SE 3XA3: Test Report
Spaceshooter Remix

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Table 1: Revision History

Date	**Version**	**Notes**
December 1, 2018	Rev1	Creation of the document

This document describes the test report from the test results for Spaceshooter Remix written by IRS Development.

1 Functional Requirements Evaluation

The purpose of these tests is to verify that the program operates based on the specifications of the SRS document especially the functional requirements.

Test Name	F-1
Initial State	Command Line
Input	python IRS_Space_Shooter.py
Expected Results	A box that is HEIGHT by WIDTH will appear on the desktop.
Actual Results	A game window appears instantly of size HEIGHT by WIDTH on the des

Table 2: Test for F-1

Test Name	F-2
Initial State	Main menu
Input	A keyboard press of the 'enter' key.
Expected Results	A loading screen is displayed.
Actual Results	Tester verified that a loading screen is displayed on the desktop in the gar

Table 3: Test for F-2

Test Name	F-3
Initial State	Main menu
Input	A keyboard press of the 'q' key.
Expected Results	Desktop should display and the game should terminate
Actual Results	Tester verified that the program ended.

Table 4: Test for F-3

Test Name	F-4
Initial State	Game screen
Input	A keyboard press of the ‘D’ key.
Expected Results	The ship moves towards the right boundary of the screen
Actual Results	Tester verified that the ship moved to the right boundary of the screen at

Table 5: Test for F-4

Test Name	F-5
Initial State	Game screen
Input	A keyboard press of the ‘A’ key.
Expected Results	The ship moves towards the left boundary of the screen
Actual Results	Tester verified that the ship moved to the left boundary of the screen at r

Table 6: Test for F-5

Test Name	F-6
Initial State	Game screen
Input	Left-mouse click will produce bullets
Expected Results	The bullet will appear from the y-coordinate of HEIGHT - PLAYER_HEI
Actual Results	A bullet was fired from the y-coordinate of HEIGHT - PLAYER_HEIGHT

Table 7: Test for F-6

Test Name	F-12
Initial State	Game screen
Input	Left-mouse click will produce bullets
Expected Results	The bullet that will be fired will travel at the pygame speed value of -10 u
Actual Results	A bullet was fired at roughly 1 cm/s upon the left-mouse click input.

Table 8: Test for F-12

Test Name	F-13
Initial State	Game screen
Input	The user score hits 800 after avoiding and destroying many asteroid objec
Expected Results	Increase in the number of asteroids generated by at least 2 times the previ
Actual Results	Tester verified that there was a significant increase in the number of astero

Table 9: Test for F-13

Test Name	F-7
Initial State	Game screen
Input	Left click press on mouse
Expected Results	After a period of time, the asteroid is no longer on the screen.
Actual Results	Tester verified the asteroid appeared to be destroyed after successive bulle

Table 10: Test for F-7

Test Name	F-8
Initial State	Game screen
Input	'A' or 'D' to have the spaceship sprite come into contact with the asteroid
Expected Results	The health bar decreases after contact is made.
Actual Results	Tester verified that there was a decrease in the health bar of 0.5-1 cm at e

Table 11: Test for F-8

Test Name	F-9
Initial State	Game screen with a low health bar.
Input	'A' or 'D' to have the spaceship sprite come into contact with the asteroid
Expected Results	After contact is made with the asteroid the ship is no longer visible on the
Actual Results	Tester verified at a collision at this critical health state with low health re

Table 12: Test for F-9

Test Name	F-10
Initial State	Game screen with a low health bar and one life remaining
Input	'A' or 'D' to have the spaceship sprite come into contact with the asteroid
Expected Results	Game over menu
Actual Results	Tester verified at a collision at this critical health state with low health re

Table 13: Test for F-10

Test Name	F-11
Initial State	Game over screen
Input	A keyboard press of 'R' .
Expected Results	Main menu
Actual Results	Tester verified that pressing the 'R' key resulted in the screen switching to

Table 14: Test for F-11

2 Nonfunctional Requirements Evaluation

2.1 Usability

Test Name: NF-1
Results: Each team member was able to successfully clone the git repo and download the entire set of files. They were able to run the Python game on their computer using the command 'python IRS_Space_Shooter' on operating systems Windows 10, Mac OS 11 and Linux.

