

HCC FINAL PROJECT

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## **Introduction**

This project is a redesign of the UI and HUD of a previous game made during the spring 2025 semester, in a class about 2D game development for C++. The game was developed in visual studio using SFML over the course of 4-5 weeks in collaboration with two other students. We created a 2D top-down zombie shooter that features player movement, sprinting, gun swapping, as well as shooting and reloading mechanics. The player is tasked with surviving a total of 5 rounds with increasing difficulty through the use of these mechanics.

The class course put more emphasis on the functionality of the game and its systems, rather than making it visually appealing or user friendly. While the game functioned as intended, feedback from the professor notified us on how the UI not only made the game difficult to enjoy, but completely unenjoyable for someone unfamiliar with the ins and outs of the game. Moving into the fall, I entered a new course about human centered design with that same professor. This gave me the opportunity to redesign the UI and HUD of the past game with the purpose of evaluating and improving how the game communicates and interacts with the player. Specifically, the redesign focused on enhancing the UI readability, gameplay feedback, and user control through the use of an improved HUD, audio and visual cues, and menus. All this was done with the idea of reducing confusion and frustration, while improving the clarity, experience, and enjoyment of the player.

## **Background**

An effective UI and HUD design plays a critical role in how the player sees, controls, and interacts with the game. There has been research in game usability that shows how poorly designed interfaces cause frustration and makes it difficult for users to learn and understand what mechanics are available to them and how to properly use them. Pinelle et al. (2008) points out many common usability issues that are encountered in games like insufficient feedback and poor presentation of critical information. This makes it difficult for players to understand the current game state and take the appropriate action required for the situation. Their heuristics end up highlighting the importance of having a clear and readable HUD design that is still able to provide all the important information without being distracting, especially during fast-paced gameplay.

Feeding off this perspective, Caroux and Isbister (2016) focus on examining how the structure and presentation of the HUD influence the player's experience. Their exploration of clarity, visual hierarchy, and consistent information placement shows how significant of a role these elements play in the players comprehension and use of the mechanics. A well designed HUD will help players maintain situational awareness, while not overwhelming them. Novice players tend to rely more on UI elements, so understanding how to balance both permanent and occasional HUD elements is important to create an enjoyable experience for both advanced and beginner players.

## **Research Questions**

The purpose of evaluating whether the redesign of the UI and HUD improves player experience comes with the need to answer a few related questions. Does the redesign improve

the players ability to understand the game state (health, stamina, weapon status, round)? Does the new feedback systems, such as aim indicators, blood effects, and audio response improve the players responsiveness and situational awareness? Does the introduction of game menus like the pause, controls, settings, death, and victory menu improve usability, user control, and reduce confusion? After the redesign, the expectation is for players to report a higher level understanding of game mechanics, more responsiveness, usability, and an overall more positive impression of the game and its gameplay.

### **Study Design**

The design process for my project followed a somewhat linear path starting from the identification of the problem and idea to redesign my old game. Following this decision, I performed an analysis of the previous games UI and HUD before listing out all of the changes I planned to make. Using a paper prototype, a quick low fidelity redesign was made by including all the features that could be realistically implemented into it. Then using the low fidelity prototype as a visual guide, all the planned changes of the UI, HUD, and feedback systems were implemented.



## **First Iteration: Original Game**

The original version of the game featured a main menu, tutorial, movement, sprinting, aiming with the mouse, reloading, switching between two different guns, and a round based progression system. The main menu (Figure 1) screen simply acted as a buffer between booting the game up and starting gameplay, with its only feature being a ‘START’ button that goes from white to yellow when it is hovered over.

