Unity Games Development: Design and Plan

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1 Introduction

With several development sprints having been completed for the game so far, progress in various areas has been achieved to a level sufficient enough for this document to outline the implemented systems and discuss their purpose and relevancy within the entire project. Clear justification and honest evaluation for the current systems within the game will improve the organization of future development and allow for a more straightforward implementation of any remaining systems. Furthermore, the highlighting of currently implemented features will provide a great visualisation and outline for what is to be expected of the game in its final state.

2 Overview

The game is a first-person wave shooter with a built-in economy system, multiple different maps and a variation of in-game objectives, providing diverse and unique gameplay experiences with every attempt. The game takes many elements from action and shooter games in order to situate itself properly within those genres, while also employing minor elements from games within the horror genre as a way to bring together overarching thematic choices by providing them with an adequate degree of context. While still important, the aforementioned horror elements will be minimal as to not detract from the genres at the forefront of this game. Nonetheless, the balance of these genres is largely appropriate for the entire game at hand.

2.1 Core Concepts

The ability for the core game to be replayed many times to a maintained, enjoyable standard is imperative to its success. Massive effort and thought were placed into constructing the outline for the games core gameplay loop that would be at the root of all the experiences each player will have with this game. Progress within the game revolves around earning currency and using it to better the player so that they may then survive for longer, either through player upgrades of some kind or through expansion of the area available to the player. This cycle will then repeat, with enemies growing in difficulty as the waves progress in order to incentivise the player to make the necessary improvements. In order to implement this loop effectively, the player must start within a confined area of the map and should only be granted a basic arsenal that is sufficient enough to earn currency. This loop will remain consistent, even when other aspects of each replay are altered, such as what map is being played or what final objective the player is working towards.

The most apparent objective to the player will be to simply progress through the waves in an attempt to obtain the highest possible wave that they can. This will ultimately be a test of endurance for the players that will promote close investigation into many areas of the game in order to locate new optimisations and strategies in order to make the process of obtaining higher waves more efficient. Although out of scope for the project, a great way to accentuate this system would be to include a variation of a leaderboard system that would allow players to share their highest achieved waves with everyone.

Another objective that will be provided to the player will be the unique questlines implanted into the individual maps within the game. Featuring multiple smaller steps, the questline will offer a separate challenge that will take place across the entire map and will attempt to thoroughly test

the players ability to solve puzzles and find the next possible steps. This will offer a more linear experience for the players that find that to be more preferable than the more arcade-like playstyle offered by the standard wave system, which will not be forgotten even if the player is focused on the questline. It will be required of the players to balance both as a test of their abilities and to not alter the game too much in an attempt to maintain its core identity. Nonetheless, the questlines available will be completely optional in an attempt to not detriment the experience for all players.

Smaller objectives, similar in nature but entirely unrelated to the questline, will also be present in the games maps for the player to find and complete. These will be intended to only provide the player with small benefits within that replay, having little impact outside of that or on the game as a whole. While rather inconsequential, this does add to overall level of content available to player during any replay.

Ample levels of side content can provide fresh and new experiences for players for a large amount of time, making the game much more worthwhile for them to dedicate their time to for any quantity of time. The combination of all progression methods should be able to achieve the desired result of providing players with varied experiences for a long period of time. Even when all has been discovered by the player, the core systems of the game have been constructed in a manner that encourages the player to replay and continue to enjoy the game, free of tedium and boredom for any of the many different types of players that may gravitate to the game.

2.2 Inspiration

The game takes inspiration from many others within the genres it has placed itself within. As such, heavy attention was given to other first-person shooter titles, especially those that overlap with the horror genre in the same manner this game does. Three games are notable in providing heavy inspiration to this game, with those being Left 4 Dead, Sker Ritual and Call of Duty. The most influential of these is Call of Duty, however specifically the titles within the franchise that contain some variation of their Call of Duty: Zombies alternative game mode. While not a standalone game, the game mode has become very popular and is very similar to the proposed outline for this game. Figure 5 is an image taken from within one of the games in this franchise and will serve as a point of reference when constructing select systems for this game.

