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**Project Night Terror System & Object Design**

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Version 2

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of Regina

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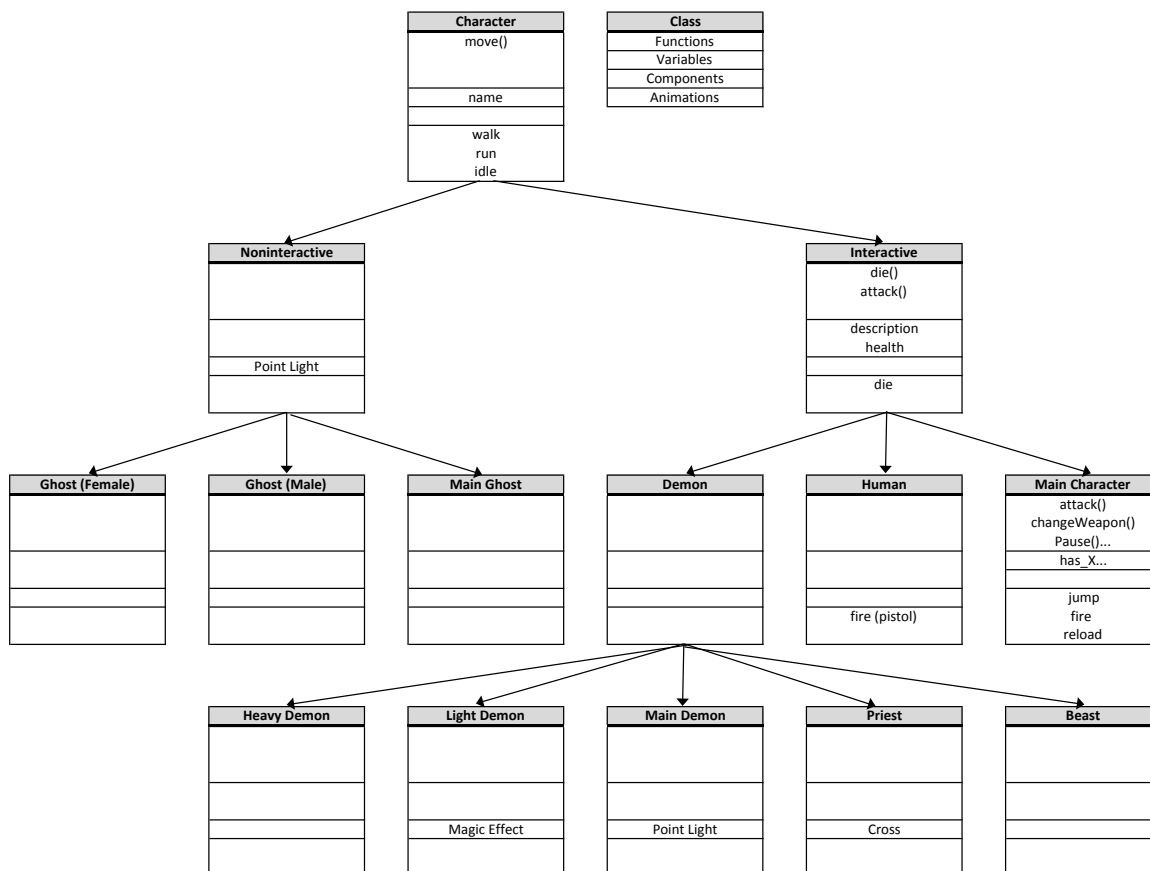
# 1 Introduction

## 1.1 Purpose

The purpose of this document is to outline and summarize the class diagrams and structures of Project Night Terror. It is important to note that as a game, there are very many structures involved. In response, this document will outline major classes, structures, and objects. It is also important to note that an Unreal Engine 4 Blueprint is a type of representation for classes and classes will be created through blueprints instead of text code.

