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THE ROLE OF MODERN ARTIFICIAL INTELLIGENCE IN GAME DEVELOPMENT

We live in a world where the games industry market is rapidly growing and the revenue from sales exceeds more than double the revenue of the film and music industries combined. But in order for the game product to be successful and generate income, it is necessary to implement many good solutions during development. Along with advanced game design, interesting script, impressive artistic style and high-quality soundtrack, artificial intelligence plays an important role in the success of the game product.

Artificial intelligence (AI) refers to a collection of algorithms designed to mimic human thought processes, enabling computer-controlled objects to behave in a manner similar to humans. We cannot ignore the fact that the game artificial intelligence must entertain and challenge the player, and then gracefully lose to him. Therefore, it is designed to use various kinds of deception and artificial underestimation of abilities, which makes it able to make mistakes in its own decisions, just like a human.

According to gaming industry experts, computer-controlled artificial intelligence can be divided into three main types:

1. Non-player characters represent characters which can be used for various purposes in the game, such as trading, giving tasks, or simply creating circumstances that add to the game world;

2. Highly-intelligent bots represent characters that are used to oppose the player, they imitate the intellectual behavior of a human and interact according to the set rules with the game environment. It should be noted, that they are the most difficult to implement and at a certain moment, only a small number of these bots can oppose the player because they are very demanding on system resources;

3. Low-intelligent bots represent characters that are used to simulate crowds to oppose the player, so at a certain point in time, a large number of these bots can oppose the player, usually unable to deal significant damage to the player's character and only being a target for his beating.

The principle of operation of AI is based on repeating the cycle of four basic systems, such as sensors, the core of thinking, the reaction system and memory.

We will examine how this cycle operates in practice. First and foremost, AI receives information about the environment through sensors. These sensors detect various elements such as the enemy's position, the presence of shelter, suspicious sounds and more. Next, the information collected by the sensors is stored in the AI's memory, which includes past events. The next step is to consider the information received from sensors and past events artificial intelligence makes decisions about how to act in response. With the help of the response, the AI turns this decision into reality: attack, call for reinforcements, escape, wait, chase, and so on. Finally, the AI repeats this cycle.

When implementing modern AI, we can use two different approaches: traditional and innovative concepts for creating artificial intelligence. The traditional approach to creating AI includes methods that have been employed for an extended period and boast a rich history of application. Among such methods, we can include the system based on the rules of rigidly defined conditions, Finite State Machines and Behavior Trees. Among the advantages of this concept, we can include popularity, ease of implementation and understanding, scalability, and reactivity. On the other hand, we can observe that when creating a very complex AI, it becomes difficult to manage and understand it.

Among the innovative concepts, we can include methods that use machine learning. The basic idea of these methods is that a neural network learns to make decisions by analyzing large amounts of data and feedback in the form of rewards and punishments received from the environment.

Let us consider what the advantages and disadvantages of deep reinforcement learning are. Among the advantages, we can include the ability to adapt the game to the individual skills of the player for a more interesting confrontation, there is no need to create response scripts because the AI bot learns complex behavioral scenarios. On the other hand, we can observe that

this method needs high computational effort and a large amount of data. Moreover, before this method can be implemented to control AI bots, some time needs to be spent on training the agents. After the agents are trained, there is a chance that some changes or optimizations will need to be made to the model, and then the agents may need to be retrained with updated parameters or algorithms. Besides, AI bots implemented using this method can frequently exploit bugs to gain an advantage.

In conclusion, one can say that entertainment serves as a crucial escape from daily routines and global challenges, with computer games emerging as a popular and unique form of entertainment. AI plays a key role in the development of successful and interesting modern games. It helps to create immersive experiences that entertain and challenge players. While traditional methods provide scalability and simplicity, innovative methods offer opportunities for more complex and adaptive behaviors. Unfortunately, it has been observed that developers have not spent enough time on the development of artificial intelligence in recent times. Their focus is on creating basic AI behavior models with reduced man-hour expenditure and the ability to quickly modify behavior scenarios. Therefore, it is unlikely that game products using innovative concepts of AI construction will become widespread in the near future.