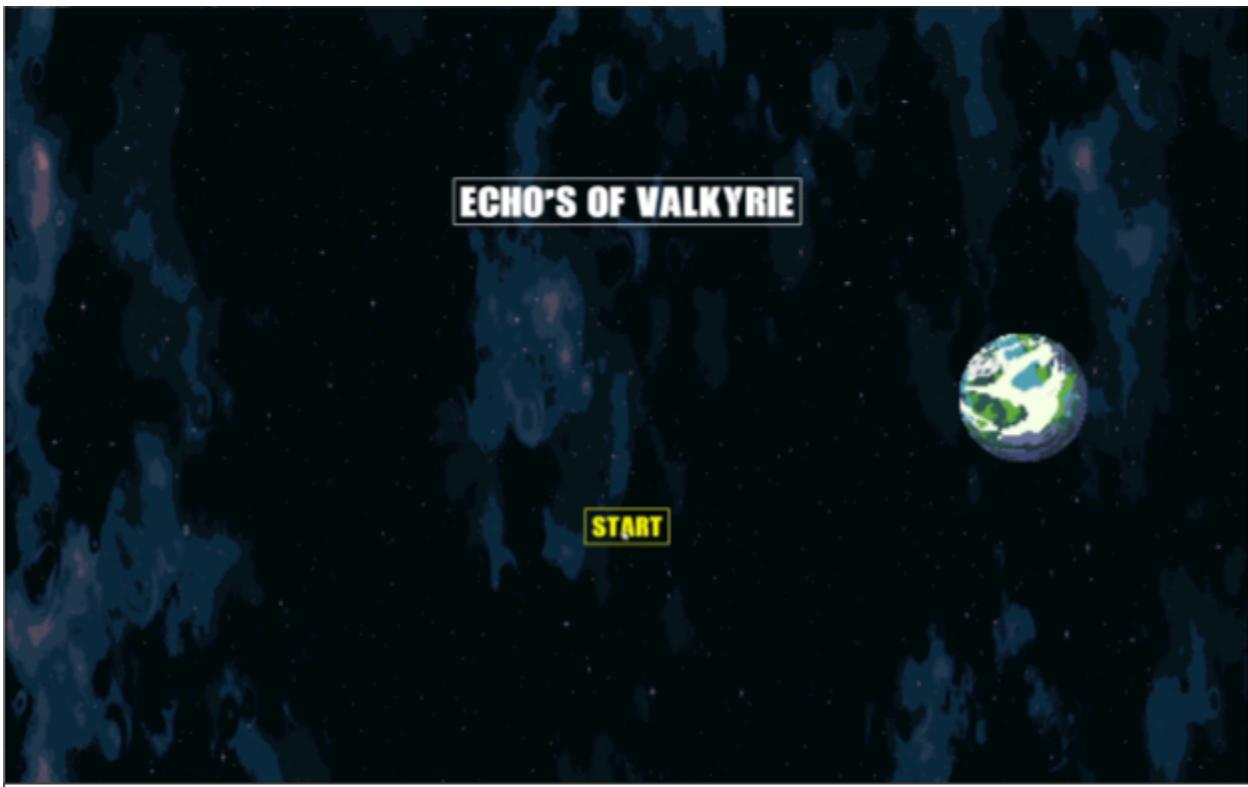


Figure 1: Old game’s main menu screen

After clicking ‘START’ the player is taken through a cutscene with some dialog before being placed in the tutorial. The tutorial consists of a dialog box (Figure 2) that explains the controls for the player, it is skippable by pressing or holding the spacebar. When the player is finished with the tutorial, the player officially begins the game and is tasked with surviving 5 rounds. The player’s health is positioned in the upper right corner and is represented by a red