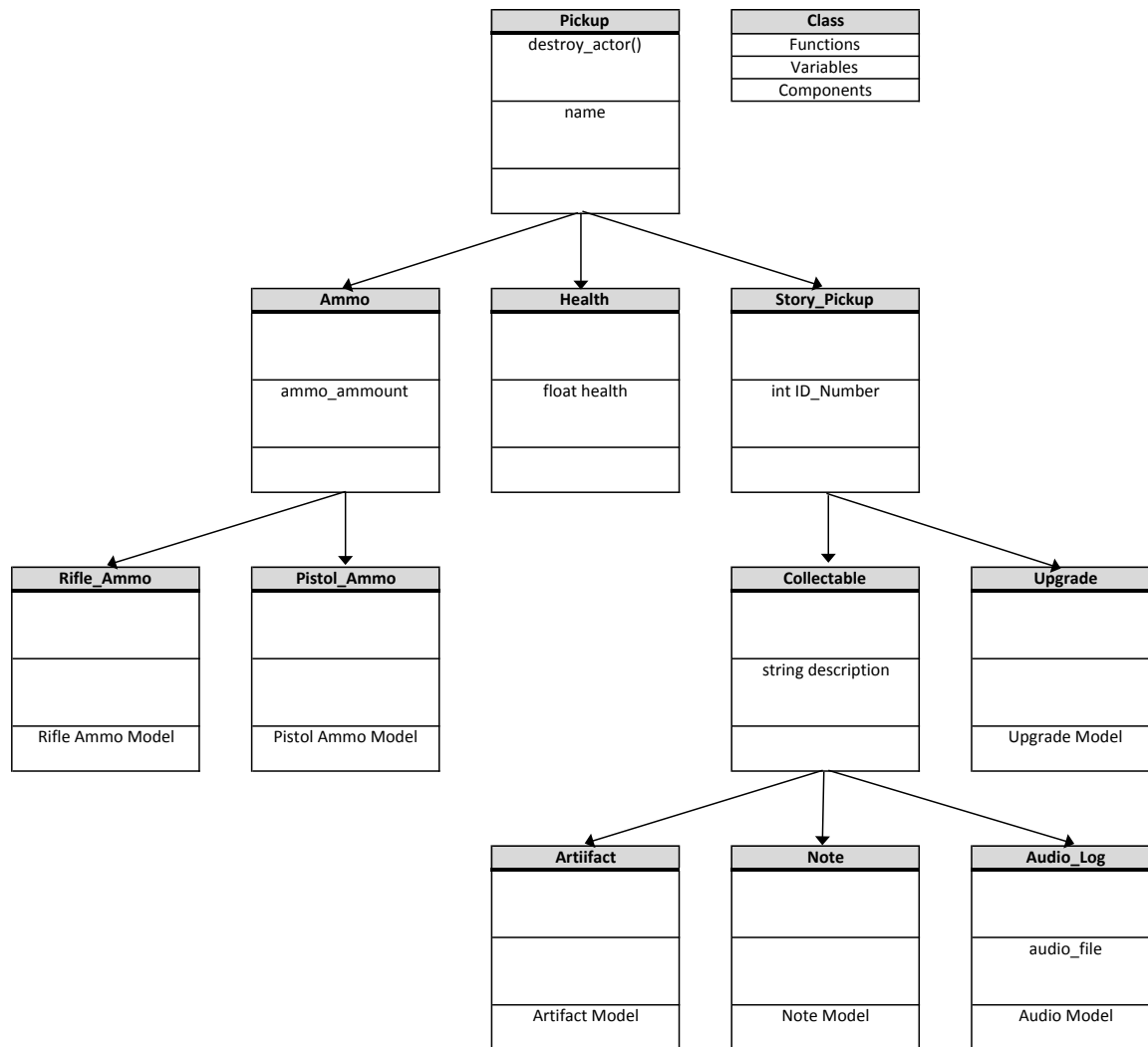
## 2 Class Diagrams

### 2.1 Characters



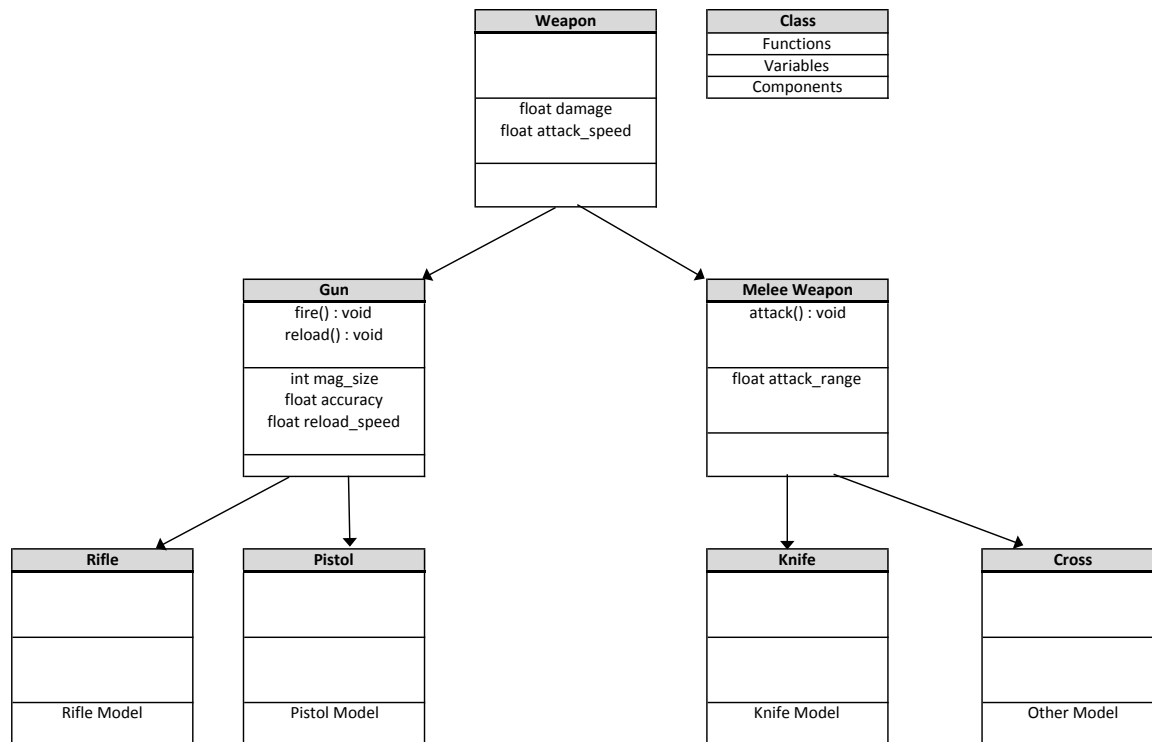
**Figure 2-1. Character Class Diagram**

### 2.2 Collectables



**Figure 2-2. Collectable Class Diagram**

## 2.3 Weapons

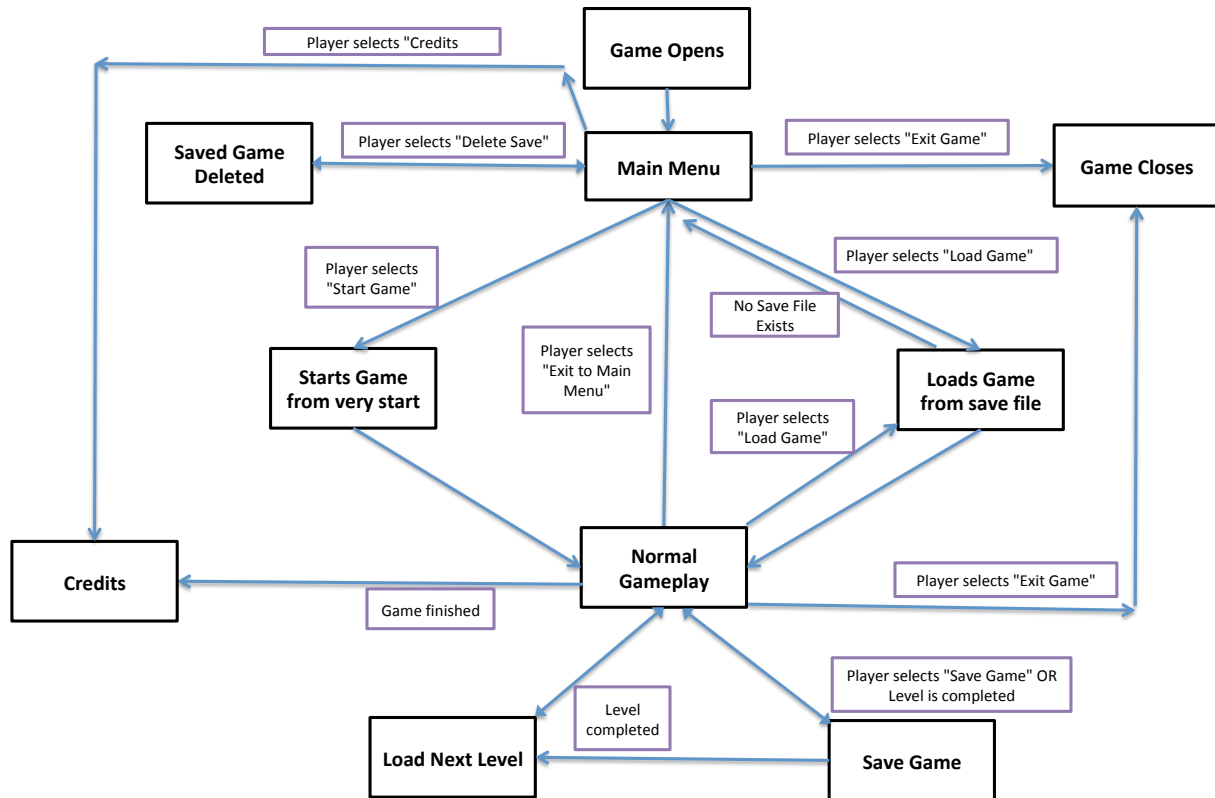


**Figure 2-3. Weapon Class Diagram**

### 3 Flowchart Structures

#### 3.1 Purpose

