

SE 3XA3: Test Report

Zombie Survival Kit

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Table 1: **Revision History**

Date	Version	Notes
December 3 2018	1.0	Document created
Date 2	1.1	Notes

This document contains the results of our initial testing plan, the information derived from it as well as the changes that have been implemented in our project based on the results of the tests that have been conducted.

1 Functional Requirements Evaluation

1.1 Functional Requirement 1:

1.1.1 Description:

The player must be able to move forward, left, backwards and right using the WASD keys.

1.1.2 Type:

Manual

1.1.3 Observation:

By pressing the WASD keys on the keyboard, the player can move around on the game terrain.

1.1.4 Result:

Passed

1.2 Functional Requirement 2:

1.2.1 Description:

The player must be able to look in all directions by moving their mouse.

1.2.2 Type:

Manual

1.2.3 Observation:

By moving the mouse in a certain direction, it is observed that the camera turns in the same direction.

1.2.4 Result:

Passed

1.3 Functional Requirement 3:

1.3.1 Description:

Zombie enemies must walk back and forth between random points in their 'spawn' circle, which imitates them walking around.

1.3.2 Type:

Manual

1.3.3 Observation:

When the game scene is initialized, zombie enemies can be observed at various positions on the game terrain. These zombies are observed to be moving around a certain position on the map.

1.3.4 Result:

Passed

1.4 Functional Requirement 4:

1.4.1 Description:

Zombie enemies must start attacking the player when they come within a certain radius.

1.4.2 Type:

Manual

1.4.3 Observation:

When the user controls the player and moves close to a zombie, then the zombie starts attacking the player, and the zombie character model is animated to show an attack movement.

1.4.4 Result:

Passed

1.5 Functional Requirement 5:

1.5.1 Description:

Zombie enemies must follow the player when the player is at a certain distance from the zombie.

1.5.2 Type:

Manual

1.5.3 Observation:

When the user controls the player and moves close to a zombie, then the zombie starts attacking the player, and the zombie character model is animated to show an attack movement. When the player then starts to move away, the zombie starts to follow the player.

1.5.4 Result:

Passed

1.6 Functional Requirement 6:

1.6.1 Description:

If the player runs past a certain radius from the zombie's original spawn location, the zombie must return to their circle..

1.6.2 Type:

Manual

1.6.3 Observation:

When the user controls the player and moves close to a zombie, then the zombie starts attacking the player, and the zombie character model is animated to show an attack movement. When the player then starts to move away, the zombie starts to follow the player. The user then presses and holds the shift button while moving the player away from the zombie. When the distance between the player and zombie is sufficiently large, the zombie stops chasing the player and starts returning to their own position. A bug reported in the testing surveys was if the player stops at the exact point the zombie is supposed to turn around, it gets stuck repeatedly turning between its spawn point and the player, until the player moves closer or farther.

1.6.4 Result:

Pass with Partial Fail

1.7 Functional Requirement 7:

1.7.1 Description:

Different types of zombies must have different statistics (health, damage and attack speed). Different types of zombies will be distinguishable by their different appearances.

1.7.2 Type:

Manual

1.7.3 Observation:

When the user assumes control of the player and attacks various zombies in the game scene, different zombies require a different number of hits to kill.

1.7.4 Result:

Passed

1.8 Functional Requirement 8:

1.8.1 Description:

Zombies must have randomly generated chance of dropping items the player can equip or consume when killed.

1.8.2 Type:

Manual

1.8.3 Observation:

When different zombies are killed, they drop a different type of pickup after they die.

1.8.4 Result:

Passed

1.9 Functional Requirement 9:

1.9.1 Description:

The player must be able to pick up items they are looking at with the 'interact' key.

1.9.2 Type:

Manual

1.9.3 Observation:

When the user looks at a pickup and presses the 'E' button on the keyboard, the pickup item disappears from the screen.

1.9.4 Result:

Passed

1.10 Functional Requirement 10:

1.10.1 Description:

The player must be able to access their inventory by pressing the 'inventory' key, and will have a maximum space of 20 items.

1.10.2 Type:

Manual

1.10.3 Observation:

When the user presses the 'I' button on the keyboard, the inventory UI is shown with 20 item slots.

1.10.4 Result:

Passed

1.11 Functional Requirement 11:

1.11.1 Description:

The player must be able to equip, consume and drop items in their inventory UI using the LMB.

