The Purple Guardian

CSCI346 – Assignment 2 Report

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UNIVERSITY OF WOLLONGONG - DUBAI
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Assignment Cover Sheet

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Due Date:	October 23rd 2020
Date Submitted:	October 22nd 2020

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Contents

1. Executive Summary

The document briefly explains the development of the game starting firstly by mentioning the game prototype and then moving onto the implementation, the functionalities tested, and the learning outcomes under the discussion section. Later, this document concludes the entire experience whilst developing the game for CSCI346, assignment 2.

The design document briefly describes the idea, the functionalities planned, the entire proposed prototype and the creative and distinctive aspects planned for the game that are all discussed under the design section.

The implementation section deals on how the proposed design was implemented throughout the development phase and how the project is structured to further understand the developmental process flow.

The test case section shows the result of the functionalities tested and their results.

2. Design

This is a game where the protagonist (Ninja) traverses through a level to fight the enemies and reach the end point in any given level. There are three levels and after the third level, the game shows the winning screen.

3. Implementation

This section describes the implementation of the game:

3.1. The Main Menu

The first and foremost step is to create the starting menu to receive the player. The UI of the menu will greet the player with a title image and the name of the game. To further enhance the UI, an image has been used to decorate the button in the title menu. This menu will aim to provide the player with a starting point. The main menu will have the following options:

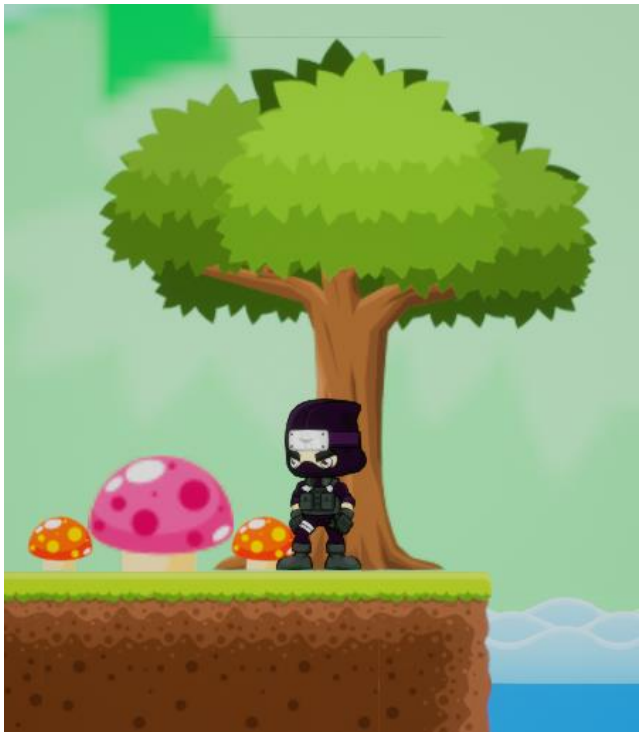
- Tutorial: The first option will redirect the player to the tutorial level in the game. This is intended to be the first option to sub-consciously communicate to the player that playing the tutorial is recommended before progressing to the new game. This is achieved using the open level node in the blueprint when the user has clicked the button.
- New game: The second option will redirect the player to the first level in the game. On button click, it first checks whether a previously saved game exists or not, if there is a previously saved game then it deletes that and creates a newly saved game to later overwrite on.
- Load game: The third option will redirect the player to the last played incomplete level in the game. It basically loads the latest saved game.
- Quit: This option will quit the game.

For UX, each button is supposed to play a feedback audio when the player hovers or presses on the button by using the play sound at location node in the blueprint. Therefore, a widget was created and attached to the level called main menu and was set as the starting point of the game by changing the maps and mode default level option under the project settings. The main menu looks like:

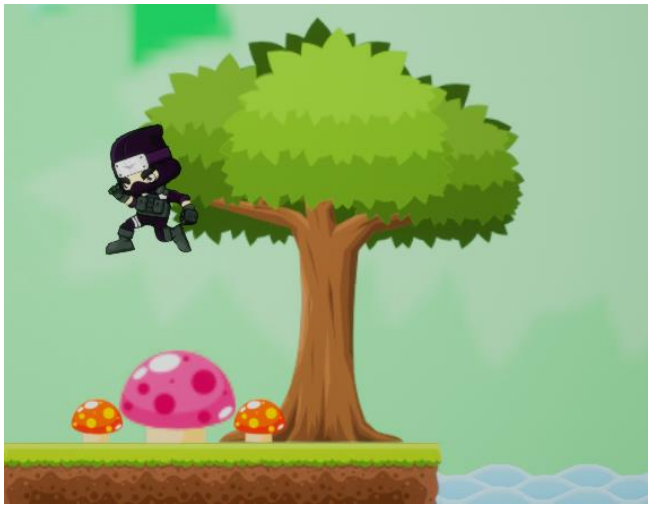
3.2. Character Mechanism

The protagonist of the game is expected to have essential and basic movement just like any other platformer:

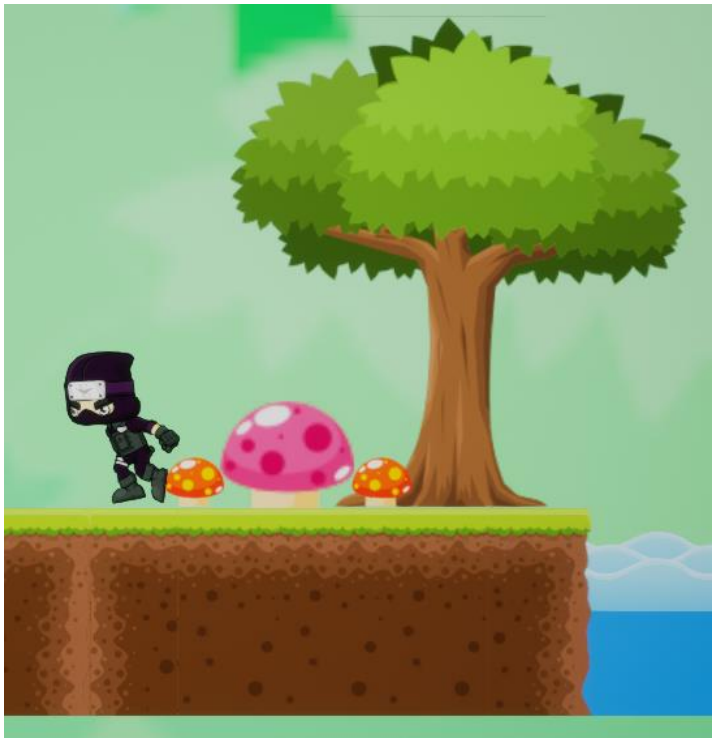
- Idle: When there is no player input.



