

Research on the Influence of Randomness of Non-Player Character Interaction Behavior on Game Experience

Yu-Tao Mo¹ and Seok-Kyoo Kim^{2*}

¹Master Student, Department of Game Design and Development, Sangmyung University, Seoul, Korea.

²Assistant Professor, Department of Game Design and Development, Sangmyung University, Seoul, Korea.

ORCID of Author 2: 0000-0003-4725-0288, *Corresponding Author

Abstract

The non-player character refers to the program-controlled character set in the game for the game to play. It is an important part of the virtual game world, and it always runs through the game plot. At the same time, in the interactive design of the game, the non-player character takes on most of the tasks that interact with the player, and is the most important part of the game interaction. At present, there are obvious deficiencies in the design of non-player characters in games on the market. The interaction logic of non-player characters in most games is relatively simple; while some games adopt pure player interaction mode, the uncontrollability of this interactive mode is too high. Both interaction modes have different negative effects on the player's game experience. The core difference between the two modes is the difference in behavioral randomness. By studying and comparing the two interaction behavior modes, this paper starts from the randomness of interaction and hopes to find a better non-player character interaction behavior mode.

Keywords: Game experience, Interaction behavior, Non-player character

I. INTRODUCTION

Owing to the important role of non-player characters in game interaction, non-player characters have always been the focus of players' attention, and the design quality of it has greatly affected the success of the game. In order to submit a complete game interaction narrative, evoking the player's cognitive and emotional attitudes towards non-player characters, designers often use the control of non-player character behavior mechanisms to achieve information interaction between game characters. Therefore, the behavioral research of non-player characters has been highly valued by game designers.

Through the search and analysis of related literatures, this study knows that most of the behaviors of non-player characters in digital game research are determined based on traditional pre-defined behavior decisions, so that as players experience more games, it is possible to clearly understand The general behavior pattern of non-player characters in the game, which greatly reduces the player's participation and makes the player lose interest in continuing to experience the game. The other part of the game adopts the interaction mode between the player and the player. In this mode, the object of

the player interaction is the true human. This model appears to have been a huge improvement in degrees of freedom, but at the same time the player's uncontrollability and the weakening of the game's function greatly weaken the player's gaming experience.

The core of these two interaction modes is the randomness of interaction behavior. Therefore, this paper starts from the randomness of interaction behavior, combined with relevant theoretical research, puts forward the focus of research, that is, the degree of randomness of non-player character behavior, which can make it have randomness close to real human pairs, and will not have a bad impact on the gaming experience. In turn, the real experience of the game is increased, and the player's attention is firmly attracted.

II. RELATED WORK

II.I Definition of non-player characters

The word character comes from the stage performance, and the theme of performing on the stage becomes a character. A character can be anything from person, creature, or personification, and the character is the subject of the story. [1] The role of "game character" in the game is to achieve interaction with the player, and complete a certain bio-image of the story of the game story, which has all or part of the life characteristics.

In digital game, game characters are often divided into player characters and non-player characters. Player characters are characters controlled by players in role-playing games. Most of the player characters are the key or protagonist of the game story, so the player characters are also used to be called a player. The bio-image that opposes the player's character is a non-player character, which refers to the program-controlled characters set in the game for the progress of the game. Therefore, in order to increase the fun of the game, game developers set a large number of non-player characters in the game, allowing them to play the player's friends, opponents, bystanders, level masters and so on.

II.II Related concepts of non-player character behavior

II.II.I Definition of non-player character behavior

This study draws on the concept of behavior between behaviorist psychologists and Gestalt psychologists, and combines the performance characteristics of role behaviors in

digital game to summarize the concept of non-player character behavior. That is, the non-player character behavior is in a virtual digital game. The non-player character is a combination of rich game story plots, showing a combination of a series of complex behaviors based on instinct or voluntariness. It can also mean a simple mechanical system. The predictable sequence of actions or the unpredictable complex actions produced by the chaotic system highlights the emotions and attitudes of non-player characters.

II.II.II Behavior type of non-player characters

1) Move. Moving in the world built by the game, movement is the basis of all non-player character behavior, but this movement is limited and cannot be beyond the limits of the game scene. The smoothness of the game character's movement in the game is often critical to the success of the game.

2) Game. Many games are always accompanied by a man-machine confrontation, and this man-machine confrontation, and this man-machine confrontation is mainly embodied in a kind of game behavior. The most popular chess game is an instance, which is the original form of game behavior.

