SELF-REARRANGEMENT CHESS

THE EFFECT OF VIOLENT VIDEO GAME ACCEPTANCE ON THE DEVELOPMENT OF VIDEO GAMES.

A Thesis Prospectus
In STS 4500
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By
Selena Pham

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Technical Team Members:

Bryam Ayvar, Bruce Bui, Marshall Mcllyar

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

Catherine D. Baritaud, Department of Engineering and Society

Harry Powell, Department of Electrical And Computer Engineering

AI and Robotics have influenced the way games are designed and played over the past decades, from the early days of scripted behavior to procedurally created content up to player modeling via neural networks and evolutionary algorithms (Ipfelkofer, 2018). Robot machines with artificial intelligence can learn how to perform certain tasks through tactile, physical interactions instead of relying heavily on visual cues. During recent decades, various types of artificial intelligence have been playing against people in highly competitive games and then quickly destroying their human competition (Holley, 2019). In 1997, the Deep Blue computer beat the world Chess champion Garry Kasparov (Miley, 2018). In 2015, a computer program, AlphaZero, beat human opponents at all 49 games in the Atari 2600 suite (challenges that include Pong, Space Invaders, and Pac-man) (Mihn, 2015). Human players have since been shown to be weak opponents in such games compared with a variety of machine programs.

Realizing the advanced development and popularity of artificial intelligence and robotics in playing board games, the objective technical project is to design a chess board with the automatic rearrangement ability that supports players to reorganize their chess pieces to the original positions to start a new game. Chess is one of the oldest board games (Pastor, 2019). Played by humans, chess is a game of strategic thinking, calm concentration and patient intellectual endeavor. There are a great deal of robotic inventions, such as, automatic chessboard, robotic arms, etc, that let AI and humans play chess against each other (Srivatsan & Lakshmi Sutha, 2020). Robotics in board games have become more accepted by society, however, the AI and robotic developers have still faced some challenges. According to Henley (2022), a chess-playing robot unsettled by the fast responses of a seven-year-old boy, grabbed and broke his finger during a match at the Moscow Open. This incident raised the questions about the responsibility and ethics in robotics. The loosely STS research project will focus on investigating

the social acceptance of violent video games. The technical project will be conducted during the Fall 2022 and the STS research will be implemented during the Fall 2022 and Spring 2023, as depicted in Figure 1.