#### 3.2 General Game Flow

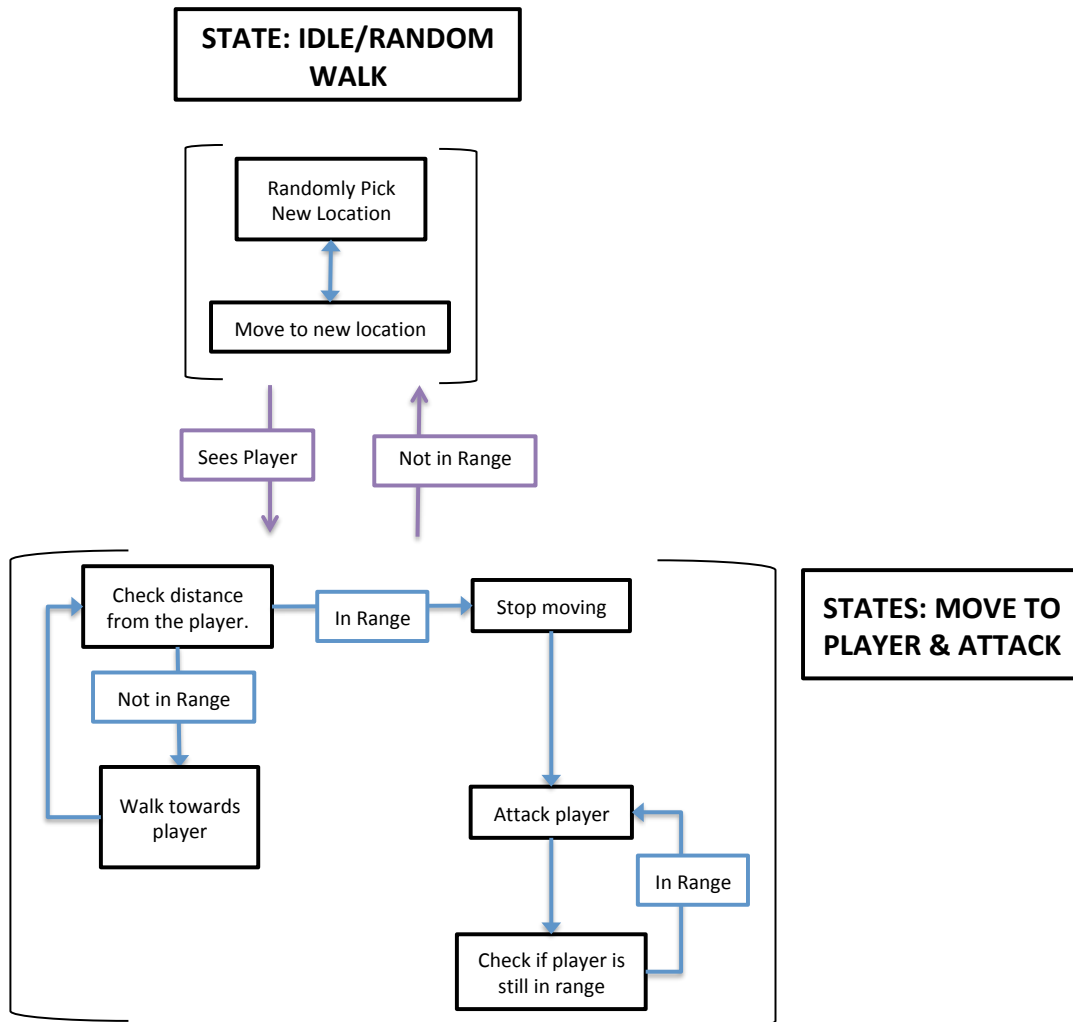


**Figure 3.2-1. Basic Flowchart of the Game**

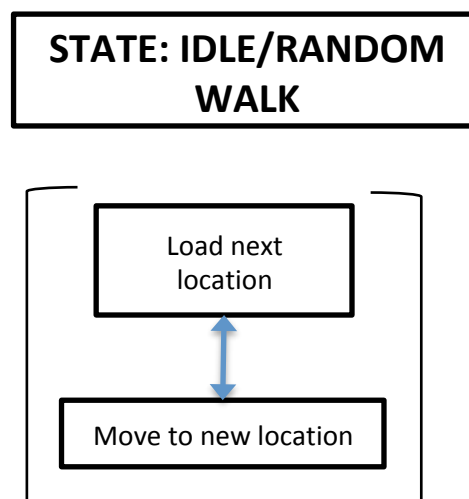
### 3.3 AI Behaviour State Flow

All demon characters follow the same general state machine. Upon begin play, the demon will either stand idle or will randomly walk to a randomly picked location within a navigation bound area. Upon seeing the player, the demon will move so they are in range with the player; if the demon is a ranged character they will stop further away from the player and will stop closer if they are a close combat demon. For example, light demons, the main demon, and the priest all have ranged attacks while the heavy demon and beast characters have short ranged attacks.