3) Cooperation. Non-player characters in digital game can work with multiple characters. If working with player characters, non-player characters can assist players in accomplishing mission goals when faced with greater task difficulty; if working with non-player characters, this requires multiple non-player characters to be appropriate at the right time and place. The behavior is otherwise prone to chaotic execution.

4) Combat. There are two types of battles in a multiplayer character game. One is the battle between the player character and the other player character; the other is the battle between the player character and the computer-controlled non-player character, which is mainly for promotion. This is mainly to improve the combat power and operational skills of the player character.

5) Trading. Just like real-life trading, non-player characters in the game world can also be "selling", except that the currency they exchange is the game currency in the virtual game world. The redemption items are the equipment and food in the game world. Etc. These items are only valuable to the characters in the game world. For example, in the "DNF" game, after the player has explored a dungeon, there are many game spoils, but many of these spoils are not suitable for their own use. At this time, the player can trade with the non-player characters in the game. Come over, non-player characters can also sell or purchase these items to players.

6) Chat. Language communication is the most common form of communication between humans. In the virtual game world, the communication between players and non-player characters is also the most common form of conversational chat. For example, in a "World of Warcraft" game, a player can use a form of conversation with a non-player to accept a game task or request a boss to allow access to an item, and the like.

II.II.III Characteristics of non-player character behavior

Researchers attempt to scientifically develop the behavior of non-player characters. According to psychology, researchers believe that human behavior is a cycle of "perception-decision-action". These autonomic and intelligent characters that are what we usually call a non-player character.

The intelligent non-player character works by giving the intelligent characters a certain initial intelligence when the game is initialized, so that it can sense the changes in the environment in real time through continuous interaction with the unknown environment, and then comprehensively consider the environmental conditions. Many factors, such as their own situation (knowledge, ability, goal and state) and influence from other roles, dynamically adjust their behavioral strategies to make more reasonable and rewarding behavioral decisions and action choices.



Fig. 1. Non-player character behavior

This determines the adaptive behavior of non-players in the game should have the following five characteristics.

1) Purpose. The behavior of non-player characters with adaptive behavior in the virtual environment should be based on the storyline plan. For example, the task of a defending city soldier in the game is to guard the castle. When the enemy appears, the enemy must be fired immediately until the enemy dies, but not in other game scenes.

2) Real-time. Non-player characters with adaptive behavior should change their behavior strategies in real-time in response to changes in the environment and state of the digital game.

3) Interactivity. Non-player characters with adaptive behavior will constantly interact with the player character or some other type of non-player character in the game plot, and use different behaviors to highlight the presentation.

4) Order. Non-player characters with adaptive behavior are sorted strictly according to the time parameters of the state sequence. The order of behavior execution is different and the results are different.

5) Unpredictability. In the execution of the game, non-player characters with adaptive behavior should adaptively adjust their behavior patterns according to changes in the

environment and their own state, making it difficult for players to control the running status of non-player characters, and it is difficult to predict the reaction of the other party. This increases the realism of the game. For example, if a non-player character once falls into a trap set by the player in a game area, then the next time it enters the area, it will show some vigilance based on previous experience, which will bring the player real. Experience the feeling.

In most traditional game, non-player character interactions are determined by pre-defined behavioral decisions, that is, non-player characters perform various tactics according to pre-defined behavioral interaction scripts, but not real-time according to the game environment. Change, autonomously adjust behavior selection strategies. This is simpler to implement for game design, but it has the following disadvantages:

- 1) The scripts set first are easy to solidify some of the personal thoughts of the programmers, which will affect the intelligence and authenticity of the non-player characters.
- 2) This non-player character always maintains a constant ability. They do not judge whether the player is at the primary level or the advanced level. They use the same behavioral strategy from beginning to end, and do not rely on continuous improvement. Ability to change and adjust your behavior patterns, which causes players to either feel the game is boring or feel the game tired [2].
- 3) If the implementation mechanism is experienced by the player multiple times, it is easy to guess the behavior pattern of the non-player character, which will greatly reduce the playability of the game.

In summary, this study combines the analysis of non-player character behavior types in digital games and the important role these behaviors play in the game. Imagine if the non-player characters in the game can simulate the strategies and behaviors people use when playing games, and can dynamically adjust their behavior according to the current environment changes and prior experience knowledge, so that in complex game. The decision-making and interaction with the environment in the scene is autonomous and "real", which undoubtedly enhances the vitality and adaptability of non-player characters in the game, and greatly enhances the playability and immersion of the game, enriching the player's game experience [3].