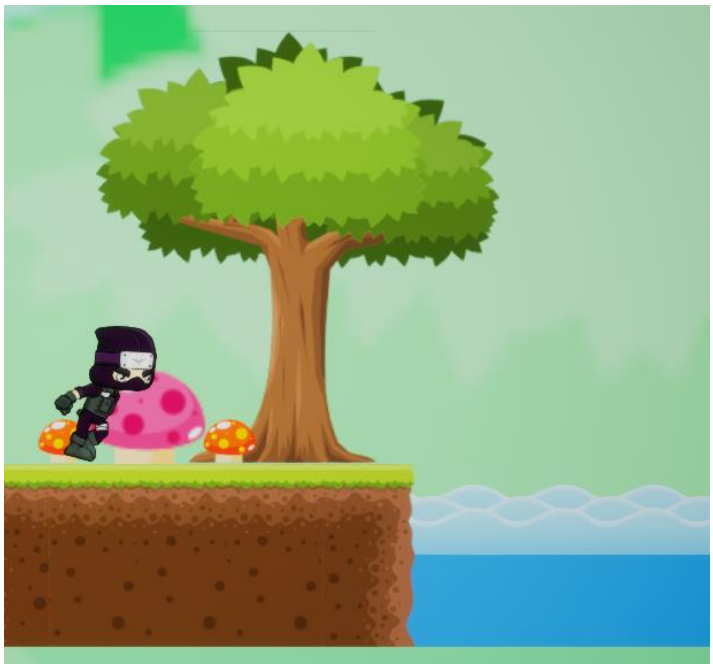
- Jump: When the player presses ‘W’ key to jump.



- Move left: When the player presses “A” key to move left.



- Move right: When the player presses “D” key to move right.

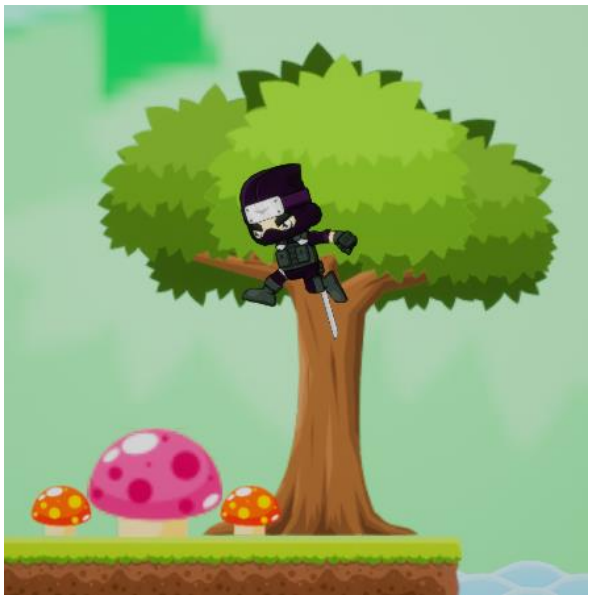


These basic movement will help the player to traverse through the level from one point to another.

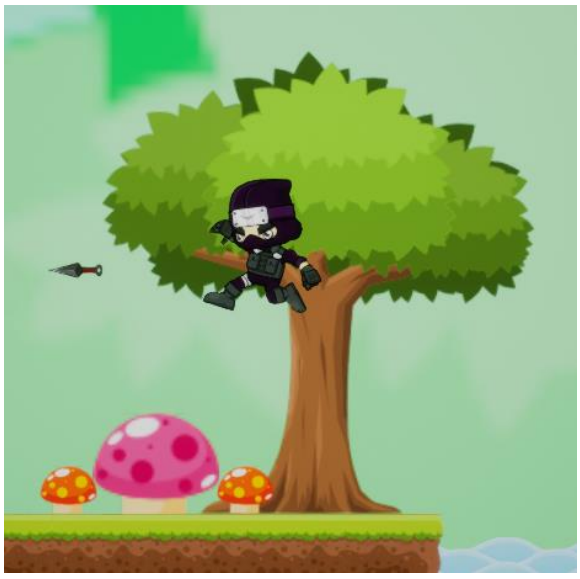
To achieve this, the first step was to create a player. Therefore, the ninja asset was downloaded from an online site and later they were changed to a sprite. These sprites were later transformed into flipbook animations that were called whenever the player pressed the respective button and then were detected in the blueprints of the player character.

The comprehensive player movement will allow the player to attack the enemy in two different ways. The player can either use his sword to attack the incoming enemy or throw a kunai to achieve the same. The procedure is the same to achieve the sword and throwing animation of the player. However, a separate sprite was created for the kunai that will project from the character’s hand as starting point and with some in-game predefined gravity will land at some another object.

- Jump attack animation: W + LMB



- Throw attack animation: W + RMB



The distinctive player movement mechanics would allow the player to jump and attack at the same time or even jump and throw the kunai at the same time to allow for more robustness while dealing with the enemy and hence, giving the player more choices during their playthrough.

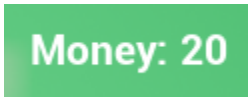
This game also introduces four functionalities of the protagonist:

- Health bar: Player has a health limit and if the player dies in the level, they will have to restart the level.

