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Video Game Graphics: A Comprehensive Analysis of Styles and Techniques

By

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Abstract

This paper seeks to provide a comprehensive overview of the world of video game graphics by analyzing prevalent styles and techniques utilized to create game content. The paper opens with a brief history of the development of video game visuals across time, highlighting significant turning points and demonstrating how changes in technology have affected the visual aesthetics of video games. The paper also charts the development of video game graphics and shows how they have evolved into an essential component of the gaming experience from the early days of Pong and Space Invaders to the contemporary era of photorealistic 3D visuals .The article explores the various stages of the graphic design process, from conceptualization to final implementation, stressing the difficulties and opportunities that exist at each stage. In addition, the article examines the various programs and equipment employed by graphic designers in the field and how they have changed through time

Introduction

Video game graphics refer to the visual elements that are displayed on a screen while playing a video game. These graphics are created using a combination of computer software and hardware, and they are responsible for creating the game's immersive environment. With the rapid pace of technological advancements, the graphics in video games have evolved significantly over the years.

The impact of technological advancements on the graphical styles used in video games has been significant. Advances in graphics technology have allowed game developers to create more realistic and immersive environments, with more detailed textures and lighting effects. This has resulted in a more engaging and immersive gaming experience for players (1).

One of the most significant technological advancements that have impacted video game graphics is the development of high-end graphics cards and processors. These advancements have allowed for more complex and detailed graphics to be displayed in real-time, leading to a more immersive and lifelike gaming experience (2). Moreover, the use of artificial intelligence has also contributed to the improvement of video game graphics. Artificial intelligence allows for more realistic and accurate movements and interactions of objects in the game world (3).

An understanding of the most recent tendencies and standards in game graphics can be gained by conducting research on the graphical styles that are employed in games that are commercially successful and widely played within the industry.

A Journey through the History of Video Game Graphics

The development of graphics and artwork in video games has been a fascinating journey that has been marked by significant technological and creative leaps forward. According to Carl Therrien, an expert on the history of video games, Due to technological limitations, the earliest video games, such as Pong and Space Invaders, used simplistic geometric forms and limited color palettes. These early games focused primarily on gameplay, not graphics, and their simple graphics reflect this (4).

The graphics of video games started getting better as technology advanced. The release of 8-bit and 16-bit consoles, such as the Nintendo Entertainment System and the Sega Genesis, made it possible to create graphics that were richer in both detail and color. These game consoles allowed for a new level of visual expression in video games, which contributed to the widespread popularity of games like Super Mario Bros and Sonic the Hedgehog. The Super Mario Bros series utilized the technology of the time to create a new kind of game that was fun to play and visually appealing, stated Shigeru Miyamoto, the designer of the Super Mario Bros (5).

Even more advanced graphics, such as 3D graphics, were introduced with the release of 32-bit and 64-bit consoles like the PlayStation and Nintendo 64. The use of these consoles made it possible to create environments, characters, and special effects that were more realistic and detailed. The capabilities of these new gaming systems became epitomized by games like Super Mario 64, The Legend of Zelda: Ocarina of Time, and Final Fantasy VII, which became cultural icons in their own right. "Final Fantasy VII was a turning point for the series," said game designer Hironobu Sakaguchi. Final Fantasy VII was the first game to use 3D graphics, and it set a new standard for RPGs (6).

The Xbox, PlayStation 2, and GameCube each brought new levels of graphical sophistication to the gaming industry when they were released. These gaming consoles featured more advanced graphics engines and greater processing power, which made it possible to create environments, characters, and special effects that were even more realistic and immersive. The capabilities of these systems were demonstrated by a number of games, including Grand Theft Auto III, Halo: Combat Evolved, and Metal Gear Solid 2: Sons of Liberty, amongst others. Metal Gear Solid 2: Sons of Liberty is said to have been the game that "pushed the limits of the PS2's hardware to create a cinematic and immersive experience." This statement was made by the game's designer (7).

The graphics in video games have become even more lifelike and immersive in recent years thanks to technological advancements such as more powerful computers and game consoles, as well as more sophisticated graphics engines. The graphics of recent video games, such as The Last of Us Part II, Red Dead Redemption 2, and God of War, have pushed the medium to new heights, demonstrating the enormous potential of the medium as a whole. "The Last of Us Part II pushed the boundaries of what was possible in terms of storytelling and graphics in video games (8).

