**Thesis Project Portfolio**

# Design and Construction of Modern University of Virginia Themed Pinball Machine

(Technical Report)

# Peering into the Simulation: A Study on the Desire for Realism in Military Video Games

(STS Research Paper)

An Undergraduate Thesis

Presented to the University of Virginia School of Engineering and Applied Sciences

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

**Thomas Cook**

Spring, 2024

Department of Mechanical and Aerospace Engineering

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A Research Paper submitted to the Department of Engineering and Society

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the honor guidelines for thesis-related assignments

Advisor

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## Introduction

As video games have become a more prominent form of entertainment, their influence on society has increased dramatically, especially in their massive popularity among children and young adults. This gives the creators of video games an absurd amount of influence over society, providing developers a great opportunity to change minds, for better or for worse. Throughout the years the technology powering video games has gotten more advanced, and many games have striven for a quality known as “realism”. Realism is a measure of how realistic a game is, in terms of how it looks, sounds, or feels. The more realistic these games become, the further they can influence the minds of their players, as more realistic visuals, audio, and concepts can convey even stronger mental and emotional responses (Krcmar, 2011). But why does this desire for realism exist? It may seem obvious for video games about playing soccer or racing cars, but this question becomes much more complicated with the desire concerning games about violence and war. This paper hopes to answer the question of why there is a desire for realism in militaristic video games such as Call of Duty and Battlefield.

## Background

In 1982, the game designer Chris Crawford (1982) stated that “video games are a subset of reality”. By this, he meant that video games must remain a subset of reality as if they became too real, they would become almost “indistinguishable from life itself.” Granted, this was said in the year in which the most popular video game was Pac-Man, but looking back this seems to be a warning to future generations: be careful about video games becoming too real and making them indistinguishable from reality. As years have passed, and computers have become more and more powerful, games no longer look like Pac-Man – they provide sprawling landscapes and rich visuals to supplement their gameplay. And even more than this, the development of new

technologies has gone further to blur this line, with devices such as Virtual Reality or VR headsets, which give the player a 360 view of the game, or haptic feedback, which is the idea of providing the player with a physical sensation to go along with what their seeing. Haptic feedback and virtual reality are often used in training simulations and provide a level of realism to allow doctors to simulate surgeries (Våpenstad et al., 2013).

These tools are put in the hands of game developers, who are in charge of creating the game, to make their game feel more realistic. These developers want to provide an experience to the player to make the game feel or seem fun so that they can sell more copies of the game. O'Sullivan (2021) states that although there are developers who stick to more unrealistic animation in their games, "games are becoming more and more realistic, and realism sells." However, these technologies are not the only ways they make the games more realistic. For military or military-themed video games, the developers also consult with experts to make the content in their games similar to reality, such as giving the player the same equipment as a real soldier or using realistic tactics. Game companies often consult with the military or military personnel to achieve this, which can be seen in popular game franchises such as Call of Duty. There have even been cases where the military has developed its own video games, such as America's Army. This consultation increases the realism present in these games by making sure the game has realistic technology and ideas, but it also provides a way for the military to influence these games for their purposes, such as using them to influence the players indirectly (Andersen & Kutri, 2009).

Video games have also been shown to promote militarism and militaristic ideologies (Hammond & Pötzsch, 2019). They promote racism against enemies of the US (Leonard, 2004), and idealize military action, making it seem more beneficial than it is (Robinson, 2015). There

has not, however, been any research going into the effects of realism in video games on recruitment.

