Achieving the Illusion of Agency

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Abstract. Games with a strong notion of story are increasingly popular. With the increased amount of story content associated with games where player decisions significantly change the course of the game (branching games), comes an increase in the effort required to author those games. Despite the increased popularity of these kinds of games, it is unclear if a typical player is able to appreciate the rich content of these games, since any given player typically only experiences a small amount of that content. We create a non-branching game that simulates branching choices by providing players with choices followed by immediate textual feedback. We hypothesize that this game, where player decisions do not significantly change the course of the game, will maintain the player's sense of agency. Experimentation showed that in a text-based story with forced-choice points there were in most cases no significant difference in players' reported feelings of agency when they experience a branching story vs. a linear story with explicit acknowledgement of their choices.

1 Introduction

One important way video games, especially role-playing video games, are appraised is on how much control the player has over the story content. Fallout: New Vegas [12], for example, allows the player to sculpt his or her story experience using the decisions the player makes over the course of the game; however, creating these customizable story experiences requires authoring exponentially more content [2]. Dialogue, voice acting, and testing has to be done for all of the story paths, many of which the typical player will never encounter. It could be desirable, therefore, to provide the illusion of control players experience from truly branching stories without creating all combinations of game content.

L.A. Noire [5] is a successful game that simulated a strong sense of player control, but actually has a fairly linear story. L.A. Noire gave dialogue feedback to the players that acknowledged their choices, but ultimately the choices didn't affect the outcome of the game. We believe that this immediate textual feedback can evoke a similar sense of control as an actual long term effect of an action in the story. *We hypothesize that a non-branching story with explicit feedback on players' decision will evoke a similar sense of agency to a truly branching story.*

In this paper, we use a branching story, and two non-branching variants of it to study the effects of players' choices on their sense of agency. The branching

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story represents a heavily-authored game like Fallout: New Vegas. The two non-branching stories were created from the most visited path of the branching story. The first non-branching story acknowledges the user's choices with immediate textual feedback, but the choices do not actually affect the path through the story. This represents a successful non-branching game like L.A. Noire. Finally, as a baseline, we created a non-branching story that gives little to no feedback and does not acknowledge the user's choices. This was created to demonstrate that it is the feedback text that is important for preserving players' sense of agency. The three variants of the story were made available online as part of a human subjects experiment. Before the participants began, they took a demographic survey, and after completion of one of the stories, they took a survey measuring their sense of agency at a story level and at a per-decision level.

The results of the study showed that there was no significant difference between the branching story and the non-branching story with feedback for four out of five pair-wise comparisons between questions measuruing components of agency. This result is encouraging because it implies that game designers can preserve players' senses of agency while reducing the burden of authoring.

2 Defining Agency

Previous work that dealt with the concept of agency is varied; each research effort that has addressed agency commits to a particular definition to operationalize. Despite the particular choice of definition, all of these approaches have examined agency as a phenomenon which lies in between game control and player control, and the approaches vary in terms of where to situate agency along that spectrum.

Wardrip-Fruin *et al.* [18] reviewed definitions of agency in an attempt to characterize it as a phenomenon involving both game and player, one that occurs when actions players desire are among those they can take as supported by an underlying computational model. Mateas characterized agency as a structural property of games [10]. Mateas built upon Laurel's Aristotelian characterization of interactive experiences [7], defining agency as a phenomenon which a game player experiences when there is a balance between material and formal affordances [10]: material affordances are opportunities for action that are available to the player, and formal affordances are motivations the game presents to pursue particular courses of action. Murray's characterization, on the other hand, presents agency as a phenomenon in the player: she posits that agency is the satisfying power to take meaningful action and see the results of our decisions and choices [11]. This definition is advantageous because it does not depend on identifying the player's desire (as Wardrip-Fruin *et al.* posit), nor does it rely on intuition for how to strike a balance between providing actions the player can take and providing motivation for player actions (as Mateas posits). Our work is based on an operationalization of Murray's perspective, and we posit that the feedback presented to the player shows the results of her decisions and choices.

As Harrell and Zhu [6] indicate, there are multiple levels of interaction (and consequently, multiple levels of agency) that game designers could be interested

in. We are less interested in interactions that don't relate to plot (such as those that deal with avatar customization or interactions with the environment). Our primary focus is on a player's perceived sense of agency as it pertains to determining the outcome of a story's development.