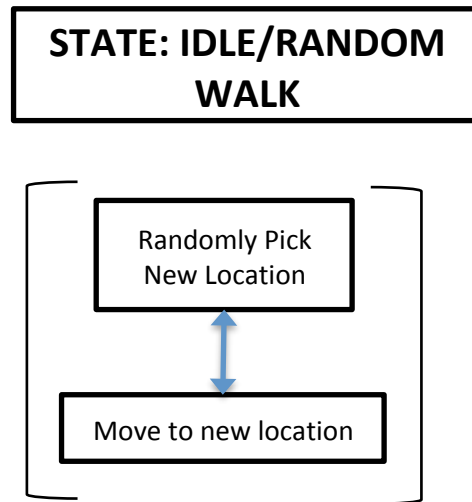




**Figure 3.3-1. Demon Flowchart**



**Figure 3.3-2. Main Ghost Flowchart**



*Figure 3.3-3. General Ghost Flowchart*

### 3.4 Saving & Loading

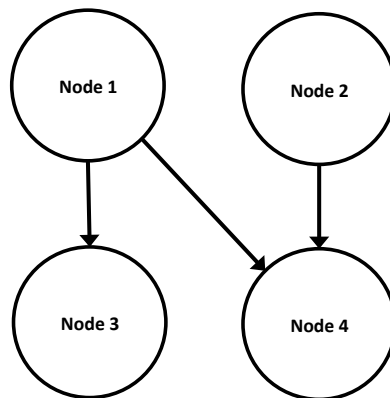
*Figure 3.4-1. Saving & Loading Flowchart*

## 4 Perk Trees

### 4.1 Purpose

Throughout the game players collect upgrades to enhance their character in different categories. The different areas are: health, flashlight, pistol, rifle, cross, and knife. The player can select any perk they want as long as all prerequisite parent nodes have been unlocked. Initial nodes in the tree can be chosen with no prerequisite nodes required.

For example, in Figure 4.1-1 node 1 and node 2 can be chosen right away. However, node 3 can only be chosen once node 1 has been previously chosen. Node 4 can only be chosen once node 1 and node 2 have been previously chosen.

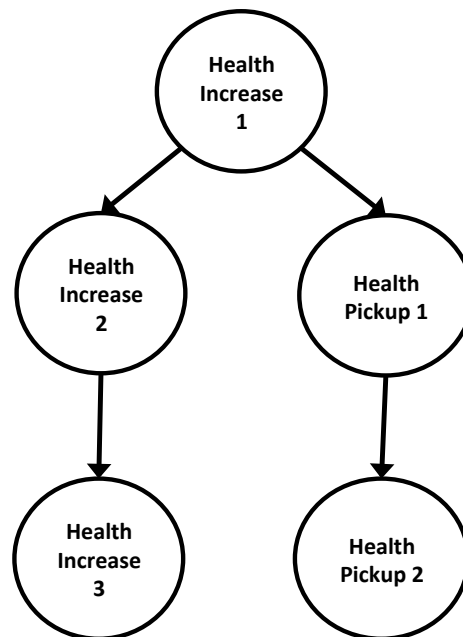


*Figure 4.1-1. Perk Tree Example*

For the scope of this project, only perks for health, the flashlight, the pistol, and the rifle will be implemented. Perks for the cross and knife will be created or implemented currently.

## 4.2 Health

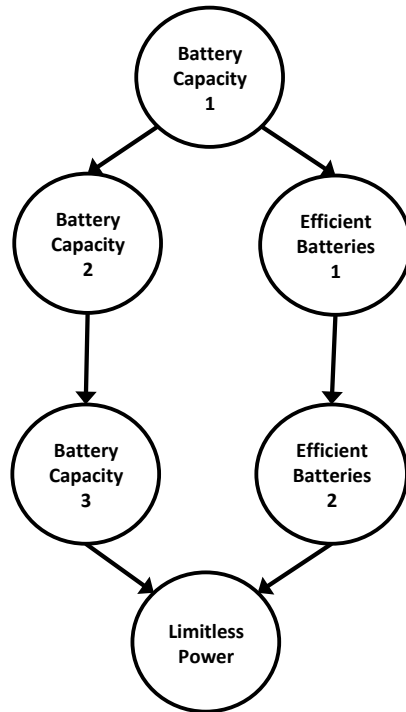
The health perk tree consists of 5 nodes shown in Figure 4.2-1. These nodes include permanent health increases to the player and also increases to the health gained from health pickups. *Health Increase 1* and *Health Increase 2* increases the player's maximum health by 25 and *Health Increase 3* increases it by another 50. *Health Pickup 1* and *Health Pickup 2* increases the amount of health gained by 10 each.