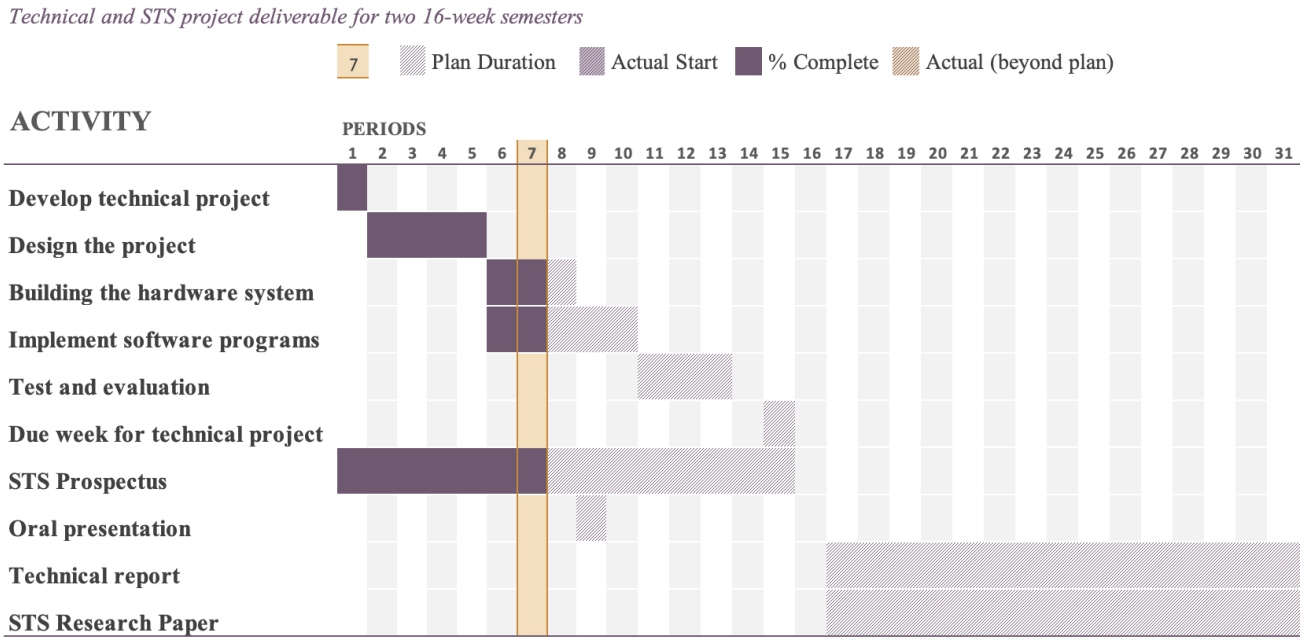

Figure 1: Gantt chart Self-rearrangement Chess. This figure depicts the expected timeline for the technical project and STS research in 32 weeks (Pham, 2022).

SELF-REARRANGEMENT CHESS

The objective of the technical project is to design a device that can rearrange chess pieces back to their original playing position. The design is divided into two major parts: hardware system and software programs. The hardware system is a gantry structure designed based on the core XY technique. Core XY provides a parallel belt-driven mechanism that has an ability to reduce the moving load of the system (Yin et al., 2018). It is composed of a gantry made of the aluminum bars to support the whole structure, a carriage mounted on a metal connected on the top of the frame, an electromagnet carried by the carriage, and two motors to control the carriage

movements. Figure 2 shows the design of the Core XY gantry.

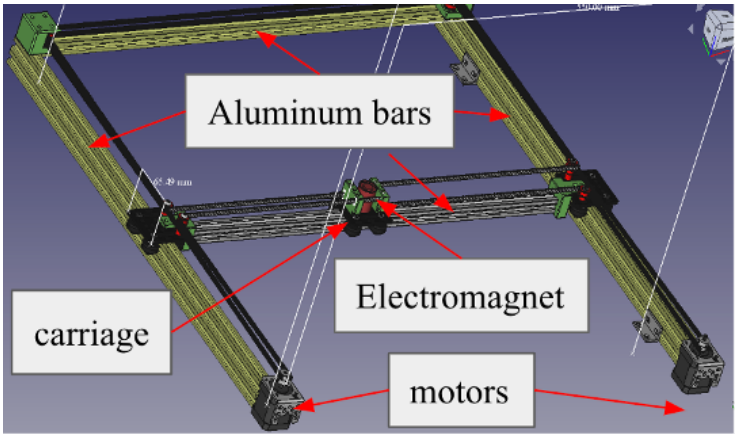

Figure 2: Core XY gantry design. Depictions of core XY structure, consisting of aluminum bars, a carriage, an electromagnet and two motors. (Adapted by Pham (2020) from Mcllyar, 2022).

The software programs include an image processing program to detect pieces and their locations, a rearrangement algorithm to find the best path to rearrange the pieces, and an embedded code program to manipulate the motors to turn on the electromagnet and move the pieces. The image processing program will use a few algorithms from the OpenCV library (Culjak et al., 2012) and the Canny algorithm which detects the edges of the picture (Xu, Baojie & Guoxin, 2017). The rearrangement program will apply the Divide and Conquer algorithm that is a strategy of solving a large problem by breaking it into smaller sub-problems, solving the sub-problems, and combining them to get the expected result (Smith, 1985). This approach will narrow down to find the shortest path to move each piece back to its original spot individually instead of dealing with all the pieces. The algorithm can reduce the time implementation and increase the efficiency of the system.

The self-rearrangement board will be designed, built, and tested during a semester-long capstone project under the guidance of Harry Powell, a professor of electrical engineering in the Department of Electrical and Computer Engineering. The design process to achieve the project objective will include the following steps: (1) develop the design, (2) specify requirements, (3) Build hardware system, (4) Implement software programs, and (5) test and validate.

The design process is depicted in Figure 3.

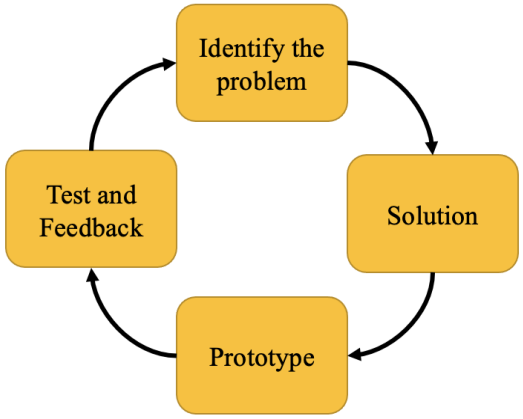

Figure 3: Design process. Depictions of the progression of steps that will be taken to develop the Self-Rearrangement chess (Pham, 2022).