- Stamina bar: This determines whether the player can attack the enemy depending on the stamina left. If there is not enough stamina, then the player cannot attack the enemy.

- Kunai ammo: This determines the number of kunai that the player has left to throw.

- Money: This is a creative and distinctive feature of the game where the player can earn money by getting a random drop from killing an enemy to then buy health or stamina upgrades with an intention to ease their playthrough. This is the scoring system developed for the game that the player can use.



The health, stamina, ammo, and the money are all part of the HUD that was created in a widget. This widget is attached to the player blueprint to consistently keep track of the player's attributes and update the progress bar or the text, respectively.

3.3. Enemy Mechanism

There are three different types of enemies in the game mainly called Knight one, Knight two and Knight three with their level of difficulties in their respective order. The enemies only have a basic idle, left, and right movement, but they cannot jump (due to their heavy armor). Moreover, the knights are created in the same manner of fashion as the player was created by creating their sprites and then collecting them to create their respective flipbooks.

The three basic knights are:

- Knight one

- Knight two

- Knight three

Basic movement:

- Idle

- Right movement

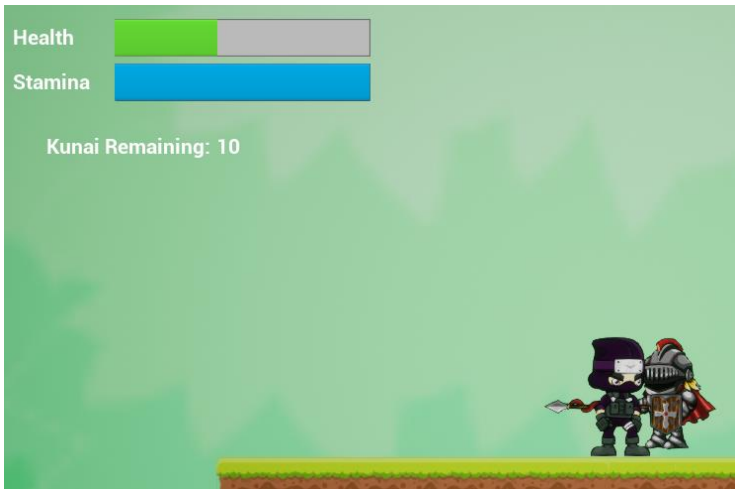
- Left movement

The movement of the enemy is dependent on the player's position in the world. The enemy has a vision which is determined by a sphere collision area. If the player overlaps the sphere collision or the vision of the enemy, then the enemy detects the player and sets a Boolean variable called "Player overlapped with vision" to true. Then, the logic in the blueprint is to get the world transform of the player and the enemy on the x-axis and subtract their x position in the world. If the x value is greater than 0, that means that the player is on the right side of the enemy and the enemy must go right and left otherwise. Then this difference is updated at every frame and added to the movement input of the enemy.

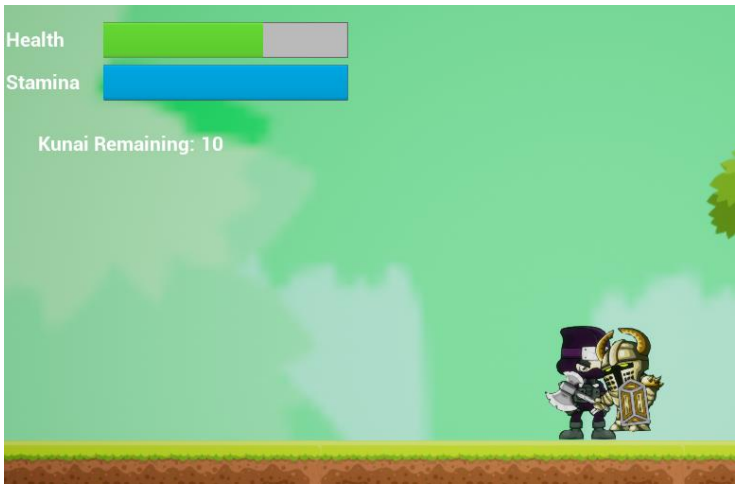
If the player is not in the sphere collision in the blueprint, then no input is added to the enemy movement and it stays idle.

The enemy only has one type of attack but varies from the type of the enemy attacking the player. Each knight has a different attack animation:

