Video Game Development with Microcontrollers, Emulators, and Snap!

Gaming Culture Leading to Gender Exclusivity in Video Games in the Past Decade

A Thesis Prospectus

In STS 4500

Presented to

The Faculty of the

School of Engineering and Applied Science

University of Virginia

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Science in Computer Science

By

Anisha Poudel

October 27, 2022

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.

ADVISORS

MC Forelle, Department of Engineering and Society

Rich Nguyen, Department of Computer Science

Introduction

In 2022, the video game console market saw $52.2 billion in revenue. However, a closer look reveals that only 39% of these purchases were made by women (Clement, 2023). Exploring the reasons behind this gender imbalance isn't just about gaming. According to the Journal of Computer in Education researcher Javier Corredor, owning a video game console at home had a positive academic effect in STEM courses for students (Corredor, 2022). By delving into why women may not be as invested in video games as men, we not only gain insight into consumer behavior, but we also open doors to fostering greater inclusivity in STEM disciplines, leveraging the potential of an industry that shows no signs of slowing down.

Addressing the gender imbalance in video game participation is a start to ensuring broader inclusivity in STEM. In 2021, women made up only 22.1% of all undergrads awarded Engineering and Computer Science degrees in America (Coolick, 2022). If women are not encouraged or welcome to pursue careers in STEM, the fields will lose out and potential talent and contribution of nearly half the population.

Considering the gender imbalance in video games, my STS project and my technical project both address causes and attempt to create avenues to increase inclusivity in gaming. My STS project explores how the sexualization, harassment, and lack of representation women face are aspects of video game cultures that deter women and girls from participating in playing video games. By analyzing how these factors affect women's mental health and perceptions of gaming, it will provide a more comprehensive understanding of the challenges women face in the gaming world and how these factors combine to create an unwelcoming environment for female gamers.

My technical project acknowledges that some demographics are exposed to video games sooner than others, sparking an interest in science and technology from a formative age. The project offers a detailed guide on video game creation, catering to all skill levels and using gender-neutral figures and language to promote inclusivity. The guide dissects the intricate components of the arcade game systems, giving users a foundational understanding of the functionality of each individual element and its relationship to the overarching gaming system. Additionally, the guide will encompass code walkthroughs with step by step breakdowns of the game coding process, which will ensure readers grasp the logic behind every line. Video games are more than just entertainment, they are a fusion of logic, innovation, and technology. My intent with the guide is to foster inclusivity for everyone by breaking down barriers to understanding, and by doing this, the realm of game creation becomes accessible for all ages and gender. By translating an idea to a playable game, it can ignite an interest in technology, motivating readers to explore further.

Technical Topic

During my first semester of my fourth year at the University of Virginia, I had the opportunity to partake in independent research alongside two of my professors. Our collaborative efforts were dedicated to writing a comprehensive textbook that explores the hardware and software facets of game development. Although I have contributed to various software projects through coursework and internships, this was among the first projects I was eager to see other people use and engage with.

The project is a how-to guide for creating arcade games using emulators, microcontrollers, and Snap! code. As the tester, my job was to review and follow the steps outlined in the rough draft of the guide. The first step of the guide was to install the emulator

used to allow the game to run. The emulator we first chose to use was MAME, one of the most popular arcade emulators. I first researched its capabilities and confirmed that it met the requirements of our project. Next, I followed the guide on my local machine when I ran into my first problem. The MAME software was not compatible with my computer. With further research, I learned that MAME is suitable for Windows computers, slightly less stable for Macs, and unstable for Chrome computers. This is when I realized that the initial outline for the how-to guide was entirely done on a Windows computer, so each software we used was compatible with a range of operating systems. My next task was to find another emulator that was compatible with a broader range of operating systems. I chose a Chrome plugin-in and updated the guide instructions accordingly.

My favorite part of the project was creating the game code. Since this was a guide for all experience levels, I had to keep in mind the complexity of my program and truly explain what I was doing. I created three games and provided a step-by-step implementation of the code for readers to follow.

