FULLY AUTOMATED GAME OF BATTLESHIP

ARTIFICIAL INTELLIGENCE IN VIDEOS GAMES AND THE IMPACT ON SOCIAL BEHAVIORS

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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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Introduction

Recently the field of video games has advanced to using high-definition graphics to create a virtual reality. During the pandemic, starting in 2020, many of these video games had an increased playing usage of 71%. The need for socialization increased due to the constriction of human interaction, so people started playing video games more. Video games simulate the act of playing a game with another human being. The systems can emulate human beings by using nondeterministic Artificial Intelligence. This technology causes a game to feel unpredictable and adapt to player tactics. The benefits of this AI for the industry allow the game experience to improve and for the computer to respond better to the player's actions. Each video game genre uses this AI differently, and it is most frequently utilized in Shooter, Fighting, Survival, and Battle Royale games. With these violent-themed games in high popularity, people are now experiencing long-term exposure to violent visuals. While nondeterministic Artificial Intelligence presents an incredible opportunity to the video game industry, it also contains a potential risk in differing social behavior. Time once spent playing with another human is now spent playing aggressive video games against a computer. The main topic I wish to explore is the impact of violent AI Video Gaming on players' social behaviors.

For my technical project, the Electronic game Battleship with an Automated Player uses SBnondeterministic AI qualities to create an opponent. The game will have a physical board that allows the user to communicate with a computer program. The automated player will utilize an algorithm that will test a randomized location and move orthogonally on its next move in response to the human player's moves. The game is a video game with violent nature of trying to blow up opponents' ships. The use of this game explores the impact of violent gaming.

Technical Project

The technical project consists of a human player playing against an automated opponent. The computer-shaped game board has the “keyboard area” representing the location of the computer light-emitting diode (LED) display and the “screen area” representing the location of the player LED. The player LED display and computer LED display will consist of a 8 x 8 matrix with 64 LEDs that can change to red, blue, and green. These three colors will communicate to the player the location of their ships, locations that the computer has guessed, sunken ships, and the player’s selections. With 128 LEDs to control, the method of multiplexing simplifies the operation. Multiplexing is a method of networking that combines multiple signals into one signal. This method makes it easier to interface with the LEDs as a whole.

The player communicates with the computer system by placing a game piece on the bottom display. The system will be able to detect the player’s move selection through the magnet in the game piece. Hall Effect Sensors are used to detect the game piece. A Hall Effect Sensor is a sensor that detects the presence of a magnetic field. The computer LED display will also have 64 Hall Effect Sensors. The sensors will detect a change in voltage at a precise location in the 8 x 8 matrix. Multiplexor chips interface with the 64 Sensors to simplify transmission. Multiplexor chips allow multiple pins data to output through a single pin using a set of state inputs to determine which ones are connected.

The computer player will communicate with the player through a Liquid Crystal Display (LCD). An LCD is a flat screen that can display characters and letters. The display will convey to the player the state of the game, meaning whose turn it is, the computer’s move, and who won the game.

The logic of the game and the automated opponent are handled in a separate program. The python program randomly selects the positioning of the computer's ship and the computer's next move. The logic keeps track of the state of the game and communicates what LEDs should be lit and what color the LED should project. The python program and the embedded encoding exchange serial data by a universal asynchronous receiver/ transmitter (UART). The UART simplifies the microcontroller to computer data transfer.

STS Project

AI methods create machines that can exhibit some limited form of intelligence. The intelligence draws players in and suspends their reality for some time. Deterministic AI techniques have been used in video games for longer than nondeterministic ones. Deterministic systems use predictable, fast, and easy techniques to implement and represent nonplayer characters. These methods do not facilitate evolution and make the system predictable as humans expect computers to be. Nondeterministic AI changed that predictable gameplay, instead facilitating learning and adaptive behaviors. The nondeterministic AI gives the player a better opponent to compete against in the virtual reality game. The AI provided escape brings many ethical concerns that could influence a human's social behavior. Violent video games have caused many concerns about the behavioral influence of these games on individuals.

