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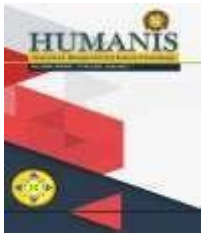

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Implementation Artificial Intellegence In Games Development

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Abstract : Artificial intelligence (AI) has become one of the core technologies in modern game development, with its applications ranging from adaptive character simulation to the development of dynamic environments that respond to player actions. This study explores the role and applications of AI in games, and how this technology improves the quality and depth of the gaming experience. Through the analysis of literature studies and the development of AI methods, this study aims to explain how Non-Player Characters (NPCs) can respond to player actions in a more realistic and interactive way. AI is also used in game worlds to automatically generate environments, enabling a unique and personalized game world for each player. This study also covers the challenges in developing AI in games, such as ensuring that NPCs are not too adaptive so as not to reduce the essence of the game. The right implementation of AI can increase the appeal and complexity of the game, creating a more immersive and engaging experience.

Keywords : Artificial Intelligence, Non-Player Character (NPC), Game Development, Interactivity, Adaptive Simulation, Dynamic World.

INTRODUCTION

The development of digital technology has brought major changes in various industries, including the entertainment industry, especially in game making. Games are no longer just a means of simple entertainment, but have developed into an interactive platform that allows players to experience simulations that are close to the real world. AI technology, or artificial intelligence, has made significant contributions in creating characters and game environments that are able to respond to player actions in a more realistic manner.

One common application of AI in games is in NPC characters, where AI allows NPCs to interact and react to players in a more natural and complex manner. AI is also applied in creating vast and detailed game worlds automatically, as seen in Minecraft and No Man's Sky games. This study aims to understand the role of AI in improving game quality and identify the challenges faced in its development.

LITERATURE REVIEW

Artificial intelligence (AI) in games is an important aspect that has developed rapidly in the last decade, allowing developers to create more natural and engaging interactions between players and Non-Player Characters (NPCs). According to Abdennour El Rhalibi and K.W. Wong, artificial intelligence (AI) plays a significant role in game development to improve the gaming experience. AI allows non- player characters (NPCs) to have more dynamic and realistic behavior, creating more challenging and engaging interactions for players. In addition, AI helps make games more adaptive by adjusting the difficulty level or game strategy based on individual play styles, providing a more personalized experience. Not only that, AI is also used to create realistic world simulations, such as living environments that include weather, animal behavior, or virtual community interactions, thereby increasing player immersion in the game world.

According to A. S. Milak, E. W. Hidayat, and A. P. Aldya, artificial intelligence (AI) has an important role in character development in games, especially to increase interactivity and realism. They argue that AI allows non-player characters (NPCs) to exhibit dynamic behavior, such as the ability to adapt to player actions and the game environment. With AI, in-game characters do not just follow a static script, but are also able to make decisions based on changing situations, creating a more immersive and challenging gaming experience. They emphasize that AI helps NPCs display more natural responses, both in terms of actions and emotions, thereby increasing player immersion in the game. Intelligent AI characters can also provide strategic challenges by learning player play patterns, making each interaction unique and unpredictable. Their view suggests that the use of AI in game characters is not only to enhance aesthetics, but also to create a more adaptive and satisfying gaming experience.

According to Hidayat, Rendi A. (2016), AI in games increases interactivity by making non-player characters (NPCs) more responsive and adaptive to player actions. AI allows NPCs to make decisions based on changing situations, creating more dynamic challenges and improving the overall gaming experience.

According to M. A. Wahyudi, artificial intelligence (AI) in games is used to create more realistic and responsive non-player characters (NPCs). AI allows NPCs to adapt to player behavior, changing game strategies, and creating a more dynamic experience. This makes games more interesting because NPCs not only follow fixed patterns, but can also provide varying challenges depending on the player's actions. According to Ian Millington (2011), AI in games serves to create characters and worlds that are responsive to player interactions. Millington explains that AI allows NPCs to make decisions based on the information they have, leading to more dynamic and realistic behavior. AI is also used to set the difficulty level of the game, by allowing NPCs to adapt to player tactics and creating more interesting challenges.

Overall, AI enriches the gaming experience by increasing immersion and interactivity in the game.