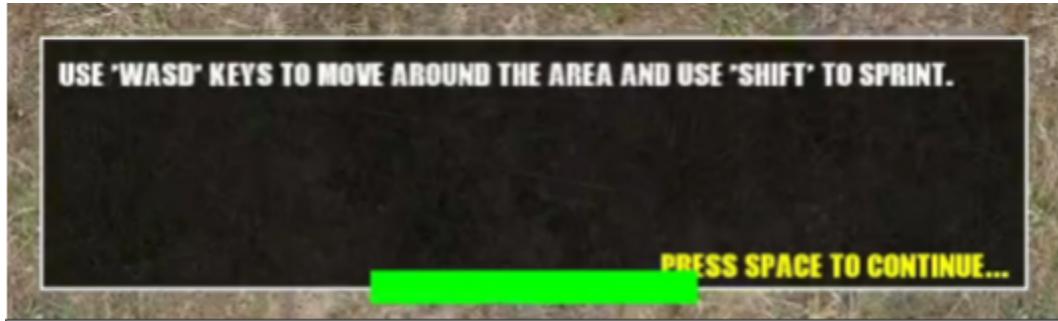


Figure 2: Old game's tutorial dialog box

progress bar, right underneath is the ammo count for your equipped gun formatted with the current number of ammo on the left of the ‘/’ and the max amount of ammo to the right of it. Due to the font being used not having a ‘/’ it appears as a dot. The upper left corner features points (which is unused), text that indicates the round (incorrectly), and a counter for the amount of zombies left which writes the ‘:’ as a dot as well. At the bottom of the screen sits a green progress bar that represents the player's stamina, while the red progress bars on top of the zombies represent their health (Figure 3). This is the main HUD of the old game (Figure 4), and besides some sounds like gun fire or reloading, the only way for the player to interact or get feedback from the game. Using this older version of the game, user testing was conducted using a survey that included two different sections. Section A consisted of usability testing in the form of answering questions through a 1-5 scale, 1 being bad and 5 being good. While Section B gave the participants open ended questions to give them a chance to give more specific feedback and answers. The exact questions asked are given below:



Figure 3: Zombie health bar



Figure 4: The main HUD of the old game.

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## SECTION A — Ratings (1 = strongly disagree, 5 = strongly agree)

### HUD / UI Clarity

1. It was easy to understand my **current health**.

1   2   3   4   5

2. It was easy to understand my **stamina** while sprinting.

1   2   3   4   5

3. It was easy to understand how to **aim**.

1   2   3   4   5

4. It was easy to tell when I was **hitting a zombie**.

1 2 3 4 5

5. It was easy to understand my **ammo count**.

1 2 3 4 5

6. I always knew what was happening during gameplay.

1 2 3 4 5

7. It was easy to find the options or information I needed while playing.

1 2 3 4 5

### **Feedback & Responsiveness**

7. The game gave enough feedback when I took damage.

1 2 3 4 5

8. The game gave enough feedback when I attacked a zombie.

1 2 3 4 5

9. The aiming felt responsive.

1 2 3 4 5

### **Overall Usability**

10. The UI helped me understand what to do.

1 2 3 4 5

11. I felt in control of the character.

1 2 3 4 5

12. Overall, the HUD/UI was easy to use.

1 2 3 4 5

## **SECTION B — Open-Ended Questions**

- 1. What parts of the HUD or UI were confusing?**
  - 2. What information did you feel was missing while playing?**
  - 3. Was aiming easy or hard to understand? Why?**
  - 4. Did you always know when you hit a zombie? Why or why not?**
  - 5. Was it easy to monitor your ammo and reload? Explain.**
  - 6. What frustrated you the most about the UI/HUD?**
  - 7. If you could improve one thing about the UI/HUD, what would it be?**
- 

Each participant was given a laptop with a mouse and a pair of headphones. The task they were given was to simply attempt to beat the game. They were given as much time as needed to play the game, then given the survey above before they gave some feedback through speaking briefly with the test conductor. The data collected included the usability ratings, open-ended feedback, player behavior, and level of experience with video games. The following table below shows the results:

Participant 1 (Beginner)	College student	46/60
Participant 2 (Advanced)	College student	52/60
Participant 3 (Advanced)	College student	38/60
Participant 4 (Beginner)	College student	41/60
Participant 5 (Intermediate)	College student	45/60

This gives us an average usability rating of 44.4/60, which is a bit higher than expected. I believe this is due to other students not having high expectations on what the game should look and feel like. Some of the feedback received involved the text on screen being too small and unreadable, not knowing the controls or what is possible, and mixing up the health and stamina bars or not being able to see them at all. Most of the participants never knew it was possible to switch to another gun, leaving them stuck using the pistol the whole time. I observed that participants were likely to simply skip over dialog that tried to communicate the controls to them, whether purposefully or accidentally. Less experienced participants tended to get frustrated with not knowing when they needed to reload or not knowing when they were taking damage, suggesting that they were more reliant on the UI for feedback, but the UI was not clear enough for them to use effectively.

### **Second Iteration: Paper Prototype**

When making the paper prototype, I had a general idea of what I wanted the UI and HUD to look like, but I was not sure what I was going to be able to implement properly in the actual code. My paper prototype ended up being a bit simpler than the final game but still was a helpful