Furthermore, the concerns about video gaming affecting the brain have expanded as more evidence is provided. For example, video games are known to affect attention. While some studies include that players gain better sustained and selective attention, others say that violent video games cause increased aggression and change in behavior. Due to the slight addictivity of these games, players have seen increases in social isolation, maladaptive coping strategies, low self-esteem, and irritability. Due to the aggressiveness of the games, positive attitudes toward

violence have increased. Video game behavioral changes can also be found to be associated with positive effects as well. Playing video games can cause positive emotions and social relationships. Thus, it is essential to explore how violent video games affect players' behaviors.

Social Groups

With over 3 billion people playing all types of video games, the primary age group is 18-34 years old, with under 18 years of age being second. These two groups are relevant social groups in this topic because they interface with this technology the most. Among these two groups, those under 18 undergo the most influence from this technology.

There are various ways that these social groups see AI in video games. The main differentiating factor is what specific games are these social groups playing. The age group, 18-34 is the primary demographic for which aggressive games are advertised and tailored, making this age group the leading social group. Although the games are tailored to adults, many younger users, ten and up, also play these games. Younger players 10-18 years of age are a relevant social group. Adult players older than 34 are relevant but have a lower volume of users, causing them not to be the focal point.

STS Frameworks and Methods

Three of the STS frameworks are used to analyze this topic. The frameworks include Pinch and Bijker's Social Contract of Technology (SCOT), Winner's, and Trace Connections of relation. SCOT framework is a theory that human action shapes technology. Winner's framework is a theory that addresses the politics of artifacts. Tracing Connection of relation a is a method that allows for data analysis and if it may or may not correlate to some other data.

The SCOT framework will investigate the technology's meaning and what human actions shaped the virtual reality technology. Many violent games are based on war and other fighting situations.

These human acts are compared and used when making AI technology for video games, especially war games.

The Winner's framework will investigate who has access to the technology, associated social groups, and specific behaviors. While these games are not meant for all groups of people, many games have some underlying political nature. This framework will be used to expose the underlying political themes within violent video games and how they influence or change a person's social beliefs or behaviors.

Trace connections of relation will be used to investigate correlations between different behaviors and the increased use of violent video games. I will use case studies to understand how a person's views or behaviors change over the extensive use of virtual reality technology.

Relevant Literature

The impact of violent AI Video Gaming on the players' social behaviors will be explored through the collection of existing documents and research. A critical piece of text is from the national medicine library, *Neural Basis of Video Gaming: A systemic.* In the piece, Mark Palaus and others try to understand the relationship between video games and neural activity, such as cognitive factors. The research and analysis are explicitly done around the violent content of video games. The study results suggest that brain structural changes occurred. This is important to my STS topic because it addresses the relationship between violent video games and visuals with changes in brain activity. Changes in brain activity link with changes in actual behaviors.

Another primary source of literature is the essay *The Impact of Video Games on Society.* In the essay, the impact of video gaming on society is to determine whether it leads to aggressive, violent, or anti-social behavior. It dives into specific genres of video games that have

caused the behavior change. Then references how video games may impact factors of aggression and anti-social behavior. This is important to my STS topic because it draws the connection between different social actions based on specific genres of video games.

The third primary source of literature is from the National Center for Health Research by Lauren Goldbeck and Alex Pew, *Violent Video Games and Aggression.* This essay explores violent video game exposure and criminality or delinquency. The article articulates that it is vital to be mindful of personal exposure to violent video games because it is one reason a person may behave differently or aggressively. It does emphasize that video games are only one risk that leads to aggressive behavior and that there are other factors. This is important to my STS topic because it challenges other narratives and studies that may suggest that video games are the direct cause of change in behavior or aggression.

The fourth primary source of literature is by Hannah Nichols entitles *How video games affect the brain.* Nichols discusses the increase of hours per week playing video games and the growing concern about the effects of this surge in usage. Her research suggests that video games change how our brains perform and their structures. This is important because it brings forth additional data on how video games affect humans.

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