
Research on the Design of Interactive Narrative Mode for Puzzle Games

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Abstract: With the rapid development of the current digital culture industry and the continuous maturity of the game industry, using different narrative logic and interaction design to empower puzzle games and provide players with diverse participation opportunities and rich narrative experiences is gradually becoming an important trend in the digital culture industry and the game industry. By combining specific game cases and using the three-dimensional model of “narrative structure-interaction mechanism-player experience” as a framework, this article explores the practical paths of different narrative modes in puzzle games and their deep impact on player experience. The study found that the narrative mode in the game will not only bring different responses to the development of the game, but also the players participating in the game will have a unique gaming experience due to the change of the narrative mode. The article also studies the development trends of modern puzzle games in terms of mode integration and technological innovation. This article not only fills the research gap in puzzle game narrative mode design, but also provides a practical path for the deepening of interactive narrative theory and game design.

Keywords: Interactive narrative; Puzzle game; Pattern application; Game design; Player experience

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1. Introduction

The digital entertainment industry is currently developing continuously, and puzzle games occupy a place in the field of interactive storytelling with their distinctive characteristics. Interactive narrative theory is also in the process of continuous evolution, and practical application needs are driving the continuous improvement and deepening of this theory. As one of the models of interactive narrative, puzzle games can provide more powerful support for the enrichment and expansion of interactive narrative theory by conducting a systematic and in-depth study of it. Although academic circles at home and abroad have accumulated some research results in the field of interactive narrative theory, there are still obvious academic gaps in the research on the interactive narrative model of puzzle games. In response to this current situation, this article will strive to explore the narrative design and interaction mechanism of puzzle games from different dimensions, thereby filling the research gap in this field, providing valuable theoretical reference for the design and development of puzzle games, and also contributing to the in-depth expansion of interactive narrative theory in this game category.

2. The intervention of interactive narrative theory in the construction of puzzle game framework

2.1. Theoretical definition of interactive narrative

“Narrative” includes narratives and events. Simply put, it is a process in which events are told from the subject to the object. With the continuous development of interactive technology, game designer Chris Crawford proposed the concept of “interactive narrative”^[1]. Janet H. Murray, a pioneering theorist of digital media, systematically explained the three core attributes of interactive narrative to the public in her book “Hamlet on the Holodeck” as follows:

- (1) The first is procedural, which means the dynamic construction of narratives with the help of algorithmic logic;
- (2) The second is participatory, which focuses on highlighting the substantive role of user behavior in the narrative process;
- (3) The third is spatial, which is embodied in the different arrangements of narrative elements in virtual scenes.

Compared with the traditional linear narrative model, interactive narrative has undergone essential changes in the distribution dimension of narrative weight. The interactive narrative hierarchy theory constructed by Marie-Laure Ryan points out that this change has the characteristics of gradual development. Starting from the most basic operational interaction form, such as the page switching function of e-books; then transitioning to the middle level exploratory interaction, such as independent exploration behavior in the open world; and finally reaching the highest level of transformative interaction, such as the core decision-making process in some games. This change demonstrates the gradual transformation of narrative practice from a “one-way monologue” led by game developers to a “two-way dialogue” in which creators and participants participate.

2.2. Narrative characteristics of puzzle games

As an emerging narrative form, the core feature of interactive narrative is to break through the linear framework of traditional one-way narrative, giving players more creativity and initiative, making the entire narrative experience richer and more personalized^[2]. Under the structural framework of the “double helix narrative structure”, game mechanics and narrative elements have established a mutually dependent coupling relationship: the cracking of puzzles can directly drive the narrative process. For example, in “Portal”, players can unlock new narrative fragments every time they conquer a test room; the narrative background gives the existence of puzzles a logical level of rationality, such as the Victorian antique machine box in “Unlocked Room”. This setting cleverly provides logical support for puzzle design (**Figure 1**). This strengthening mechanism of two-way empowerment can provide players with intrinsic motivation to continue participating, and can also provide players with a more immersive gaming experience.



Figure 1. “Unlocked Room” puzzle box interface.

On the other hand, puzzle games are highly dependent on the presentation of spatial environment narratives. Kevin Lynch proposed the urban image theory and pointed out that environmental image is a result of the two-way interaction between the observer and the environment. According to the observer’s personal wishes and adaptability to the environment, the observer will give things a unique meaning while making choices^[3]. Game designers use theory to integrate narrative connotation into the coding design of spatial components, which is specifically reflected in: first, the

symbolic connotation contained in the architectural form in “The Witness” is a narrative carrying form in the material dimension; second, such as the narrative bifurcation triggered by different path choices in “The Stanley Parable” (Figure 2), is a narrative activation mechanism in the behavioral dimension; third, another example is the player’s gradual deepening of the understanding of the formation of ruined civilization in “The Law of Talos”, which is a meaning reshaping process in the cognitive dimension.