3 Related Work

Our work is different from most work within the interactive narrative community, which focuses on maximizing agency by creating systems capable of authoring a vast amount of story content in a variety of different ways [1,17]; our approach aims to elicit a sense of vast story content with a minimal amount of authoring effort. Our approach is also different from emergent-narrative approaches [3,13], since the story arcs we are interested in using remain, for the most part, fixed. Given our emphasis on the perceptual nature of agency, we leverage a concept developed in experimental psychology relating to one class of meaningful actions: choice. Thompson et al. developed, what they term, the "Control Heuristic," a way to estimate a person's perceived degree of control in a situation which requires that person's input [14]. The heuristic predicts a person's perception of control based on four factors: the *foreseeability* of a choice's outcome, the *ability* to make the choice (make the outcome occur), the *desirability* of the outcome that resulted from the choice, and the *connection* perceived between the actor's choice and the observed outcome. Within the Interactive Narrative community, there has been work developed to address two of the four factors. The *PaSSAGE* [15,16] system modifies the plot fragments that players experience in a video game, based on their measure of how *desirable* a particular plot fragment will be for a player. Recent work by Young and Cardona-Rivera[20] has begun to address the notion of *foreseeability* through the use of narrative affordances; subsequences of narrative content that a player *foresees* as completions to her current game experience. Our work here begins to address a third factor: *connection*. Our approach involves providing feedback to the player, which explicitly provides information regarding the connection between a player's choice and the resultant outcome. Instead of spending time creating a diverse and branching story with multiple paths and then modifying which plot fragments to present, we propose that constructing and modifying textual feedback that a player experiences after she makes a decision is enough to create a comparable sense of agency.

4 Experimental Design

We created a branching, text-based, choose-your-own adventure story where the participants played the role of "Stump Junkman", a monster slayer who searches for the king's lost "Crown of Power". The story involved the participants making six decisions at fixed points, each with two choices. Of the six decision points, two were true branch points in the story where the players' inputs would result in substantively different story content. The remaining four decision points were non-branching, where the players would receive an acknowledgement of their

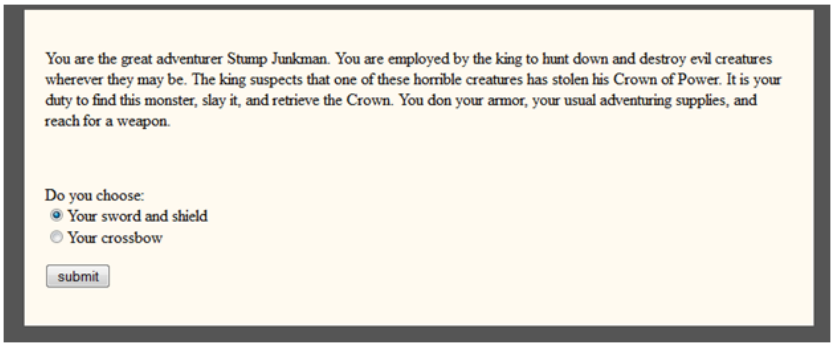

Fig. 1. A screenshot of the story interface during a story event. The top text contains the story content for the event, and the bottom text contains the choices the player has available. The radio buttons allow players to select their input, and the submit button confirms the input and presents the player with a subsequent story event.

decisions (to varying degrees depending on the version of the story they played) before the plot would move forward linearly. This story was created to simulate a typical, heavily-authored game which has branching story content.

This story was written in HTML with JavaScript to help handle the participant input. We recruited participants using snowball sampling, with direct recruiting messages sent via email, message boards, in person, and on social networking sites. We encouraged the participants who had taken the study to recruit others. The participants were given a link that directed them to a consent form. If they clicked accept, they were directed to a multiple choice demographic survey that asked for their gender, age, how long they had been playing video games, genres of video games they prefer, and how familiar they are with text-based video games (like the one they will be taking in the study). In this survey, and in a subsequent exit survey administered after completing the story, the participants were allowed to leave any question unanswered. After the demographic survey, they were redirected to a page that trained them on how to use radio buttons, since radio buttons were how they were to enter their choice in the story. Finally, they were redirected to the actual story. The participants read the text, and made their choice using a radio button (See Figure 1).

After the story was finished, the participants completed a survey with questions designed to measure their sense of agency at a story-wide level and at a question-by-question level. The questions were created to measure different components of Murray's definition of agency:

> Agency is the satisfying power to take meaningful action and see the results of our decisions and choices [11].

They were measured on a five point Likert scale [8]. The first five questions were asked to measure participants' overall sense of agency and can be found in Figure 2. Next, players were asked if they would play the story again. Finally, participants

Exit Survey Story-level

1. I felt that the actions I took were meaningful within the context of the story.
2. I felt that my actions were important to the progression of the story.
3. I was able to see the results of my actions.
4. I felt that the story would have been different if I had selected different choices.
5. I felt like I had control over aspects of the story that I wanted control over.
6. If given the choice, I would play the game again.