1.11.2 Type:

Manual

1.11.3 Observation:

When the user presses the 'I' button on the keyboard, the inventory UI is shown with 20 item slots. When the player then picks up some pickups from the game scene, the inventory UI updates and shows the pickups in a slot. By clicking on an apple, the player's health increases according to the health bar and by clicking on a boot icon, it moves from the inventory UI at the right side of the screen to the equipment UI at the top left of the screen.

1.11.4 Result:

Passed

1.12 Functional Requirement 12:

1.12.1 Description:

The player must be able to unequip items in their Equipment UI using the LMB or the 'unequip all' key.

1.12.2 Type:

Dynamic, Manual

1.12.3 Observation:

When the user has items equipped, pressing the U button moves all items from the Equipment UI to the Inventory UI. When the user individually clicks on the items in the Equipment UI using the LMB, the specific item is moved from the Equipment UI to the Inventory UI.

The Test script containing the Assert statements, when executed, does not report any assertion errors.

1.12.4 Result:

Passed

1.13 Functional Requirement 13:

1.13.1 Description:

The player must be able to fire/use an equipped gun or axe by pressing the left mouse button (LMB).

1.13.2 Type:

Manual

1.13.3 Observation:

When the player has a gun equipped, pressing the LMB causes the gunshot sound to be played and the bullet UI at the bottom left corner is updated to show the ammo count in the gun. ~~When the player tries to equip an axe by opening the inventory UI, the cursor does not show up and the switch cannot be made.~~ When the axe is equipped, clicking the LMB causes the axe swing sounds to be played.

1.13.4 Result:

~~Failed~~ Passed

1.14 Functional Requirement 14:

1.14.1 Description:

If the player has a firearm equipped, the user can reload the gun using the 'reload' key. The maximum amount of bullets will be 7.

1.14.2 Type:

Manual

1.14.3 Observation:

When the player has a gun equipped, pressing the LMB causes the gunshot sound to be played and the bullet UI at the bottom left corner is updated to show the ammo count in the gun. By pressing the 'R' button on the keyboard, the ammo UI count is set back to 7, and a reload sound effect is played.

1.14.4 Result:

Passed

1.15 Functional Requirement 15:

1.15.1 Description:

The environment must slowly go through a day and night cycle.

1.15.2 Type:

Automated, Manual

1.15.3 Observation:

A unit test script is used to test the working of the daylight controller object. This script is supposed to return assertion errors if the rotation of the daylight object in the game does not change as time passes. This test is considered to have passed as no assertion errors were returned.

While playing the game, a change in the orientation of the daylight object is visible and it's effect on the game terrain is noticeable.

1.15.4 Result:

Passed

1.16 Functional Requirement 16:

1.16.1 Description:

The player must lose health when hit by a zombie.

1.16.2 Type:

Manual

1.16.3 Observation:

When the user assumes control of the player and moves the player close to a zombie, the zombie attacks the player. When this happens, a decrease in the health level is demonstrated by the health bar UI at the bottom left corner of the screen.

1.16.4 Result:

Passed

1.17 Functional Requirement 17:

1.17.1 Description:

Zombies must lose health when hit by the player by using the LMB once the player is within attacking distance from the zombie.

1.17.2 Type:

Manual

1.17.3 Observation:

When the user assumes control of the player and moves the player close to a zombie, then uses the LMB to attack the zombie, the zombie dies after multiple clicks of the LMB, and drops a pickup object on the ground.

1.17.4 Result:

Passed

1.18 Functional Requirement 18:

1.18.1 Description:

Players or zombies must die when they reach 0 health.

1.18.2 Type:

Manual

1.18.3 Observation:

When the user assumes control of the player and moves the player close to a zombie, then uses the LMB to attack the zombie, the zombie dies after multiple clicks of the LMB, and drops a pickup object on the ground. The user then navigates the player to another zombie and allows the zombie to repeatedly damage the player. Eventually, the health level in the health bar UI (at the bottom left corner of the screen) becomes zero and a hit to the player after that causes the "Game Over" message to be displayed on the screen.

1.18.4 Result:

Passed

1.19 Functional Requirement 19:

1.19.1 Description:

An Inventory UI will give the user a visual representation of the player's inventory and will be accessible by pressing the 'inventory' key.