III. RESEARCH OF PLAYER GAME EXPERIENCE

III.I Flow Theory

Csikszentmihalyi [4], a professor of psychology at the University of Chicago, first proposed Flow Theory in 1975. He explained that when people do some daily activities, they are fully engaged in the situation, concentrate, and filter out all unrelated perceptions enter an immersive state.

The research on immersion theory uses the two factors of challenge and skill as the most important components to determine the immersion experience. If the difficulty of setting the game task is too high, the player will feel lack of control

over the virtual game world, and will have deep anxiety or frustration; on the contrary, if the difficulty of the game is set too low, the player will feel that the game is very Bored, eventually leading to the loss of interest in playing games. Therefore, the immersion state mainly occurs when the game difficulty and the player level are balanced. The relationship between challenges, skills and streaming experience is shown in Figure 2.

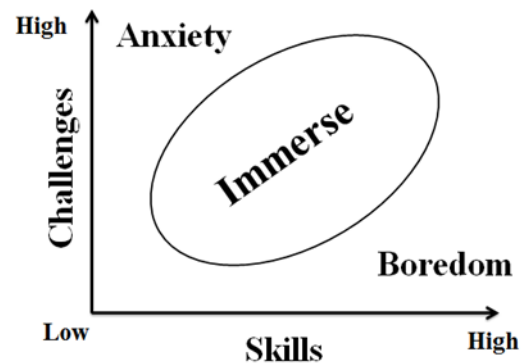


Fig. 2. Diagram of challenges, skills and flow experience

III.II Acquisition of novelty

The psychophysicologist Poole D. Marklin once proposed the famous "triple brain model", which is the psychological basis for the player's novelty. In this model, the human brain is divided into three levels: the reptilian cortex, which is mainly responsible for the low-level physiological needs of people, such as diet, sleep, etc.; low-grade mammalian cortex, used to protect the body, resist external aggression, and through auditory sense, visual, olfactory, etc. capture the information of the outside world; the new breast cortex is used for rational thinking [5]. In the past, character games, such as early character games and LAN role games, stimulated the player's low-grade mammalian cortex, made them feel panic, quickly judged the influence of the outside world, and destroyed the enemy, gaining a sense of pleasure. [6]. There are two reasons why open interactions can bring a new look to the player.

First, the interaction is in dynamic change, and the outcome is difficult to grasp. The story clues in the game are not pre-set. This is a complicated game world. There are many game clues. These game clues are connected by game characters, non-player characters, scenes and other game elements. Players can choose Different clues, but at the same time, there are other non-player characters in them, their actions are unknown, and their action clues influence the player's action clues at any time. The clues in a plan are influenced by other clues, resulting in new story clues and narratives. This dynamic change spurs the player's nerves at all times, so that the player always retains the freshness of the game [7].

Second, real-time updates to the game bring a continuous story and event experience. The results of this survey show that players sometimes roam in the same map (scene). In this case, most players say that although the scene is the same, it does

not feel boring. Homans believes that if the emergence of a particular stimulus has been the cause of a person's behavior, then the more the current stimulus is the same as the past, the more likely this person is to take such action or a similar action [8]. However, if the same stimulus occurs multiple times, the player will inevitably produce "aesthetic fatigue." Aesthetic fatigue in psychology means that when the stimulus is repeated in the same way, intensity and frequency, the reaction begins to weaken [9].

To put it simply, after being stimulated by the same object several times, people's psychology will become tired, tired and even disgusted. In order to prevent the player from playing the game, the game must constantly update and absorb new elements to maintain the novelty experience of player.

The stimulating feeling of digital game players is to maintain their motivation in the game world. The narrative structure of multiplayer character games is more open than the "closed" narratives of other types of character games [10]. The result of electronic interventions makes the definition of social scenes and behaviors no longer dependent on the natural environment [11].

IV. ANALYSIS OF THE CHARACTERISTICS OF TRADITIONAL GAME INTERACTION BEHAVIOR

IV.I Interaction type of traditional game

Currently available games on the market can be classified into two categories according to the type of interaction. One is the NPC interaction mode in which the non-player character is the interactive subject, and the other is the Non-NPC interaction mode in which the player is the interactive subject. The Non-NPC interaction mode can be regarded as a change and exploration of the NPC interaction mode. Next we will analyze the two interaction behavior patterns.