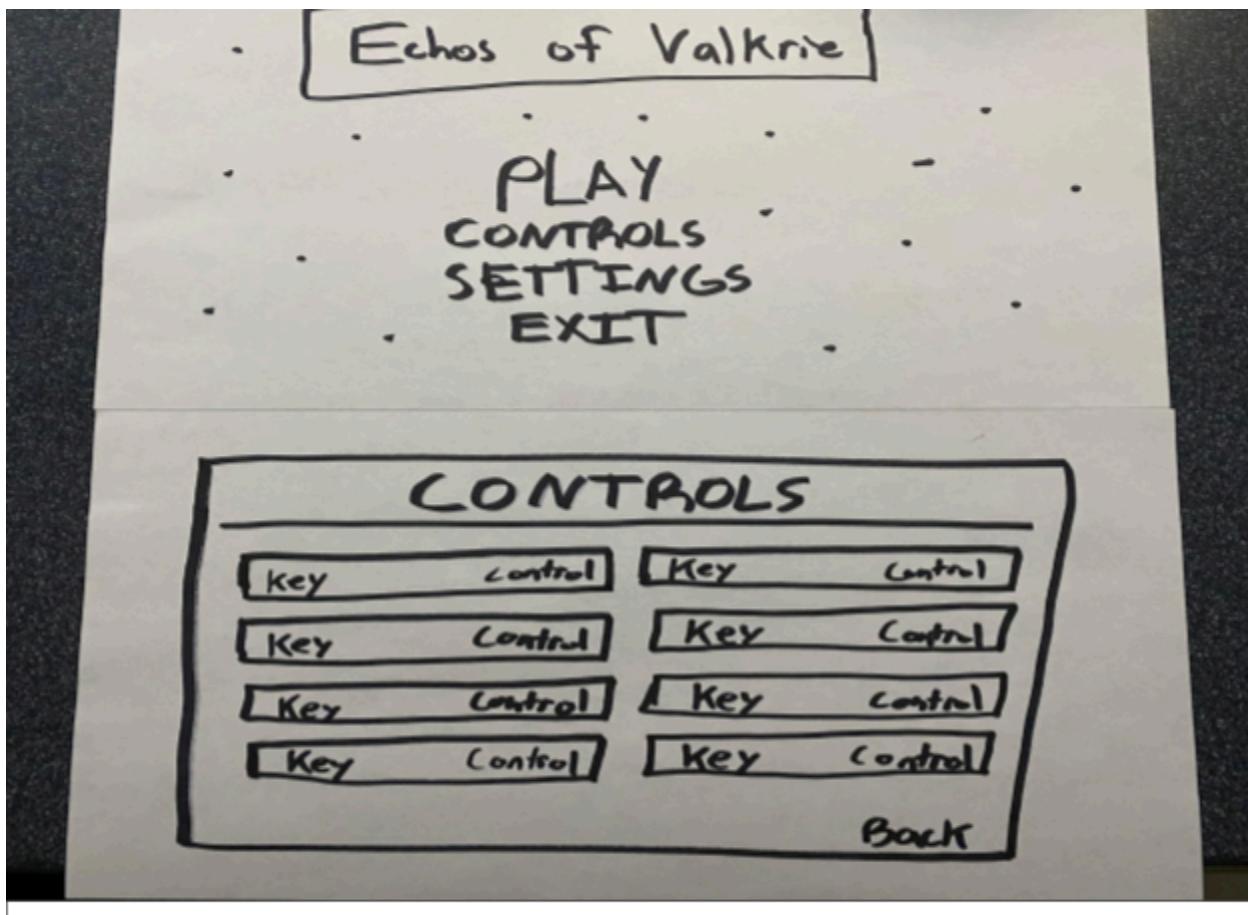


Figure 5: Main menu on top. Controls panel on bottom.

tool to guide the basic look of the HUD. To start with, the main menu had 'CONTROLS', 'SETTINGS', and 'EXIT' added (Figure 5). Since players were likely to forget or accidentally skip the dialog that explained the controls, I needed a way for them to be able to pull up the controls at any time. For this, I designed a controls panel (Figure 5) that could be pulled up in the main menu and game. I planned on making a settings panel as well but didn't know what I could realistically implement in the code, so I left the design for it later. An exit button was put at the bottom of the main menu since before, there wasn't anywhere on the screen that told you pressing 'Esc' closes the game.

The actual gameplay HUD elements were resized, recolored, removed, and moved in the redesign (Figure 6). Health and stamina are moved to the bottom left and put on top of one another, with health being higher. The top left text was cleared out so only the amount of zombies left remains, while the round number was moved to the top right corner and corrected. Some permanent HUD elements were added, such as aim spread indicator and the weapon inventory in the bottom right that contains the current weapon equipped and its ammo, as well as the unequipped weapon and its ammo. An occasional HUD element was added in the form of a small reload panel that appears whenever the current gun is out of ammo. Finally, the zombies health bar was redesigned to take up less space and be more readable (Figure 6).