1.19.2 Type:

Dynamic, Manual

1.19.3 Observation:

When the user presses the "I" key on the keyboard, an Inventory UI and an Equipment UI is displayed with 20 slots in the Inventory UI and 6 slots in the Equipment UI. If the player has picked up an item from the game, it is scene in the inventory UI.

1.19.4 Result:

Passed

1.20 Functional Requirement 20:

1.20.1 Description:

An Equipment UI will give the user a visual representation of the player's equipped items and it will appear with the Inventory UI by pressing the 'inventory' key.

1.20.2 Type:

Dynamic, Manual

1.20.3 Observation:

When the user presses the "I" key on the keyboard, an Inventory UI and an Equipment UI is displayed with 20 slots in the Inventory UI and 6 slots in the Equipment UI. If the player has picked up and equipped an item from the game, it is scene in the Equipment UI.

1.20.4 Result:

Passed

1.21 Functional Requirement 21:

1.21.1 Description:

A Player UI will give the user a visual representation of the player's health and remaining bullets if a gun is equipped to the player. The Player UI will also consist of a reticle.

1.21.2 Type:

Manual

1.21.3 Observation:

At all times in the game scene, a red reticle can be seen at the center of the screen. The reticle remains at the center of the screen at all times, irrespective of where the camera is moved. At the bottom left corner of the screen, a health bar UI can be seen. When a gun is equipped, the ammo count UI displays the number '7' which is the maximum capacity of a gun. When a shot is fired using the LMB, the number changes to 6.

1.21.4 Result:

Passed

2 Nonfunctional Requirements Evaluation

To evaluate our non-functional requirements, we created a Google Form to go along with an executable version of our project. These are shared with 10

volunteer testers who use our software while following a set of instructions and share their feedback through the Google Form.

2.1 Usability

2.1.1 Min-Learn-F-1

According to our survey, 10 out of 10 testers reported that the controls for our project were easy to remember.

2.2 Performance

2.2.1 Start-Time-F-1

According to our survey, 10 out of 10 testers felt that the game loading time was fast.

2.2.2 FPS-F-1

According to our survey, 8 out of 10 testers reported that the average frame rate that the game ran at was at least 60 frames per second.

2.2.3 Close-Time-F-1

According to our survey, 6 out of 10 testers felt that the time taken to quit the game was short.

2.2.4 Enough-Ram-F-1

According to our survey, 9 out of 10 testers reported that the amount of RAM used by the game was less than 1 GB.

2.3 Look and Feel

2.3.1 Graphics-F-1

According to our survey, the following objects were observed by testers:

- Helath and ammo bars: 10 testers
- Red reticle: 10 testers

- Tall, grey zombies: 10 testers
- Short, beige zombies: 10 testers
- Colored cubes around a tent: 6 testers
- Fruits: 10 testers
- Tent: 8 testers
- Trees: 10 testers
- Day and Night cycle: 10 testers
- An inventory UI (when 'I' button is pressed on the keyboard): 10 testers
- Axe: 10 testers

2.3.2 Ease-of-Use-F-1

According to our survey, 10 out of 10 testers reported that they felt the controls to be easy to learn.

2.3.3 Ease-of-Use-F-1

According to our survey, 10 out of 10 testers reported that they felt the controls to be intuitive.

2.4 Safety

2.4.1 Enough-Space-F-1

According to our survey, 9 out of 10 testers reported that the size of the downloaded executable was greater than 1 GB.

2.5 Precision

2.5.1 Player-Attack-Animation-to-Effect-F-1

According to our survey, 10 out of 10 testers reported that the player's effect of attacking the zombies felt intuitive, but 3 testers also reported that the system could be improved by incorporating some form of feedback.

2.5.2 Time-Day-Night-Transition-F-1

According to our survey, 10 out of 10 users reported observing a day and night cycle in the game.

2.5.3 Zombie-Attack-Animation-to-Effect-F-1

According to our survey, 9 out of 10 users reported that when attacked by a zombie, the health bar reflected a change in health levels instantly.

2.5.4 Distance-to-Pickup-Item-F-1

According to our survey, 10 out of 10 testers reported that the maximum distance from which a pickup can be added to the inventory felt intuitive.

2.6 Reliability and Availability

2.6.1 Reliable-Input-Commands-F-1

According to our survey, 9 out of 10 testers reported that the game responded to their inputs within a suitable time frame.