This research examines the different graphical styles used in video games, including pixel art, hand-drawn animation, and photorealism, and how they are applied to achieve various effects and moods. The study also looks at how the video game industry doesn't know enough about how the style of graphics affects how engaged and happy players are, and how this makes it hard for game designers and developers

Moreover, research also examines the relationship between the graphical style of a video game and player involvement and enjoyment, and to identify the key factors that contribute to an effective graphical style. To put a comprehensive review about graphical styles used in video games, the research explores various graphical styles used in video games and analyze how they impact player involvement and enjoyment. Additionally, the research considers technical limitations that game designers must take into consideration when creating game content, and how these limitations affect the overall graphical style of a game

Research Objective

The objective of this research is to investigate the impact of technological advancements on the graphical styles used in video games, as well as the practical aspects of creating game graphics, the process and challenges of graphic design, the tools and software used by graphic designers, the technical limitations that must be taken into account, and the various graphical styles used in video games. Moreover, it also aims to provide a brief history of how video game graphics have changed over time, pointing out important turning points and showing how changes in technology have affected how games look.

Literature Review

The term "graphical style" is used in the context of video games to describe to the overall look and feel of the game, which can range from comical to realistic. Different graphical styles have the potential to elicit a range of feelings in the user as well as produce a variety of gameplay experiences (9). Tetsuya Mizuguchi, the creator of Rez and Lumines, noted that "The graphical style is like a brand for the game, it should be recognized and consistent (10)." The graphical style can also act as a signature for the game. In addition, Shigeru Miyamoto, the creator of Super Mario and The Legend of Zelda, stated that "The graphical style should not merely be a cosmetic layer," meaning that it should be an extension of the gameplay (11).

There is a wide variety of graphical styles that can be used in video games, ranging from whimsical to serious, from realistic to abstract, and from 2D to 3D (12). The following are some examples of common graphic styles :

- These games strive to provide a highly realistic and lifelike portrayal of the game environment in order to give the player an authentic experience .
- Cartoonish: Video games that fall under this category have a more exaggerated and stylized art design, frequently utilizing bright colors and basic geometric shapes .
- The visual presentation of these video games is intended to be simple and abstract rather than representational. They frequently make use of geometric forms and a restricted color palette .
- D: These games use two-dimensional visuals and frequently have a vintage or traditional flavor to them .
- D: These games use graphics in three dimensions and typically have a more contemporary and immersive feel to them .

It is important to highlight the fact that it might be difficult to collect statistics on the graphical style of video games because the graphical style is often a subjective part of game creation. However, developers can acquire a better knowledge of how players engage with and respond to different graphical styles by employing a combination of quantitative and qualitative data. This is because both types of data can be measured quantitatively and qualitatively (13).

Early Arcade Game Graphics

In the 1970s and 1980s, the video game industry was in its early stages of development. The technology of the time was limited, and as a result, video games featured simplistic graphics. Despite these limitations, early video game developers found ways to create engaging and memorable experiences for players (14).

One example of this is the 1983 Star Wars arcade game, which used lines of different colors to create the illusion of 3D graphics. While these graphics may not compare to today's standards, they were considered cutting-edge technology at the time. Another popular game of the era, Space Invaders, used simple sprite graphics to represent characters on the screen. This type of graphics would eventually become the standard for video games as they became available for play on home consoles (15).

It is worth noting that the advancements in processing power and graphics technology have allowed for the development of much more advanced and immersive video games. Today, players have access to a vast array of games online, ranging from platform games and RPGs to shooters and puzzles. In comparison, the technological limitations of the 1970s and 1980s would have made such a wide variety of games seem like science fiction.

Early Console Game Graphics

The early home game console industry was established in 1977 with the introduction of the Atari 2600 (16). However, the graphics capabilities of these consoles were limited in comparison to those of arcade games. One example of this limitation can be seen in the difference between the arcade and home versions of the popular game Pac-Man. While the arcade version of the game featured rich colors and detailed sprites, the home version was restricted by a limited color palette and choppy animation, resulting in a less visually appealing experience for players (16).

This disparity in graphics quality between arcade and home games was due to the technological limitations of early home consoles. The hardware capabilities of these consoles were limited, making it difficult to produce graphics that were as advanced as those used in arcade games.