According to Yannakakis, G. N., & Togelius, J. (2014), AI in games serves to enhance the gaming experience by creating dynamic and adaptive challenges. They emphasize the importance of using AI to adjust the difficulty level in real-time based on the player's ability, thus creating a more personal and engaging experience. AI can also be used to develop systems that learn the player's playing style and adjust game elements, such as the behavior of non-player characters (NPCs) and interactions in the game world. This enriches the interactive and immersive experience in games.

RESEARCH METHOD

The study in this research uses a qualitative method, which focuses on literature studies to gain an in-depth understanding of the application of artificial intelligence (AI) in games. Data were collected from scientific sources, articles, journals, and previous research that discuss the development of AI in games. The qualitative method was chosen because this study seeks to explore descriptive aspects, such as how AI is used to control Non-Player Character (NPC) characters to look intelligent, shape the game world dynamically, and create an adaptive gaming experience. The researcher's approach to studying and understanding in detail the various applications of AI, the challenges in its development, and its impact on player interactions in the game. The analysis was carried out in depth by comparing the AI methods used in various games, such as difficulty adjustment strategies, adaptive character simulations, and procedural generation algorithms to create a broad and unique gaming environment. With this approach, the research is expected to provide comprehensive insight into the development of AI in games and the contribution of this technology in creating a more immersive and realistic gaming experience.

RESULTS AND DISCUSSION

The results of the study show that AI in games plays several important roles in shaping interactive and immersive gaming experiences. First, AI is used to control NPCs to give the illusion of adaptive, yet controlled intelligence. NPCs in games like Pac-Man and Grand Theft Auto provide a unique experience through their seemingly understanding reactions and responding to the player’s actions. In DOTA, AI characters can even communicate with their teammates, creating a more realistic gaming experience as players must anticipate varying enemy tactics. In addition to characters, AI also plays a major role in the automatic creation of game worlds. In Minecraft, AI is used to create worlds with varied landscapes, such as mountains, deserts, and oceans, all of which are automatically generated each time a player starts a new game. This approach allows developers to create games with larger worlds without having to manually design each element. No Man’s Sky uses AI to generate planets with unique flora and fauna, allowing for different explorations for each player.

AI is also used to adjust the difficulty of a game. For example, in a game of chess, AI can be designed to adapt to the player’s abilities. If the player is a beginner, the AI will play a simpler strategy, but if the player is an expert, the AI will increase the difficulty by choosing a more complex strategy. AI also helps developers in the game development process.

AI can be used to test game mechanics, detect bugs, and provide accurate analytics data on how players interact with the game. By leveraging this data, developers can improve gameplay elements and fix less effective features. The role of AI in games also extends to the development stage where AI analyzes user play patterns to provide developers with insights. For example, by studying data collected by AI about player preferences, developers can make improvements and adjustments to game mechanics to make them more palatable. AI can also help in testing games before they are released, allowing developers to find and fix issues in game mechanics.

Future developments in AI are predicted to further change the way games are created and played. One major potential is the ability of AI to create games from scratch based solely on data about what players want. Additionally, future NPCs may be able to understand how players feel and respond emotionally, creating deeper interactions between players and in-game characters. This will open up new opportunities to create more personalized and immersive gaming experiences.

CONCLUSION

Artificial intelligence (AI) in gaming has become one of the most important innovations in the entertainment industry, having a major impact on the way we understand and interact with games. AI allows developers to create responsive Non-Player Characters (NPCs) and environments, which can provide players with a more immersive and realistic gaming experience. As experts have said, AI in gaming is not only a supporting technology, but also the core that gives life to the game itself.

The role of AI in controlling NPCs allows games to be more adaptive to player actions. NPCs that can adapt their behavior present more interesting and dynamic challenges. Games like DOTA or F.E.A.R. show how AI characters can work together, communicate, and even strategize against players, creating a more lively and unpredictable experience.

This approach leads to games that are not just entertainment, but also an intellectual challenge for players, where each action will be responded to with a different strategy. While AI has brought many advantages, major challenges remain in its development. Experts point out that AI that is too adaptive or “smart” can reduce the level of fun of playing, especially if the NPC becomes too good at reading the player’s playing patterns. NPCs that learn deeply and can anticipate every player’s action may make the game too difficult or even frustrate the player. Therefore, it is important for developers to find a balance between the intelligence and limitations of AI to keep the game challenging but still fun.

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