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A Review of Game Design Techniques for Managing Suspense

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Abstract. Suspense is key to the enjoyment of games and interactive storytelling. Although suspense has been studied extensively in traditional media such as fiction and film, there has been relatively little research on managing suspense in games. As interactive media, games differ from traditional media in many ways. Although many conventional techniques for managing suspense still apply to games, certain suspense manipulation techniques are specific to games. In this paper, we discuss a framework for managing suspense in games and present a comprehensive study of various game design techniques for managing suspense. In particular, we focus on the use of game mechanics and game artifacts to manipulate suspense, which has not received enough attention in previous works. Our goal is to provide a comprehensive guide for game designers to explore different ways to manage suspense in their games or use it to analyze the suspense management techniques in existing games.

Keywords: Suspense · Game Design · Game Mechanics · Artifacts

1 Introduction

Suspense is a key literary device used by traditional media, such as fiction, non-fiction, film, and TV, to engage the audience. As a result, suspense has been studied extensively in literature, film, and TV [4–6, 11, 22, 31, 40, 44, 49, 52, 53, 55]. Researchers have also studied suspense in psychology [1, 25, 35], economics [20], marketing [2, 30], and sports [7, 26, 37]. Lehne and Koelsch [27] had attempted to develop a general theory of suspense that also covers music.

Suspense has also been studied in the interactive media, such as interactive storytelling [9, 13, 15–19, 23, 33, 34, 38, 47] and video games [3, 8, 14, 28, 41, 42, 45, 48, 54].

The difference between video games and traditional media is that many video games have three layers: story layer, gameplay layer, and artifact layer, while

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traditional media does not have the gameplay layer. For example, books only contain the story layer. Films and TV contain both the story and artifact layers. While many video games contain all three layers, some video games, such as Pacman or Tetris, have little or no story.

In the story layer, traditional media generally adopts linear storytelling, but video games may also support non-linear storytelling. The gameplay layer is similar to sports, where players overcome obstacles or engage in simulated combats. The artifact layer includes sounds, lights, special effects, animations, and the 3D environment.

Most existing works on suspense in games focused on the story layer [8, 14, 41, 42, 45] and a few touched on the artifact layer [48]. But there has not been a comprehensive analysis of suspense management using non-narrative game mechanics or game artifacts. Although many game designers have learned from experience to manipulate suspense with various game design techniques, a theory-driven, comprehensive study of the subject is needed to fill this gap.

In this paper, we present a theoretical framework for suspense management in games and an analysis of various game design techniques for manipulating suspense. Our review focuses on using game mechanics and game artifacts to manipulate suspense because this is an area that has not received enough attention. In this regard, we also include sports games in our analysis. Our goal is to provide a comprehensive guide for game designers to explore different ways to manage suspense in their games or use it to analyze the suspense management techniques in existing games.

The rest of the paper is organized as follows. In Sect. 2, we briefly review the theories of suspense and previous works on suspense in games. In Sect. 3, we present our theoretical framework for suspense in games. In Sect. 4, we discuss suspense management in the story layer. In Sect. 5, we discuss suspense management with game mechanics. In Sect. 6, we discuss suspense management with game artifacts. The last section is the conclusion and future work.

2 Background and Related Work

2.1 Theories of Suspense

Suspense is the feeling of excitement or anxiety over an uncertain future. The term suspense is often used interchangeably with the term tension. But based on Stein [46], tension is short-term, and suspense lasts longer. But there is no clear guideline on the length of time that delineates tension from suspense. We adopt Stein's definition and treat tension as short-term suspense in this study.

Another related term is curiosity, which is the strong desire to know or learn something. Curiosity is an integral part of suspense because the uncertainty in suspense generates curiosity. Without curiosity, there is no feeling of suspense. For example, Cuddon defined suspense as "A state of uncertainty, anticipation and curiosity as to the outcome of a story or play, or any kind of narrative in verse or prose." [12]

Suspense has long been studied in literature, film, TV, psychology, business, and economy [1, 2, 4–7, 11, 20, 22, 25–27, 30, 31, 35, 37, 40, 44, 49, 52, 53, 55].

