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)

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The Development of a University of Virginia Themed Pinball Machine

The Desire for and Effect of Realism in Military Video Games

A Thesis Prospectus
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By
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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

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General Research Problem: Analyzing the Effects Interactive Media Has on Our Society

How do forms of interactive media, such as video games and pinball machines, affect our society?

As the power and accessibility of technology have developed, facets of our society involving that technology have increased. A prime example of this is entertainment, as people move to movies and television shows as their primary forms of media. Technology has even allowed storytellers to go a step further, allowing the consumer not just to be a listener in the story, as they were with books and film, but an active participant in the narrative. These forms of entertainment, despite being ever present in our current society, are not studied by experts nearly as much as other fields. Most experts see them as toys for children, and not worth studying, but they have a much greater impact than these people think (Leonard, 2004). As this new wave of interactive media has come about, it has enormously impacted our society, but how? The general research question aims to analyze the impacts of interactive media on our society, from its early forms in pinball machines and arcade games to the household video games we see today.

One of the earliest forms of interactive media is the pinball machine. Early forms of the game did not involve player input, making it purely a game of chance. This was changed in the late 1950s when flippers were added to the machine to discourage using them for illegal gambling (Littman, 2023). Far from the original machines from one hundred years ago, machines today have large amounts of complex mechatronic systems presenting an engineering challenge for those of all calibers and disciplines. The technical project described in this prospectus aims to create and display a pinball machine themed around the history and culture of the University of Virginia.

As technology became more accessible, games such as pinball evolved into video games, present in households around the world. Over the years children and adults alike have been exposed to more and more advanced simulations, resulting in technological marvels like the games we see today. These games have the potential to impact the players drastically, most notably in the realm of militaristic video games. And as the technology behind these video games has developed, the ability to create more and more realistic simulations has come about. The research project aims to examine the desire and development of more and more realistic video games and the effects this push for realism has on the world around it.

Technical Project: The Development of a University of Virginia Themed Pinball Machine

Can a fully functional pinball machine be made to be used by students from the remains of a failed project?

The technical research problem is the design and manufacturing of a UVA-themed pinball machine using modern technology, such as linear actuators and stepper motors, in which a fully functional pinball machine will be designed, manufactured, and displayed for use in a public place for UVA students. This project will build off a failed technical research project from 2016, where a group of students started to design and build a pinball machine, but failed to create a functional prototype in time. According to Professor Gavin Garner, the technical advisor for both the present project and the failed project, the organization of the team was fundamentally flawed, as the previous team was broken down into smaller subteams with little to no communication between them. This led to the machine being incoherent when all of the parts were put together. The current team plans to fix this problem by remaining a larger team and having everyone work

on all parts. Team members will be assigned to projects, and project assignments will change every few days, removing the idea of ownership over individual components and parts of the machine. Manufacturing competencies are spread out throughout the team, so teamwork is required to make each part. This will also motivate them to keep extensive documentation, as team members will need to brief themselves on what work has been done so far, as well as what work needs to be done, on the component they are working on. They also failed to test and prototype the parts they made before putting them on the final machine, so the current team will make a prototype board to test the mechanisms developed. The technical research team will take the remains of the failed project and salvage what can be used to create a fully functional machine that can be used by all students. This project will provide experience in several skills, starting with the analysis of a failed design, allowing for numerous design iterations. Other skills will include various manufacturing techniques including 3D printing and laser cutting, as well as experience with circuitry and mechatronics. The preliminary steps for this problem will be to read the previous technical report and analyze the parts of the machine that were manufactured to gauge what can be salvaged, then the technical team will start with performing the bare-bones steps to create a functional prototype, such as fixing the flippers and creating a way for the game board to sit in the machine. After this, the capstone team will start designing the individual components of the machine, such as pop bumpers and drop targets. Despite these mechanisms being present in many pinball machines, the team aims to redesign these components. One example of this is using a linear actuator in the drop targets (as opposed to a solenoid) so the drop target can move up and down electronically, as opposed to the old design which can only put the target back up after it is hit.