The development of the self-rearrangement board is sponsored by the Department of Electrical and Computer Engineering. The team members on this project include Bruce Bui, Bryam Ayvar, Marshall McIlyar, and Selena Pham. Every team member is an undergraduate student studying electrical engineering and computer engineering in their fourth year at the University of Virginia School of Engineering and Applied Science. This project will be documented in a technical report.

THE EFFECT OF VIOLENT VIDEO GAME ACCEPTANCE ON THE DEVELOPMENT OF VIDEO GAMES.

Over the past decade, the majority of the top-selling video games have fallen under the violent category, either depicting war settings, strong language, and physical fights. Slowly, video game consumers have become desensitized to graphic violence in their devices and as a result, the user base for violent video games has dramatically increased (Anderson et al., 2003). Video games can increase aggressive behavior, cause emotional outbursts, and decrease

inhibitions in people (Anderson et al., 2003, p.81). This has propelled more major game publishers to shift more to these titles, such as shooting and fighting games, which have overall changed the focus of the gaming industry as a whole ("Impact of Video Games on Society", 2018). The very first video-game to have ever been released, pong, had little to no violence, with the main objective of the game being sliding a paddle to get rid of floating points with a bouncing ball. As the years went on, the popular titles have turned into first-person shooters, which incorporated violent elements featuring war and even apocalypse settings in a first person perspective ("First-person shooter", 2018). However, what has been the cause of this change and whether the game developers or the audience changed the development path of video-games. To analyze this, the STS research will apply the Social Construction Of Technology (Bijker & Pinch, 1984) into video-games and identify which social groups were responsible for the current, stabilized idea of a video game we have as of now. Figure 4 describes how social groups drive violent video game acceptance in society.

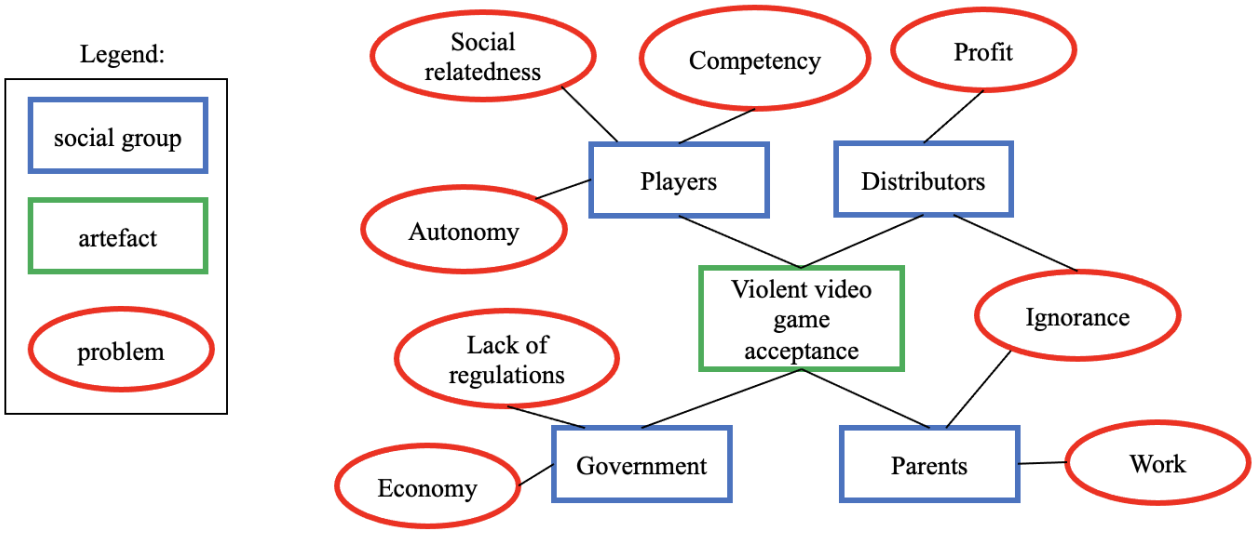

Figure 4: Violent video game acceptance. The violent video game acceptance is affected by social groups, each which prefer different solutions based on their interpretation of the technology (Pham, 2022).