The “standard” theory of suspense was developed by Ortony, Clore, and Collins [35], commonly known as the OCC model. Based on this theory, suspense is generated by hope, fear, and uncertainty. Hope is related to the prospect of a desirable outcome, while fear is related to the prospect of an undesirable outcome. The intensity of suspense depends on the level of uncertainty and the significance of the outcome. However, the role of uncertainty in suspense has been controversial because of the paradox of suspense [39]. To address this issue, Smuts proposed a desire-frustration theory of suspense that eliminates the uncertainty premise [45]. Smuts applied this theory to video games [44], suggesting that suspense can be managed by giving or removing options for a player.

Brewer and Lichtenstein’s structure-affect theory [5] states that suspense can be manipulated by adjusting the length between the initiating event and the outcome event, the discourse materials in between, and the significance of the outcome.

Lehne and Koelsch [27] proposed a general theory of suspense that covers fields such as literature, film, TV, and music. This theory combines elements from both Brewer and Lichtenstein’s model [5] and the OCC model [35].

In Gerrig and Bernardo’s theory [22], suspense can be manipulated by the reader’s perceptions of the range of possible solutions to a problem. The level of suspense is higher when the number of paths to a solution is reduced.

Ely, et al. [20] defined suspense in the context of economics as the variance of the next period’s beliefs. The greater the variance of the beliefs, the higher the suspense. This theory implies that suspense is closely tied to uncertainty.

2.2 Previous Work on Suspense in Games

Zhu [54], the first author of the current paper, proposed a theoretical framework in which suspense is elicited through an affective loop. However, this was a high-level discussion and did not get into specific details of game design techniques.

Many researchers have studied manipulating stories to manage suspense [8, 9, 14, 19, 23, 33, 34, 38, 47]. For example, Giannatos, et al. [23], O’Neill and Riedl [34], and Cheong and Young [9] used plan-based AI to create suspense by manipulating story structures. These methods were mostly based on the work by Gerrig and Bernardo [22].

Several studies have shown that sound effects can be used to manipulate suspense [10, 24, 32, 48, 50, 51]. Delatorre, et al. [13] suggested decorative objects could also generate suspense.

Some researchers connected suspense with adaptive gameplay. For example, Liu, et al. [29] adjusted the difficulty of a game based on anxiety. Vachiratampon, et al. [51] showed that a player’s level of suspense was affected by the timing of scary events. Bailey and Zhu [3] and Levin, et al. [28] designed experimental games that managed game suspense via adaptive gameplay based on the OCC model.

3 Theoretical Framework of Suspense Management in Games

We are interested in studying the game design techniques for manipulating game player's emotions and how these emotions can be used to create and maintain suspense. We propose the following theoretical framework of suspense management in games.

- Suspense management in games can be divided into two tasks: generating suspense and maintaining suspense.
- Suspense is generated by a combination of four emotions: desire, hope, fear, and curiosity.
- Suspense is maintained by delaying the outcome of a desire and by manipulating hope, fear, and curiosity.
- Game designers have many options to manipulate game content to evoke desire, hope, fear, and curiosity in game players.
- Game designers have many options to manipulate game content to delay the outcome and maintain suspense.
- Game content can be divided into three layers: story, game mechanics, and artifacts. Game designers can generate and maintain suspense by manipulating game content in each of the three layers.

Our cognitive model of suspense is based on the OCC model [35], which states that the three main components of suspense are hope, fear, and uncertainty. But uncertainty is a state of things, not an emotion. So we replace uncertainty with curiosity because uncertainty generates curiosity. The more uncertain the game outcome, the stronger the curiosity.

We also add desire as a key emotional ingredient to suspense because suspense starts when a desire is evoked. Hope and fear are closely related to desire. The desire to win creates hope and fear. The stronger the desire to win, the stronger the feeling of hope and fear. The stronger the desire to know, the stronger the curiosity.