It is worth noting that as technology continued to improve, home consoles were able to close the gap in terms of graphics quality with arcade games. Today's home game consoles, such as the PlayStation 5 and Xbox Series X, are capable of producing incredibly realistic and detailed graphics, rivaling and even surpassing those of many arcade games (17).

The Nintendo Entertainment System and Home Gaming

The introduction of the Nintendo Entertainment System in 1983 marked a significant milestone in the development of home game consoles. The 8-bit graphics of the console's games represented a major leap forward in terms of visual quality. The developers of these games found innovative ways to work within the limitations of the hardware to create graphics that were more visually appealing.

One example of this innovation can be seen in the creation of characters like Mario, who was created by seamlessly stitching together four unique sprites (18). This technique was

groundbreaking at the time and helped to overcome the restrictions of the programming and hardware technology available. This marked a key moment in the evolution of home game consoles, as it demonstrated the potential for greater creativity and innovation in the development of video games. It paved the way for further advancements in graphics and other aspects of video game technology, leading to the highly advanced and immersive games available today (18).

The 16-Bit Era and Video Game Graphics

The Advancement of Video Game Graphics in the 1990s: A Study of the 16-Bit Era. In the 1990s, video game graphics underwent a significant transformation with the advent of the 16-bit era. The expansion of color palettes and increased detail in sprites represented a substantial leap forward in the visual aspect of video games (19).The launch of 16-bit consoles such as the Super Nintendo Entertainment System (SNES) marked a new level of sophistication in video games, as evidenced by popular games like Super Mario Bros (20).

A comparison of games from previous generations, such as Final Fantasy and Dragon Warrior, to 16-bit games such as Final Fantasy II and Chrono Trigger, highlights the significant differences in graphics and gameplay that characterized the 16-bit era (21). Alongside these advancements in graphics, the 1990s also saw the implementation of new technologies in video games. For example, the utilization of the Mode 7 technique in Nintendo racing games allowed game designers to create 3D imagery by manipulating 2D objects (22). Additionally, the addition of a processing chip to game cartridges, as exemplified by Super Mario RPG, allowed for even greater graphical processing power (23).

Over all, the 1990s represented a crucial turning point in the evolution of video game graphics, as the 16-bit era brought with it expanded color palettes, increased sprite detail, and new technologies that pushed the boundaries of what was possible in video games.

The Rise of 32-bit Gaming: Sony PlayStation Era

In the late 1990s, the video game industry saw the introduction of the 32-bit era of graphics. The Sony PlayStation emerged as the leader in this new era, with its use of CD-ROMs as the medium for game storage. This allowed for greater storage capacity, enabling game developers to produce games with more advanced graphics. Despite this, the 3D graphics in many of the PlayStation games still did not compare to the level of today's games (24).

The transition from 16-bit to 32-bit graphics marked a significant leap in the development of video game technology. The increased storage capacity of the CD-ROMs allowed game developers to create games with more advanced graphics and greater levels of detail. However, it would still take several years for the graphics in video games to reach the level of sophistication seen today.

Game Graphics Advance: Nintendo 64 impact

The advent of 64-bit graphics technology in video games marked a significant milestone in the evolution of video game graphics (25). The Nintendo 64, which was released in 1996, was instrumental in popularizing this new era of graphics. With its powerful hardware, the Nintendo 64 allowed game developers to create games with stunning 3D graphics (26). One

of the best examples of this new era of graphics was the game Super Mario 64, which was widely regarded as a game-changer in the world of 3D platform games (24).

Despite the remarkable advances in graphics technology, the fundamental technology used to create 3D graphics still relied on clever sprite placement and manipulation. This highlights the ingenuity of video game developers and their ability to work within the limitations of technology to produce visually stunning games (26).

The Evolution of 3D Graphics in Video Gaming

With the advent of computer hardware, the video game industry has seen a significant rise in the development of 3D graphics (27). In 1999, the Sega Dreamcast console was launched, marking the beginning of a new era in video game graphics (28, 29). The Dreamcast was ahead of its time and brought new features to the table such as the ability to play games in true 3D and built-in modular modem for online play (30). This was a stark contrast to previous generation games, which relied on clever sprite placement and manipulation for their 3D graphics.