Our team had a two to three week iteration period where we would work independently and reconvene to showcase what we had been working on, discuss updates, and address any questions. This allowed us to work with an agile framework called Kanban.

Although this project solely focused on the technical components of video games, it indirectly aims to make video games more gender inclusive in two ways: by adopting a gender neutral narrative throughout the material and being accessible to readers of all experience levels, allowing people to engage in technology in their earlier years.

STS Topic

Historically, video games have been a male-dominant field. According to PubMed Central researcher Marja Leonhardt, boys under the age of 18 are three times more likely to play video games once a week compared to girls (Leonhardt, 2021). While female games are becoming more common in gaming spaces, there is still a clear discrepancy between the participation between genders. While having a predominantly male driven environment for video games may not seem like an issue, especially at a young age, it's important to assess the effects it poses on women as they transition into adulthood and potentially pursue STEM fields.

There have been many barriers to women playing video games. Real world spaces, such as retail stores and conventions, can subliminally perpetuate these gendered perceptions. Large retail chains, notable Toy 'R' Us and Target, have been known to put video games in the boys section of the store in the past decade. Although this does not directly stop young girls from engaging in video games, it subconsciously sends a message of who these games are made for. In 2014, California lawmakers decided that retail chains that continue to do this will be fined as it promotes "the proliferation of science, technology, engineering and mathematics-geared toys" for the boys sections while discouraging the same pursuit for women. (*California to Enforce 'Gender Neutral' Toy Aisles in Large Stores*, 2021). Furthermore, the Electronic Entertainment Expo (E3), one of the most prominent annual gaming conventions in America, had its record low female representation in 2014. Over 45,000 people descended to the city of Los Angeles to uncover the latest video games set to release in the upcoming year. Among the various representatives, only a single woman took the stage to speak, and to make matters worse, her presentation only lasted two minutes (Sydell, 2014). Feeling unseen in these real world spaces reinforces the notion that certain people don't belong in the world of gaming.

Even after overcoming barriers in real world spaces, video gaming culture poses another setback. One of which is the representation of women in video games. Video games companies often implicitly target specific demographics when advertising for a game. In the same given year as the one female spokesperson, from all the video games showcased at the E3 in 2014, only 9% had female protagonists. (Sydell, 2014). Grand Theft Auto, a popular video game released in 2014, made headlines after a "user pays a prostitute for sex, which happens in graphic footage, then punches the woman to the ground." (Allen, 2014). If users don't already find that appalling, according to the American Psychological Association, sexualization of girls negatively affects cognitive and emotional consequences development in women. Sexualization and objectification compromises a person's confidence in and comfort with their own body. This results in emotional distress and self-image problems, such as shame and anxiety. (Black, 2017). Additionally, female gamers are targeted more than any other group of minorities. Studies show that prerecorded audio tracks of female gamers were three times more likely to receive negative interaction than their male counterparts (Wong, 2023). While these examples don't directly stop women from playing these video games, they often deter women from participating in video games for the sake of their own mental health. Even as women overcome real-world obstacles to engage with video games, the gaming culture itself presents additional challenges.

To further investigate and support my claim that the allure of video games for boys is not a mere coincidence, rather calculated outcomes of the portrayal of women in games, I will utilize the Social Construction of Technology (SCOT). With this framework, "the artifact with its specific attributes is at the core of the analysis and defines the relevant social groups" (Baalen et al., 2023). Being able to consider artifacts and their development is integral to understanding their relation to society and their social implications. By using this framework we can gain

insight into the social groups that engage with video games the most and the role of society shaping technological outcomes.

Research question and methods

To investigate this discrepancy, I want to ask: How has gaming culture deterred women from participating in video games in America in the past decade? By evaluating how the sexualization, harassment, and lack of representation women face are aspects of the culture, we can get a better understanding of the gender disparity in gaming. Understanding these results could not only bridge the gap in gaming, but all help increase female interest in STEM related fields in the formative years.

