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Impact of Interactivity on Information Management for Suspense in Storytelling

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Abstract. One of the most common purposes of storytelling is to amuse the audience. Triggering different emotions and feelings is a common method for entertaining with stories. Among these, suspense is strongly linked to narrative, and delivering a suspenseful feeling along the story to increase the fun is an effective, well tested practice when producing stories. Specifically, controlling the amount of information is a part of how suspense is provoked, but the information flow varies across different media. In this paper, we explore the impact of the amount of given information and the perception of amusement in suspenseful narrative settings. We provide evidence that non-interactive audiences prefer less information and more suspense, and interactive audiences find a higher amount of information more enjoyable. To validate this hypothesis, an experimental escape story in which a threat approaches the main character is presented to a number of subjects. Interactive and non-interactive versions have been tested, and the relation between given information, perceived suspense and amusement has been analysed, producing results supporting the hypothesis.

1 INTRODUCTION

Amusement is one of the most typical objectives of storytelling. This has been thoroughly studied in different fields (narratology [64], psychology [62, 17] and learning [8] among others). How to improve the feeling of amusement is fundamental in mastering valuable storytelling in humans. As such, good storytellers are generally assumed to master the skill of adjusting the level of different components along a story in such a way that the overall perceived fun is high.

Among the aspects influencing the quality and effectiveness of successful storytelling, suspense plays a crucial role in emotional gratifications. Reactions to suspense are known to be directly related to enjoyment [39, p. 315], having a big impact on the audience's immersion and suspension of disbelief [26, p. 1359]. The impact of suspense is backed up by several studies showing that people enjoy not only positive, but also negative aspects in stories [3, p. 2]. Readers tend to be amused by suspenseful, coherent and complex narratives, accounting for roughly 54% of the variance in situational interest [49, p. 445] (in that study, suspense made the most relevant contribution with a 34% of the variation). The same pattern has been evidenced to appear in videogames, in which suspenseful ones are rated as more enjoyable than non-suspenseful ones [29, p. 31].

This suggests that creating and properly adjusting suspense is a fundamental asset in storytelling. Among others, one of the ways of managing the delivered suspense is by means of controlling the amount of information that is given to the audience, having them know about a threat, a resource to handle it or what the main character knows.

This influence of information flow is not only applicable to passive, linear storytelling. Active audiences of an interactive fiction, effectively performing as actors, need to be able to take decisions (where to go, what to do...) based on what the spectator knows about the environment. We hypothesize that if the active subject's uncertainty is too high for taking informed decisions, she might feel unable to enjoy the story. However, a full disclosure of the environment could decrease the player's feeling of suspense.

Suspense and information flow are therefore tightly interconnected. Controlling information is a useful resource to control suspense. Interactive storytelling systems, when implemented as computer simulations or games, can make use of this to try to convey different levels of suspense to the user. In these kind of systems, controlling information does not only impact suspense, but also playability and believability (among other), ultimately influencing the levels of amusement and engagement.

The present paper hypothesizes that the effect of information flow is different between interactive and non-interactive stories. The underlying involved cognitive processes completely change the whole experience when the audience is not passive. Modelling the information flow requires a distinction between interactive and non-interactive storytelling. In particular, this work is based on the following hypotheses:

1. The impact of suspense in overall amusement is, in general, lower in interactive fiction than in non-interactive fiction.
2. Interactive storytelling requires more information than equivalent non-interactive stories for producing and amusing experience.

These hypotheses imply that, to maximize amusement in interactive storytelling, more information is required, even at the cost of jeopardizing the equilibrium between classical suspense delivery by hindering facts to the audience.

This arises from the intuition that some classical assumptions in suspense cannot be applied to interactive fiction. One of the most relevant is that suspense can be influenced by managing the information provided to the audience. For instance, this happens when the audience knows the location of a murderer but the victim does not. Any information about the increased vulnerability of the victim typically increases the suspense.

In case of interactive stories where the audience or player has full control over a character, giving information to the character is the same as giving this information to the player and vice versa. For this kind of interaction, there is one single information channel, instead

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of two (one for the characters and one for the players) which means that there is a loss of one degree of freedom for directly influencing the amusement of the audience.

It follows that, if the audience is omniscient, the character represented would be so as well. This indicates that some classic suspense strategies are not enough to keep the interactive audience amused. Instead, we believe that the audience must have a certain feeling of control over the progression of the scene in order to maintain the amusement and to get engagement.