2.3 Unique Features

In order for this game to successfully come together it must be unique and not just a copy of one of the games that it is inspired be. For this to be achieved, development of the game will take more care to improve the versatility of the game, making it more accessible and appealing to a wider audience. Furthermore, the systems inspired by other games will be altered enough to provide a definitively unique experience that would not be achieved by playing any of those games.

2.4 Target Audience

Another aspect of the games that inspired this one that can be translated over is their target audience. Being situated within the same genres, the predominant target audiences will be fairly similar to one another. The target audience for a first-person shooter game is young men aged between 15

and 35. The people that are most likely to be interest in this game will likely fit into this demographic, however there is hope that the scope of the target audience will be further expanded due to the diverse gameplay attempting to be constructed by this game.

3   Design

The game will utilise an increasing popular visual style in the modern game development landscape, in which low poly models are used in conjunction with impressive lighting and digital effects.

The use of low poly 3D assets provides many benefits to development. As they are becoming increasingly popular, they are easy to locate and acquire from online marketplaces. If something is not found on an online marketplace, it could potentially instead be constructed from scratch. Furthermore, low poly assets grant better performance to the game and reduce the final file size. The lighting and effects previously mentioned will be used to highlight and accentuate the models and the constructed environments. When they are all combined together well, they create something very visually appealing.

3.1   Engine

Unity was the engine chosen to develop this game, with the choice being made very early on. The biggest reason for using Unity over any of the other options was ultimately the foundation of support that it had and the accessibility of that support. Within lecture and lab content, there is a greater level of knowledge and support for Unity development. Furthermore, there is a surplus of tutorials, documents and other resources that can be found very quickly online. These reasons made Unity appear to be the sensible and secure option for the development of this game. Beyond this, the scale of the game aligned closely with the scale of other popular games also developed in Unity. It appeared to be the best option for the balance of scale and performance.

Unreal Engine was also a contender for the game engine to be used. Unreal contains many of the same feature, accessories and systems that are found within Unity. Furthermore, Unreal has shown to be very impressive in creating large scale, AAA [1] games. On the other hand, personal usage and experience with the new version of Unreal Engine have allowed me to conclude that it would not be the most suitable option for the game. Unreal Engine 5 is a much larger engine than any of the others considered for this game. It is known to create final products with a much larger file size, something that was substantially different from the direction this game needed to be taken in. Lastly, support for Unreal is still plentiful, however the support within the in-person sessions would be less than that of Unity. It is because of these factors that Unreal Engine was not considered further as a potential candidate for this game's engine.

The last potential option considered for the game was the Godot Engine. Godot is a free and open-source game engine, making it very appealing for many – especially those developing independently. Furthermore, it is incredibly lightweight while still containing an impressive set of features for development. Although there are a large number of positives, Godot support in person was going to be non-existent and as such, development using it could potentially become very difficult with no support to help realign the project.

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[1]AAA or Triple-A refers to games made with a high budget and using a large development team.

Upon review of all the possible engines and weighing their positives and negatives, Unity was the engine that best aligned with the game as a whole. It will be able to continue to support the expansion of the game through development and can do so effectively and efficiently. The large collection of support for Unity means that development will be able to effectively move past any issues and continue with minimal overall disruption.

3.2 Story

As it currently stands, the story and background of the game has not yet been fully developed as it is less important that the implementation of the many foundational systems. Nonetheless, it has been given some degree of thought.

Environmental storytelling is an impressive way to provide essential story information to the player and improve the maps within the games, making them feel more relevant and tied together. This would be the ideal method of imparting story information onto the player.

Using other methods, such as pages of text for the player to read, detract from the gameplay and take the player out of their immersive state. While sometimes necessary to give information in a similar manner, it will be minimised in this game and will be done in the best possible way in order to not detract from the gameplay or potentially confuse the player.

3.3 Controls

In the modern gaming landscape, there are an abundance of well-designed first-person shooter games. This has resulted in a great standard being found for the control schemes used within these games, which can then be taken and implemented into this game. The benefit of this is that players will be able to quickly pick up the control scheme and play confidently, as they would in many other first-person shooter games.