The Dreamcast was well received by the gaming community and received critical acclaim for its advanced graphics. Games like Sonic Adventure, Crazy Taxi, Shenmue, and Jet Set Radio demonstrated the capabilities of the new console and showcased some of the best graphics and gameplay ever seen in video games (31). The Dreamcast paved the way for other gaming companies to follow suit, and it was not long before the big three companies of today's gaming industry, Nintendo, Sony, and Microsoft, released their own consoles, such as the GameCube, PlayStation 2 and Xbox, which continued to push the boundaries of 3D graphics (32).

The rise of 3D graphics in the video game industry can be attributed to advancements in computer hardware and the innovation of companies like Sega. The Dreamcast set the standard for future consoles and games, and the big three companies continued to push the boundaries of 3D graphics and gameplay.

Graphics for Today's Modern Era

The video game industry has seen significant advancements in graphics technology in recent years. The rise of high-definition displays and improved computer hardware has allowed for the creation of games with stunning visuals and high frame rates (33). For example, LA Noire: The VR Case Files boasts graphics that surpass what was considered realistic just a few decades prior (34).

Many modern games possess a cinematic quality, with images that are near-photorealistic (35), as demonstrated in games created using the Frostbite game creation software suite (36). This is a testament to the continuous effort of gaming studios to push the boundaries of what is possible in terms of graphics technology. As virtual reality and machine learning continue to play a role in the development of video games, the future of game graphics looks even more promising (37). It is possible that future games will feature graphics so realistic that they closely resemble the real world (38).

Methodology

This study employs a qualitative research approach to investigate the video game graphics, and techniques about the graphics in video games. This study aims to get a

comprehensive understanding of how video game graphics and affect the gameplay experience as well as which techniques has used in the graphics development.

For this purpose, existing literature about video games is explored and reviewed. The data gathering approach involve selecting a variety of video games from various eras and genres, and then analyzing them through multiple playthroughs and examination of in-game elements. The analysis concentrates on detecting repeating patterns in the graphic design of the games, as well as techniques used for graphics in various genres games.

Data Collection

The data used for this study is the early arcade, home console, and video game graphics of the 1970s, 1980s, 1990s, and early 2000s. This data obtained from various online sources, such as gaming blogs and archives. Moreover, the modern era's video game graphics like GTA theft, Apex Legends, and Fortnite battle field games are also analyzed.

Data Analysis

The collected data analyzed in order to assess the evolution of video game graphics over time. This process involved comparing the graphics of early arcade games, such as Space Invaders and Star Wars, to those of later 16-bit games, such as Super Mario Bros., and 32-bit games, such as those on the Sony PlayStation. The analysis also includes an assessment of the impact of new technologies, such as the Mode 7 technique and processing chips, on the development of video game graphics.

Graphics Comparison

The collected data then used to compare and contrast the graphics of different games across different eras. This involves comparing the visual quality and level of detail of graphics in early arcade games to those in later 16-bit and 32-bit games. The comparison also includes an assessment of the limitations and advancements of early home consoles in comparison to arcade games.

In the late 1990s and early 2000s, 3D graphics became popular, and games began to feature more lifelike characters, environments, and special effects. With the advent of high-definition displays and powerful graphics cards, game developers were able to create even more detailed and realistic images.

Recent Editions of the Video Games

In recent years, there has been a push towards photorealism in video games. Games like "Grand Theft Auto V" and "Red Dead Redemption 2" feature stunning graphics that are nearly indistinguishable from real-life photography. In addition to photorealism, there has also been a trend towards more stylized graphics, such as the cel-shaded look of games like "The Legend of Zelda: The Wind Waker" and "Okami".

After more than three decades of history for the video game industry, it become interesting to make comparisons or evaluate how things have changed.

Gaming Immersion: Gameplay and Graphics

Graphics and gameplay are two of the most important aspects of video game development, and they are closely related to one another. Both of these aspects are closely related to one another. The term "gameplay" refers to the mechanics and rules that govern the play of a game, including things like the controls, objectives, and challenges. Bjork, S., & Holopainen, J. (2005). The creation of a game's characters, settings, and special effects are all components of its graphics, which are also referred to as the game's visual presentation. Because of advances in technology, it is now possible to create visuals that are both more realistic and more immersive. Modeling in three dimensions (3D), advanced lighting and shading techniques, and physics engines are a few examples of the types of visuals that fall into this category. The impact that these visuals can have on a player's experience while playing a game can be direct .