Partially based on Perron's analysis [36], we divide game content into three layers: story, game mechanics, and artifacts. Frome [21] divided game content into four layers: story, gameplay, artifact, and environment. But we think part of the environment layer (such as culture and history) can be merged into the story layer. The physical environment can be merged into the artifact layer.

The discussion below is organized as follows. First, we divide our discussion into three layers: story, game mechanics, and artifact. Within each layer, we further divide the discussion into two tasks: creating suspense and maintaining suspense. Within each task, we discuss the game design techniques for evoking the emotional effects on game players and how these emotional effects are related to the suspense.

4 The Story Layer

Creating and maintaining suspense in the story layer is similar to suspense management in film and fiction. The main difference is that the player controls the

avatar. Therefore, the player has more freedom in navigating the game world, making it more difficult to create a tightly controlled narrative.

Another difference is that the player and the avatar almost always receive the same information. Films often use dramatic irony to create suspense. When viewers know more (e.g., threats) than some characters, the desire to either give the information to the character or hide the information from the character creates suspense. However, dramatic irony is generally not used in video games, except for perhaps the cut-scenes.

There are cases where the main character in the game knows more than the player. In the game *The Witch's House*, the ending reveals that the player played as a witch that had stolen the body of a young girl. This is revealed by the main character implying that they knew this the entire time. This creates surprise, not suspense.

4.1 Creating Suspense

There are numerous storytelling techniques for generating suspense. Discussing all these techniques is out of the scope of this paper because they are not unique to games. Readers can easily find them in other publications. Here we will give a quick overview.

A common method to create suspense is to evoke curiosity by revealing some information about an event or a person but withholding the rest. Mystery creates a desire to know. For example, someone is missing or killed, and the player does not know what happened, who did it, or why. Many detective-style games, such as *L.A. Noire* (Fig. 1a), *Gone Home*, *Her Story*, use this approach.

Another method evokes hope and fear by making the main character do something difficult and dangerous. It also creates curiosity: can they succeed? In the game *The Last of Us*, Joel needs to take Ellie to a place via a long and dangerous trip. This technique is used in most first-person shooter games or adventure games.

The third method is to evoke fear by creating an external threat that is coming to harm the character. The external threat can be an environmental hazard, illness, dangerous animal, or an enemy. Suspense can be created by the announcement, prediction, or hint of a threat.

The fourth method evokes curiosity and fear by putting a player in a dilemma and forcing the player to make difficult decisions. The game *Until Dawn* (Fig. 1b) features branching storylines, where the player has to decide at critical moments choices that will affect how the story progresses.

4.2 Maintaining Suspense

To maintain suspense, game designers must delay the outcome. There are numerous storytelling techniques to do this. You can slowly release information to the player, thus controlling the story's pace. You can create a series of enemies for the player to defeat or problems for the player to solve. You can create another



Fig. 1. a. L.A. Noire; b. Decision in Until Dawn

plot line to distract the player. For example, you can create another mystery for the player to solve or make the player take a dangerous side trip.

5 The Game Mechanics Layer

The terms “gameplay” and “game mechanics” are used extensively in game design, but their meanings are often vague and ill-defined. Many people use these two words interchangeably. In the Oxford Dictionary, gameplay is defined as “the tactical aspects of a video game, such as its plot and the way it is played, as distinct from the graphics and sound effects.” Sicart [43] defines game mechanics as the methods invoked by agents for interacting with the game world. In many places, game mechanics are defined as the game rules.

In our study, we differentiate gameplay and game mechanics in the following ways. Gameplay includes all the player actions and avatar actions that can alter the state of a game. Gameplay is about looking at the game from a player’s perspective. Game mechanics include gameplay and everything a player cannot see or control, including goals, rules, attributes, and behavior of game objects. Game mechanics is about looking at a game from a game developer’s perspective. In our definition, neither gameplay nor game mechanics include the story content.