Currently in development, this control scheme is the extent of what has been implemented, however further plans are in place to expand on the control system. Support for controllers is very important, as it is common for a players preferred way to play a first-person shooter to be with a controller. Furthermore, allowing for controller support will hopefully allow for a greater degree of accessibility within the game, as controllers are sometimes not just a preference but instead a necessity in order for some players to experience the game to any degree.

The final planned aspect relating to the control system is a fully customisable set of controls that would allow the player to remap their actions to whatever buttons they desire. This will provide the player with an even greater level of accessibility support and should allow for anyone to play the game in the way they prefer or require.

3.4 Levels

To provide the player with a greater level of opportunities when playing the game, there will be multiple maps available to play. All will be thematically different and mostly disconnected to one another in order to provide unique experiences within each. Nonetheless, they will all serve the same general purpose and feature the same core gameplay loops. Furthermore, the inclusion of thematically distinct maps will help to widen the scope of people that may be interested in the game. In

order to achieve the goal of having many maps within the game, they will be of slightly smaller scale. This will be done to a level that is not a detriment to the overall experience of the map itself or the game as a whole but that will also allow for a more streamlined development experience of the maps.

3.5   User Interface

The design of any menu or UI element within the game will follow a set design pattern, being modern, angular and flat. This is not only to be clear and straightforward but to also be thematically consistent with the other graphical elements of the game.

The menus within the game will be constructed to be clear and effective. Relevant information and sub-menus will be grouped together correctly and not unnecessarily, in order to prevent there being difficulties locating certain areas. Menu control systems will be inspired by other modern games, allowing for appropriate and fluid movement between menu locations.

UI that appears during gameplay will also need to be clear and concise in order to not detract from the rest of the game. This will entail a well-designed and minimalistic HUD for the player and not much else. The HUD will provide the player with the essential gameplay information that would be impractical to show anywhere else.

4   Implementation

As it currently stands, only a select number of fundamental systems have been implemented into the game. These have so far established the game correctly as a first-person shooter, with other aspects yet to be implemented to full encompass the entire foundation of the game.

4.1   Player

The first and arguably the most important feature to be implemented into the game was the player themselves. This began with creating a rudimentary model and adding a camera that would allow the player to view the preliminary testing level. Controls were then implemented to allow for movement of the camera from mouse input. Further additions were added in order to make the camera behave more like any other first-person camera would, such as clamping the angle the camera can move when looking up and down.

Once camera controls were implemented, player movement was next. A simple script was created that allowed the player to move horizontally, taking advantage of the Unity input manager. Once this felt complete, jumping and sprinting were added in order to expand the available movement options. The implementation of jumping entailed adding a small collider to the base of the player model that would check if the player was touching the floor, allowing them the opportunity to jump. Sprinting detects if the left shift key is being held down and if so, provides a small movement speed increase to the player. The values for all the individual movement components needed to be fine tuned, however they are now in a good place and provide a well rounded and adequate first-person character controller.

The last major implementation relating solely to the player is the player UI. Rudimentary UI was given to the player in order to gauge the effectiveness of their proposed design and highlight