**Figure 4.2-1. Health Perk Tree**

## 4.3 Flashlight

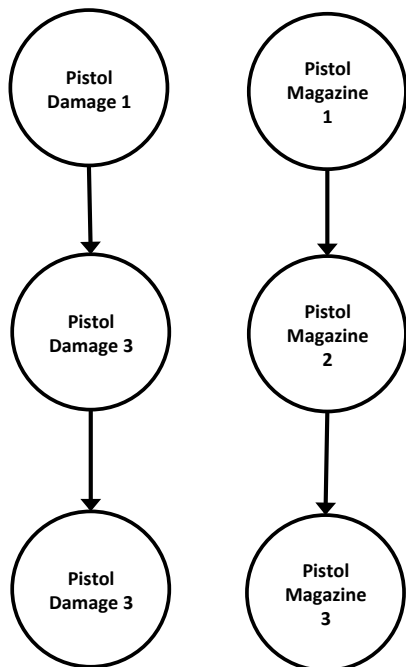
The flashlight perk tree consists of 6 nodes shown in Figure 4.3-1. *Battery Capacity 1*, *Battery Capacity 2*, and *Battery Capacity 3* increases the flashlight maximum charge by 25, 25, and 50 respectively. *Efficient Batteries 1* and *Efficient Batteries 2* decrease the speed that the flashlight runs out of power by 0.25s each. Finally, *Limitless Power* allows the user to have the flashlight on for as long as they want without having to recharge it.



**Figure 4.3-1. Flashlight Perk Tree**

#### 4.4 Pistol

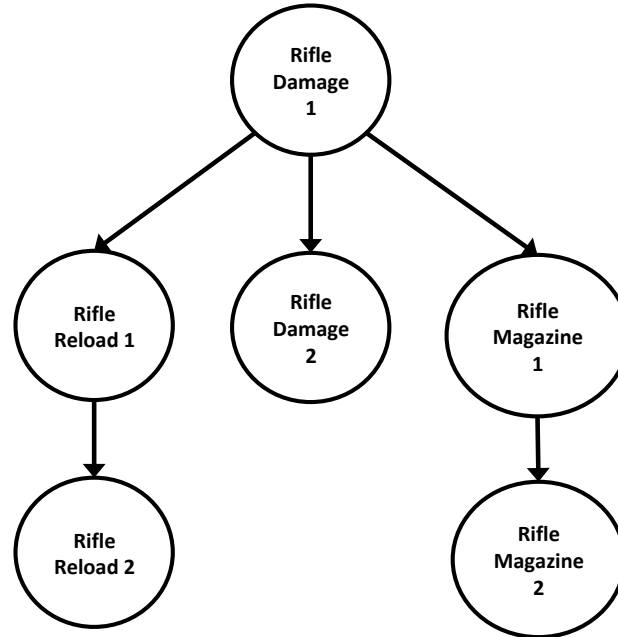
The pistol perk tree consists of 6 nodes shown in Figure 4.4-1. *Pistol Damage 1*, *Pistol Damage 2*, and *Pistol Damage 3* increases the damage dealt by the pistol by 10% each. *Pistol Magazine 1*, *Pistol Magazine 2*, and *Pistol Magazine 3* each increase the magazine size of the pistol by 2.



**Figure 4.4-1. Pistol Perk Tree**

## 4.5 Rifle

The rifle perk tree consists of 6 nodes shown in Figure 4.5-1. *Rifle Damage 1* and *Rifle Damage 2* increases the damage dealt by the rifle by 5% each. *Rifle Reload 1* and *Rifle Reload 2* decreases the time it requires to reload the rifle by 5% each. *Rifle Magazine 1* and *Rifle Magazine 2* each increase the magazine size of the pistol by 2.



**Figure 4.5-1. Rifle Perk Tree**

## 5 Blend Spaces

### 5.1 Purpose

A blend space is used to create smooth animation transitions for characters when certain variables are constantly being changed or updated. In this application, all transitions are based on the character's speed and direction. The blend spaces are used alongside state machines that, given the character's direction and speed, will play a specific animation. Animations are added to discrete points on the blend space graph so the state machine knows which animation to use based on the variable input described above. If the variables are not on one of those specific points then the animation that is used will be a blend of nearby animations that creates a smoother transition.

### 5.2 General Blend Space

All character blend spaces follow the same variables, coordinate system, and general animation set up. The animations will be slightly different depending on what the character is currently doing and who the character is. For example, the main player character will have multiple blend spaces for each item they have equipped, as the animations will be different. The player will still have the basic animations in the

same locations (walk, walk left, walk right, etc.), but the animations will reflect the item they have such as holding a rifle would use rifle walk, rifle walk left, rifle walk right, etc. in place of walk, walk left, walk right, etc.