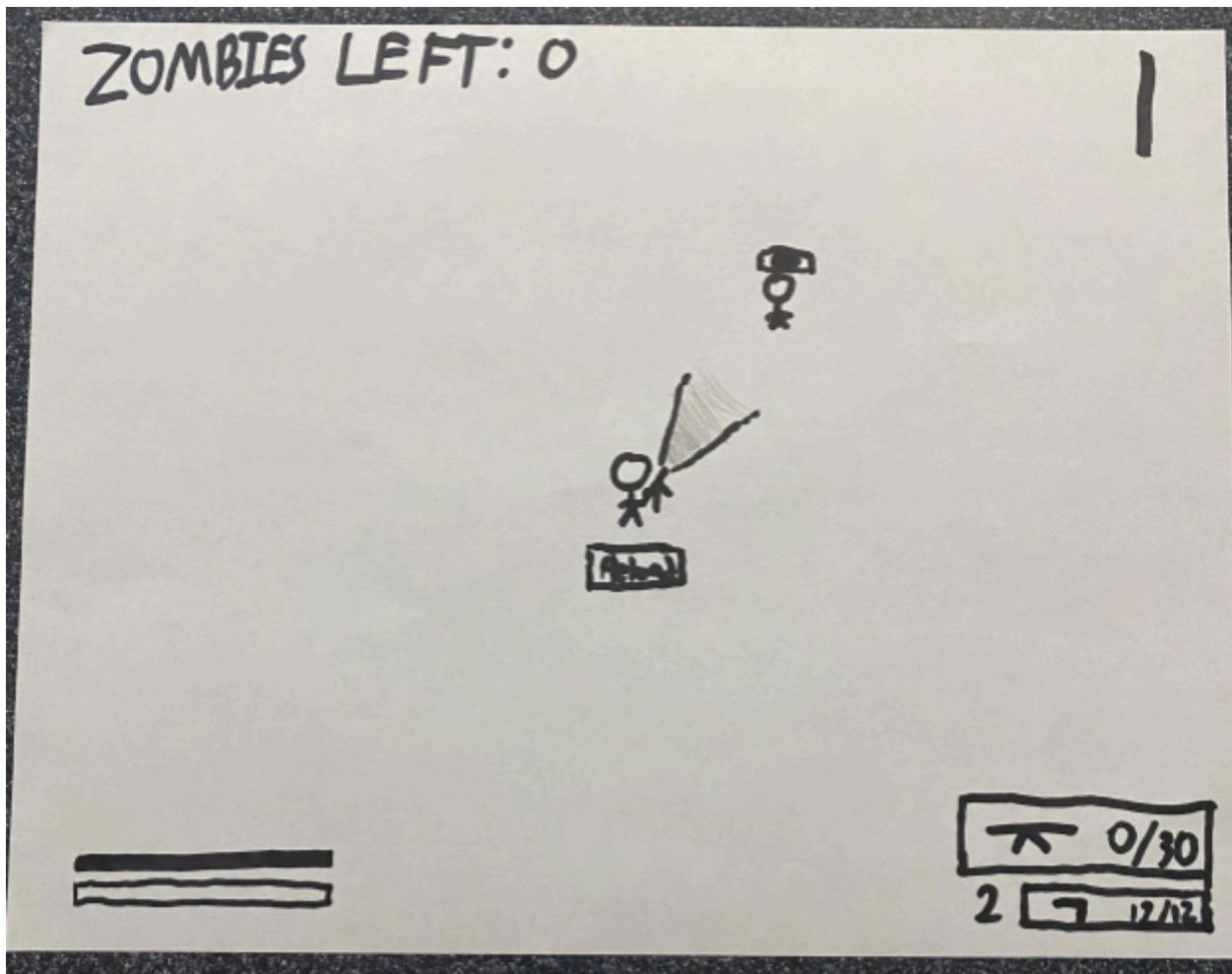


Figure 6: Gameplay HUD

### **Third Iteration: Updated Game**

The updated game was developed using the same tools as the old game, SFML in visual studio. All of the design changes from my previous low fidelity paper prototype were implemented, as well as some extra ones that either weren't realistic to show on the paper prototype, or were thought of after the fact. While the base main menu followed the paper prototype (Figure 7), a settings panel was added that featured the ability to adjust audio through both sliders and mute boxes (Figure 8). The controls panel went as expected but with subtle changes (Figure 9).

