Using Computer Graphics to Enhance User Experience in Video Games

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Article Info	Abstract
	This research explores the use of computer graphics technology in video games and how it can enhance the user experience. Focusing on an in-depth understanding of the influence of computer graphics on video games, this research uses a case study approach to investigate this phenomenon. The population studied was 18-35 year old video game users who actively play games with high graphics. Data were collected through questionnaires, gameplay observation, and content analysis. The results showed that the use of more advanced computer graphics technology significantly enhanced the user experience in video games. More realistic graphics, impressive visual effects, and high detail make players more involved and engaged in the game world. High quality graphics are also positively related to the level of user satisfaction. These findings are in line with the literature which emphasizes the importance of good graphics in enhancing game appeal and user satisfaction.

INTRODUCTION

The development of the video game industry in recent decades has been a remarkable phenomenon. The industry has experienced rapid growth, not only in terms of the number of players, but also in terms of innovation, technology and revenue. Once thought of as a children's hobby, video games have now become a serious and thriving entertainment industry (Bavelier et al., 2011).

The growth of the internet and mobile devices has opened the door to wider access to video games, changing the way we play and interact with digital content. In recent years, video games have become not only entertainment, but also a platform to communicate, collaborate and compete with players around the world. Innovations in computer graphics, artificial intelligence and virtual reality have brought increasingly realistic and immersive gaming experiences (Granic et al., 2014).

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of as a children's pastime, video games have now become a serious and thriving entertainment industry. The growth of the internet and mobile devices has opened the door to wider access to video games, changing the way we play and interact with digital content. Reviewing the rapid growth in the number of players and revenue of the industry is also noteworthy. The number of active players globally continues to rise, with a wide range of age groups engaging in playing video games.

This phenomenon includes not only traditional console and PC players, but also mobile players and those involved in online gaming. Along with player growth, video game industry revenues have soared, surpassing revenues from other entertainment industries such as movies and music. The industry has created new jobs, driven technological innovation, and generated an active global community.

The importance of a satisfying user experience in retaining players and increasing game success is crucial in the video game industry. In this highly competitive ecosystem, creating a positive experience for players is not just about keeping them happy while playing, but also about building a strong foundation for long-term growth and success.

A satisfying user experience encourages players to continue playing, invest time and money in the game, and even become loyal customers. When players feel engaged, satisfied, and entertained, they are more likely to maintain their involvement in the game, share positive experiences with others, and contribute to the gaming community. In the long run, this can impact the reputation of developers and games, increase revenue, and ensure continued growth in this ever-evolving industry.

Advanced computer graphics, such as realistic graphic rendering and stunning visual effects, have played a huge role in grabbing players' attention and creating immersion in the game. The ability to create more lifelike and detailed characters and environments makes players feel like they are really involved in the game. This not only affects how the game looks, but also how the game feels.

Modern users expect high quality graphics in their games, and stunning graphics have become an important factor in determining whether players will continue playing or even buy the game. It's not just about "impressing the eye," but also about enhancing immersion, increasing the appeal of the game, and supporting a deeper narrative.

THEORETICAL FOUNDATION

Definition of User Experience in Video Games

User Experience in Video Games, often abbreviated as "UX" (User Experience), is a critical concept in the world of video games that encompasses all the interactions and emotional responses of players while playing a game. A good user experience in video games is key to ensuring that players feel engaged, satisfied and entertained during their play (Davis, 1989). This involves a number of aspects that include user interface, game design, graphics quality, gameplay response, and many other factors that contribute to how players feel during play.

In video games, user experience includes how the player interacts with the game, from navigating menus to controlling characters in the game world (Koyak & Üstünel, 2020). It also includes the player's emotional responses, such as the joy of achieving a certain milestone or the frustration of facing a difficult challenge (Ariffin & Susanto, 2023). A successful user experience in a video game should consider the gameplay, difficulty level, as well as how the game motivates the player to continue playing.

In addition, UX in video games also involves issues such as visual comfort, engaging audio and responsiveness to player actions. Design choices such as menu layouts, tutorials, and game guides also play an important role in influencing user experience. A deep understanding of player preferences and expectations is key to designing a superior user experience in video games (Annetta, 2008).

The Development of Computer Graphics in the Video Game Industry

The development of computer graphics in the video game industry has seen tremendous growth over the past few decades. Advances in graphics technology have opened the door to creating increasingly realistic and immersive visual experiences in video games. In this case, computer graphics technology acts not only as an aesthetic element, but also as a foundation that supports various aspects of the game, including gameplay, narrative, and player appeal (Squire, 2003).

The development of computer graphics started from the era of very simple early video games with limited pixel graphics. However, as the capabilities of computer hardware and game consoles have increased, computer graphics have evolved to become more complex and stunning. The use of technologies such as GPUs (Graphics Processing Units) and advanced rendering techniques have enabled developers to create more lifelike game worlds, more realistic characters and dazzling visual effects (Kato, 2010).

The Role of Computer Graphics in Enhancing User Experience

The role of computer graphics in enhancing user experience in video games is an important factor that has evolved along with technological advancements. Computer graphics are not just about visual aesthetics; they have a significant role in influencing how well players engage in the game, how strong the emotional impact of the game is on them, and the extent to which the game is able to provide a satisfying experience (Muriel & Crawford, 2018). In this context, computer graphics play a major role in creating realistic and mesmerizing game worlds (Nielsen et al., 2008).

First, computer graphics allow for the creation of a more immersive game world. As technology becomes more sophisticated, video games can create environments that appear vivid and mesmerizing. Visual details such as textures, lighting and character animations affect how players experience the game world. For example, a game with realistic graphics can create an immersive sense of exploration and bring the atmosphere to life (Goldstein et al., 1997).