***Figure 5.2-1. General Blend Space Graph***

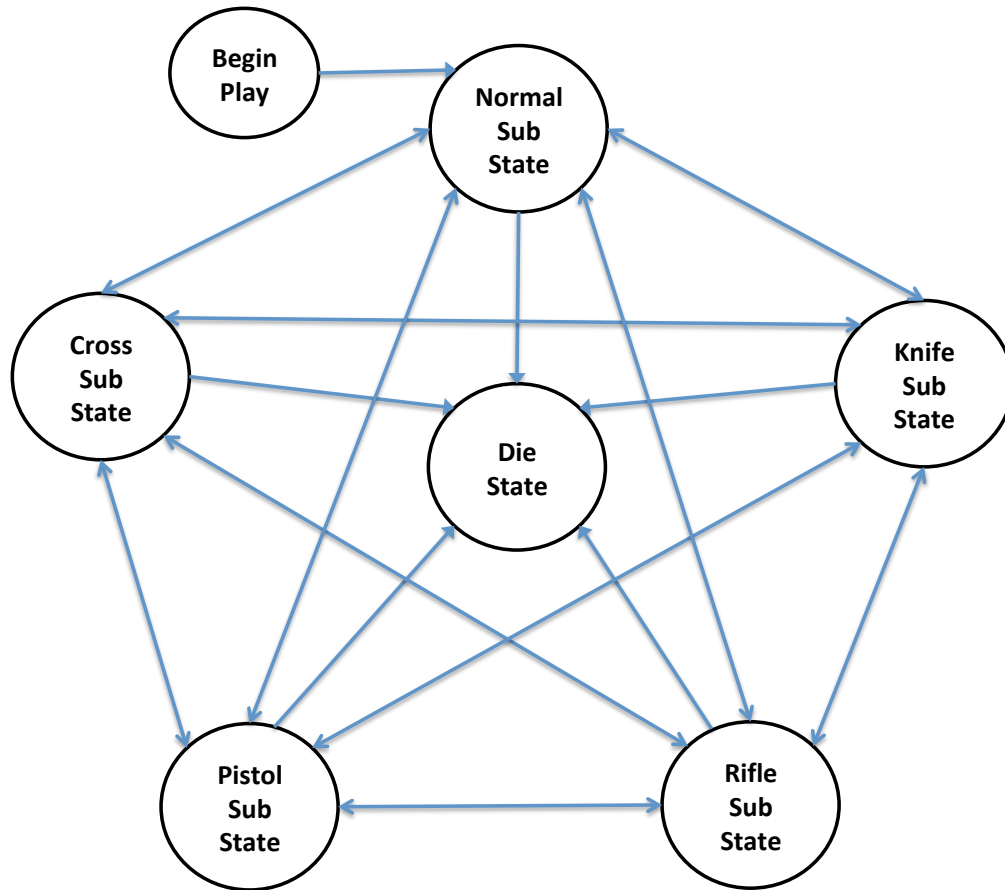
## **6 State Machines**

### **6.1 Purpose**

The state machines described below allow the characters to move from one animation state to another. The state machines allow for better and smoother transitions created by blend spaces. This also allows separation and use of unique animation subsets such as normal movement blend spaces versus movement with a weapon blend spaces.

### **6.2 Main Character**

The main player character has multiple sub state machines that make up one large machine to reflect the items that they are currently using. The main state machine, only showing the sub state machines and the transitions is shown in Figure 6.2-1. The transitions between these sub states are controlled by an equipped integer variable that updates when the player swaps between items or has no item equipped. It is important to note that all sub state machines can enter the *Die* state at any point and does not need to transfer to other states first. It is also very important to note that although not planned or intended, the main state machine is a pentagram; this is very fitting for the feel and mood of the game. Laudate satanico sint status machine.



**Figure 6.2-1. Main Character Main State Machine**

When no item is equipped, the player uses the default Walk-Run sub state machine shown in Figure 6.2-2. This allows the game to display the correct animations while the user is walking, running, or idle.

**Figure 6.2-2. Main Character Walk-Run Sub State Machine**

When the rifle is equipped, the player uses the rifle sub state machine shown in Figure 6.2-3. This allows the game to display the correct animations while the user is walking, running, or idle with a rifle. The rifle also utilizes reload and fire states for additional animations. These two states do not have blend spaces associated with them as character speed and direction will not impact the animations. A very similar state machine is used for the pistol since the actions the player goes through are the same. The difference between the pistol sub state and the rifle sub state are the blend spaces and animations used.