Ensuring amusement and engagement is fundamental in all kinds of narrative discourse. These include game-like scenarios and many other forms of what is assumed to be interactive storytelling nowadays. In these environments, if no progress is possible, a player may try to continue playing for some time, becoming increasingly frustrated before giving up [33, p. 7]. When this happens, engagement for the narrative may decrease. According to the working hypotheses, guaranteeing engagement through interaction is more influential than suspense, being the added interactivity a new degree for conveying a different, complementary form of amusement.

With this idea in mind, Delatorre et al. (2016) propose the architecture of a system whose main objective is the adaptation of the descriptive elements of a scene, in such a way that the amount of information of the scene output is adjusted to the required suspense intensity [18].

The system manages the structural components of the scene based on a *weighted corpus* consisting on a set of concepts, each one associated to a quantitative value that represents its level of suspense: a) characters' features related to balance of outcome oriented implicit strengths, empathy and proximity between threat and victim to the outcome, as a spatial or temporal dimension concerning both sides; b) objects involved in the scene influencing the scene plot (as weapons or doors) or just decorative elements without direct participation in terms of emotional valence and dominance; and c) environments as spatial context, atmosphere or scenery, which are a verifiable generator of suspense and may affect the skills of the characters.

The development of such an architecture requires a careful analysis of how to adapt the parameters. According to the previously exposed ideas, it is necessary to quantify the actual differences and particularities of suspense in interactive storytelling as opposed to producing suspense in non-interactive settings.

To confirm the previously proposed hypotheses, an experiment has been designed and run. In this experiment, $N = 23$ human subjects experienced interactive or non-interactive versions of a suspenseful story. The amount of information they were given was different on each version.

No claims are made about what the underlying cognitive aspects are. The aim of this experiment is to provide evidence for this phenomenon, as it is considered influential in the design of suspenseful interactive stories. Other aspects influencing engagement and amusement (playability, context, plot) are not studied in this experiment.

The rest of the paper is organised as follows: Section 2 describes the related previous work on suspense and information used for designing the experiment. Section 3 describes the experiment, whose results are detailed in Section 4. Section 5 and Section 6, respectively, discuss and summarize these results.

2 BACKGROUND

The experiment described in Section 3 tests the results of watching and playing non-interactive and interactive versions of short, suspenseful stories. In these stories, a murderer chases a victim controllable by a human. The information concerning the position of the murdered is not provided, or provided by sound, visual footsteps or a full view of the setting, depending on the version of each story. This section analyses the psychological ground of this work and other related systems and results based on suspense, information and automatic storytelling.

Suspense "has been conceived of as *pleasant excitement*" [63, p. 282]. This evidences the relation between suspense and amusement. In this way, suspense is defined as "the pleasure experienced immediately prior to the anticipated resolution of uncertainty, and posit that it is positively related (up to a point) to the amount that is at stake on the outcome of an event" [10, p. 73].

For interactive systems, it has been proposed that the amount of outcome uncertainty produces enjoyment [1, p. 1]. More specifically, in video-games –taken as a form of interactivity in which narrative can take place [47, p. 45]– players feel bored when the challenge is too easy and stressed when it is too hard [41, p. 137]. This leads to believe that giving full information and easing the challenge produces boredom and giving no information at all provokes frustration.

Against this background, controlling information seems fundamental to provide amusement to the audience and active audiences in interactive storytelling. This seems to affect the information given about characters, their situations and their related events, so that suspense happens directing the course of the narrative [27, p. 42].

For instance, in Hitchcock movies (as well as classical thrillers), suspense is delivered by providing the audience with information the characters in the story lack. This resource makes it possible for the spectators to know more than the protagonists and can make the question "how can the situation be solved?" more intensely [56, p. 95]. These data are key because enforce active cooperation with the audience for coming up with a meaning [9, p. 154]. Suspense is then generated as a function of the spectator's perception on the character escape options [24, p. 460], which can be inferred from the information provided by the story.

From this standpoint, suspense can be defined too as the result of foreseeing a jeopardizing situation; "the activity that lies in equally calculating, expecting and evaluating a coming event" [61, p. 1], foreseeing participates "in the constructive process by which a reader interprets details in a text and works towards an understanding of a text as a whole" [35, p. 277]. It is not unusual that the anticipation of negative outcomes triggers the feeling of suspense in the audience [14, p. 51]. Even when uncertainty does not exist (as it happens when a movie is watched more than once), the emotion that foreseeing provokes can be experienced [25, 16, 27]. from this perspective, suspense is an anticipation feeling [36, p. 54].