any issues that there may be. Nonetheless, it assists in making the character feel much more like those in other first-person shooter games. The design of the UI can be seen in figure 1, with its current level of implementation being seen in figure 6.
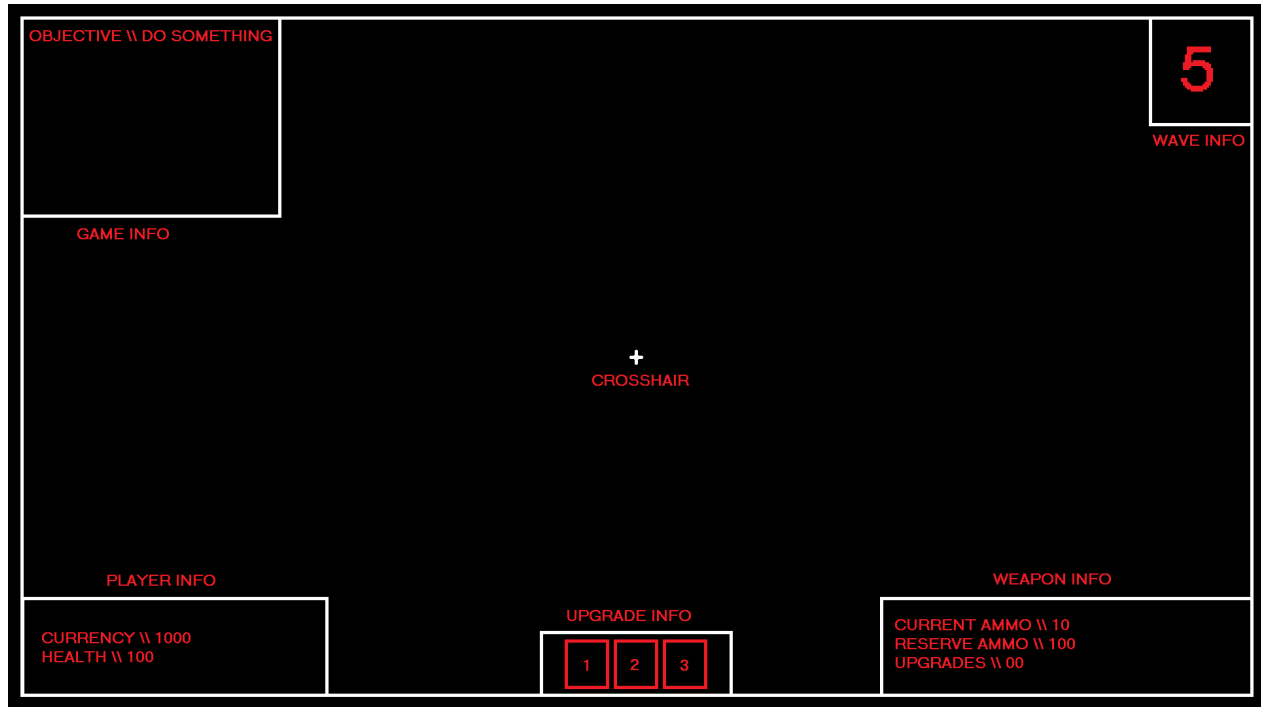
OBJECTIVE \\ DO SOMETHING

5

WAVE INFO

GAME INFO

+
CROSSHAIR

PLAYER INFO

WEAPON INFO

CURRENCY \\ 1000
HEALTH \\ 100

UPGRADE INFO

1   2   3

CURRENT AMMO \\ 10
RESERVE AMMO \\ 100
UPGRADES \\ 00

Figure 1: Mockup design of the player UI.

4.2 Enemy

Enemy systems were implemented after the player had been completed. Similarly to the player, rudimentary 3D models were constructed in order to serve as a representation of the enemy. This was then followed by the functionality of the enemy, beginning with the UI that would be used to convey essential information about the enemy to the player during gameplay.

A health bar system was created in order to indicate to the player how much damage the enemy has so far received. In order to maintain its effectiveness, it was ensured that the health bar would always face the player head on in order to avoid the possibility of the information being interpreted incorrectly due to distortions. Furthermore, the health bar only activates when there is an update to the enemy's health. This helps to minimise visual pollution at any given time, reducing the information always being given to the player in an attempt to prevent them from being overwhelmed.