5.1 Creating Suspense

Gameplay makes all games suspenseful, with or without stories. A typical player starts each game with a desire to win. This desire to win creates both hope and fear, which create suspense. On top of this inherent suspense, we can use game mechanics to create additional lines of suspense or enhance the inherent suspense.

In the game mechanics layer, rules can be created to generate fear in both players and spectators. For example, fouls create fear in sports. Figure skating is suspenseful because the strict rules for deducting points create fear. In football, the offside rule creates fear in the attacking players, while the handball rule creates fear in the defending players. Potential yellow and red cards create fear.

Timers or clocks are widely used in sports games, video games, and other games. They are particularly effective in creating suspense. For the losing side, a timer means the defeat is closer and closer. For the winning side, it is the opposite. It creates a stronger and stronger feeling of fear or hope. Basketball has two timers: the overall game timer and the shot clock. For example, the game *Resident Evil 2* (Fig. 2a) has a final segment where the player must navigate through an area with enemies to the exit before a self-destruct timer displayed overhead reaches zero.

A conveyor belt can be seen as a variation of a timer because objects stay on the conveyor belt only for a specific time. Therefore, it can also create suspense. For example, the game *Overcooked 2* (Fig. 2b) has levels with conveyor belts that requires timing and coordination with other players to transport items and people correctly.



Fig. 2. a. Timer in *Resident Evil 2*; b. Conveyor belt in *Overcooked 2*

Direct opposition creates more suspense than indirect competition because they create higher tension (short-term suspense). For example, golf generally feels less suspenseful than basketball or football.

Simultaneous goals (desires) can create multiple lines of suspense. The combined suspense is higher if a player has simultaneous lines of suspense. For example, an advanced tennis player has two simultaneous goals for each shot: keep the ball in the court and make it difficult for the opponent to hit back. Therefore, a tennis match is more suspenseful for an advanced player than for an inexperienced player who primarily worries about keeping the ball in the court. In a snooker game, a player can play continuously if the player can pocket the correct balls. In this case, an advanced player also has two simultaneous goals: pocket the right ball and set up the next shot. This also makes the game more suspenseful for advanced players.

These rules may not have been originally designed to create suspense, but their emotional effects make the game more suspenseful. It is helpful to analyze these techniques from a suspense management perspective.

5.2 Maintaining Suspense

Maintaining suspense is about delaying the outcome. In video games, we need to complete a certain number of levels to win the game. For tennis, you must win a

certain number of games to win a set and certain sets to win a match. These rules were designed to delay the outcome. Many games use timers to explicitly delay the outcome, thus maintaining suspense. For example, suspense is maintained for at least 105 min in a football game.

Another way to delay the outcome and maintain suspense is to create obstacles and opposition. This method is very commonly used in video games. Game designers often create obstacles or enemies to slow down the player. Think of the number of obstacles Mario needs to overcome to complete each level.

Another common method is to adjust the complexity of gameplay to slow down or speed up the game. In games such as Super Mario's 3D games and A Hat in Time (Fig. 4a), platforming challenges often require players to combine gameplay systems skillfully and creatively to progress.

We can withhold information or resources and release them slowly to control the game's pace. For example, we can hide the information about the next step in a series of puzzles and let the player gradually solve them. In the game Alien Isolation (Fig. 3a), certain doors and passageways can only be unlocked when the player has spent time gathering the appropriate tools, such as the maintenance jack, hacking device, the ion torch, and the plasma torch.



Fig. 3. a. Locked doors in Alien Isolation 2; b. Plasmids in Bioshock

To maintain suspense, it is not only necessary to delay the outcome but also important to vary the level of hope, fear, and curiosity along the way to keep the player interested. For example, a side quest can be created to generate new curiosity and distract the player from the main line of suspense. To adjust the level of hope and fear, we can adjust the player's resources and the strength of the opposition.