This anticipation requires: 1) information as the starting point for future developments; 2) a scenario of what is coming; 3) alternative possibilities which are more or less probable; 4) finally, the individual possibilities and possible counteractions by the protagonist conceived [61, p. 1].

In particular, in the case of a suspenseful situation caused by a chase, "the tension of the chase comes from the proximity of the two characters", being "greatest at the moment just before it seems capture is inevitable" [55, p. 81]. "Suspense situations arise from the possible close proximity of lethal danger" [7, p. 67], where "proximity increases the sense of danger" [15, p. 61]. If the threat is too far away, the emotion is hardly experienced [56, p. 232]. Isolating and limiting the character also raises the suspenseful feeling [55, p. 84].

For achieving to evoke this suspense, there are several possible information channels as visual images, text, music, speech and environmental effects [59, p. 694]. For instance, and according to

Smith (1999), fear makes us notice dark shadows, mysterious noises and sudden movements and thus provides more possibly frightening cues [51]. Van Vught & Gareth (2012) support this view. To them, it is more common for players to experience a startle suspense in response to games with fictional worlds because the atmosphere that triggers the anticipation is more easily created through fictional clues. This is the case in games with portray dark alleys and scary-looking monsters that can jump out at us unexpectedly. Atmosphere effects as dark/foggy and the music/soundscape are continuously suspenseful [58, p. 100]. Perron (2012) sustains a similar opinion about the fog and darkness as used to hide what is not depicted. Players do not see very far, so they are always scared to run into something awful [44, p. 27]. Since players with omniscient knowledge will use it for their own benefit [9, p. 214], controlling what they know is fundamental to keep the narrative and the corresponding suspense under the designer control.

Sound is another useful component of suspenseful environments. Sounds can contribute to environment and spatial definition. If a character hears a subtle whisper, she will probably be far from the speaker. If she understands the words, she is nearer. A clock tower sound far away will increment the space [5, p. 101], and the sound can inform the character about the proximity of an enemy [20, p. 104]. Therefore, sound is fundamental in interactive scenarios because it provides specific information about the environment and conveys emotional information like surprise or terror [46, p. 192]. Mixing sound and visual information can provide useful redundancy for the player and enhances vividness [52, p. 12].

Regardless of the strategy to evoke suspense, interactive scenarios in which the audience takes the role of one of the characters have a particularity: the player has the same information as the main character. In this sense, information revealed to the spectator-controlled character is automatically revealed to the audience. In these cases, systems focus on the user's experience of the story as it participates as the character and, therefore, choices are made by the user influence the story development [12, p. 1907].

While the treatment of suspense in the main narrative is supported by several prototypes of automatic storytelling systems (MEXICA [43], MINSTREL [57], Suspenser [12], Dramatis [40] or IDtension [53]), interactivity is not addressed by the most. Attempting to undertake this feature, proposals as DEFACTO [50], Character-Based Interactive Storytelling [11] or Façade [34] are interesting initiatives, considering the difficult and limitations of the matter. These limitations are mainly based on the "narrative paradox" or how to reconcile the needs of the user who is now potentially a participant rather than a spectator with the idea of narrative coherence [4, p. 35]. Some other important challenges as the order in which actions must be performed and the system is often inflexible, it is usually hard to recover from mistakes, and each system has its own interaction conventions [45, p. 315] are implied. Similarly, in connection with suspense, interactive narrative techniques do not provided mechanism to ensure that particular narrative qualities (such mentioned suspense, as well as surprise or romance) will be produced in resulting plans [54, p. 21].

Along with this, the effect of suspense in experimental prototypes and practical narrative are often not the same. Stories developed through research projects generally create much shorter and less intense narrative experience than films, novels or story-centered commercial games do [60, p. 338].

Naturally, video-games have been the discursive narrative space which have taken more advantage of this strategy from primal interactive fiction textual games [37, p. 7] to, recently, filmic interactive dramas [60, p. 338]. Beyond the narratology versus ludology debate [38, p. 231], computer games may be considered as "interactive cinema" [23, p. 78]. Actually, current developments of interactive narrative systems borrow the design of video-games [30, p. 189], particularly of genres as survival horror and RPG [32, 22, 19, 42].