IV.II Features of the NPC interaction mode

The non-player character interaction mode, that is, the NPC interaction mode, is currently used in most games. Most digital games often contain a large number of non-player characters, which has become an integral part of digital games. Non-player characters can play a variety of game characters, such as some insignificant shopkeepers, passers-by, soldiers; some meaningful characters such as player teammates, opponents; in addition, in multi-player games Non-player characters can also play many characters that human players don't want to play, such as blacksmiths, alchemists, and other non-heroes.

In the NPC interaction mode, the non-player character is both the main object of the player interaction and an important part of the game's main function implementation. For non-player characters, on the one hand, you can use different attribute characteristics, such as identity, personality, ability, etc., to better present the emotions and behavior patterns of different characters, which will greatly evoke the player's perception of the characters. And emotional attitudes, which in turn stimulate the player's immersive feeling, as if they are in a real game environment; on the other hand, non-player characters as a

necessary carrier for the game function to achieve interaction, can help the player character smoothly develop the game activity Process, complete some mission objectives with certain meanings, such as system help, plot acquisition guidelines, and item sales.

IV.III Limitations of NPC interaction mode

Through the investigation and analysis of existing games, this paper finds that the limitation of NPC interaction mode is mainly reflected in the lack of randomness of non-player character interaction behavior. At present, the behavior of non-player characters in digital games is mostly determined based on traditional pre-defined behavior decisions. As the number of game experiences increases, it is possible to clearly recognize the general behavior patterns of non-player characters in the game, which greatly reduces the player's participation and makes the player lose interest in continuing to experience the game.

Based on the immersion theory and novelty acquisition theory mentioned in this article, the player's experience in the game world needs to be obtained by continuous and changing stimuli. The lack of randomness of the non-player character interaction behavior will cause the effective stimulus that the player can get weakened and eventually disappear.

IV.IV Features of Non-NPC interactive mode

Non-NPC interaction mode is the interaction between the player and the player. In this mode, the main object of player interaction becomes the player. This interaction mode is developed on the basis of NPC interaction, and the representative work is Fallout 76. Game developers have noticed the shortcomings of the traditional non-player character interaction mode, and introduced the Non-NPC interaction mode in pursuit of higher authenticity and randomness.

In this interaction mode, the player itself also undertakes some functions of the non-player character, such as forming a small team with the player to complete the task; guiding the player to the task location; trading with the player to buy and sell equipment items such as equipment supply; The player communicates and gives guidance; even plays the final BOSS waiting for the player to challenge.

IV.V Limitations of Non-NPC interaction mode

Through the investigation of the players and the research on the game works, this paper finds that the biggest limitation of the Non-NPC interaction mode is the excessive randomness. Introducing the interaction mode between the player and the player can bring a higher degree of freedom, but in most cases this randomness gives the player a negative experience.

Because the player's behavior is unpredictable, the game cannot guarantee that the interaction between the player and the player can help the game process. In the game, the player can often encounter the following situations: when the player is

teamed up with other players to destroy the monster, the other player attacks the teammate without any reason, causing the player to die or the task to fail. Or the player deliberately gives false information during the process of guiding other players to perform the task, so that the player completes the task according to the wrong guidance, wasting a lot of time. Even in most cases, many players don't want to interact with other players, causing the player to experience the gaming experience of the interaction for most of the time.

The most fundamental reason for these situations is that the randomness of the Non-NPC interaction mode is completely uncontrollable. The result of this randomness is often irrelevant to the content of the game, and the interactive experience that the player gets is mostly ineffective. This kind of invalid interaction can cause a variety of results such as task failure and wasted time. It not only affects the operation of the main functions of the game, but also brings a lot of negative mentality to the player, which greatly affects the game experience.

V. RESEARCH AND ANALYSIS OF GAME INTERACTION BEHAVIOR

V.I The effect that non-player character interaction should have

1) Realize the interactive narrative of the game. In the digital game, the non-player character has the characteristics of appearance, personality, identity, depth, motivation, audience, etc. In order to fully realize the interactive narrative in the story, the information exchanges between the non-player character and the player character is through the non-player. The main channel through which the behavioral mechanism of the role is presented is achieved. This behavioral mechanism is an important part of the character formation of non-player characters. It is also the key to the internalization of non-player characters. It can also make the character, ability and personality of non-player characters manifest themselves. Therefore, in order to ensure that the player more realistically experience the game storyline, improve the player's emotional experience level, and improve the non-player character behavior mechanism becomes an important guarantee for the successful realization of the interactive narrative of digital games.