Many different kinds of realism have been presented in media throughout the years. For this scenario, however, it would be best to use the six-dimensional structure to define realism that was used in Ribbens et. al. (2016). Ribbens et. al. (2016) defines six branches of realism, each with its domain and influences. The first branch is called “simulational realism”, and is defined as the degree to which the physical rules programmed into the game, as well as the behaviors of the characters in the game, credibly simulate reality. One example of this would be if gravity works while the player is on Earth. The second branch is defined as freedom of choice, which does not mean the amount of choices available to the player, but that the choices presented are similar to the choices one would make in the situation the game presents, such as what battle plans a general would choose. Social realism, the third branch, covers whether or not characters or events presented are similar to characters or events that have happened in real life. Another branch is called “perceptual pervasiveness”, which pertains to if the visuals look realistic and the audio sounds realistic. This is where the technology presented above comes into play, as more powerful computers create more powerful perceptual pervasiveness. The fifth branch is called character involvement and has to do with whether the player “feels” like the character they are playing. Note that this means both the individual character they play, for instance, a general named Alex, but also that they feel like a soldier on the battlefield. The last branch, authenticity, is whether or not the themes and message of the game are emotionally convincing. It should be noted that most of the games being asked about have two game modes; a single-player mode in which the player experiences a story and plays as a named character that makes decisions impacting the story, as well as a multiplayer mode in which the player fights both alongside and

against other players as a nameless soldier. In some of these modes, some of these forms of realism will be more useful than others, as the multiplayer mode has no story and therefore no authenticity to convey.

To first address the research question, it is necessary to show the desire for realism exists; that is, players want to play more realistic shooting games. This was shown by Ribbens et al. (2016) where researchers performed a study by analyzing the realism of both video games on player enjoyment. This study found that sensory realism, meaning more realistic sounds and visuals, and character involvement, meaning interaction with the game through a character, were alluring factors. They did not find that simulational realism predicted enjoyment in the game, however, this is debated by other sources that find that in other games about war, this is something of value (Vandewalle et al., 2023). The question of why remains, however.

Now that the desire for realism has been established, it is also important to note the effects of this realism. It has been found that players who play violent video games are proponents of violence and aggressiveness (Adachi & Willoughby, 2011). Research has also been done on the effect of realism on violence and aggression, and a study by Krcmar shows these results. The study was done by analyzing players' aggression on two different video games, one of which was widely considered to be more realistic by the player's standards, and found that players who played the more realistic game exhibited more violent and aggressive tendencies.

**Methods**

The primary method used to answer the research question is to interview people who have had experience with these games. Participants will be found via a survey that will be sent to students of the introductory programming classes and the video game design class at the University of Virginia, and will simply ask if they have had experience with military shooter

games, most specifically in the Call of Duty or Battlefield franchises. It should be noted that the true topic of the interview will be hidden from the participants, as they will be told the interview is about the enjoyment of military video games. This is done so that the answers the participants give will remain unbiased, and they won't be led into certain answers. First, the participants will be asked about the level of involvement they have had with the games, such as how many of the games they have played, an estimation of the number of hours they have played, which games they played the most, as well as which game modes they frequented. Second, the participant will be asked questions about their experience with the games, such as about the context of the game (some of the games are set during historical events, while others are set in the future), the inclusion of realistic weaponry, and tools, and the physics systems present in the game. Lastly, it will be asked what in particular drew the participant to play these games and, if they have identified one as their favorite, why. After interviews are conducted, conceptual coding will be performed on the recordings and the interviews will be analyzed to determine the results.

**Results**

Throughout the study, 18 participants responded to the pre-interview survey. Out of these 18 participants, 12 were interviewed (the 6 others did not respond to communication). All of the participants were males between the ages of 18-22 and were students of the University of Virginia. They had (estimated) experience of between 300 to 3000 hours in Call of Duty, Battlefield, and other games such as Rainbow Six Siege. Conceptual coding was performed on the interviews by looking for concepts that relate to each of the 6 branches of realism as defined above, and the results are analyzed below.

**Analysis**

The most common result from the interviews was the desire for immersion. Being immersed means achieving a deep mental involvement in the task at hand, commonly referred to as being in a flow state or “in the zone.” This seemed to main the main push to play not just these games, but video games in general. The ability to completely immerse oneself in a task that has little to no negative consequences for failure seems to be very enticing for players. The way to achieve this immersive experience seems to differ from game to game, but a common theme throughout the interviews was that a lack of believability could break this flow state. If the world doesn’t behave believably, this immersion would break and the enjoyment of the game could wear off. But what aspects of realism correspond to this quality of believability?