In this new discourse denominated *transmedia storytelling* [28, p. 21] in which the player takes the role of the character, there is an emotional impact coming from such transference. This is different from the impact happening in classic discourses [31, p. 139]. For instance, suspense decreases as the player control increases [44, p. 99]. On the other hand, some suspense-generation techniques based on how to provide information are not possible, as players need a different amount of information [9].

Taking this difference into account, quantitative and qualitative analyses are needed to approximate the impact of information and suspense between interactive and non-interactive storytelling.

Against this background, an approaching threat comes out as a useful resource for experimenting with suspense. Given that most accounts of suspense assume foreseeing as a fundamental component, physical approximation has been used in the prototype system for the experiment, as described in Section 3.

3 EXPERIMENT

This section describes the experiment and the methodology that was applied to extract the information about what the differences between audiences of interactive and non-interactive stories are. Section 4 describes the results.

3.1 Interactive environment

To test the hypothesis proposed in Section 1, a testing environment was built. It consisted on an interactive application that displayed a top-down, tile-based 2D closed environment in which a female character (the *victim*) has to find a key to get out of an apartment, as depicted in Figure 1. During the escape, the *victim* is chased by a male murderer (the *threat*), who will kill her if he reaches her. The choice of both genders concerning their respective roles have been taken from classical suspense movies [48].

Figure 1. Screenshot of the 2D environment used for experimenting with the suspenseful story

The *victim* is initially located in the central corridor of an apartment with only one door to the outside, and the *threat* is initially located in a random border of the apartment. The location of the *threat* is initially unknown to the audience (whatever experimentation group they are). Each participant in the group *A* takes the role of the *victim*, and must escape the apartment. To do that, the *decision-maker* needs a) to find the key (randomly placed in any wardrobe of the apartment) and b) to get out through the door. If the murderer reaches the victim, she is killed and the *decision-maker* loses the game.

The gameplay is turn based and the victim moves first. On each turn, the *decision-maker* subject must move the character with the keyboard cursor arrows (up-down-left-right) and search for the knife or the key with the space bar. The *victim* moves four tiles on each turn, and the *threat* can move up to five times. This advantage for the murderer avoids endless or very long matches and forces the victim to try not to face him (since otherwise the player will not be able to escape).

The murderer is controlled by a simple AI (whose behaviour is unknown to the participants). This AI systematically explores each one of the rooms of the apartment. The exploration goes on until the *victim* is within the sight area of the *threat* (less than four tiles away, in the direction the *threat* is facing) and there are no obstacles between them.

If the *threat* detects the *victim*, he approaches her until he reaches her, or she is out his sight area. If this happens, the *threat* gets back to his initial position and starts over the exploration (unless he finds the *victim* again).

The prototype was implemented with RPG Maker VX[6] and it is freely available[7].

3.2 Story

The structure and the decoration of the apartment are the same through the different executions. The interactive experience has five versions:

0. A *sandbox* version (not used for data acquisition) in which the subjects can move freely and get used to the controls, the space and the basic interactive mechanics. This version has no *threat*. This version was used to train the participants in the experiment.
1. An interactive session in which no information about the threat position is given. The *victim* has a flashlight that allow to see only the very nearby area. The rest of the scene remains in complete dark. No sound or other clues are revealed until *victim* is reached.
2. An interactive session in which, for each turn of the murderer, there is an audible feedback of footsteps revealing approximately how far he is. The visibility is the same as in version 1.
3. An interactive session in which, for each turn of the murderer, there is an audible feedback of footsteps revealing approximately how far he is. Additionally, footprints are displayed on the screen to inform the user the relative part of the apartment the *threat* is. The visibility is the same as in versions 1 and 2
4. An interactive session in which the *decision-maker* can see the whole scenario including the *threat* location, the footprints and the sound feedback.

3.3 Method

A total of twenty-three participants ($N = 23$; three women, twenty men), with ages ranging from 20 to 41 years ($m = 24.28$, $sd = 4.95$) voluntarily took part in this experiment. Participants were divided randomly in two groups. Group *A* or *decision-makers* ($N_A = 12$) is formed by participants who will perform the role of decision-makers during the interactive stories; and group *B* or *viewers* ($N_B = 11$), who will be the audience without a chance of influence.