Test Name: NF-2
Results: 2 beta-testers from outside McMaster and not in engineering were chosen for this study and they were able to successfully install the game following the instructions on the README file only within 5 minutes.

2.2 Performance

Test Name: NF-3
Results: Beta testers rated the game with the criteria of ease of installation, gameplay, graphics and overall satisfaction on a scale from 1 to 10 with 1 being lowest, and 10 being highest score. The score across the 4 categories was 8 for ease of installation, 7 for gameplay, 7 for graphics and 7.5 for overall satisfaction. There was feedback on asking for a greater number of powerups and in-game objects to improve graphics. Another suggestion was asked to provide permanent high score lists.

Test Name: NF-4
Results: The same beta testers played the game on their local machines and the response of the program was recorded for each movement and input. All the interactions were instant and well below the EXEC-TIME and there was no noticeable delay for any feature in the game.

2.3 Robustness

Test Name: NF-5
Results: Beta testers jammed the controls with several inputs at the same time from the mouse and keyboard pressing several buttons at once yet the game did not produce any abnormal behavior producing responses within the EXEC-TIME. The game would produce the response of the first button

pressed rather than producing any other response other than the movement and behaviors that it is expected to do based on the input 'A' and 'D' keys and the firing of bullets from the left mouse click. This demonstrated robustness as there was no other unexpected output from these abnormal inputs.

3 Comparison to Existing Implementation

The results of the systems tests showed this implementation of the game had markedly better features as it was voted 7.5 in overall experiences. The game was also stable and did not crash or display bugs, unlike the existing implementation which did not pass many of these tests especially regarding the robustness and performance. Thus, the results show that there was an improvement over the original game.

4 Unit Testing

Originally there were plans to perform unit testing on certain modules to explore how the functions in them behave. However, these were scrapped in favor of manual, black box testing and as result, there was no specific unit testing that occurred.

5 Changes Due to Testing

The results of the non-functional tests and usability surveys prompted the creation of an improved README guide for installation and instructions for playing the game. There was also an attempt to produce a permanent high score list instead of a temporary one that is valid for the game session. That change will not be implemented in this revision but is going to be shelved for the future. Over the course of several of these tests, modifications were made to the code to allow the game to achieve the desired results of the specifications and test plan. For example, an adjustment was made on the asteroid generation after the increase in levels to accommodate for only a 2X increase in frequency to match with the specific intended goals of increased difficulty.

6 Automated Testing

Most of the testing performed in this project was black box testing and several code inspections. The code uses the pygame library to create animations and display menus that are easier checked by visual, manual inspections of the output. Almost none of the modules actually contain any sort of calculations that can be further evaluated by automated testing. Integration testing was employed in evaluating the running of the game. As changes were made to the game and code was modified, the main game was executed to ensure that the addition of new code or changes did not break the game. The basic functionality of the game was intended to be intact even with the addition of new modifications in the code. The calculations of the speed of the bullets and sprites were done visually using a ruler on the screen of the testing computers rather than using an automated testing approach because it provided accurate enough results for the scope of the project and functions. The design of the game is not to produce very specific movements or demonstrate a particularly specific speed at every behavior and hence a measurement using the human eye was sufficient. This was mainly a decision made by the group because the precision of such movements was deemed superfluous to the overall objective of delivering a stable, enhanced version of the spaceshooter game to an average user.

