Graphics and Game Development: Past, Present, and Future

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Abstract:

Advancements in graphics technology have allowed a significant evolution within game development over the past few decades. Not only have video games taken a massive leap visually, but the process of creating them has changed drastically over time. This work explores how such adaptation occurred, and will continue to occur.

Introduction:

Thirty to forty years ago, the term "video game" had a fairly clear definition and association, as back then the industry tended to be limited to arcade machines, game consoles, and those residing on desktop computers. Since then, the term effectively broadened, as it can be found anywhere from the forms previously stated to a cell phone, to even inside someone's Tesla car. On top of this, the public perception of video games has changed drastically since then, as the media has taken the form of a prevalent part of modern society. Prior to the twenty-first century, the concept of playing video games was often considered niche-level, where those who participated in such were often less accepted by society than those who partook in sports and other more socially acceptable activities. In comparison, video games have become so popular today that even professional leagues exist for competition within them. The evolution of hardware and software, and the graphics they produced with such technology were the major reasons for such an explosion in popularity and reconfiguration to how society views the industry.

The Gaming 'Wild West', Downfall and Recovery

Although the public tends to associate the beginning of significant video game culture with the 1980s, the decade prior initiated such development and increase in popularity, with one of, if not the first-ever home video games being created in that time period. The game PONG was introduced to homes in 1972, and essentially consisted of a simplistic two-person game of ping pong. A person with broad computer science knowledge might expect this work to be completed through a few outdated lines of code, when the reality was that it was built solely through discrete logic chips, and did not contain any lines of code at all (Alcorn). Consumers enjoyed the concept of this new form of home entertainment, and businesses across the globe took note of that and saw the industry's potential.

Even though such reactions should typically set the stage for a massive industrial "boom", the industry's growth became fairly short-lived at first, arguably due to corporate greed. Companies knew they could easily earn revenue by entering this kind of business, and as a result, video game publishers (and video games) flooded the market. Looking at the thousands and thousands of games that currently exist today, a market with that many products may not seem like a negative circumstance. However, since nearly all of the products being produced were considered low in quality by the consumer in terms of design and

creativity compared to other products on the market, the interest in video games sharply declined. As a result, the Great Video Game Crash of 1983 occurred, which caused many of the companies that jumped into the industry to promptly leave, including Mattel, one of the largest competitors. The United States market was the most affected by the market crash, as the country dominated the industry in that time period. The profit margin for the industry decreased by 35 percent compared to the previous year, leaving consumers disappointed and the remaining businesses scrambling (Wolf).

The only way to escape such an industry crash was to increase the quality of their products, and Japan took control of the market by doing exactly that. In 1985, the Nintendo Entertainment System was introduced to the United States, and the quality products that it produced brought the interest of consumers enough to end the market recession. A major reason as to why another similar market crash did not occur afterward is the limiting of third-party companies' abilities to develop games for their console, thereby allowing Nintendo (and companies thereafter) to help judge the quality of the products available before releasing them to the market. One of the greatest and most iconic video games of all time, *Super Mario Bros.*, was published and released for this home game console. (Greenwood Press). Not only was the gameplay improved on average for the post-crash video game market, but they were also more visually appealing, with developers doing what they can to maximize the potential of the 8-bit CPU that came with the NES and other competing consoles, and continued to do so as the graphics capabilities improved with future technology.

The "8-bit" design still has some popularity in modern society despite much greater technology existing within consoles and computers, heavily in part due to nostalgia from the previous era but also due to the consumer's appreciation and adoration of the pixelated design. The increase in visual quality allowed less potential confusion by the consumer, as they would be able to see what was going on more clearly and be able to differentiate between desired objects. Less imagination would be needed to appreciate the visual showcase and the game itself, which continued to prove itself as the industry upgraded to 16, 32, and 64-bit processing units to work with.