Figure 2. The trigger selection interface of the game “The Stanley Parable”.

2.3. Construction of different model frameworks for puzzle games

Related research on game narratology takes interdisciplinary theory as its foundation. The narrative system of puzzle games can be studied from the three dimensions of time, space and interaction to build a complete theoretical framework. In terms of the time dimension, this type of game exhibits a unique “pulse” narrative rhythm. Higher-quality puzzle games often adopt the alternating mechanism of “puzzle cluster-narrative release”, every time players overcome 3 to 5 related puzzles, they can obtain corresponding narrative feedback. Represented by “Portal 2”, this game will play surveillance images at the end of each chapter, which not only maintains the coherence of the puzzle solving process, but also cleverly regulates the release rate of narrative information. This type of design mechanism has shown relatively obvious results in empirical research. A related analysis and study of 12 classic puzzle works was conducted. The final results showed that 89% of the samples conformed to this rule. This data confirms the key significance of time dimension control for player experience.

Relevant research in recent years has paid more and more attention to the effectiveness of player subjectivity in the entire narrative construction process. Ryan introduced the “possible worlds” theory derived from Gottfried Wilhelm Leibniz’s theological thought into the literary field, further developed it and applied it to game research, defining game narrative as a potential narrative network activated by player choices. This perspective provides a new dimension for the understanding of branching narratives. At the same time, Murray emphasized the relationship between games and narrative in the book “Hamlet on the Holodeck”: “Games are a form of participatory narrative realized through a rule system.” From here, we can see that contemporary game narratives are complex systems composed of dynamic interactions between rule systems, player actions, and narrative elements (Figure 3).

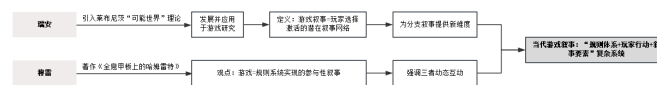


Figure 3. Construction of contemporary game narrative system.

Spatial narrative is actually a form of cross-media narrative^[4]. The spatial dimension of the puzzle game relies on Lynch’s theoretical framework of spatial cognition, and an environmental narrative analysis model can be constructed from three levels: the decorative elements of the Victorian period in “The Unlocked Room” show that the material level can convey basic narrative information with the help of scene furnishings; “See The totem-like symbols in “The Witness”

(Figure 4) uses visual symbols to metaphorically represent the deep narrative connotation at the symbolic level; while at the systemic level, they can rely on spatial layout to map the internal logic of the narrative, such as the philosophical connotation contained in the architectural structure in “The Law of Talos”. This multi-level spatial narrative architecture shows excellent information transmission efficiency in practical applications, and also reflects the key supporting position of the spatial dimension in the puzzle game narrative system.



Figure 4. Solving the puzzle of totem symbols in the game “The Witness”.

The implementation process of player initiative focuses on the interactive dimension and shows a distinct step-by-step evolution feature. At the basic level, players adjust the order of the narrative through operations. At the advanced level, players modify the narrative details by choosing different puzzle paths. Finally, at the innovative level, players can independently complete the reconstruction of the meaning of the narrative, so that the depth of player participation can gradually increase with the level. “The Stanley Parable” generates multiple narrative branches through the player’s choice of path, while “Baba Is You” supports players to building a new narrative context through rule rewriting. This type of innovative design fully demonstrates the development potential of different narrative dimensions for puzzle games.

Transforming the above theoretical dimensions into practical solutions can provide specific guidance for puzzle game design: it is recommended to set up a core narrative node every 30 minutes, configure three or more types of narrative clues in each scene, and design at least two differentiated narrative feedback paths in key puzzle-solving links. Designers no longer need to stick to the traditional design process and can make appropriate use of AI tools to improve efficiency or find starting points to create unprecedented game experiences ^[5].