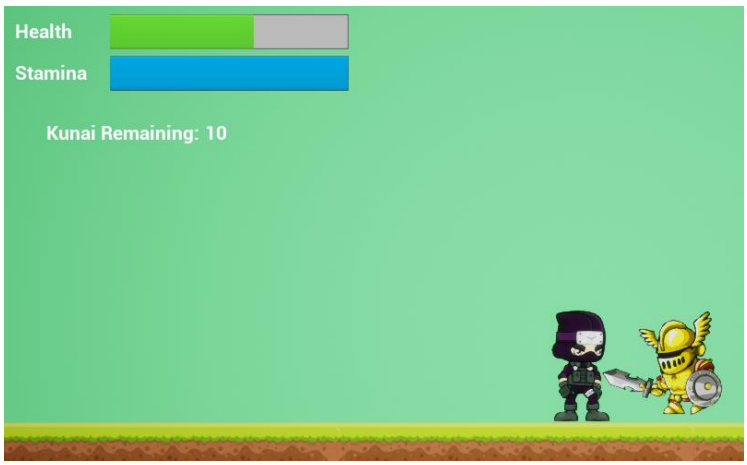
- Knight one



- Knight two

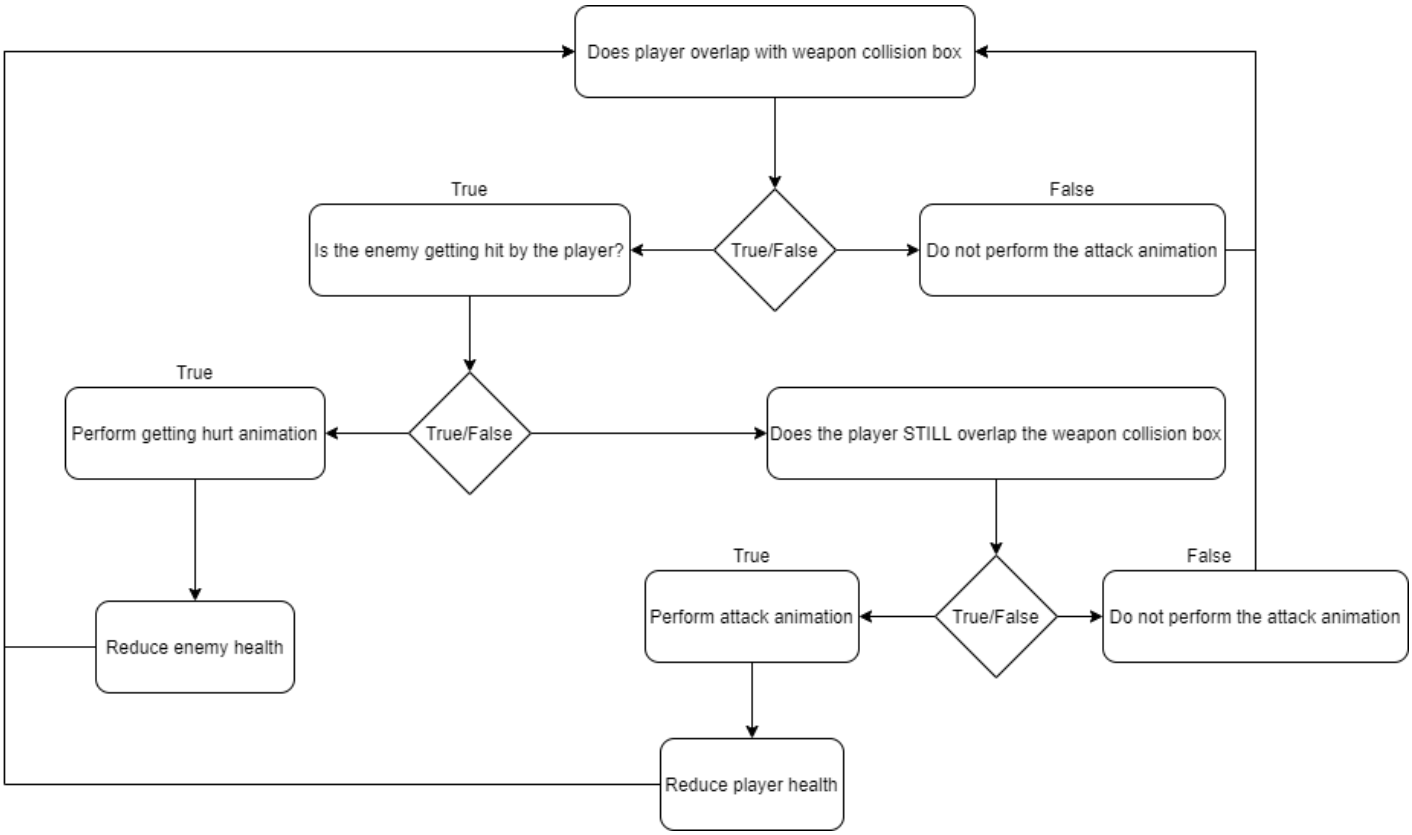


- Knight three



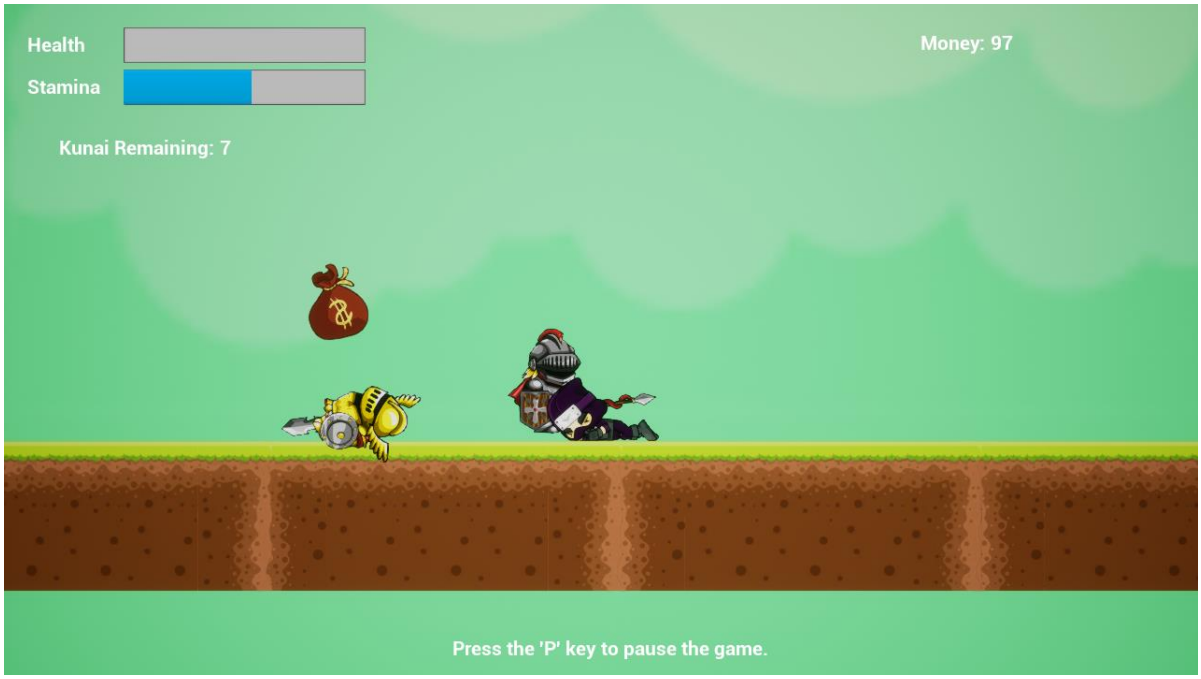
For the enemy, there are three types of collisions, one is the sphere collision for the vision as explained above and the other is the box collision for the weapon of the enemy and the last a capsule collision encompassing the enemy's body to detect player attacks.