"Good game design happens when you view your game from as many perspectives as possible," Pobłocki, K. (2003) , the creator of the Civilization series of video games. "Good game design happens when you view your game from as many perspectives as possible." " The man who helped create Doom and Quake, John Romero, once said that "gameplay is the cake, and graphics are the icing on the cake." John Lasseter, one of the co-founders of Pixar, has stated that the graphics of the game serve as representations of the characters in the storyline of the game Marques, J., & Mintzberg, H. (2015).

As part of the ongoing research projects in the field of game graphics design, real-time rendering, global illumination, and physically based rendering are just some of the aspects of game graphics design that are currently being investigated (Hoffman & Preeti, 2019). These studies have the goal of improving both the graphical quality of video games and the level of immersion that is offered to the player by those games. In addition, research on gameplay mechanics and design (Sweetser & Wyeth, 2005) can shed light on how to create gameplay experiences that are both interesting and simple to comprehend. This can be of use in the development of interactive video games .

To elaborate, the creation of the video game's graphics as well as the game's mechanics are both necessary parts of the production process. The development of new technologies and the continual research into these areas are both essential elements in the creation of gaming experiences for players that are immersive and enjoyable.

The specific style will depend on the intended audience, message, and purpose of the graphic.

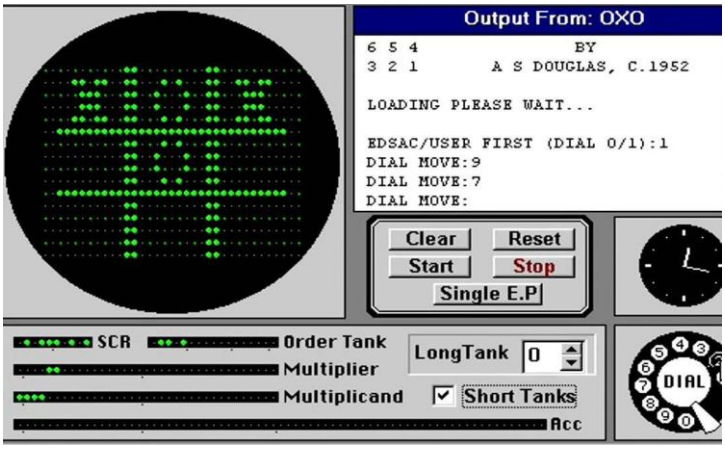

Figure 1: *Typical Graphics*

Examining the oscilloscope, one might initially presume its purpose to be limited to laboratory use. However, it also served a secondary, more recreational purpose. The first video game in history, called "Tennis for Two," was born from this very oscilloscope. Observing the gold and green trace on the oscilloscope, it is easy to recognize the representation of a tennis court. Created in 1958, this pioneering video game was simple in design, befitting of its status as the first video game in human history. With gameplay similar to the 1970s classic "Pong," "Tennis for Two" was a hit during open house events at the Brookhaven National Laboratory.

The game was designed by physicist William Higinbotham, who sought to add an element of excitement to the otherwise lackluster exhibits at the laboratory. Created in October 1958, "Tennis for Two" paved the way for the video game industry as we know it today.

However, At the time of 1958, the technology available for creating video games was extremely limited, so the graphics in Tennis for Two were simple and primitive by today's standards.

The game was displayed on an oscilloscope, which was a type of cathode ray tube used for displaying waveforms. The game used simple dot graphics to represent the tennis ball and two horizontal lines to represent the tennis net. The background was a simple grid pattern, and there were no other graphics or decorations.

Given the technology available at the time, the graphics in Tennis for Two were impressive for their day, but they would be considered quite rudimentary by today's standards. Despite its simple graphics, Tennis for Two was a groundbreaking game that paved the way for the development of more advanced video games in the years to come.