The least enticing branch of realism seemed to be authenticity and this seems to be for several reasons. One reason is that it pertains to the story mode of the game, which seems to be less popular than the other game modes. Out of the 12 participants, only 5 had played the story modes, and out of these 5, only 3 remembered details from the story. Even then, the details provided seemed to be more related to the events the player got to experience, rather than the story going on behind it. One example was that a participant remembered that there was a mission where they had to play on a large boat that was rocking back and forth, and remembered the challenge of dodging the crates that were moving around on the ship, but they didn't remember why the story put them on the ship. Most of the participants played game modes that were more based around playing with others, such as multiplayer modes where they could play against others, or survival modes where they could work together to play against the game. The developers of these games seem to recognize this, as there have been games, such as Call of

Duty: Black Ops 4 that forego even creating a story mode to focus all of their efforts on the multiplayer modes.

The most impactful branch of realism when it comes to immersion is simulational realism. This is not in a way that seems to pertain exactly to realism, however. Simulational realism, as defined above, is the idea that the game follows the same physical rules as the world we inhabit. Apples fall from trees and bullets take time to fly to their target. Some participants preferred games that allowed the character to defy physics and some preferred games that allowed for more realism in the simulation. At first glance, it seems that this could not be the most impactful branch of realism, however, the reason people disagree is a very important one: simulational realism has to be done right. Participants, when asked why they didn't like more realistic games, had two different answers. The first was that the game tried to simulate reality, but was just off the mark. This makes the physics system seem alien and gives them the feeling that something isn't quite right (as opposed to not trying to be realistic at all, in which the user knows the physics system is wrong). The other reason was consistency. Some players just stated that they preferred games that were consistent with their physics and had bad experiences with games that tried realism but were inconsistent about it. The inconsistency makes them remember that this is just a game, and therefore breaks their immersion.

One reason that some players preferred simulational realism had not necessarily to do with realism, but the mechanics of the game themselves. To talk about this subject, it is necessary to define two different physical systems they use to rule their physical worlds. Hitscan is one of these systems and is a system in which bullets are not physical objects in the game world, meaning if the player is aiming at someone and pulls the trigger, the bullet always hits the target. This is in opposition to the other physical system, which makes the bullet a physical

projectile in the game world. In this system, the bullet is subject to gravity and takes time to reach its target. The projectile system adheres to simulational realism much more closely than games that use hitscan physics. While some players preferred the hitscan system (they admitted it was because this is just what their favorite games used), other players stuck with the projectile system. This, in their words, was because they enjoyed the challenge of it. If all you have to do to hit a target that's far away is center the gun on them and shoot, it doesn't present much of a challenge. But if the player has to account for things like how far the target is from them, or the time it will take the bullet to get there, or even in some games, the wind, this presents a greater challenge and therefore makes success all the more satisfying to achieve.

The last branch of realism that should be touched on is social realism, or the idea that events in the game correspond to events in real life. This does not pertain necessarily to believability but seems to provide enjoyment to other players. While some players felt indifferent to this aspect, a few of them reacted very positively to this idea. They liked playing games that were set in historical or modern times because they liked learning about guns, vehicles, and other weaponry used in these conflicts, and found it satisfying that these details were realistic in the games. One participant recalled researching weapons from Call of Duty: Black Ops, which is set during the Vietnam War, and enjoying seeing that the guns their player used were not only real but used in the same way. In contrast, some players preferred to play games that were set in the future, however this was because they found that it made the game more interesting in terms of gameplay, such as the player using a jetpack to give them higher mobility.

**Conclusion**

As video games become more and more popular, it is necessary to consider the mutual shaping involved. It is also important to consider why these interactions between society and

technology happen. Video games about war and violence have been around for decades and the desire for realism in these games does exist, but it is important to understand why players want this, especially as technology becomes more advanced and these games become more and more realistic. Players do not desire to feel like they are soldiers, and do not want to experience war; they desire immersion and enjoyment.

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