The other major system implemented for the enemy was its artificial intelligence, used predominantly to locate and move to the position of the player. Utilising the navigation systems available within Unity, the enemies were assigned the role of an agent with the player as their target. A navigation mesh was then constructed using the current level geometry being used, allowing for the enemy to traverse effectively. The efficiency of this system was also improved through the utilisation
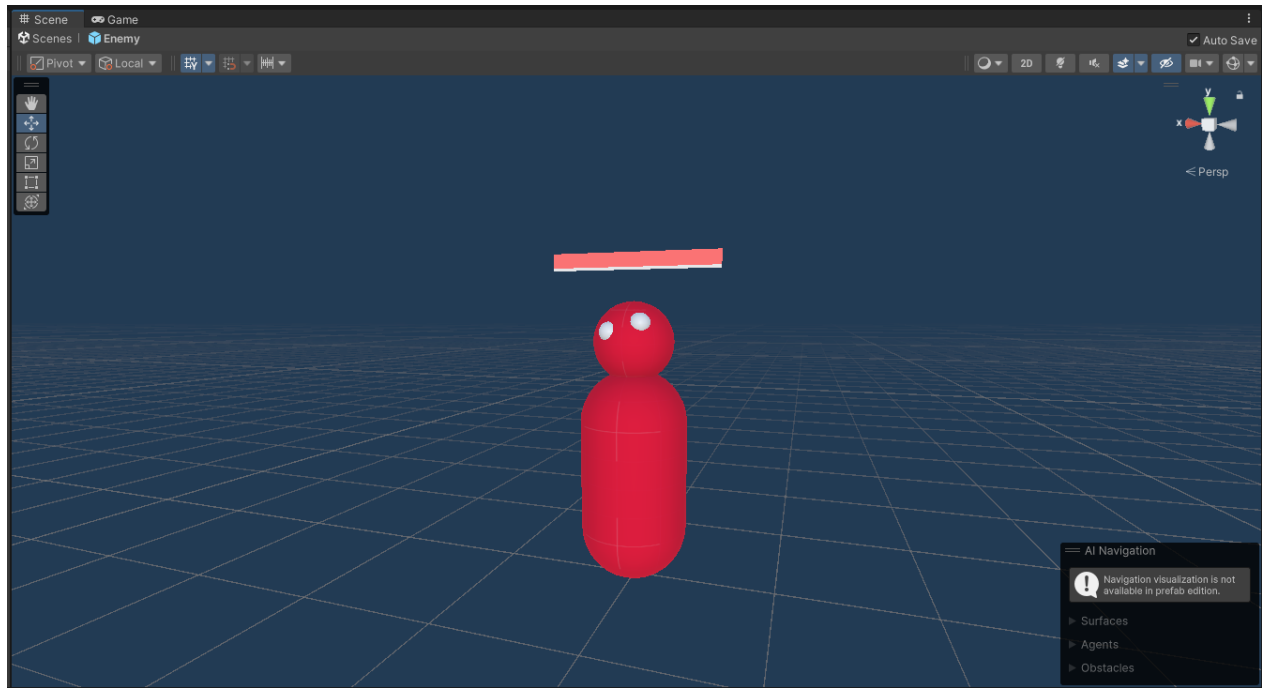
Figure 2: Enemy model with healthbar system.

of the A* algorithm in helping the enemy locate the player.

4.3   Combat

Combat systems could begin development after adequate player and enemy systems had been implemented. Initially, this consisted of constructing a very basic representation of a weapon for the player to hold which can be seen in figure 6. After this, functionality could be implemented. This consisted of a script that detects player button input, fires a ray cast and detects what has been hit by it. This would allow for signals to be sent to the recipient so that the event could be handled within the relevant script.

The script makes use of a weapon class that was constructed. The weapon class was built from the ground up to be easily adaptable and modular, as to make the addition of future weapons or the modification of current ones easier. The class contains several modifiable fields for the weapons attributes and statistics, such as the damage, the range, the rate of fire and if the weapon is fully automatic or not. This is all taken into consideration by the combat script.

A comprehensive health system was then fully constructed and given to the player and enemies. This health system is what handles the signals sent by the other facets of the combat system, correctly applying information like the damage. Furthermore, the health system is able to make distinctions between the area of the entity that has received damage. This allows it to calculate damage modifiers if necessary, such as if an enemy has received damage to its critical location. As is common for many other first-person shooter games, the critical location on enemies was chosen to be their head.