3. Design and application practice of different modes of puzzle games

3.1. Filmic narrative integrated into linear narrative mode

Linear narrative is the most traditional and common narrative form in puzzle games. This model mainly relies on the continuity of chronological order and causal logic to connect the entire events in a sequential order to create a complete and closed story line ^[6]. This mode is based on a fixed plot line and uses the author’s carefully arranged narrative clues to integrate various puzzles into an organic and unified whole. The first generation of “Mysterious Island”, released in 1993, pioneered the construction of a “book-style” chapter structure—each island area corresponds to an exclusive narrative segment, and players need to follow the preset order to solve the core puzzles in order to gradually advance the plot. This type of design gave rise to a unique “lock-key” interaction mechanism: the narrative process is broken down into a number of independent paragraphs, and the unlocking of each paragraph requires the cracking of a specific puzzle.

One of the distinctive features of the linear narrative mode is the integration of filmic narrative techniques. It uses shot combination, rhythm control, and scene transitions to strengthen the rhythm of the overall narrative, so that the plot progress can be kept at the same level as the emotional tension. The “Mysterious Island” series uses the rendering of scenes and cutscenes to create a strong cinematic atmosphere. This series adopts a “dual-channel” structure in the transmission

of narrative information, using “explicit channels” such as cut-scene images to carry the core plot of the game, and supplementing story background information through “hidden channels” similar to diary fragments. This type of structure not only ensures the continuity of the game’s story narrative, but also leaves room for players to explore hidden plots independently. This is not only superficial game feedback, but also closely connects the game plot with the player’s game experience, forming a more lasting memory^[7].

However, the realistic dilemma of limited replay value is still one of the problems in the linear narrative model. A tracking survey of “Mysterious Island” players showed that only 23% of players will complete a second pass, which is significantly lower than the average value of other narrative modes. The core reason for this phenomenon lies in the strong certainty of linear narrative experience. In order to improve this situation, contemporary linear puzzle games have begun to try to add optional narrative segments in addition to the fixed main plot. They can also extend the life cycle of the work by collecting different types of elements (**Figure 5**).



Figure 5. Puzzle solving interface of the game “Call of the Sea”.

3.2. Application of multiple ending settings in branching narrative mode

Under the construction of a variety of different interactive forms, the game’s narrative breaks the linear structure of traditional game levels and relies on branches to form a huge network structure, allowing the game’s story development to span different levels and dimensions. Such a game allows players to choose the final fate and ending of their characters on the basis of parallel plot branches^[8]. “The Stanley Parable” can be called the ultimate presentation of branching narrative mode in puzzle games. The core breakthrough of this work is to transform the player’s choice into the core driving force of narrative bifurcation, and build a more complex “narrative possibility space”. Game developer Davey Wreden innovatively uses multiple narrative techniques and uses the narration system to achieve self-reference at the narrative level. When the player chooses to go against the game’s guidelines, the game will generate unique satirical narrative content. This type of design breaks the inherent framework of traditional branching narratives.

The technical implementation of the branched narrative mode requires a sophisticated state control system. “The Stanley Parable” constructs a network structure composed of 189 narrative nodes, each node is configured with multiple entry and exit criteria. The player’s subtle choices will be recorded by the system and used for subsequent narrative directions. This type of design creates a highly impactful narrative diversity: there are more than 300 unique narrative matching forms at the theoretical level, but only about 15% of the parts that players need to explore during the actual clearance process. This “iceberg-style” architectural design not only ensures the adequacy of game content, but also effectively avoids the problem of players being overburdened at the cognitive level.

Multiple ending settings are the core identifier of the branching narrative model^[9]. “The Stanley Parable” not only has a very rich number of endings (there are 7 official endings in total), but also has a clear hierarchical structure: the

surface ending focuses on resolving the suspense of the plot, and the deep ending explores the core essence of the narrative in depth. Player survey data shows that 82% of the respondents reported a “sense of enlightenment” when unlocking the hidden ending of the game. This type of experience has significantly increased the replay rate of the game, and the average number of clearances by players has also increased.

3.3. Multi-sensory collaborative integration into environmental narrative mode

In narrative creation, the basic method of emotional expression is to set the appropriate emotional tone of the environment. The performance of the environment can create an appropriate atmosphere and background for emotions, ensure a more natural emotional transition, and make emotional expression more coherent, thereby enhancing the player’s emotional experience in the game^[10]. “The Witness” pushes the artistic expression of environmental narrative to its peak, and its core design concept is rooted in the creative proposition of “space is narrative”. Developer Jonathan Blow built an isolated island scene that relied purely on the environment to convey narrative connotations, abandoning various traditional narrative media such as dialogue and text. This extreme design has shown remarkable results: eye tracking research data shows that players miss an average of 63% of narrative clues in the first 5 hours of the game. As the game progresses, the clue recognition accuracy will increase to 89%, presenting a unique narrative clue perception learning curve.