THE EFFECT OF CULTURE ON THE REGULATION AND DEVELOPMENT OF VIOLENT VIDEO GAMES

Within a modern society, direct and physical violence is unacceptable under any circumstance. Nonetheless, these same societies are more tolerant towards virtual violence. Violence as a performance has been used as a form of leisure entertainment throughout the ages (Goldstein, 1998). Humans are driven by their inherent competitive spirit which is often witnessed the most during a match or a duel that has life at stake. Although, winning a game adds up as a major element in enhancing people's lives, defeat is gracefully accepted as well. During ancient times, the team finishing second lost their limbs and even life along with the game (Delamere & Shaw, 2006). Seminole Indians wrestled alligators for food and sport (Alderson, 2020). Mayans played a ball game where the losing team was sometimes sacrificed (Zaccagnini, 2003). Roman chariot racing let drivers whip their rivals, toss them from the chariots, or trample fallen riders with their horses (Fedak & Humphrey, 1987). Although this human inherent spirit of competition propels the violent gaming industry to move forward, engineers and developers also play a role in the decision making process of this technology.

Video-games are technology and tantamount to other technologies. They cater to specific social groups who advocate for a specific feature. In terms of the violence in video-games, there are five main stakeholders: players, government, distributors, game-development companies, and parents. Although there is a standardized rating system for who can play certain video games set by the government, distributors in charge of enforcing these standards have failed (Cunningham, Engelstätter, & Ward, 2011). For example, RowdyRogan, a gamer username, is a famous five year old known for professionally playing the Call of Duty game, and his family is open to

accepting it (Coulson, 2022). Call of Duty is one of the most violent games, but they do not have any age restrictions on it (Clarke, Rouffaer, & Sénéchaud, 2012).

Children exposed to violent video games may become numb to violences, imitate the violence, and show more aggressive behavior (Sherry, 2001). Multiple researchers have already concluded that playing violent video games has been linked to increased aggressive behavior and mood changes in young children (Anderson, Gentile, & Buckley, 2007; Funk, 2006; Funk, Buchman, Jenks, & Bechtoldt, 2003). This leads to a question why the government does not enforce age-restriction for video games the same way it does for alcohol use. The answer lies behind culture. American culture is known for allowing their citizens to be free with pursuing their happiness as long as that does not hurt others (Pettit, 2004). If alcohol can lead to more direct harmful causes, such as DUI crashes and destruction of public property, and drugs can lead to physical assault, disorderly conduct, or traffic accidents, aggression from video-game appears to not affect others instead of individuals. However, it can trigger real-world violence and hurt other people (Markey, Markey, & French, 2015). Therefore, video game technology in America is a unique case in which culture places a barrier on restrictions.

The other social groups at stake, such as players are mostly interested in the nuances that new games offer. Thus leaving the restriction to parents and video-game developers. With an average of over 50% of parents letting their children play video games rated for ages of 18 years old and older (Saunders, 2003), the ethical responsibility of the amount of violence in video games falls under the hands of the engineers and developers in charge of designing the video games themselves. The engineers have the responsibility to look out for the welfare of the users, whether physical or mental. This becomes a problem of identifying the audience of a video-game and understanding the needs and requirements of the user. Within the world of video-game

development, software engineers have the disadvantage of being unacquainted with the extent of their user base, as there are low regulations and a variety of different users that make use of the technology.

Through a study of video game users within different cultural backgrounds, the effect of culture on the development and regulations of video games will be investigated. Applying the idea of Bijker and Pinch (1984), the Social Construction Of Technology will be primarily applied to these cases to better understand the video game development process. This framework asserts that technology does not determine human action, but rather human action shapes technology. In the case of video game development, the violent genre has prevailed due to the inherent competitive spirit humans have, but the ethical responsibility of the psychological implications this genre posing on users is a missing consideration in this process. Through understanding the decision-making process of the features implemented in a video game, the social construction of video-game development will be better understood. Hence, the stabilization of a meeting point between violence and safety can be realized.

The STS research will be in the form of a scholarly article comparing and contrasting different case studies where video-games have been beneficial and detrimental to users, also considering the driving factors of the developers and the cultures of interest. It will attempt to assert the driving factors behind the social construction of video game development and understand how it fits within a certain culture. By determining which types of regulations are most important and have functioned accordingly in other cultures, the field of software engineering can be more effective at tackling ethical issues. Possible outcomes are improving industry awareness behind the flexible audience of software-related technologies .

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