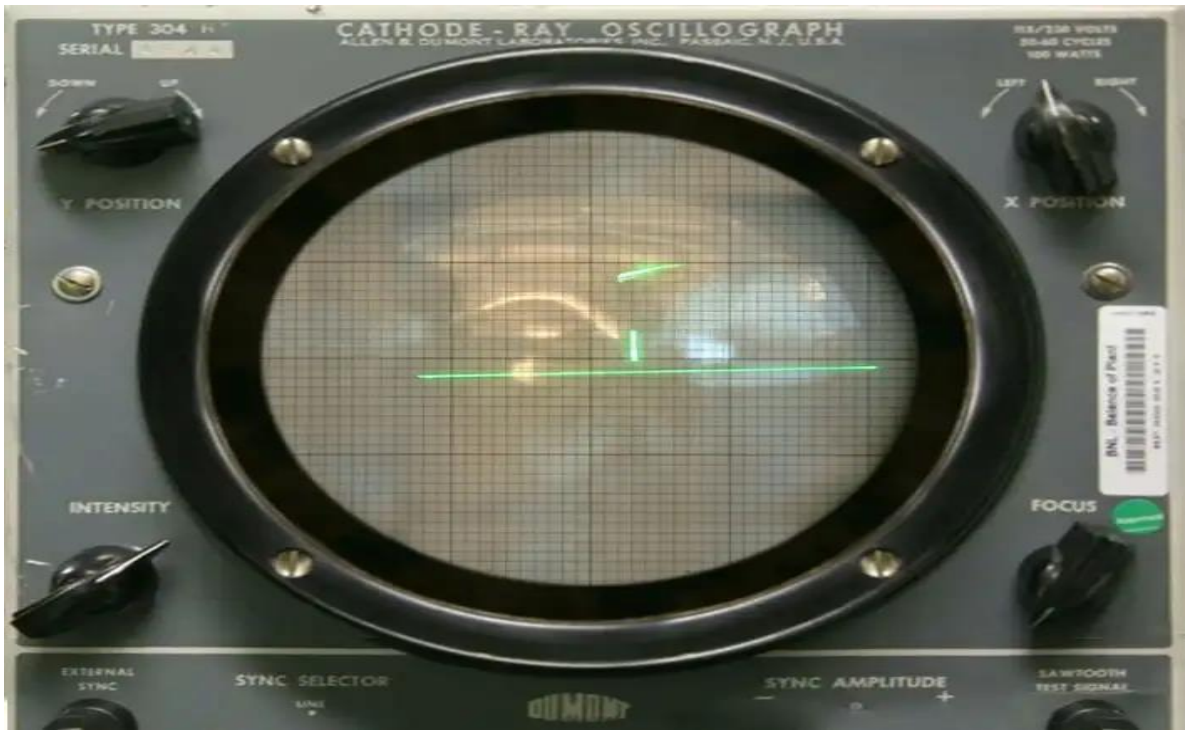

Figure 2: *Tennis For Two —Brookhaven National Laboratory New York*

Space Invaders is a classic arcade game that was released in 1978. It was one of the first games to feature aliens as the main enemies, and it quickly became one of the most popular games of its time.

The graphics in Space Invaders were simple and consisted of black and white pixels. The aliens were represented by simple geometric shapes, and the player's ship was represented by a single pixel. The background was a simple pattern of white and black lines. Despite the simplicity of the graphics, Space Invaders was an incredibly addictive game that captivated players with its simple yet challenging gameplay.

In terms of technology, Space Invaders was limited by the hardware available at the time. The graphics were generated using a series of electronic circuits, and the gameplay was controlled by a few basic chips. Despite these limitations, Space Invaders was an incredibly popular game that paved the way for the development of more advanced video games in the years to come.

Overall, the graphics in Space Invaders were simple, but they were well-suited to the technology available at the time, and they played an important role in establishing the video game industry as we know it today.