The Nintendo Wii, and Other Major Industry Changes:

As home gaming hardware continued to improve, there was a decent push within the industry to consistently display 3-D graphics. As video games continued to upgrade into the 16-bit industry, developers often used lighting and shading techniques to mimic a three-dimensional perspective, but outside of a few minor exceptions, there was a lack of commercial titles with 3-D graphics until the introduction of consoles with 32 and 64-bit processing units. *Super Mario 64* on the Nintendo 64 is widely considered the first of its kind to display such graphics naturally. Prior to more advanced consoles such as the Nintendo 64, games often had to pass up on significant detail by making the initial upgrade from 2-D.

In the mid-2000s, however, the industry took a different turn. Genuine 3-D graphics were consistently present in games for over five years, and Nintendo

decided to take a step towards implementing augmented reality within their games. The Nintendo Wii was the first gaming console to completely implement motion control, having a remote and accessories that interact with a player's arm and even leg movement. For this reason, the console itself was not as graphically advanced as its main competitors, the Xbox 360 and Playstation 3, and therefore could not provide as realistic visual showcases as them. However, game developers for the groundbreaking console did provide visuals that corresponded smoothly with the motion controls, and that were visually pleasing enough to let the console generate more sales than all of its competitors at that time. On top of this, online multiplayer within video games continued to increase in popularity, leaving developers needing to create products with the best visuals they can to stay competitive in the market while acknowledging these other features previously not present in other games or consoles..

Game Development: Present and Future:

It may be easy to assume that the game development process in the past compared to the current day was more simplistic and less difficult considering how complex modern games are, but that isn't necessarily true. Before the age of online multiplayer and game access, game developers would need to produce a completely working product by the time of the game's release, as the game itself could not be updated for each user remotely. Today, companies can release games without doing extensive bug testing, and take the feedback given by the users to update their software in real-time. However, that often means game companies need to be working on their game far after its launch to compensate for these issues, as its popularity often depends on getting some of these major issues resolved. On top of this, the continuous growth of the industry has allowed companies to employ teams of developers more often than not of greater size than those of the past. Such large teams are often necessary though, in order to deal with consistently updating online multiplayer games, either by fixing bugs or regularly adding new content to keep up with its competitors.

Given that the hardware for which the developers are working went from logic circuits to computers with Graphics Processing Units that would blow any technology from the twentieth century away, the overall quality and complexity of video games and the work that goes into developing them can be directly correlated to such. The recent introduction to mobile phone gaming has essentially shown a nostalgia trip within the industry's development history, as smartphones have gone from being able to play 8-bit games such as Tetris to full, complex, 2000s 64-bit titles only desktop computers and gaming consoles used to be able to run (Taylor & Francis). This development is not exclusive to smart devices, as even modern scientific and graphing calculators currently have the capabilities to play 8-bit titles, despite that not being their intention for use. As shown on a smaller scale with the Nintendo Wii, virtual reality technology continues to improve in order to present the best visual experience possible for the user, and allow a complete desired immersion effect.

This consistent strive to push the limit and improve products has allowed the video game industry to reach what it is today, and its strength and consistency

over these decades have allowed it to stay prevalent in society. The current future plans for video games appear to be centered around VR, as such potential immersion allows for new ways a game, no matter how simple, can be enjoyed. For example, a user playing a game where they are flying by using virtual and augmented reality devices will feel very different than using a standard controller and viewing a TV a foot or two away. As cryptocurrency becomes more popular within modern and future society, it already has shown signs of entering the gaming world. As it may become intertwined with in-game currency, potential ethical issues could arise from the continued blurring of real and virtual lines, as glitches within games could become far more detrimental to the user's life (Nicovich, Scheld).

Conclusion:

The presence of video games in modern and future society has allowed the industry to mesh with other aspects such as sports, as well as political topics. Esports allows users to play various online multiplayer games professionally, competing for cash prizes and providing similarities to modern (physical) sports by doing so. On the political side, the violence in video games has always come into question in regards to how much should be allowed to show to the public. As time has gone on, these political discussions get even more serious, with those suggesting children playing violent video games influence them to perform violent actions, such as school shootings. None of this would likely be discussed if the video game industry did not survive the Great Video Game Market Crash of 1983, as the massive popularity of the industry simply would not exist. However, since game development has consistently evolved to create the best usage of its hardware, and overall produce products of higher quality and less quantity, the video game industry has reached its current status in society and will continue to have such impact for decades to come.

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