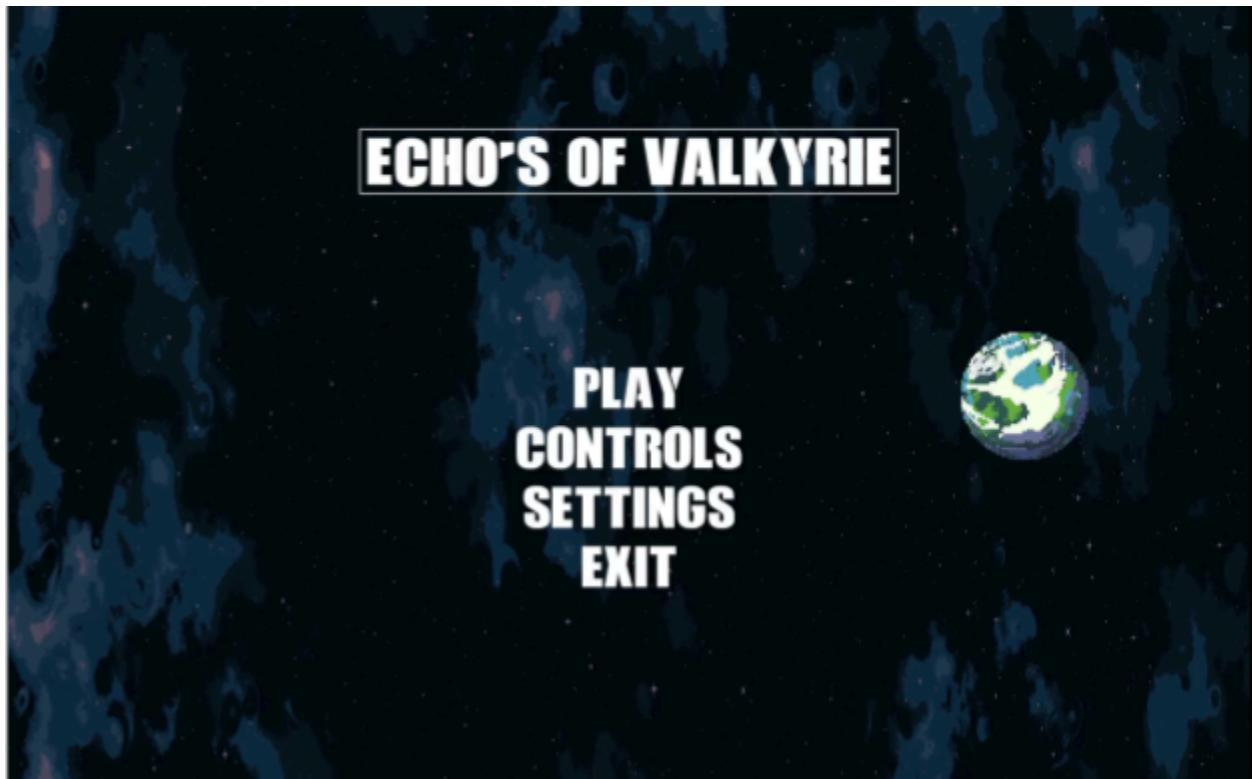


Figure 7: Updated game's main menu

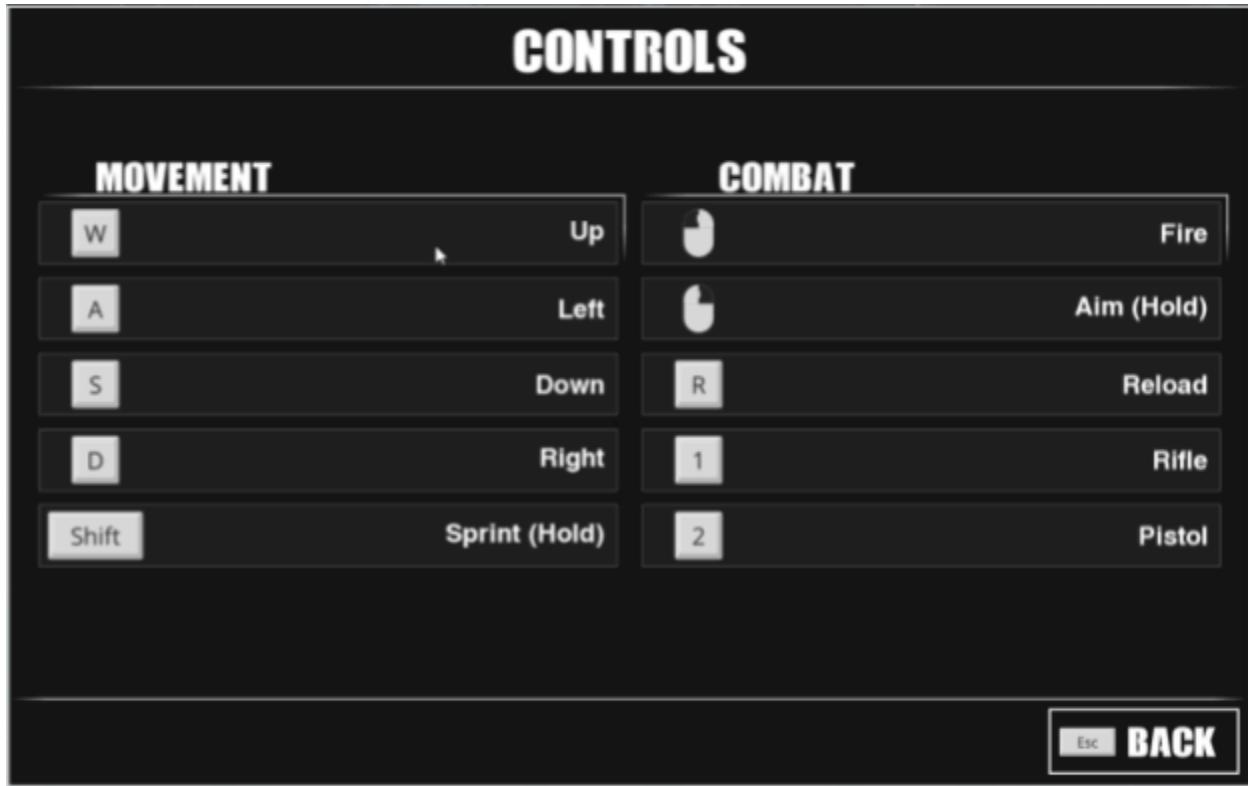


Figure 8: Control panel



Figure 9: Setting panel

Upon entering the actual game you are given a HUD that is similar to the paper prototype's, but with some slight modifications like transparent boxes as backgrounds to make the HUD elements more visible (Figure 10). The dialog box at the bottom now forces the player to press 'Esc' to continue bringing up the new pause menu (Figure 11) that features the same controls and settings panels from figures 8 and 9. Some things not included in the paper prototype are audio cues, like the sound of zombies being shot or killed, a new round starting, or the change in gun pitch when it starts to get low on ammo. Visually, as the player loses health, a blood overlay gets less transparent (Figure 12). Zombies now create a blood splatter effect when shot, this along with the updated zombie health bars make it clear to the player when they are connecting with the zombies (Figure 12). The last two additions are a death and victory screen, the former allowing the player to retry from the round they just failed at (Figure 13 and 14).



Figure 10: HUD with dialog box



Figure 11: Pause menu.