Research Project: The Desire for and Effect of Realism in Military Video Games

Why do players desire realism in military games, and how does that realism affect them?

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 societal actors a great opportunity to change minds, for better or for worse. And arguably no actor has done this better than the United States military. Military-themed video games play a significant role in shaping perceptions of warfare and patriotism among players, influenced by the portrayal of armed conflicts, heroes, and nationalistic ideologies (Leonard, 2004).

As time has passed, and the technology powering video games has gotten more advanced, many games have striven for a quality known as "realism". Realism is a measure of how realistic a game is, and for most games, it is an aesthetic choice to make the game look as real as possible. This goes one step further in military games, as many developers will contract the military as consultants to help make aspects of their game as realistic as possible. This allows them to affect all aspects of the game, from the mechanics, or how the game is played, to the narrative (Andersen & Kutri, 2009). This is not to say that realistic visuals do not affect society, as there are instances of video segments from these games being used as news footage for real-life global conflicts (Myers, 2023). The player's desire for realism seems strange, as most people do not want to go to war, however, people want their war games to be as realistic as possible. The STS research project hopes to answer this question and the effects that this push for realism will have on society in the future.

Video games provide a complicated sociotechnical system to study. For our question of realism, however, one of the most important elements of this is the machine on which the machine is played. As stated earlier, as time has passed, the machines these games are played on have gotten more and more advanced, resulting in more and more realistic graphics in games. Another consequence of this is the way these games are experienced, as new technologies, especially in the realm of virtual reality, allow the player to become even more immersed in the game. This can be seen in the Xbox Kinect, which removes the need for a controller and lets the player use more realistic hand motions to control their character (Walker, 2010).

Military-themed video games fall under an umbrella known as the Military Entertainment Complex, or the MEC, which is a branch of entertainment that is about or formed around the military, most often the US military (Robinson, 2012). In the MEC, media is used to show the United States as the protagonist, garnering support for military actions. This is most notable when considering the War on Terror, and how after the events of September 11, 2001, most antagonists in military video games were Arabs (Leonard, 2004). It could be argued that the interactive nature of video games makes them a less potent medium for military ideology because the player has some level of agency in the narrative, but this ignores the fact that the developers of the games want the game to be played as much as possible. They make playing as a soldier, being a hero, as much fun as they can, even consulting the military to make it as realistic as possible at the same time (Andersen & Kutri, 2009).

Militaristic video games follow the theory of technological politics, which states that technologies have political and social implications and do not merely exist in a void of neutrality (Winner, 1980). These games were shaped by political means, and their existence had social and

political ramifications. These effects cannot be ignored, as they are ingrained in the identity of the games.

To answer the question of why people desire realism in military games, and the effects this realism has on the people that interact with these games. First, to understand why this desire exists, a survey will be conducted. The target of this survey will be university students, as they are easily accessible, and most students were born in the early 2000s, so video games have been prominent throughout their lives. This survey will ask students questions about their experiences with video games, what they look for in these games, and why, mainly focusing on the realism aspects. An example of a question might be to ask if they prefer the old version of a game, or the "remastered" version, which is a rerelease of the same game, but with updated visuals. The results of this survey will be analyzed and will go into the STS research paper.

Conclusion

Through the STS research project, I hope to gain a further understanding of the effects of realism in these military video games. These games are being played by children and because they are seen as toys, the research in the field has not been taken as seriously (Leonard, 2004). The STS research project will shed light on this topic, and hopefully encourage further research in the field. In the technical topic, the team hopes to create new ways to design old products and modernize the equipment found in these pinball machines. This modernization is important as we move into the future, as many aspects of our technological society need to be modernized, such as infrastructure and power systems. These two projects will come together to analyze the effects that interactive media has on this world, so that we may better understand the impacts of these technologies.

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