4.4 Levels

An appropriate testing level was constructed in order to validate and confirm the functionality of new systems. While not complex, it features large amounts of randomly places walls that were useful in testing the effectiveness of the navigation of the enemy AI. It can be seen in figure 3.
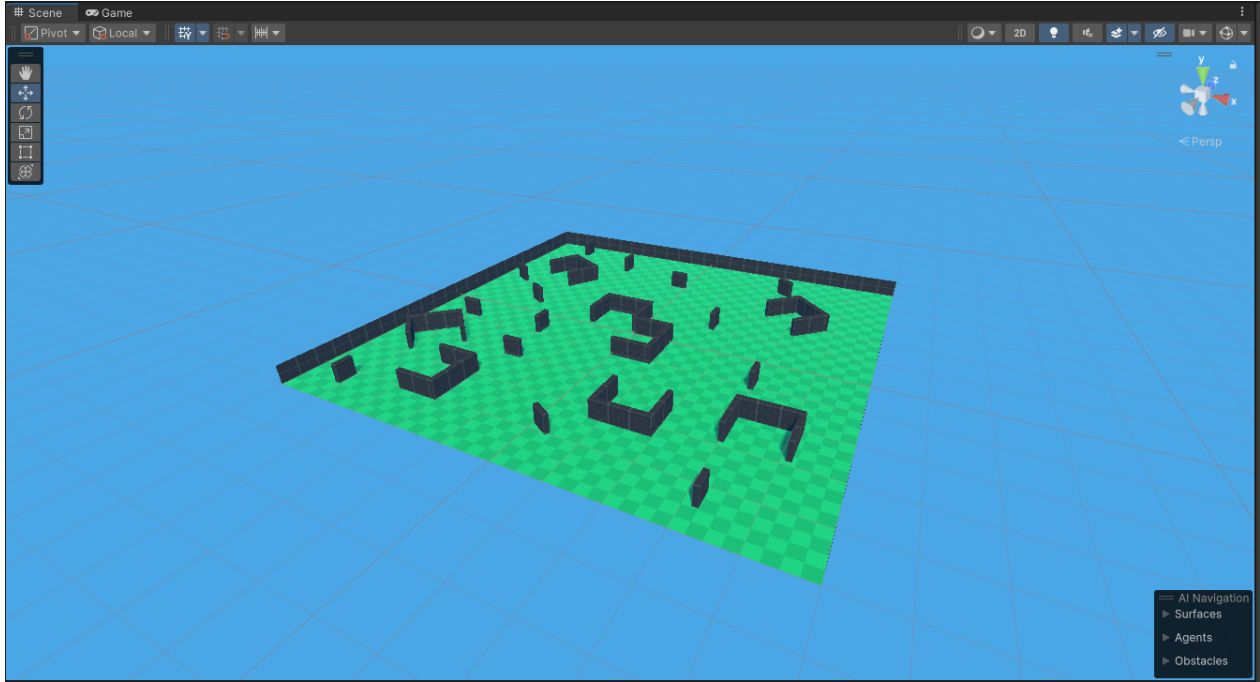

Figure 3: View of the testing map from above.

A basic and grey-boxed ^{2} version of the first level 'Farm' has also been constructed, using a rudimentary blueprint made specifically for it that can be seen in figure 7. It can currently be played and is as effective as the testing map, however is visually lacking compared to what the final version of the map is to be. Nonetheless, it can be seen in figure 4.

5 Conclusion

The development of the game is in a very appropriate place for the time that has so far been spent. With the correct pacing being continued from this point, all required features will be implemented within reasonable time frames, allowing for additional time to be spent ensuring that all systems are working together as intended and giving the final product other essential testing and cleaning.