To develop an answer to this question, I will be conducting a literature review and discourse analysis. For the literature review, articles will consider the effects of self image and body issues for women after playing male centered video games. A constraint of the articles are ones that focus on participants ages 5-18. The discourse analysis will be conducted with various prominent games from the gaming industry, such as Call of Duty and Grand Theft Auto. I will be examining how certain games employ hyper-masculine imagery or even sexualized content to appeal to certain demographics.

Conclusion

My technical work aims to introduce readers to basic underlying components of computer science, such as coding, computer systems, and apply that knowledge to make video games using microcontrollers, emulators, and Snap! code. By the end of the spring 2024 semester, the book should be finished and reviewed for publication. The STS deliverable delves into the underrepresentation of women in video game culture, analyzing the portrayal of women in

popular video games in the past decade. By understanding the disconnect between certain technologies, we can pave the way for greater female representation for all STEM fields.

References

Allen, G. (2014, November 20). Grand Theft Auto V: Shocking video of prostitute sex with gamer in controversial first-person viewpoint. *The Mirror*. Retrieved October 27, 2023, from https://www.mirror.co.uk/news/uk-news/grand-theft-auto-v-shocking-4659247

Baalen, P. V., Fenema, P. V., & Loebbecke, C. (2023). Extending the Social Construction of Technology (SCOT) Framework to the Digital World. 8. https://core.ac.uk/download/pdf/301370166.pdf

Coolick. (2022). *Degree Attainment - Society of Women Engineers*. SWE. Retrieved March 20, 2024, from https://swe.org/research/2024/degree-attainment/

Stiastny, T. (2021, October 12). *California to enforce 'gender neutral' toy aisles in large stores*. BBC. Retrieved October 27, 2023, from https://www.bbc.com/news/world-us-canada-58879461

Clement, J. (2023, August 29). *Global gaming revenue by segment 2022*. Statista. Retrieved October 26, 2023, from https://www.statista.com/statistics/292751/mobile-gaming-revenue-worldwide-device/

Gestos, M., Smith-Merry, J., & Campbell, A. (2018). Representation of Women in Video Games: A Systematic Review of Literature in Consideration of Adult Female Wellbeing. *Cyberpsychology, behavior and social networking*, *21*(9), 535–541. https://doi.org/10.1089/cyber.2017.0376

Kokkinakis, A. V., Cowling, P. I., Drachen, A., & Wade, A. R. (2017). Exploring the relationship between video game expertise and fluid intelligence. *PloS one*, *12*(11), e0186621. https://doi.org/10.1371/journal.pone.0186621

Leonhardt, M. (2021, June 4). Are There Differences in Video Gaming and Use of Social Media among Boys and Girls?—A Mixed Methods Approach. *International Journal of Environmental Research and Public Health.* Retrieved October 27, 2023, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8200210/

Near C. E. (2013). Selling Gender: Associations of Box Art Representation of Female Characters With Sales for Teen- and Mature-rated Video Games. *Sex roles,* 68(3-4), 252–269. https://doi.org/10.1007/s11199-012-0231-6

Rennick, S., Clinton, M., Ioannidou, E., Oh, L., Clooney, C., T, E., Healy, E., & Roberts, S. G. (2023). Gender bias in video game dialogue. *Royal Society open science,* 10(5), 221095. https://doi.org/10.1098/rsos.221095

Black, P. (2017). Sexualization of girls is linked to common mental health problems in girls and women. *American Psychological Association*. Retrieved October 27, 2023, from https://www.apa.org/news/press/releases/2007/02/sexualization

Sydell, L. (2014, June 13). At E3, Critics Renew Calls For More Diverse Video Game Characters. *NPR*. Retrieved October 27, 2023, from https://www.npr.org/2014/06/13/321544943/critics-renew-calls-for-more-diverse-video-game-characters

Wong, S. (2023). How Does Exposure to General and Sexual Harassment Relate to . Female Gamers' Coping Strategies and Mental Health? *Games and Culture*, *0*(0). . https://doi.org/10.1177/15554120231177600