The experiment was run in two sessions in one single laboratory. Subjects from groups *A* and *B* were matched randomly in pairs and intercalated (subjects from group *A* would be surrounded by members of group *B* and vice versa). The screen of the *decision-makers* (the interactive version) was shared through Adobe Connect so that the corresponding *viewer* (group *B*) could see the interaction in real time. Viewport, tile size and other rendering aspects were identical between systems: all of them had the same specifications and configuration (Toshiba Satellite Pro S500-10D).

Before the sessions started, each participant was asked about age, gender and experience in video-games (*low*, *medium* or *high*). After that, group *B* was presented with version 0 of the environment (see Section 3.2) for five minutes, in order for them to familiarize with the context, characters and controls. After that, each *decision-maker* (group *A*) and, passively, each viewer (group *B*) played or watched twice each version (eight plays in total). On each iteration, all the versions (from 1 to 4) were played in random order. After two iterations were finished, the experiment concluded.

After each *threat* turn and before the *decision-maker* made a decision for the *victim*'s next move, the participants had to fill in a line in a questionnaire consisting of five questions:

- *How much suspense does the situation generate?*
- *What hope do you think the character has to escape?*[8]
- *What degree of enjoyment are you experiencing?* (the responses to questions are given in a 4-likert scale with the following values: *none*, *low*, *high* and *very high*, corresponding to values ranging from 1 to 4, respectively)
- *Do you think it makes sense to go on with the story?* (*yes/no*)
- *How much information do you feel you have about the current situation?* (4-likert scale with the following values: *too little*, *little*, *enough* and *too much*).

4 RESULTS

After running the experiment as previously described, demographic information for all participants and a total of 1811 report lines were collected. Each one of this report lines included answers for the five questions made on each step. 48 entries had to be discarded because they were partially missing or erroneous.

Results show a moderate downhill correlation between *suspense* and *hope* ($\rho = -0.470$, $p < 0.000$) and a weak uphill correlation between *suspense* and *amusement* ($\rho = 0.179$, $p < 0.000$). The correlation is slightly stronger in the group *B* (*viewers*), both between *suspense* and *hope* ($\rho = -0.527, p < 0.000$) as, noticeably, between *suspense* and *amusement* ($\rho = 0.315$, $p < 0.000$). This evidences that subjects taking an active role (*decision-makers*, group *A*) are also influenced by other aspects beyond suspense.

Regarding participants' perception about the information provided during the scenes, there is a very strong correlation between the sensed perception and the actual information flow (i.e. actually giving them more information): disclosing the whole apartment ($Z = 32.869$, $p < 0.000$), hear the audible feedback ($Z = -25.86$, $p < 0.000$) and displaying the footsteps indicating the position of

[6] http://www.rpgmakerweb.com/products/programs/rpg-maker-vx
[7] http://goo.gl/C4YMJ3

[8] Both questions based on Gerrig & Bernardo's (1994) experiment [24], aforementioned in Section 2.

the murderer ($Z = -35.543$, $p < 0.000$), which supports the validity of the reported value by the subjects and is also in line with the successive versions of the story ($\chi^2 = 75.441$, $p < 0.000$).

As expected, the higher the amount of information, the lower the reported *suspense* ($\chi^2 = 15.782$, $p < 0.005$). Consequently, the amount of information given in the experiment should influence in *hope* but the gathered data showed borderline signification ($\chi^2 = 7.323$, $p < 0.07$).

A significant difference in *amusement* can be found: version 3 yields a *high* value, *low/high* in version 2 and *low* in versions 1 and 4 ($\chi^2 = 18.908$, $p < 0.000$). The amount of information seems to affect the participants' opinion about going on with the story: the data evidence that as the amount of information decreases, participants tend to want to keep on with the experience ($Z = 4.099$, $p < 0.000$).

The influence on engagement by *suspense* ($Z = -5.971$, $p < 0.000$) and, more intensely, *amusement* ($Z = -11.144$, $p < 0.000$) can be equally observed. This effect is not evident in the case of *hope* for *decision-makers* ($p < 0.5$), but it could be verifiable for the *viewers* ($Z = 2.021$, $p < 0.05$), for which the loss of *hope* influences the desire to go on with the story or not.

As trivially expected, the differences in information also influence the interaction ($F_{3,88} = 4.967$, $p < 0.01$), making less disclosed scenarios faster to play (10 turns in average) than fully viewable ones (14.78 turns on average, version 4). There was no significant difference between versions 2 (12.21 turns) and 3 (11.35 turns).