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^{2}Grey-boxing is the process of building a prototype of the level geometry to a playable version, usually constructed only with grey boxes.
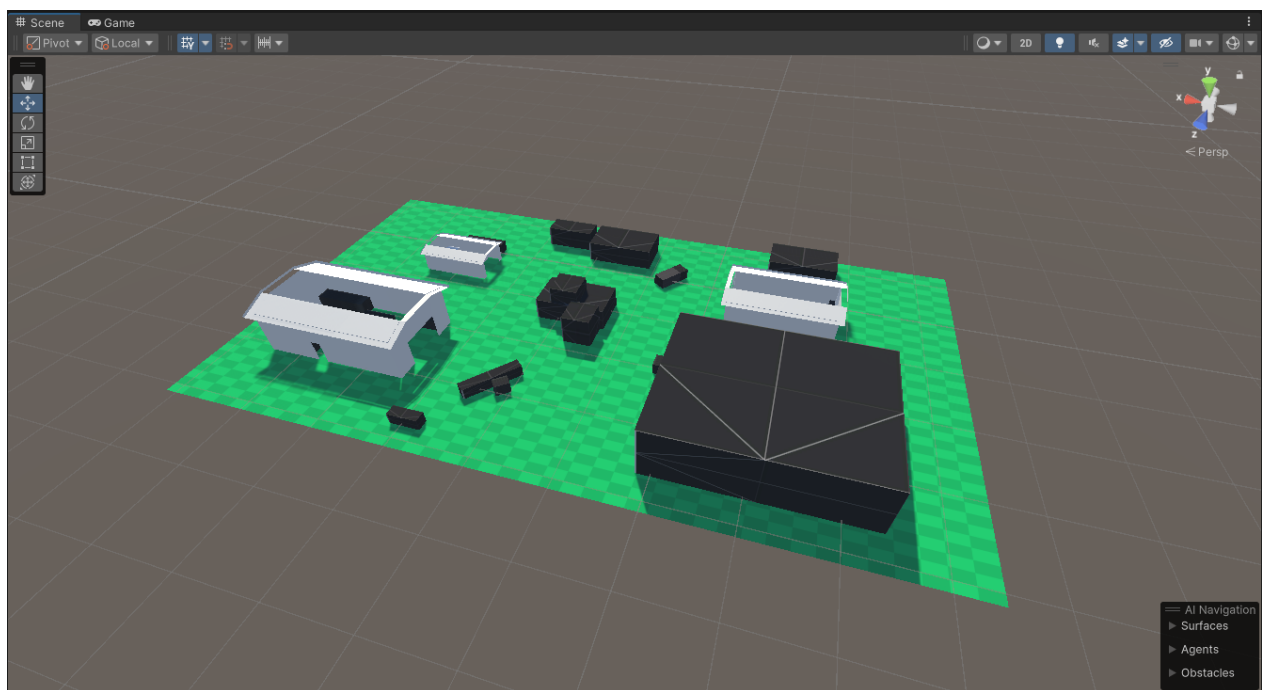
Figure 4: View of the farm map from above.