7 Trace to Requirements

Test Case #	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16
F-1	x	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F-2	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
F-3	-	-	-	-	-	-	-	-	-	-	x	-	-	-	-	-
F-4	-	-	-	-	-	-	-	-	-	x	-	-	-	-	-	-
F-5	-	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-
F-6	-	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-
F-7	-	-	-	x	x	-	-	-	-	-	-	-	-	-	-	-
F-8	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	-
F-9	-	-	-	-	-	-	-	-	-	-	-	x	-	x	-	-
F-10	-	-	-	-	-	-	-	-	-	-	-	-	x	-	-	-
F-11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x
F-12	-	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-
F-13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	-

Test Case #	NF1	NF2	NF3	NF4	NF5	NF6	NF7	NF8	NF9	NF10	NF11	NF12	NF13	NF14	NF15	NF16	NF17	NF18	NF19	NF20	NF21
NF-1	-	-	-	-	-	-	-	x	-	-	x	-	x	x	x	-	-	-	-	-	-
NF-2	-	-	-	-	-	-	-	x	-	-	x	-	x	x	x	-	-	-	-	-	-
NF-3	x	x	x	-	x	x	-	-	-	x	-	x	-	-	-	-	x	x	-	-	x
NF-4	-	-	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NF-5	-	-	-	-	x	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-

8 Trace to Modules

Test Case #	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
NF-1	-	-	-	-	-	-	x	-	-	-	-	-
NF-2	-	-	-	-	-	-	x	-	-	-	-	-
NF-3	-	-	-	-	-	-	x	-	-	-	-	-
NF-4	-	-	-	-	-	-	x	-	-	x	-	-
NF-5	-	-	-	-	-	-	x	-	-	x	x	-
F-1	-	x	-	-	-	-	x	-	-	-	-	-
F-2	-	x	-	-	x	-	x	-	-	-	-	-
F-3	-	-	-	-	-	-	x	-	-	-	-	-
F-4	-	-	-	-	-	-	x	-	-	x	-	-
F-5	-	-	-	-	-	-	x	-	-	x	-	-
F-6	-	-	-	-	-	-	x	-	-	-	x	x
F-7	-	-	-	x	x	x	x	-	-	-	x	-
F-8	-	-	-	x	x	-	x	x	-	x	-	-
F-9	-	-	-	x	x	x	x	-	-	x	x	-
F-10	-	-	-	x	x	x	x	-	-	x	x	-
F-11	-	-	-	-	-	-	x	-	-	-	-	-
F-12	-	-	-	-	-	-	x	-	-	-	x	-
F-13	-	-	x	x	x	-	x	-	-	-	-	-

9 Code Coverage Metrics

We managed to achieve 90% code coverage as shown by the trace to modules that explains how different modules are explicitly covered by the tests. This shows how we have managed to cover the modules and the code inside of them. Every test covered some module. As a result of all the testing, each of the modules were indirectly or directly used. However, it must be noted that must of our testing was black-box testing done on the results of the functions and performed visually rather than using a testing framework like pyunit. Thus, while our actual code is checked for syntax errors and output, it is not explicitly checked line by line for each word.

10 Acronyms, Abbreviations, and Symbols

Table 15: **Table of abbreviations**

Abbreviation	**Definition**
OS	Operating System
product	The game that we are creating
program	The code that our game uses to function
ex.	example
etc.	et cetera
client	who we are creating the game for
customer	who will be consuming our game
gitlab	Gitlab repository
IDLE	The integrated development environment for python
repo	The repository that our product will be stored
sprite	The spaceship displayed on the screen representing the user's character
Git repo	Gitlab repository
player	The human playing the game or using the software
user	The human playing the game or using the software
tester	The human who is assigned the role of tester to play the game or using the software
README	Instruction document provided in the root directory

11 Symbolic Parameters

The definition of the test cases will call for SYMBOLIC_CONSTANTS. Their values are defined in this section for easy maintenance.

Table 16: **Table of symbolic constants**

Abbreviation	**Definition**
HEIGHT	600 pixel screen size for height
WIDTH	800 pixel screen size for height
PLAYER_HEIGHT	The y-coordinates at which the sprite of the player is located in the game screen
EXEC-TIME	0.3 seconds