Weapon collision: The enemy can attack after checking and performing multiple series of events. The following diagram will help to understand those series of events:



Before checking the above series of events, at the start of every frame the blueprint of the enemy detects whether the enemy is dead or alive. If the enemy is dead then, do not execute any of the above statements, otherwise execute the sphere collision. If the player overlaps with the sphere collision, then execute the weapon collision and do not execute otherwise.

Moreover, it also checks if the player has died. If the player has died, then the AI will stop attacking the player and then play the dying animation.



However, if the health of the enemy reaches 0, then the enemy plays the dead animation and then drops two kinds of pickup at random discussed in the next section.

3.4. Pickups

These pickups are essential for the player as there are 2 pickup types:

- Health pickup: Increases the health of the player

- Coin pickup: Increases the money of the player

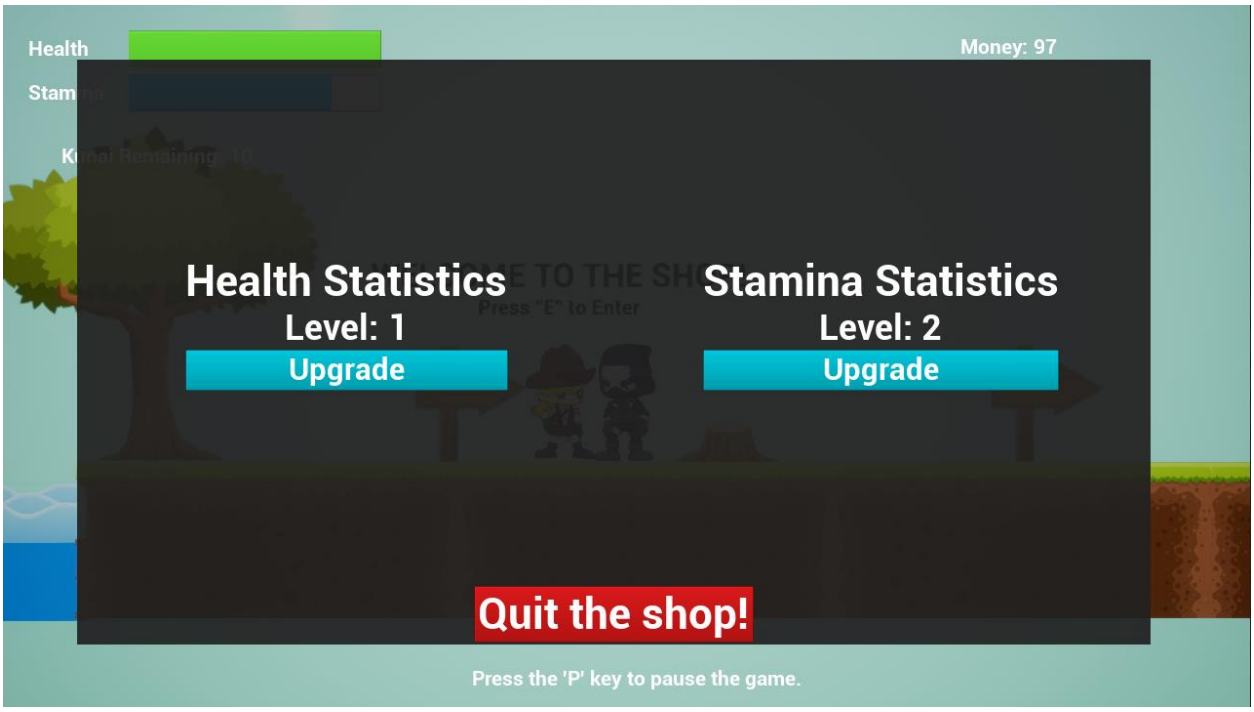
If the player has full health, then it will spawn the coin pick up because there is no point to spawn a health pickup while the player's health is already full. Otherwise, if the player's health is not full, then it will randomly either spawn a coin or the health pickup. The coin pickups can be further used by trading with a merchant discussed in the next section.

3.5. NPC

NPC is a merchant that talks to the player and allows the player to trade money to upgrade health and stamina. The NPC does not have any mechanism involved except being idle. The idea of the NPC is to initiate a dialogue to the player to invite to their shop and improve the health and stamina for the player in exchange for the money. These are the following events that happen when the player reaches the NPC merchant:

- On overlap: When the player overlaps with the NPC collision box, it will display a text.

- When the player presses the ‘E’ button, the shop opens to allow the player to upgrade either the health or the stamina in exchange for money.



- On end overlap: When the player leaves the NPC collision box, the text will disappear.

3.6. Level Design

This section talks about how the level was designed.

3.6.1. Tile set and trap

The first step is to create tiles where the player can walk on. There are plenty of tiles that were download as assets from an online site. They were all created to sprites. Then a

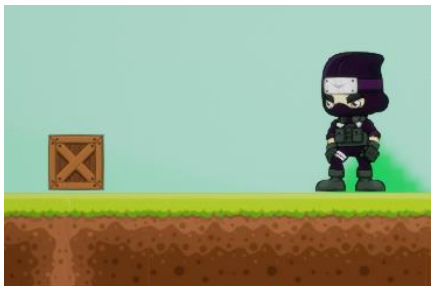
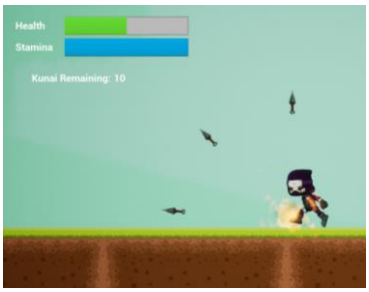
blueprint actor was created, and the sprites were added to the blueprint actor. Then added the collision so that the player collides with the tile and does not fall off. All the tiles created can be found under the directory "$Assignment2/Source/png/Tiles$".