2) Improve the player's character placement. Using the external stimulus of non-player character interaction behavior, you can gradually accumulate all the players' behaviors and feelings (emotions) together, bring them into the game world, and start to fill the game world with their own imagination. Gradually enter the best state of the game, so as to firmly attract the attention of the player and extend the life cycle of the game. We call this feeling a sense of placement. Non-role players should have the ability to enhance the player's sense of placement, that is, have certain authenticity.

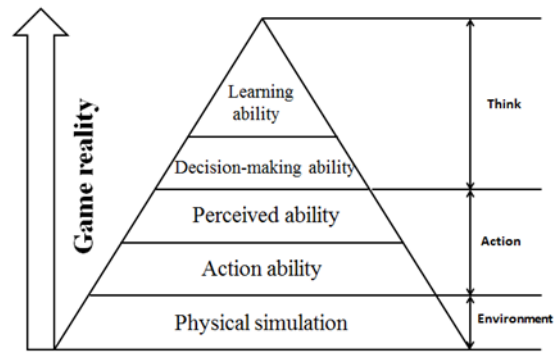


Fig. 3. Ability level of non-player characters

V.II Randomness of non-player character interaction behavior

Through the above research, this paper finds that the key point of non-role player interaction behavior is the randomness of interaction behavior. The traditional interaction mode is too low random, which makes the player lose interest in the game; the randomness of the player-player interaction mode is uncontrollable, which also brings a bad game experience. Therefore, the non-player character interaction behavior model explored in this paper is a finite random interaction mode.

The finite random interaction mode is to let the non-player character simulate the human behavior mode under the framework of ensuring the normal operation of the game. This not only gives the player a sense of placement, but also avoids the trouble for the player. Guo Lei [12] emphasized in the study that if you want to realize the non-player character "thinking and acting like a person" in the game and present the player with unreal feeling, you must have physical simulation, path navigation, action ability and perception ability, memory, decision-making ability, etc. If there is no such ability or implementation, the non-player characters will show some degree of "stupidity" and reduce the playability of the game.

In the limited random interaction mode, the non-player character should have a certain ability to perceive the player's movements or language. First, the non-player character gets the information from the player, and this part of the information is passed to the perception system. The information from the sensing system enters the emotional processing system of the non-player character after processing. The emotional processing system of each non-player character is different and is determined by the story background and personality characteristics assigned to the non-player character by the game. Finally, the information from the emotional processing system will be transmitted to the behavior system, and the knowledge base in the behavior system will receive signals and analyze them. At this time, the knowledge base will be randomly processed in the background framework of the non-player characters to simulate the real human thought pattern, and then perform action updates and ultimately feedback to the outside world. For example, depending on the background of the game story, a non-player character has the characteristics of vigilance and cruelty. If the player carries a weapon close to the non-player character, then he will make a

defensive posture, and the player will not be able to talk to him at this time. Get any help. If the player's conversation with the framework non-player character reveals a cruel tendency, then the reward he gives to the player will increase, or provide the player with some special tasks. All system settings are based on game features, and the behavioral output of non-player characters is limited to things related to the game world.

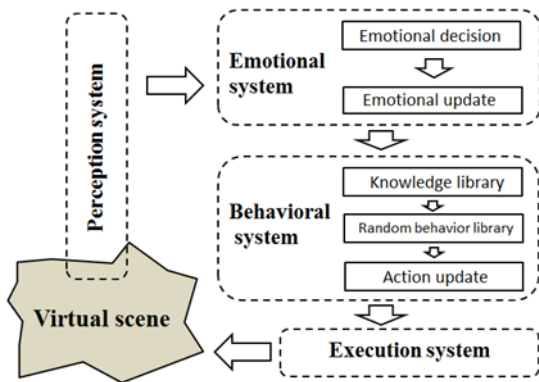


Fig. 4. Non-player character behavior

VI. CONCLUSION

This paper compares and analyzes the non-player character interaction mode, and finds that the core of non-player character interaction behavior is randomness, while the traditional NPC interaction mode and Non-NPC interaction mode have certain defects in behavioral randomness. This paper summarizes the advantages and disadvantages of these two interaction modes and analyzes them, introducing the concept of finite random interaction behavior. In the finite random interaction mode, the behavior of the non-player character is close to the real person and has some randomness, and this randomness is completely based on the game content, and is controllable for the player and the game. This mode improves the playability of the game, and also avoids the game experience of the player.

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