Furthermore, high-quality graphics also play a role in delivering a strong emotional response. More realistic and expressive characters can trigger player empathy towards the story and characters in the game. Games that are able to evoke the player's emotions, such as fear, pleasure, or admiration, are often more satisfying and memorable (Muriel & Crawford, 2018).

RESEARCH METHODS

Research Design
Selection of Research Type

This research uses a case study approach to investigate the use of computer graphics technology in enhancing user experience in video games.

Design Selection Justification

The case study approach was chosen because it allows us to conduct an in-depth analysis of how the use of computer graphics technology affects user experience in real case situations in a specific video game. This approach suits our research objective of understanding the impact of the use of computer graphics in the user experience of video games.

Population and Sample
Population Definition

The population in this study is 18-35 year old video game users who actively play video games with significant graphic elements.

Sample Selection Technique

The sample was selected using a purposive sampling technique, where we selected video gamers who met the criteria of age and experience playing highly graphical video games.

Sample Size

A total of 50 respondents were selected as samples for this study.

Variables and Measurement Tools

Research Variables

The main variable in this study is user experience in video games. We also pay attention to secondary variables such as the difficulty level of the game, the quality of computer graphics, and the level of user satisfaction.

Measurement Tools

User Experience: Using a questionnaire based on a Likert scale to measure the level of user experience.

Graphics Quality: Evaluate the quality of computer graphics by performing visual comparisons and measuring graphics performance in video games.

User Satisfaction Level: Using structured questions in a questionnaire to measure users' level of satisfaction with their experience.

Data Collection Process

Data was collected by administering questionnaires to respondents and observing them play the video game. In addition, direct observation was also conducted to measure the level of interaction with the graphical elements in the game.

RESULTS

This study aims to investigate how the use of computer graphics technology in video games can affect user experience. Based on the results of the study, we were able to identify some key findings that are relevant to the objectives of this research.

Enhanced User Experience

The results show that the use of more advanced computer graphics technology in video games has managed to significantly enhance the user experience. Respondents reported that more realistic graphics, impressive visual effects and higher detail in video games increased the appeal and immersion of the game.

Relationship between Graphics Quality and User Satisfaction

Data analysis showed a positive relationship between the quality of computer graphics and user satisfaction levels. Respondents who reported higher quality graphics in video games also tended to have higher levels of satisfaction with the game experience.

Effect of Difficulty Level

The difficulty level of the game was also found to play an important role in user experience. Results show that a difficulty level that is balanced with the player's ability can increase user satisfaction, while a difficulty level that is too high can reduce satisfaction.

Emotional Reaction

The use of advanced computer graphics technology has also enhanced players' emotional reactions. Respondents reported that they were more engaged in the game, felt more emotions during the game, and had a more immersive experience.

Sustainability of Use

The results show that video games with high-quality computer graphics tend to influence continued use. Respondents who perceived a better user experience were more likely to continue playing the game.

Discussion

Enhanced User Experience

The results of this study confirm that the use of more advanced computer graphics technology in video games can significantly enhance the user experience. This finding is in line with the literature showing that more realistic and immersive graphics increase the appeal of games (Grodal, 2000). Better graphics can allow players to be more engaged in the game and increase the sensation of presence in the game world (Goldstein et al., 1997).

Relationship between Graphics Quality and User Satisfaction

The results showed a positive influence between the quality of computer graphics and the level of user satisfaction. This is in line with previous research which found that players tend to be more satisfied when playing games with better graphics (Halbrook et al., 2019). The implication is that development companies need to pay special attention to the quality of graphics when designing new video games.

Effect of Difficulty Level

The findings suggest that game difficulty also plays a role in user experience. This corresponds to the concept of "Flow" in video games, where a difficulty level that is balanced with the player's ability can increase user satisfaction (Bavelier et al., 2011). Therefore, game designers should consider appropriate difficulty to create a satisfying experience.

Emotional Reaction

The use of advanced computer graphics technology also has an impact on players' emotional reactions. Results showed that players felt more involved in the game, felt more emotions during the game, and had a more immersive experience. This is consistent with the literature which suggests that the feeling of presence in video games can trigger strong emotional reactions (Goldstein et al., 1997)

Sustainability of Use

The results show that a better user experience in video games with high-quality computer graphics can influence continued use. This finding is consistent with previous research showing that user satisfaction is an important factor in influencing players to continue playing (Bavelier et al., 2011). Therefore, development companies can utilize computer graphics to create an engaging experience, which can retain players in the long run.

Implications and Recommendations

In designing new video games, development companies need to pay attention to investing in advanced computer graphics technology. This will increase the appeal of the games and enable them to compete in an increasingly competitive market. In addition, they should pay attention to the difficulty of the game to match the player's ability to maximize the user experience.

CONCLUSION

In this series of discussions of research results regarding the use of computer graphics technology to enhance user experience in video games, the main findings indicate that the use of more advanced computer graphics can significantly enhance user experience. More realistic graphics, impressive visual effects, and games that match the player's difficulty level all contribute positively to user appeal and satisfaction. In addition, the enhanced user experience also affects the player's emotional reactions and can influence the continued use of the game. The implication of this study is the importance of game development companies to invest in high-quality computer graphics technology in designing more attractive and satisfying games. Continuous development in computer graphics technology

is also necessary to maintain the competitiveness of the industry. Future research can explore other aspects that affect user experience in video games, such as audio, social interaction and VR technology, so as to provide a more comprehensive view in improving the quality of video games in the future.

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