Then they were placed onto the levels where the player could walk on those tiles. Each level shared one pause menu, but each level had different checkpoints that are discussed in the sub-section below.



The water tiles detect if the player has jumped in the water, if it has then it would kill the player instantly.

The similar process was used to create the trap. The difference is that it initiates an explosion audio, particle system and launches 5 kunai items when the player collides with the box. Therefore, in the blueprint actor, 5 arrow components were added inside the box sprite and on colliding they were shot at different angles. If the player collided with the kunai, the health would be damaged. Otherwise, the player successfully escaped the trap if it exploded and none of the kunai hit the player.

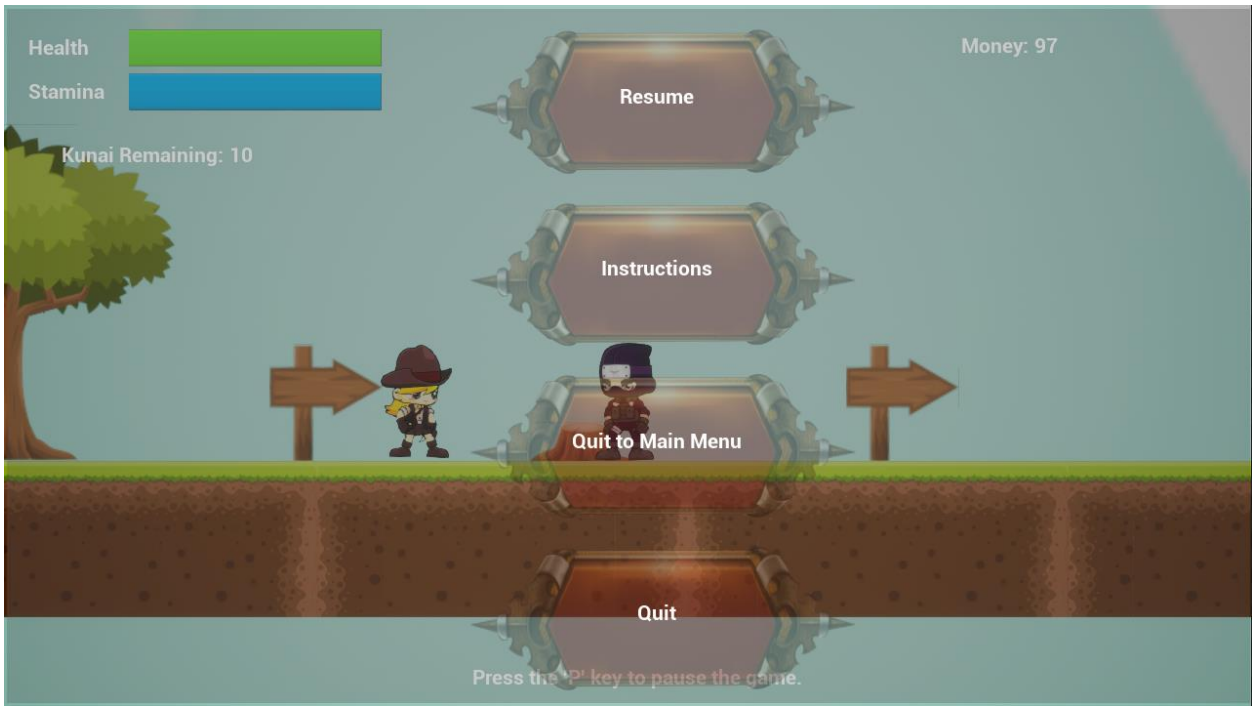



3.6.2. The Pause Menu

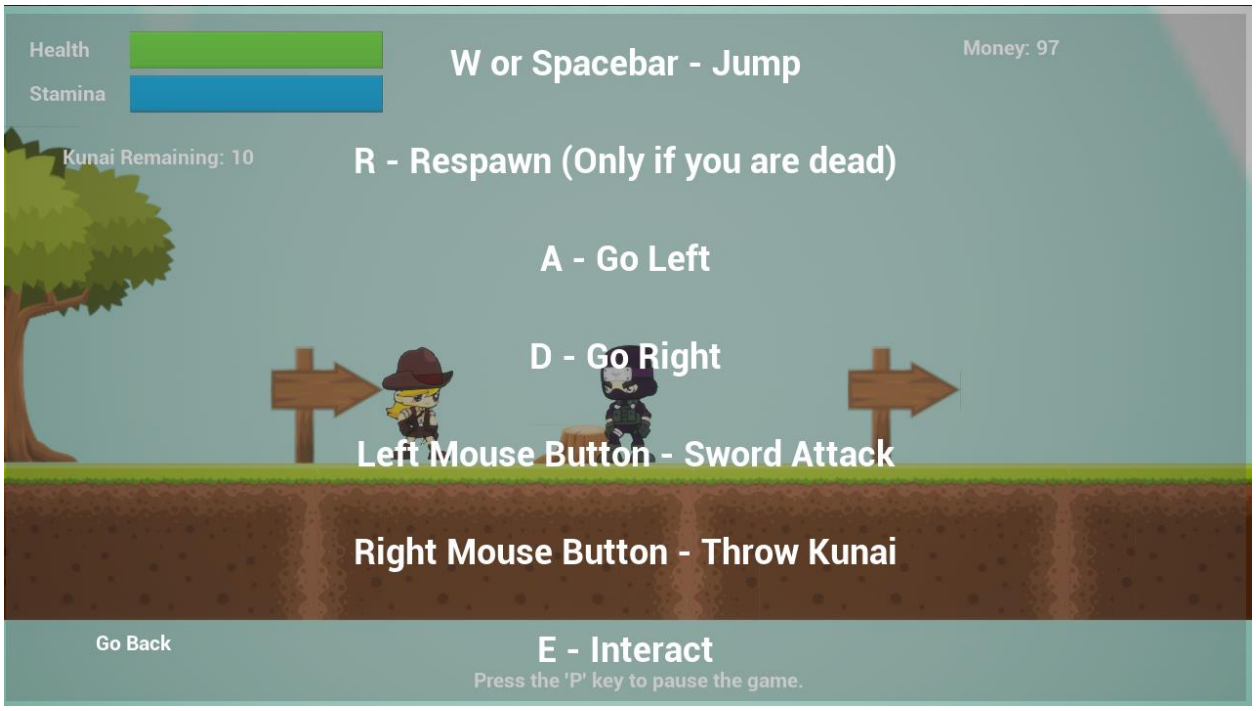
A widget for the pause menu was created and added to a blueprint actor. Therefore, when the player pressed the 'P' key the player blueprint called the pause menu blueprint and paused the game.