Experience in video-games seems to have no relevant effect on the number of turns ($p < 0.2$), *suspense* ($p < 0.6$), *hope* ($p < 0.5$) or *amusement* ($p < 0.7$). However, least experienced *decision-makers* reported a higher *suspense* ($\chi^2 = 12.99$, $p < 0.002$). This difference in *suspense* as not reflected in the least experienced *viewers* in video-games ($p < 1$), who moreover reported a slightly higher global *hope* (*low/high* versus *low*) ($\chi^2 = 6.774$, $p < 0.04$).

Perception of suspense seems to not be affected by the group. Both group *A* (*decision-makers*) and group *B* (*viewers*) answered similarly about reported *suspense* ($p < 0.8$). In contrast, *decision-makers* reported slightly higher *hope* (*low/high*) than *viewers* (*low*, $Z = 2.264$, $p < 0.05$). Reported *amusement*, when ignore versions, seems to be also affected by the group ($Z = -2.077$, $p < 0.04$).

By comparing the perceptions reported by groups *A* and *B*, it was also found a significant difference between reported *amusement* and the version of the story. The report by *decision-makers* ($\chi^2 = 24.606$, $p < 0.000$) rated as *high* the *amusement* in stories 2 and 3 (versions with *little* and *enough* information); too much information (version 4) yields *low* amusement and *too little* information (version 1) makes the participants report a *none/low* amusement, being the second try even lower. However, although with a less intense effect ($\chi^2 = 10.584$, $p < 0.02$), *viewers* reported more *amusement* in versions 1 and 2 in that order (*low/high* to *high*) and then 3 and 4 (*low/high* to *low*), which is inverse to the amount of given information. Figure 2 shows graphically this difference between both groups *A* and *B*. Concretely, reported *amusement* is significantly different in versions 3 ($\chi^2 = -6.686$, $p < 0.000$) and 1 ($\chi^2 = 6.156$, $p < 0.000$), weaker in version 4 ($\chi^2 = -2.920$, $p < 0.004$) and not significant in version 2, where both roles refer similar ratings ($\chi^2 = -0.292$, $p < 0.8$).

Remarkable differences were found between successive tries (each version was run twice). Participants from both groups report higher *suspense* in the first try (*high*) than in the second one (*low*, $Z = 3.635$, $p < 0.001$). The *hope* to escape raises in the second try (*high* versus *low* in the first try, $Z = -3.611$, $p < 0.001$). Not significantly, but still worth mentioning ($Z = 1.927$, $p < 0.06$), it was found that *amusement* is higher in the first try (*high*) than in the second one (*low*).

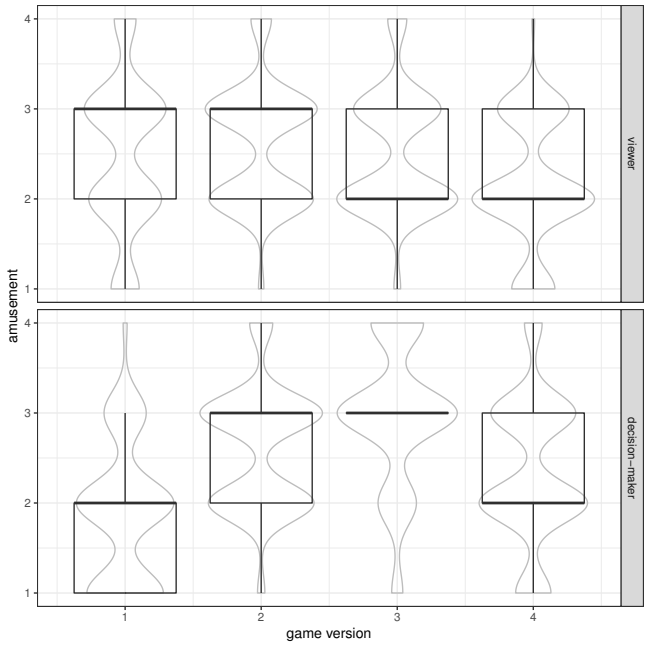

Figure 2. Amusement reported by *decision-makers* and *viewers*

5 DISCUSSION

The results of the experiment suggest differences between the impact of suspense in interactive versus non-interactive stories. However, there are some aspects that must be reviewed in order to extract a working conclusion.