To increase fear, we can either remove the player's resources or strengthen the opposition. For example, we can make the player's weapon malfunction, battery depleted, or the player's sidekick injured. The game Bioshock uses Ammo and Mana-like systems to limit the player's resources. It also has a section where the player is locked into only being able to use certain Plasmids (spell-like abilities) that randomly change at certain times (Fig. 3b).

To increase hope, we can provide the player with more resources or weaken the opposition. For example, we can place more weapons or health kits around a player to increase hope, or we can make enemies disappear for a while. In

the Fallout series (Fig. 4b), the game provides not only new weapons and armor but has a level-up system that gives the player additional skill points to unlock new interactions and perks that drastically improve their combat and social gameplay.

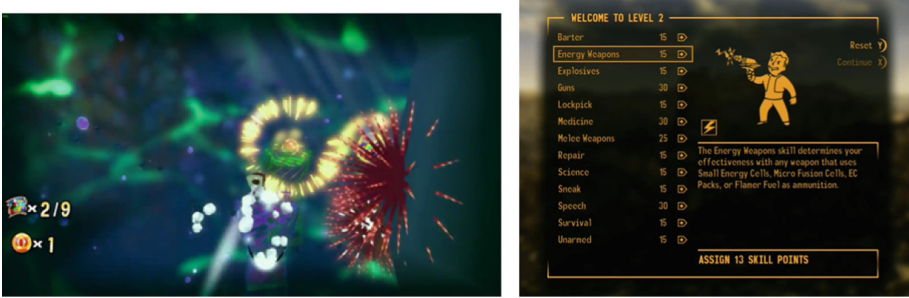


Fig. 4. a. A Hat in Time; b. Fallout

6 The Artifact Layer

The artifact layer includes all the graphics, sound, and animation.

6.1 Creating Suspense

Sound effects are very effective for generating suspense. Game designers can learn much from films about using sound to create suspense. For example, certain sound effects can be used to foreshadow a threat and increase fear. The game Team Fortress 2 uses the sound of Spy's invisibility watch to signal players their presence. The game Silent Hill uses the radio to signal to the player the enemy's presence before they are visible. The intensity of the sound indicates a closer enemy. Sounds of children playing or birds chirping can indicate safety and reduce fear. Sound can also be used to generate curiosity. A mysterious sound in the distance can create a desire to find out what it is. Lighting can be manipulated to give or hide information. A mysterious light in the distance can generate curiosity and suspense. For example, Team Fortress 2 uses the sniper's glowing dot sight to signal to the player the sniper's presence. Darkness often creates fear. Many games conceal enemies in darkness to unnerve the player. The game Tormented Souls uses darkness to hide the exact location of enemies while still using sound to convey their presence. But in certain circumstances, such as a stealth game, darkness can be a resource, thus creating hope. Fog can be used to hide information in the distance and thus create both fear and curiosity.

Certain props can create suspense. For example, blood, burned houses, and dead bodies can create fear. Certain objects may indicate our target is not far, creating hope. Unusual or mysterious objects often create curiosity.

Camera angle or camera motion can also be used to create suspense. For example, we can use the camera to show an unusual and interesting part of an object, creating curiosity, and then gradually show the whole thing. Fixed camera angles in horror games such as the original *Resident Evil* 1, 2, and 3, *Silent Hill*, and, more recently, *Tormented Souls*, increase a sense of helplessness and fear because of the limited view.

6.2 Maintaining Suspense

Artifacts can also be used to maintain suspense. For example, we can make a sound come and go or light off and on to maintain curiosity. We can also add randomness to the sound or lights to make them more mysterious, generating curiosity and fear of the unknown.

7 Conclusion and Future Work

We have presented a theoretical framework for analyzing suspense in games and reviewed the common game design techniques for managing suspense. There have been relatively few works on suspense in games, and most existing publications focused on the story layer. Our study fills this gap by providing a more comprehensive analysis of game design techniques in the game mechanics and artifact layer.

We are expanding our review to include more game design techniques. We are also creating a more comprehensive list of game mechanics and artifacts for managing suspense in games.

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