The options of the pause menu are:

- Resume: Continues playing the game.
- Instructions: Displays another widget assigned to another instruction blueprint actor which is called upon this button click and hence, displays the instructions to play the game at any given point in the level.
- Quit to Main Menu: Quits to the main menu.
- Quit: Quits the game.



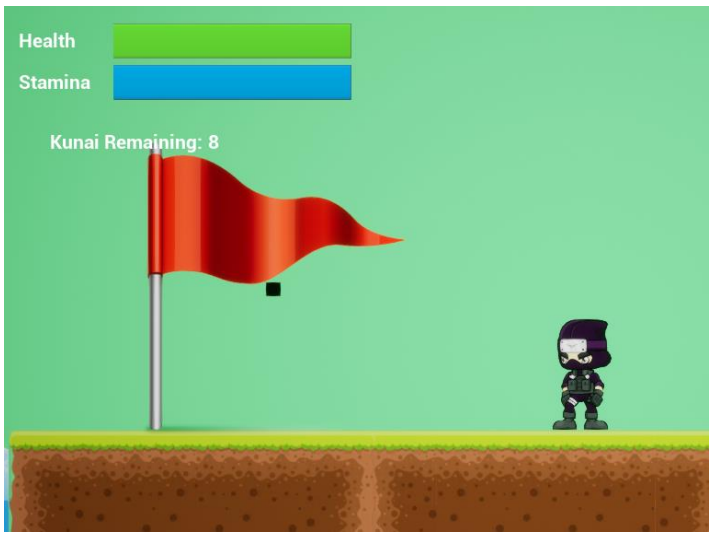
On clicking the instructions button, it will lead to the instruction screen:



The user can then click on the “Go Back” button to go back to the pause menu.

3.6.3. Checkpoints

Another distinctive game feature is to save the game when the user hits the checkpoint. The job of the checkpoint is to save the game and load another level. Therefore, when the player overlaps with the checkpoint collision box it checks if there is a previously saved game. If there is, it will overwrite the saved game otherwise, it will create a new one.



This will allow the player to access any incomplete level from the load game button in the main menu level.

3.6.4. Tutorial Level

This level was designed to introduce the player to the game and how to play the game. Therefore, this level was constructed with multiple collision boxes where the player would collide with and then a text would appear which would instruct the player according to the situation in the level. Once the tutorial was completed, it would re-direct the player to the main menu.

3.6.5. Level 01

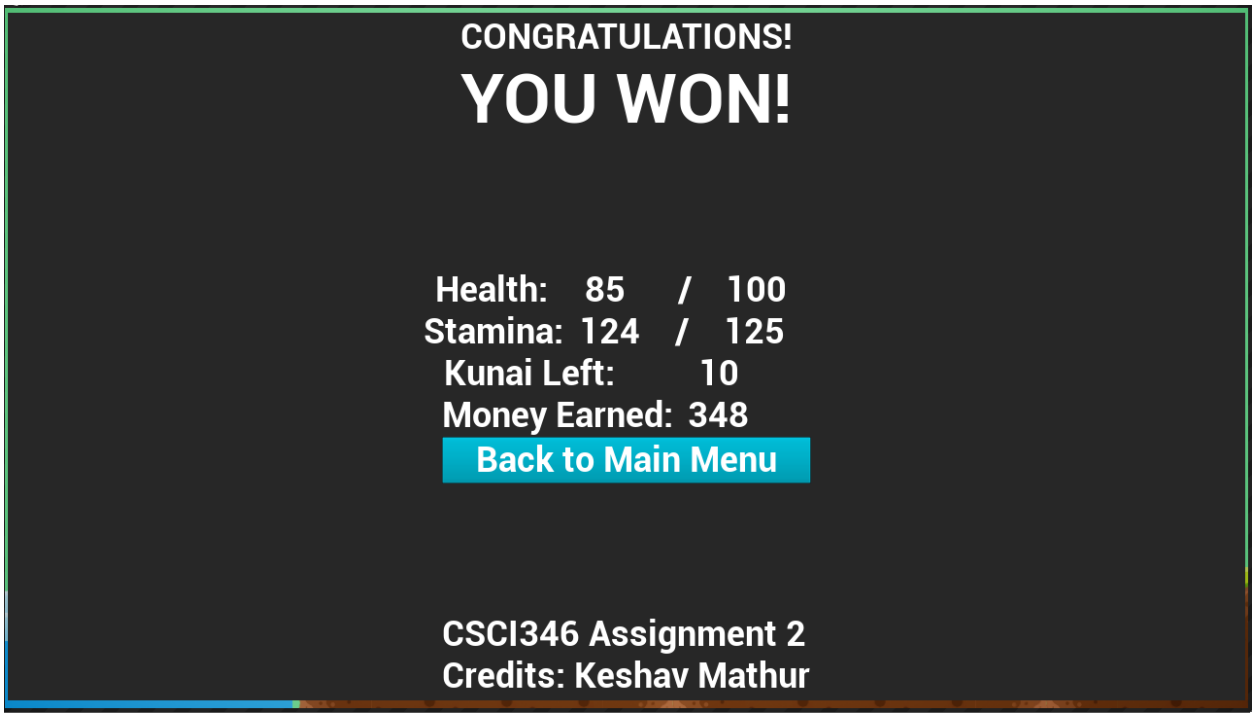
This level allows the player to get used to the game without any help. It is easy as there are only 5 knight 1 enemies and 2 exploding traps in the entire level and a merchant to help level up the player. Then a checkpoint at the end to save that the player has completed and next time to load level 2 directly.