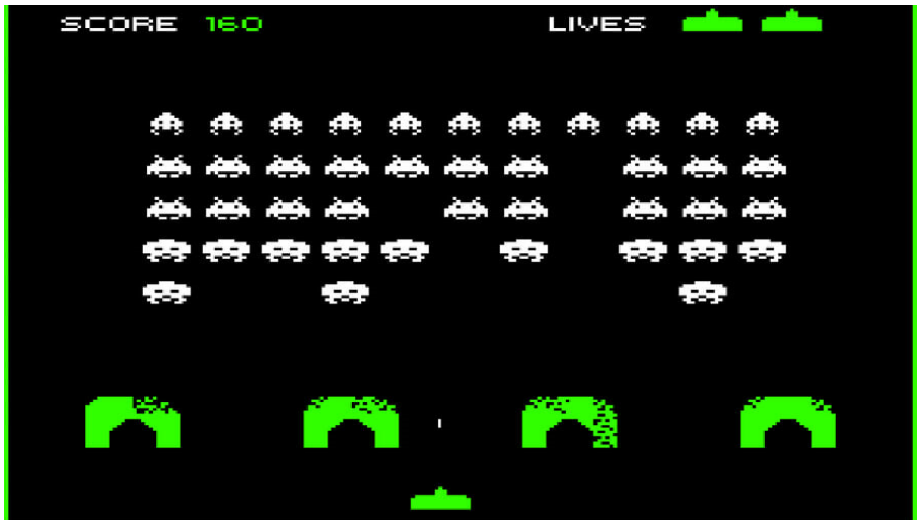

Figure 3: *Space Invaders Graphics*

Pac-Man (1980) - Pac-Man is an iconic arcade game that was released in 1980. It was one of the first games to feature a single player character that the player controlled, and it quickly became one of the most popular games of its time.

The graphics in Pac-Man were simple and consisted of colorful pixels. The main character, Pac-Man, was represented by a yellow circle with a mouth that changed shape depending on the direction he was moving. The ghosts were represented by simple geometric shapes in different colors, and the dots and power pellets that Pac-Man ate were represented by white pixels. The background was a simple maze pattern.

In terms of technology, Pac-Man was limited by the hardware available at the time. The graphics were generated using a series of electronic circuits, and the gameplay was controlled by a few basic chips. Despite these limitations, Pac-Man was an incredibly popular game that paved the way for the development of more advanced video games in the years to come.

The graphics in Pac-Man were simple but memorable, and they played a major role in the game's popularity. The bright colors and memorable character designs have helped to make Pac-Man one of the most recognizable video games of all time.

Figure 4: *Pac-Man Graphics*

Super Mario Bros. (1985) - Super Mario Bros. is a classic platformer game that was released in 1985. It was one of the first games to feature an expansive game world, and it popularized the side-scrolling platformer genre.

However, the graphics in Super Mario Bros. were created using 8-bit graphics, which were a step up from the 4-bit graphics used in earlier games. The characters in the game were represented by colorful pixels, and the background and levels were designed using a variety of textures and patterns. The game had a whimsical and playful feel, with bright colors and memorable character designs that helped to make it one of the most popular video games of its time.

In terms of technology, Super Mario Bros. was limited by the hardware available for the Nintendo Entertainment System (NES), which was the platform the game was released for. The graphics were generated using a limited number of colors and pixels, and the gameplay was controlled by a few basic chips. Despite these limitations, Super Mario Bros. was an incredibly popular game that popularized the side-scrolling platformer genre and helped to establish the NES as a major player in the video game industry.

The graphics in Super Mario Bros. were simple, but they were well-suited to the technology available at the time, and they played a major role in the game's popularity. The bright colors and memorable character designs have helped to make Super Mario Bros. one of the most recognizable video games of all time.

Figure 5: *Super Mario Bros Graphics*

Doom (1993) - Doom is a classic first-person shooter game that was released in 1993. It was one of the first games to feature 3D graphics and fast-paced, first-person shooting gameplay, and it helped to popularize the first-person shooter genre.

The graphics in Doom were created using early 3D graphics technology and were a significant step up from the 2D graphics used in earlier games. The game used a first-person perspective, which allowed players to experience the action as if they were actually in the game world. The graphics were relatively simple by today's standards, but they were impressive for their time and allowed for fast-paced, immersive gameplay.

In terms of technology, Doom was limited by the hardware available for PC platforms, which was the platform the game was released for. The graphics were generated using a combination of textured polyggonal models and sprite-based graphics, and the gameplay was controlled by the player's keyboard and mouse. Despite these limitations, Doom was an incredibly popular game that helped to popularize the first-person shooter genre and establish it as a major game genre.

Overall, the graphics in Doom were innovative for their time and played a major role in the game's popularity. The use of 3D graphics and fast-paced first-person shooting gameplay helped to make Doom one of the most memorable and influential video games of all time.

Figure 6: *Doom Graphics*

Grand Theft Auto (GTA) is an open-world action-adventure game that was first released in 1997. It was developed by Rockstar North (formerly known as DMA Design) and was originally released for the PlayStation and PC platforms. The game was a major departure from traditional video games, as it featured a large open world and non-linear gameplay, which allowed players to explore the game world and complete missions at their own pace.