A   Image Gallery

Figure 5: A screen capture from *Call of Duty: Black Ops Cold War*'s Zombies game mode.
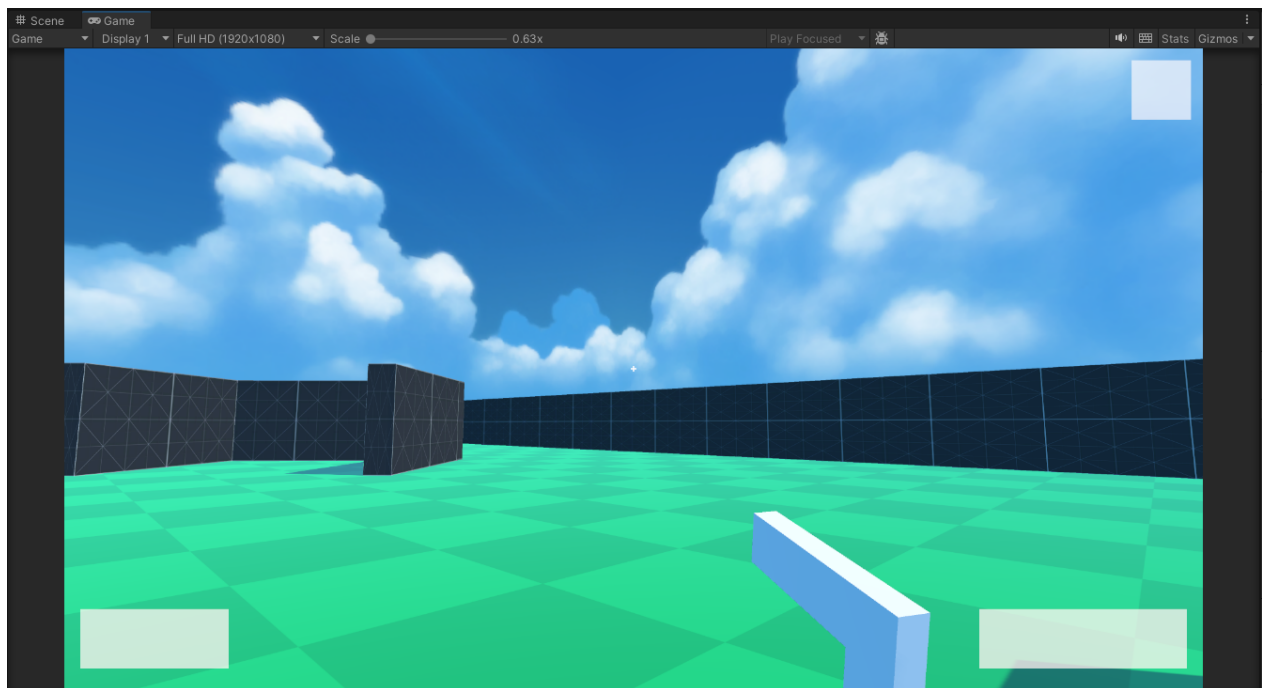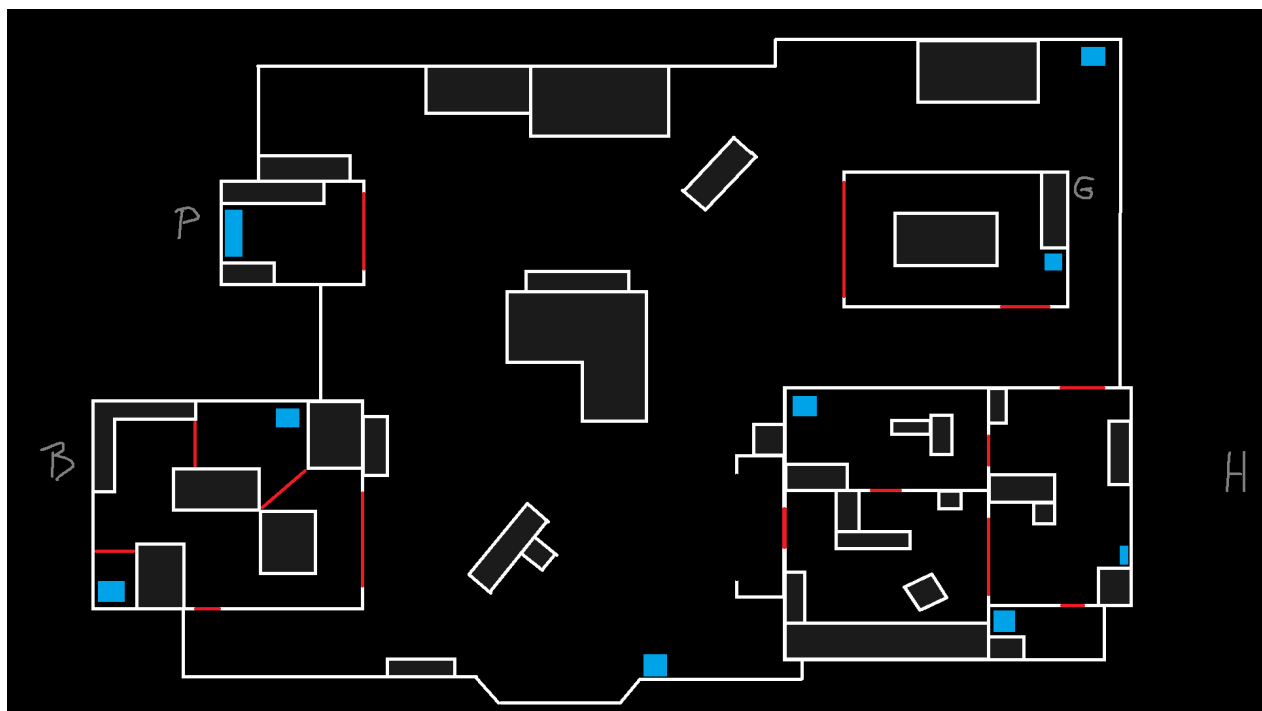
Figure 6: Weapon model and player UI as seen in game.

Figure 7: Blueprint of the farm map showing its layout.