3.6.6. Level 02

This level's difficulty has been increased up a notch. There are now 7 enemies with 4 knight 1 enemies and 3 knight 2 enemies including 10 traps and 1 merchant. This level should test the player to reach the final checkpoint and move onto level 3.

3.6.7. Level 03

This is the final level with 18 enemies and 14 traps. This will be the hardest level for the player to be able to fight through. Reaching the final check point the right way will not be easy as previous levels. Once the player has completed all the levels it will proceed to the final screen that displays that the player has won the game with player stats which will further re-direct the player to the main menu upon completion.



4. Test Cases

TOPIC	EXPECTED OUTPUT	OBSERVED OUTPUT	RESULT
4.1. Main Menu			
Tutorial Button Hover	Play Sound	Plays Sound	Passed
Tutorial Button Pressed	Play Sound	Plays Sound	Passed
Tutorial Button Clicked	Load Tutorial Level	Loads Tutorial Level	Passed
New Game Button Hover	Play Sound	Plays Sound	Passed
New Game Button Pressed	Play Sound	Plays Sound	Passed
New Game Button Clicked	Load Level 1	Loads Level 1	Passed
Load Button Hover	Play Sound	Plays Sound	Passed
Load Button Pressed	Play Sound	Plays Sound	Passed
Load Button Clicked	Load Latest Incomplete Level Played	Loads Latest Incomplete Level Played	Passed
Quit Button Hover	Play Sound	Plays Sound	Passed
Quit Button Pressed	Play Sound	Plays Sound	Passed
Quit Button Clicked	Quit game	Game Quits	Passed

4.2. Character Mechanism			
Idle	Stay Idle	Stays Idle	Passed
Left Movement – A	Moves Left	Moves Left	Passed
Right Movement – D	Moves Right	Moves Right	Passed
Jump Movement – W	Jump	Jumps	Passed
Jump Attack Movement – LMB + W	Jump Attack	Jump Attacks	Passed
Jump Throw Movement – RMB + W	Jump Throw	Jump Throws	Passed
Health Bar	Display Health	Displays Health	Passed
Stamina Bar	Display Stamina	Displays Stamina	Passed
Kunai Ammo	Display Kunai Left	Displays Kunai Left	Passed
Money	Display Money	Displays Money	Passed
Dead	Die if health reaches 0	Dies when health reaches 0	Passed
4.3. Enemy Mechanism			
Left Movement	Move Left	Moves Left	Passed
Right Movement	Move Right	Moves Right	Passed
Attack	Attack Player	Attacks Player	Passed
Dead	Die if health reaches 0	Dies when health reaches 0	Passed
4.4. Pickups			
Health Pickup	Increase Player Health	Increases Player Health	Passed
Coin Pickup	Increase Player Money	Increases Player Money	Passed
4.5. NPC			
Display Invite Dialog	Display Invite Dialog on Overlap	Displays Invite Dialog on Overlap	Passed
Upgrade Player Health	Upgrade Player Health	Upgrades Player Health	Passed
Upgrade Player Stamina	Upgrade Player Stamina	Upgrades Players Stamina	Passed
4.6. Level Design			
4.6.1. Tile set and trap			
Tile	Player should walk on the tiles	Players walks on the tile	Passed

Trap	Damage player if Kunai hits the player.	The player is damaged if the Kunai hits the player	Passed
4.6.2. Pause Menu			
Pause Menu	Open pause menu when player presses 'P'	Pause menu is opened when player presses 'P'	Passed
4.6.3. Checkpoints			
Checkpoints	Save current level completion	Saves current level completion	Passed
4.6.4. Levels			
Tutorial Level	Display instructions on how to play the game then open main menu when player finishes the level.	Displays instructions and opens main menu after finishing the level.	Passed
Level 01	Save the level on completion and load level 2	Saves the level on completion and loads level 2	Passed
Level 02	Save the level on completion and load level 3	Saves the level on completion and loads level 3	Passed
Level 03	Delete save game on completion and load the final message.	Deletes the save game on completion and loads the final message.	Passed

5. Discussion

The learning outcomes from this assignment were:

- How to create tile, tile sets, sprites, flipbooks, traps, and pickups.
- Developing simple enemy AI.
- Developing player character.
- Developing widgets.
- Understanding blueprint actors.
- How to program logic in Unreal Engine using blueprints?

- How to add simple audio on some interaction?
- Understanding the game design technique.
- What goes into game planning?
- Understanding all the best alternative starting points to start the game development for the proposed prototype.
- Patience, dedication and motivation required to make a game.

6. Conclusion

This assignment had been very exhaustive and fun at the same time to develop. Due to the time constraints I could not develop it to my heart's content but will improve on my game development skills given the time. It showed me what it takes to develop one simple game and how each small aspect of the game needs special care and understanding to be bug-free. Handling the bugs were the most tedious, annoying and exhaustive work ever but after finishing the game I was proud of what I had achieved. It gave me the motivation to work on the next project.

7. References

7.1. Tutorial

- Harm, E., 2018. *[UE4] How To Make A 2D Platformer*. [online] YouTube. Available at: <https://www.youtube.com/watch?v=gztYar1p36I&list=PLKMRiZuSgt-7wY7hfUzg8JcuTFXAf85jv> [Accessed 15 October 2020].

7.2. Assets

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