Undergraduate Thesis Prospectus

Developing an Aim-bot for a First-Person Shooting Game

(technical research project in Computer Science)

Public Perception of Video Games

(sociotechnical research project)

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

In video games, how may gameplay satisfaction be enhanced without detriment to players' wellbeing?

The video game industry is one of the fastest growing markets in the world, having almost doubled in global revenue since 2017 (Read, 2022). Playing video games can be calming, enjoyable, and restorative, but excessive gameplay can induce stress or anxiety. While gaming is now widely valued as a harmless leisure pursuit, many still perceive it as a solitary and isolating activity that must be regulated to protect players' mental health and to prevent violence.

Developing an Aim-bot for a First-Person Shooting Game

How can reinforcement learning algorithms be integrated in video games to enhance gameplay experience?

To pursue my technical project, I will be working with the computer science department, however my technical advisor and potential project collaborators are not yet determined. I plan to work on this as a capstone project for CS4501, reinforcement learning.

For this project, I plan on developing a third-party agent that can detect targets and automatically move the cursor to them without player input in a custom game environment, also known as an aim-bot. This will be an algorithmically complex project that will require me to implement a machine learning system to create an agent capable of decision making. In doing so, I hope to learn about reinforcement learning, it's role in video games and how such a system can be implemented to improve player satisfaction.

According to a survey conducted by MIDIA Research, 57% of active players prefer single player games over multiplayer (Severin, 2022) where non-playable characters (NPCs)

populate the game environment and have a major impact on player experience. Even in multiplayer games NPCs are commonly used to fill in roles too trivial for the player. Achieving a more dynamic and believable behavior pattern for these entities goes a long way in improving player satisfaction and engagement (Warpefelt, 2016). Reinforcement learning helps developers achieve this by using an independent agent capable of on-the-fly decision making to govern NPC behavior instead of relying on dozens of predictable, hard coded if-then patterns.

For the past two decades, video games have served as a virtual platform to develop and test artificial intelligence. Researchers have been able to assess the development of AI systems by pitting them against top human players in strategy games. According to Julian Togelius, Associate Professor at the New York University Tandon School of Engineering, video games are "a great way of training AI algorithms because they are designed to give human minds gradual progression into harder and harder challenges" (ITU News, 2020). The two most noteworthy instances happened in 1996, when IBM's Deep Blue computer defeated the chess world champion, and in 2016, when Google's AlphaGo algorithm defeated one of the top Go players in the world. However, much of the research done in this field is currently focused on optimizing the algorithms to make them as efficient as possible. I plan on exploring how reinforcement learning algorithms can be integrated in video games to enhance gameplay experience by adjusting to player behavior.

I plan on conducting this project with the assistance of a game making engine such as Unity, contingent on the advice I receive from my technical advisor. Should I succeed in developing this prototype, I will demonstrate the place of reinforcement learning in video games and open an avenue to explore its application in games for the purpose of making them more enjoyable.

Public Perceptions of Video Games

In the U.S., how do social groups compete to influence the extent to which violent videogames are perceived as harmful to players' mental health or proclivity to engage in violence?

Since the video game industry's emergence, violence in video games and its behavioral effects on players have been controversial. The gory violence of Mortal Combat and Lethal Enforcers magnified and drew public attention to the controversy. Following congressional hearings in 1993 and 1994, the video game industry established the Interactive Digital Software Association (IDSA), a trade association which in turn introduced the Entertainment Software Ratings Board (ESRB) to classify and rate game content. IDSA later renamed itself the Entertainment Software Association (ESA).

The Columbine High School shooting in 1999 sparked renewed debate regarding the role of game violence when it was discovered that the perpetrators were devoted players of violent games like Doom. As a result, President Bill Clinton ordered an investigation into school shootings and how video games were being marketed to the youth. According to the report, released in 2004 by the U.S. Secret Service and the U.S. Department of Education, only 12 percent of perpetrators in school shootings had demonstrated interest in video games (USSS, 2004). Despite this finding, several states attempted to introduce laws that would restrict the sale of video games. When such a law was passed by Michigan's legislature in 2006, the Entertainment Software Association, the Video Software Dealers Association and the Michigan Retailers Association sued the state, contending that the law was unconstitutionally vague and abridged First Amendment rights. The court agreed, ruling: "video games contain creative, expressive free speech, inseparable from their interactive functional elements, and are therefore protected by the First Amendment" (AP, 2006).

The most significant ruling happened in 2011 following a challenge to a 2005 California law that prohibited the sale of violent video games to children without parental supervision. The case reached the US Supreme Court who overturned the law, ruling in *Brown v. Entertainment Merchants Association* that video games are constitutionally protected speech under the First Amendment (Oyez, 2011). Being the first case on videogames to reach the supreme court, the ruling was a monumental step in establishing video games as a legitimate medium for entertainment.

Still, many political figures and gun rights activist groups resort to blaming video games as an instigator for violent crimes. Fox, a professor of criminology at Northeastern University, contends that "video games are an easy scapegoat." Politicians "don't lose votes by blaming the video-game industry." They "can lose votes blaming the gun industry, which is why some people choose not to do that" (qtd. in Bella, 2019). In the aftermath of a 2012 shooting at the Sandy Hook Elementary School, investigators discovered that the perpetrator had a collection of video games, including several with violent content. The National Rifle Association (NRA) blamed the video game industry, citing games in which players' characters shoot people in schools (Ray, 2022).

Researchers have sought to identify a causal relationship between violent video games and actual violent acts. According to an American Psychological Association task force report published in 2015, "violent video game play is linked to increased aggression in players but insufficient evidence exists about whether the link extends to criminal violence or delinquency" (APA, 2015). Evaluating the General Aggression Model and the Catalyst Model, Shao and Wang (2019) concluded that video games can be a catalyst to induce violence in individuals who have a genetic predisposition to aggression.

Players and the gaming industry generally defend video games as harmless or even beneficial entertainment. As trade associations, Entertainment Software Association and Entertainment Merchant Association help their members navigate the laws and regulations surrounding the video game industry. Advocacies such as the Video Game Voters Network and the Entertainment Consumers Association represent video game consumers; some contend that public regulation of game content is a form state censorship that constitutes a violation of rights guaranteed under the First Amendment.

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