Suspense, hope for escaping, amusement and amount of information are all part of a general cognitive process experienced when playing or watching a story. As such, the influence of several aspects in the experimenting environment (hard or impossible to control) is not negligible. First, the platform used in this experiment was intendedly modelled as an *easy-to-play* video-game for the participants to be able to play the interactive story with a low entry barrier. This may have influenced the participants since they promptly detect the story occurs in a fixed-rule scenario, with probably no surprises. The same applies to the simplicity of the plot, explained to the participants beforehand. The validity of the working hypothesis in more elaborated, real contexts would require more in-depth experimentation.

The suspense in this experiment is not based on providing additional information to the audience, as proposed by several authors [27, 56, 9, 7, 2]. This is anyway impossible in interactive stories because the audience, as *decision-maker*, takes the role of the main character, and that implies that any information provided to the character is automatically provided to the player and vice versa. This fact is evidenced in version 4 (see Section 3), where, even when the murderer is in another room that would not be visible for the *victim* as fictional character, the *decision-maker* reacts by avoiding that place. Hence, the suspense in this case is produced even when the fictional character and the player have the same information. Presumably, the participant watching the story experiences a limit when feeling suspense since this partial information process cannot take place.

Although information flow as an important constituent of suspense, anticipation seems to be restricted to situations where escap-

ing or being about to be killed is perceived as certain for the audience [61, 35, 14, 25]. Nevertheless, taking suspense as an "anticipation feeling" [36], it can be observed that it happens in versions 1, 2 and 3, being noticeably reduced in version 4, when the participant knows the location of the murderer.

Moreover, the experiment has only been run with a single pair of characters (a prototypical female victim and a prototypical male murderer, being both ideas taken from classical suspense movies [48]). The literature, however, reports on emotional differences when the gender and the aspect of characters vary [21, 13, 6]. Additionally, more differences could be expected between *decision-makers* and *viewers*. This limit is aggravated by the fact that the percentage of female participants is significantly low, which does not yield sufficient data to discard the influence of genre.

All these aspects suggest the need for a more refined experiment, once promising but not fully conclusive results have been obtained.

6 CONCLUSIONS AND FUTURE WORK

This work is based on the hypothesis that interactive stories need more information than non-interactive ones to be amusing to the audience, even at the expense of less suspense. Suspense seems not to be as influential in interactive storytelling, at least not as much as a correct information flow. While an exact quantification of how much information is needed depends on the context, it seems clear that too much information is boring and too little information can be frustrating in interactive storytelling.

Along with the hypothesis, this paper has described an experiment in which human participants were matched in pairs of *decision-makers* (active) and *viewers* (passive), both experiencing the same story from two different roles. The analysis of the results indicates that the hypothesis is plausible in the context of the experiment and the found correlations indicate that the predicted effect seems to be true. However, due to the nature of the experiment (a 2D, tile-based, turn-based game) and its limitations, it is still soon to make a general conclusion. Nevertheless, we consider the results to be relevant since the engine we have used to test the hypotheses is quite similar to several interactive systems and games.

In all versions of the narrative, suspense is produced even when the audience has the same information as the main character in the scene. Against this background, the experiment has evidenced that giving too little information to the *decision-maker* reduces the amusement, just in the same way that too much information is counterproductive. In this sense, an omniscient audience, in contrast with non-interactive stories, needs a different amount of information.

We observed that amusement and engagement are influenced by the perception of escape chances. As the hope of winning decreases, the passive audience loses interest. It seems that, whereas the passive spectator desires a quick resolution when the options of the protagonist are low, the active audience wants to have an advantage to help the character to generate opportunities that can make the story longer.

More generally, we also conclude that interactive storytelling requires challenge, but offering enough opportunities. In this way, it is important to avoid this form of "learned helplessness" in which the audience experiencing a negative outcome which cannot be controlled loses interest. Besides, simply triggering the feeling of suspense is not enough to consolidate engagement. This does not seem to be the case for passive audience, which seems to be more affected by classic suspenseful settings, some of which are replicated in interactive drama as discussed in Section 1.

Finally, based on the evidences found, we are currently working on a broader study that relates these observations with the effect of other features of suspense (use of tools and resources, distance between the threat and the victim, and other particular characters' features).

The overall objective is to provide a model serving not only to predict suspense, but to be able to do it within interactive storytelling.

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