2.7 Play-When-On-F-1

According to our survey, 9 testers reported that the game behaved as expected when it was launched and closed 10 times out of 10 attempts.

1 tester reported that the game behaved as expected when it was launched and closed 9 times out of 10 attempts.

2.8 Cultural Requirements

2.8.1 Culture-Discretion-F-1

According to our survey, 10 out of 10 testers reported that they did not find any of the illustrations and other contents of the game offensive.

3 Comparison to Existing Implementation

The existing project does not contain any documentation regarding the testing procedures in the development of the software. No unit testing has been

implemented, and the final product is not error free. For example, in the existing implementation, the axe weapon is dysfunctional and it causes the inventory UI to crash.

4 Unit Testing

Unit Testing was conducted to verify the correctness of various modules of our project. Certain modules, however, could not be tested due to restrictions imposed by the Unity 3D engine. For these modules, manual testing was used to verify that they function as intended.

Unit Testing was conducted on the following modules:

- Character Combat
- Character Stats
- Consumable Item
- Daylight Controller
- Equipment Item
- Equipment Manager
- Gun
- Inventory
- Item Store
- Player Stats
- Stat

The correctness of a module is verified by unit testing, when no assertion errors are returned by the unit test file. In case of our project, unit testing the aforementioned modules returned no assertion errors, and the modules mentioned above are therefore assumed to be correct.

[Please see the Test Plan for a detailed description of the individual Test Scripts.]

5 Changes Due to Testing

While no errors were encountered during testing, it was revealed that certain modules were preventing other modules from working correctly. Also, some undesirable behaviours were observed. These are listed below:

- The implementation of the gun firing mechanism prevented the cursor from showing up on the screen when the inventory UI was brought up, and prevented interaction with the inventory UI.

Change made: A new function was added to the First Person Controller script to enable the cursor when the inventory UI was brought up, even if the gun was equipped.

- The initial implementation of the gun firing mechanism caused a shot to be fired even when the gun was being unequipped / swapped in the inventory UI or while equipping an item or consuming a consumable.

Change made: The Gun module now checks whether the inventory UI is active and if that is true, a shot is not fired.

- The initial implementation of the player attack mechanism did not provide any intuitive feedback to the player to indicate damage being done to the enemy. This feedback was derived from our volunteer test survey.

Change made: A sound effect now plays when the player attacks a zombie.

6 Automated Testing

For our project, the only implementation of automated testing was the Unit Testing process. The results of our unit tests are mentioned in a previous section.

7 Trace to Requirements

A trace between requirements and testing is given in [Table 2](#).

Each test number matches with the requirement number because we based our tests in the test plan to each test one functional requirement.

8 Trace to Modules

A trace between modules and testing is given in [Table 3](#).

9 Code Coverage Metrics

Recording code coverage metrics for the tests was not feasible or representative of the quality of the tests for this project. Test coverage is defined to be the ratio between the number of lines of code called by the test suite to the total number of lines of code. Meaning, this would only apply to the automated unit test scripts. As mentioned in the test plan, test scripts were not possible to create for any module where a zombie has to be instantiated on the scene, since the zombies need a valid NavMesh to walk on which requires an active scene, not possible through just code. Due to this, Group 6ix would have a low code coverage metric just because these tests were not possible to create automated scripts for. Code coverage is not a good representative measure for the quality of this testing, since zombie modules were tested through manual/integration testing via a Google Survey which is not seen through the metric.

Table 2: Trace between requirements and tests

Test	Requirement
1	R1
2	R2
3	R3
4	R4
5	R5
6	R6
7	R7
8	R8
9	R9
10	R10
11	R11
12	R12
13	R13
14	R14
15	R15
16	R16
17	R17
18	R18
19	R19
20	R20
21	R21

Table 3: Trace between modules and tests

Test	Modules
1	M21
2	M21
3	M20
4	M20
5	M20
6	M20
7	M20, M16
8	M2, M3, M4, M18
9	M7, M9, M10
10	M13
11	M2, M3, M4, M5, M6, M11, M12, M13, M14
12	M2, M3, M4 , M5, M6, M11, M12, M13, M14
13	M8, M10, M22, M23
14	M22
15	M24
16	M15, M16
17	M6, M8, M15, M16, M23
18	M16
19	M13, M14
20	M11, M12
21	M25