The implicit clue system built into the game operates collaboratively in multiple sensory dimensions. In the visual dimension, it relies on architectural arrangement, light and shadow flow, and even color to convey basic or implicit narrative information and emotional tone^[11]. In the auditory dimension, environmental sound effects are used to hint at the location of the hidden space; even the tactile dimension (such as the PS4 version’s handle vibration feedback) is deeply involved in the narrative construction process. This kind of multi-sensory collaborative design can create a strong and deeply immersive experience. Therefore, during the immersion process of environmental narrative, players will be more likely to enter a highly focused “flow” state.

Player-led meaning construction is the core feature of the environmental narrative model. “The Witness” does not provide any official narrative explanation, and all interpretations of the narrative are derived from the player’s independent reasoning process. This design generates deep cognitive investment, according to game forum statistics, players invest an average of 11.7 hours in discussing and verifying their narrative conjectures. The puzzle mechanism of the game and the narrative interpretation form a clear intertextual relationship, where the thinking logic required to solve the puzzles happens to be the core key to understanding the core of the narrative. This type of design builds an integrated “gameplay-narrative” experience.

4. Pattern design and integration trends of puzzle games

The narrative structure design of puzzle games focuses on the core essence of interactive narrative theory. The linear narrative mode relies on the “lock-key” interactive mechanism and cinematic expression techniques to build a coherent and impactful emotional experience process for players; the branched narrative mode uses player choice as the core driving force to build a complex narrative possibility dimension, thereby awakening players’ deep cognitive investment. The environmental narrative mode relies on a multi-sensory clue system and a player-led meaning construction process to help players achieve a highly immersive “flow” experience. With the continuous updating of global game design concepts, although these three types of narrative modes each have unique characteristics, they no longer rely on a single narrative route. The core commonality is that they all break through the one-way transmission attribute of traditional narratives and encourage players to unlock different plot branches through free exploration in those virtual spaces full of dynamic feedback. Different narrative possibilities are triggered, thereby constructing a unique game journey, and giving players more full control over narrative construction^[12].

The three types of narrative modes show significant differentiation in the core dimensions of player experience. The linear narrative mode can generate the strongest emotional projection effect, the branched narrative mode can give players

the most outstanding cognitive satisfaction experience, and the environmental narrative mode can create the most lasting memory retention effect. The differentiated expression of these types of experience dimensions provides a clear decision-making guide and selection reference for the narrative design of puzzle games.

Contemporary puzzle games are showing a significant integration of narrative modes. The game “Outer Wilds” successfully absorbs and uses the core advantages of three types of modes: linear narrative, branch narrative and environmental narrative: it builds the core framework of the game through environmental narrative, embeds branch narrative design at key points in the plot, and maintains a clear linear evolution process, which increases the fun and diversity without destroying the overall evolution of the game. This type of “hybrid narrative” architecture has not only received widespread praise from the industry, but also won a number of authoritative awards in the narrative field in 2020. The core of the success of this work lies in its construction of a dynamic balance mechanism. While the game engine tracks the player’s progress in obtaining narrative information in real time, it will also independently regulate the appearance probability and degree of manifestation of subsequent clues, thereby ensuring that players with different play styles can obtain a complete narrative experience.

The future development trend of puzzle games may focus on personalized narratives empowered by AI. Current machine learning algorithms can already present dynamically optimized narratives based on players’ different puzzle-solving preferences, such as logical derivation players or intuitive judgment players. Once this technology matures, it is expected to revolutionize the interactive narrative model of puzzle games, but it should still depend on the actual situation to achieve a truly “thousands of people, thousands of faces” personalized interactive narrative experience.

5. Conclusion

As the core form of interactive narrative, puzzle games rely on their unique interactive narrative structure to give players more participation and diverse narrative experiences. The analysis framework of the article adopts the three-dimensional model of “narrative structure-interaction mechanism-player experience” to systematically analyze the core characteristics of the three types of modes, as well as the practical application scenarios of different modes in puzzle games, and analyze their differentiated characteristics in the three dimensions of emotional projection intensity, cognitive satisfaction and memory retention effect. The article also discusses the evolutionary trends of contemporary puzzle games in terms of narrative mode integration and technological innovation, providing inspiration for subsequent research and practical exploration in this field.

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