Basic Course

1. Players can kill enemy characters by hitting them.
2. Enemy deaths result in player score increases.
3. Combos (multiple enemy deaths in short times) result in further score bonuses.
4. Enemies patrol the levels in predetermined patterns.
5. Enemies can detect the player if the player is in their line of sight.
6. Enemies can detect the player if the player is nearby and shoots using a shooting weapon.
7. Enemies can detect the player if the player makes a sudden noise (opening a door closeby).
8. Enemies which detect player try to attack immediately.
9. Type A enemies are quick, agile, and can only attack the player by running up to the player and hitting.
10. Type B enemies are slower, but can use shooting weapons.

Map to: US2.2, US2.3, US2.4

5.2.4 Door & Portal Mechanics

Identifier UC2.2

Preconditions

1. Player is playing a level.

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Basic Course

1. Each level is subdivided into several regions, and the player can move between them through portals.
2. Portals to another region open up only when all the enemies in that region have been killed.
3. Doors are similar to portals but are only within a region.
4. Players always have perfect visibility within some screen size.

Map to: US2.5

5.2.5 Advanced Weapon & Enemy Mechanics

Identifier UC2.3

Preconditions

1. Player is playing a level.

Basic Course

1. There are handheld weapons (like knives) and shooting weapons (like lasers).
2. Killing an enemy enables the player to take the dead enemy's weapon by tapping twice over their bodies.
3. Killing an enemy results in their bodies destructing.
4. Killing the player results in his or her body's destruction.

Map to: US2.6

5.2.6 Story

Identifier UC2.4

Preconditions

1. Player starts a level.

Basic Course

1. Display a brief story outlining the purpose of the level and its relation to the other levels.

Map to: US2.7

5.2.7 Audio Mechanics

Identifier UC2.5

Preconditions

1. Player is playing a level.

Basic Course

1. Using a shooting weapon induces a shooting sound effect.
2. Hitting an enemy induces a sound effect.
3. Going through doors induces a sound effect.
4. Any death induces a sound effect.
5. Background music plays during level play.
6. Background music can be turned off from the main menu.

Map to: US3.1, US3.2

5.2.8 Level Creator

Identifier UC3.1

Basic Course

1. A level creator should be developed that allows the easy and quick creation of in-game levels.
2. Enemy positions and paths should be outlined in the level creator.
3. The content creator should be able to place tiles, walls, doors, and specify regions as well as the sequence of portals.
4. The level creator will also specify the various score ranges (for example, getting an A requires 3500 points where killing each enemy gives the player 100 points).
5. The level creator should export levels to a format understood by the program.

Map to: US3.5

5.2.9 Score System

Identifier UC3.2

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Basic Course

1. The player's score at the end of each level should be displayed.
2. An additional message should be displayed indicating a high score if one was achieved.
3. Players should be able to share their high scores on social media
4. The time, average, and high scores of the players should be recorded.
5. **If time permits**, implement an Internet database containing the highest worldwide score for every level and record it. Also record in which percentile the player's score on a level is.

Map to: US3.4, US3.6, US3.7

5.3 Non-functional Requirements

5.3.1 Platform & Performance

Identifier NF1.1

Description The platform is Android. The general expected devices have 1-2 GB of RAM. The game should run in 30-60 FPS on such devices.

Map to: US4.1

5.3.2 Version Control System

Identifier NF1.2

Description The version control system **Git** should be used for development.

Map to: NA

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6. High level plan

Iteration 1:

User Stories	Estimated Time
1. Player can open the main menu, choose a level and walk around.	10/3/2018 – 19/3/2018
2. Basic enemy mechanics. Basic level creation.	19/3/2018-31/3/2018
Total Time	3 weeks

Iteration 2:

User Stories	Estimated Time
1. Implement the level creator, about 50-60% of the gameplay mechanics.	1/4/2018-8/4/2018
2.First level without any audio but with a majority of the game mechanics working.	8/4/2018-15/4/2018
Total Time	3 weeks

Iteration 3:

User Stories	Estimated Time
1.All game mechanics working. Audio working.	15/4/2018-29/4/2018
2.Optimization and Testing.	29/4/2018-4/5/2018
Total Time	3 weeks

Table 2: High Level Plan

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7. Supporting Information

Appendix A: Traceability Matrix

RI D	US 1.1	US 1.2	US 2.1	US 2.2	US 2.3	US 2.4	US 2.5	US 2.6	US 2.7	US 3.1	US 3.2	US 3.3	US 3.4	US 3.5	US 3.6	US 3.7	US 4.1
UC 1.1	✓	✓															
UC 1.2		✓	✓														
UC 2.1				✓	✓	✓											
UC 2.2							✓										
UC 2.3								✓									
UC 2.4									✓								
UC 2.5										✓	✓						
UC 3.1														✓			
UC 3.2													✓		✓	✓	
NF 1.1																	✓
NF 1.2																	

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Appendix B: Dependability Matrix

RI D	US 1.1	US 1.2	US 2.1	US 2.2	US 2.3	US 2.4	US 2.5	US 2.6	US 2.7	US 3.1	US 3.2	US 3.3	US 3.4	US 3.5	US 3.6	US 3.7	US 4.1
US 1.1	✓																
US 1.2	✓	✓															
US 2.1			✓														
US 2.2			✓	✓		✓											
US 2.3				✓	✓												
US 2.4						✓											
US 2.5							✓										
US 2.6				✓				✓									
US 2.7									✓								
US 3.1										✓							
US 3.2	✓										✓						
US 3.3												✓					
US 3.4													✓				
US 3.5														✓			
US 3.6													✓		✓		
US 3.7													✓		✓	✓	
US 4.1																	✓