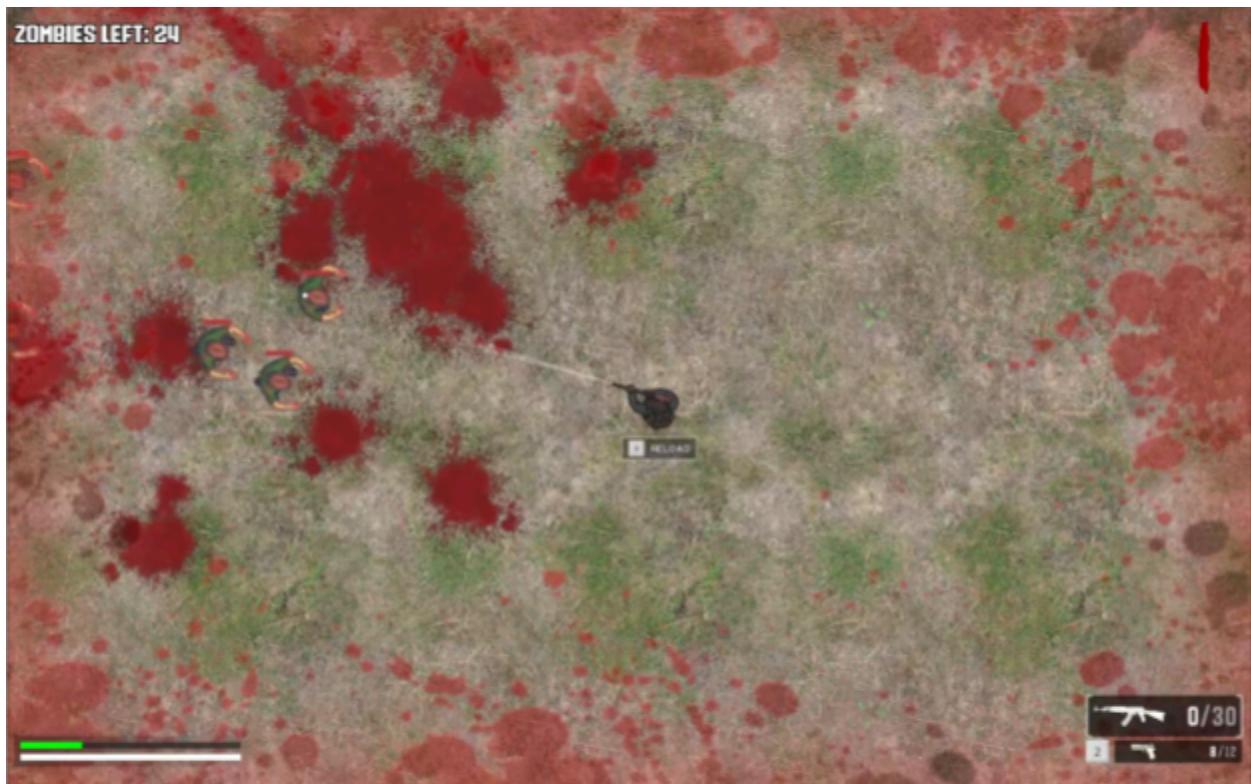


Figure 12: HUD with more effects.



Figure 13: Death screen.



Figure 14: Victory screen.

When I finished the updated game, I was given the opportunity to test 3 other people using the same questions as before with the original game. The results are shown in the following table:

Participant 1 (Advanced)	College student	59/60
Participant 2 (Intermediate)	College student	58/60
Participant 3 (Beginner)	College student	60/60

Seeing a major improvement from the last user testing, the average usability score is 59/60. There was a lack of criticism of the final product, but a lot of praise for some of the more convenient features, such as the reload pop up that appears under the player.

## **Results and Findings**

User testing for the original version of the game revealed several issues with clarity, usability, and feedback. Many participants reported issues with the controls and knowing when they need to use certain mechanics. Users struggled to interpret what was on the screen due to poor color choice, fonts, and text size. With the redesign many new UI and HUD features were completely revamped or added, with the most appreciated being the clarity of the HUD and how clear the feedback was to the user. It seemed that inexperienced users especially appreciated the extra help with things like the occasional reload panel popping up. Overall, having a UI that can import as much information to the user, while keeping the clarity of the screen intact makes a huge difference on the user experience.

## **Design Recommendations**

For future design improvements, I would have liked to add more options in the settings panel besides audio. Allowing the user to adjust the size of the UI and HUD would improve the accessibility of the game by quite a bit. Knowing how much stamina the player had was a complaint heard in the original game, and while I did not hear the same complaint in the updated version, I would have still liked to have added an audio cue in the form of heavy breathing so more experienced players don't need to look at the stamina bar as often.

## **Conclusions and Limitations**

This redesigning project showed that even a functional game can be difficult or frustrating without the proper UI, feedback systems, or user control menus. Users testing the original game relied heavily on guesswork when trying to figure out what buttons to press or understanding what they had to work with. After redesigning the game, there was visible improvement on the users experience and satisfaction levels.

However the study conducted has a few limitations. A small sample size of only 8 students isn't enough to get a complete picture of the effectiveness of the redesign. Additionally I only tested college students, getting a wider variety of participants from different backgrounds could reveal more information.

## **Works Cited**

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