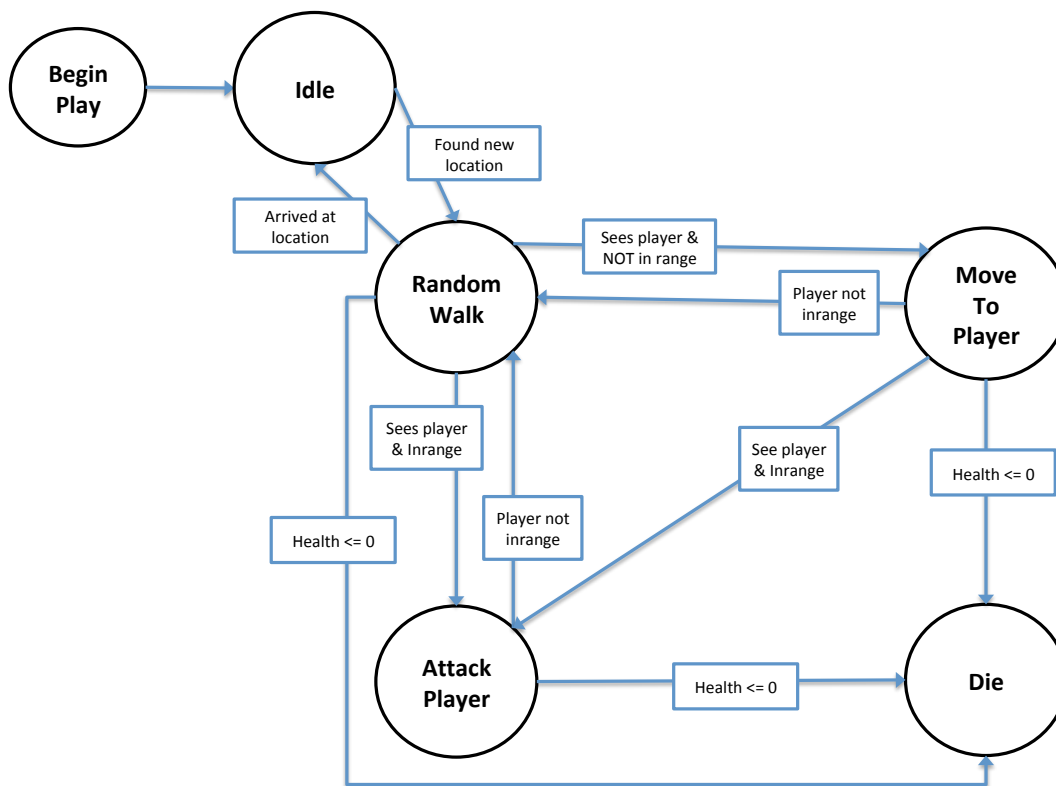
**Figure 6.2-3. Main Character Rifle & Pistol Sub State Machines**

When the cross is equipped, the player uses the cross sub state machine shown in Figure 6.2-4. This allows the game to display the correct animations while the user is walking, running, or idle with a cross. The cross also utilizes an attack state for an additional animation. This state does not have a blend space associated with it as character speed and direction will not impact the animation. A very similar state machine is used for the knife since the actions the player goes through are the same. The difference between the cross sub state and the knife sub state are the blend spaces and animations used.

**Figure 6.2-4. Main Character Cross & Knife Sub State Machines**

### 6.3 Demon Characters

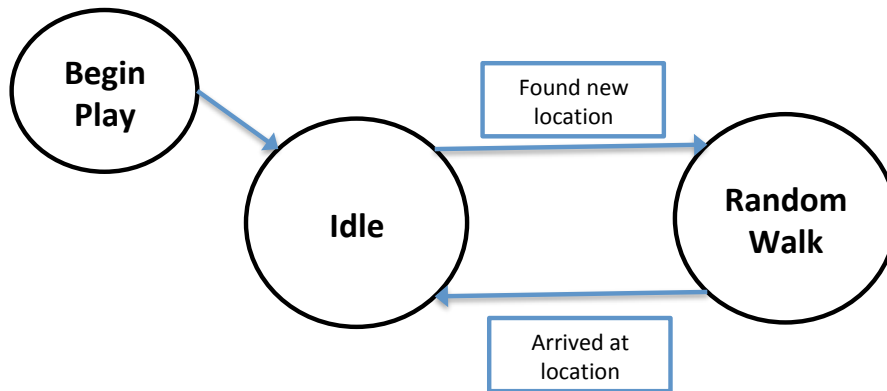
All demon characters follow the same general state machine. The demons will stand idle when finding a new location, walk when the location is found, move to the player when the player is close enough, begin to attack the player, or die if their health drops equal to or below 0. These five specific states are shown below in Figure 6.3-1.



**Figure 6.3-1. Demon State Machine**

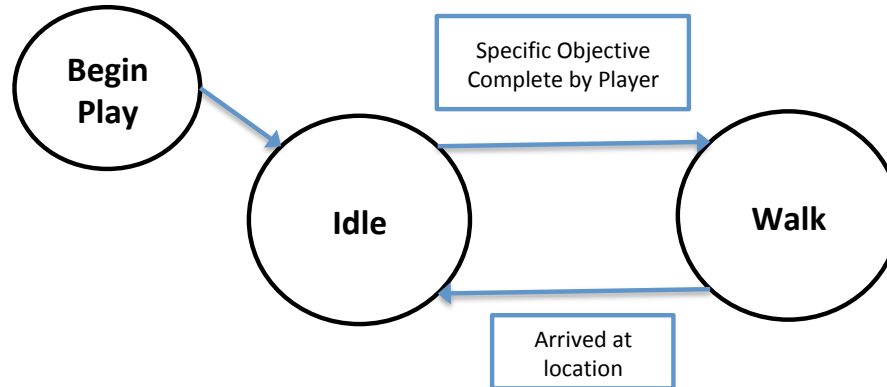
### 6.4 General Ghost





**Figure 6.4-1. General Ghost State Machine**

## 6.5 Main Ghost



**Figure 6.5-1. Main Ghost State Machine**