Over the years, the Grand Theft Auto franchise has evolved and expanded, with the release of several sequels and spin-off games. GTA II was released in 1999 and was set in a new city, with updated graphics and gameplay mechanics. GTA III, which was released in 2001, marked a major turning point for the franchise, as it introduced a fully 3D game world, allowing players to experience the game from a more immersive perspective.

GTA III was a commercial and critical success, and it established the Grand Theft Auto franchise as one of the most important and influential video game franchises of all time. Its

success helped to popularize the open-world action-adventure genre and established it as a major game genre.

Figure 7: *GTA III Graphics*

Grand Theft Auto III (GTA III) was a major turning point in the Grand Theft Auto franchise, as it introduced a fully 3D game world and allowed players to experience the game from a more immersive perspective. The game's graphic style was designed to reflect the dark and gritty urban environment of Liberty City, the fictional city in which the game is set. The graphics were a significant step up from the previous games in the series, and the game's use of light and shadow helped to create a sense of depth and realism.

The character models in the game were also designed to be more detailed and expressive, with more advanced animation systems and improved facial expressions. The vehicles in the game were also designed to be more detailed, with realistic reflections and shadows, and improved physics systems that allowed for more realistic driving and handling.

The graphic style of Grand Theft Auto III was a major leap forward for the franchise, and it helped to establish the game as one of the most important and influential video games of all time. Its success helped to popularize the open-world action-adventure genre and established it as a major game genre.

Fortnite (2017) - Fortnite is a popular battle royale game that was released for multiple platforms. It popularized the battle royale genre and helped to establish it as a major game genre.

However, the graphic style of Fortnite is brightly colored, cartoonish, and stylized. The game world is a fantastical island filled with brightly colored buildings, terrain, and vegetation. The character models are exaggerated, with large heads and hands, and the weapons and vehicles in the game are also brightly colored and stylized.

One of the defining features of Fortnite's graphic style is its use of bright, vibrant colors. This helps to create a sense of fun and excitement, and it sets the game apart from other, more

serious-minded games in the battle royale genre. The game's stylized graphics also help to create a more accessible, less intimidating atmosphere for players of all ages.

Figure 8: *The graphic style of Fortnite*

The graphic style of Fortnite is designed to appeal to a wide range of players, and it has helped to establish the game as one of the most popular and widely played games of all time. The game's bright and colorful graphic style has also inspired a number of other games in the battle royale genre, and it has helped to popularize the genre as a whole.

Apex Legends (2019) - Apex Legends is a battle royale game that was released for multiple platforms. It helped to popularize the battle royale genre and established it as a major game genre.

Figure 9: *The graphic style of Apex Legends*

The graphic style of Apex Legends is more realistic and grounded compared to the bright and cartoonish style of Fortnite. The game is set in a futuristic world where players control legendary characters, known as "Legends", each with their own unique abilities and play styles.

The game's graphics are highly detailed, with realistic character models, weapons, and vehicles. The game world is also highly detailed, with realistic terrain and weather effects, and a well-realized futuristic environment. The lighting and shading in the game are also well-done, helping to create a sense of depth and realism.

One of the defining features of Apex Legends' graphic style is its use of a more grounded and serious visual style. This helps to establish a more serious and intense tone, and it sets the game apart from other, more lighthearted games in the battle royale genre.

Overall, the graphic style of Apex Legends is designed to appeal to players who are looking for a more intense and realistic battle royale experience, and it has helped to establish the game as one of the most popular and widely played games in the genre. The game's well-realized graphic style has also inspired a number of other games in the battle royale genre, and it has helped to popularize the genre as a whole.

Conclusion

The evolution of video game graphics has been a remarkable journey, starting from the 8-bit era to the current state-of-the-art graphics. With each new generation of consoles and advancements in technology, video games have transformed into more visually stunning and immersive experiences. From the 16-bit era's expanded color pallets to the current high definition, photo-realistic graphics, the video game industry has come a long way. With virtual reality and machine learning technologies on the horizon, we can expect to see even more stunning graphics in the future. It is exciting to think about what the future holds for video game graphics and what new innovations developers will come up with. In conclusion, the emergence of 64-bit graphics technology in video games was a crucial step in the evolution of video game graphics. The Nintendo 64, with its powerful hardware and advanced graphics technology, paved the way for the creation of stunning 3D platform games that set new standards for video game graphics.

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