Fig. 2. The questions measuring the player's sense of agency for the story as a whole. Question 6 did not measure agency but was still asked at this point.

Exit Survey Question-level

1. I felt that this action was meaningful within the context of the story.
2. I felt that this action was important to the progression of the story.
3. I was able to see the results of this action.
4. I felt that the story would have been different if I had selected different choice.

Fig. 3. The questions measuring the player's sense of agency for each story choice

were shown each decision point in the story, the choices they had selected, and asked four questions regarding their sense of agency for each decision. Those four questions are listed in Figure 3.

Figure 4 shows the composition of the downselected branching story. The circles indicate decision points presented to the participants. The boxes represent text feedback that the participant receives after making a choice. For example, the "choice of a weapon" decision point in the branching story is:

> You are the great adventurer Stump Junkman. You are employed by the king to hunt down and destroy evil creatures wherever they may be. The king suspects that one of these horrible creatures has stolen his Crown of Power. It is your duty to find this monster, slay it, and retrieve the Crown. You don your armor, your usual adventuring supplies, and reach for a weapon. Do you choose: Your sword and shield or Your crossbow.

If they choose the sword and shield, they receive the text:

> You arm yourself with your sword and shield. Your sword was crafted by the king's blacksmith and your shield has saved your life many times.

If they choose the crossbow, they see:

> You arm yourself with your trusty crossbow. You add a dozen crossbow bolts to your quiver and oil the gears to your crossbow.

Either way, they move on to the "choice of location to visit decision" point. Therefore, the "choose a weapon" decision point is a non-branching choice. An example of a branching decision point would be the "choice of location to visit" decision point. The text for this decision point is:

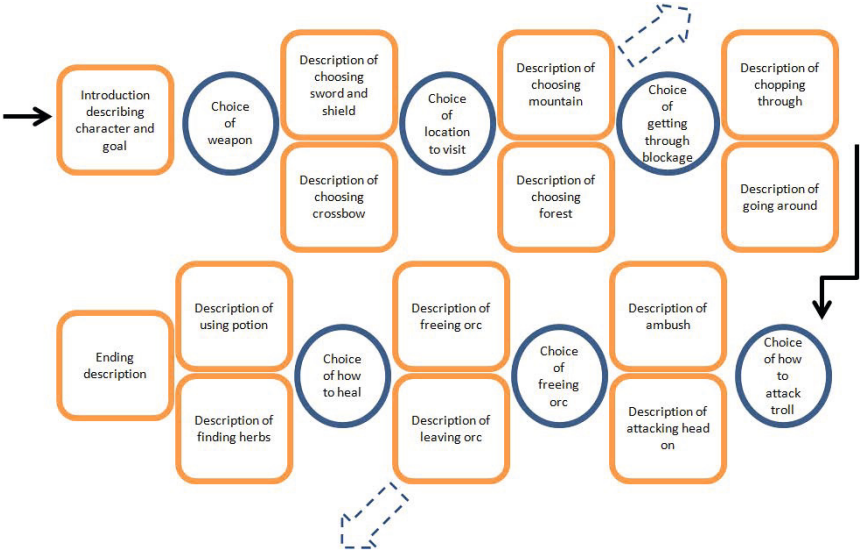

Fig. 4. A map of the downselected branching story. The circles indicate decision points presented to the participants. The boxes represent text feedback acknowledging the decisions that participants make. The dashed arrows represent elements that were removed in the non-branching versions.

> You leave your house and travel to the outskirts of the city. There are two possible locations to explore. Do you choose: The forest to the north of town or the mountains to the east of town?

If the participant selects the forest, she will receive this feedback text:

> You trek through the dense forest to the north of town. It is menacingly quiet. After several hours of hiking, you come to a place in the forest where it is completely overgrown and impassible.

and the story will proceed along the left branch (as depicted in Figure 4); however, if she selects the second choice, she will receive this feedback text:

> You trek through the mountains to the east of town. You take the narrow, windy path that crosses through the mountains. Eventually you come across a huge ravine. The bridge that normally leads across the ravine has collapsed. You need to get to the other side.

and the story will proceed along the right branch (as depicted in Figure 4).

Additionally, the choices participants' make early in the story are referenced again later in the story. This process is similar to "variable binding" found in some interactive story systems *e.g.*, ([9,4]). Continuing this example, choosing to travel to either the forest or the mountains is a branching choice. If the participant goes to the forest and takes a particular path in that branch, she

later reads "You journey back from the forest and present the king with the Crown of Power," referring back to her decision to go to the forest; however, for non-branching decisions, participants' choices are not referred to again. For example, because the choice of sword and shield or crossbow is not a branching choice, it is not referred to again in the story. This long-term variable reference for branching decision points was used to emphasize the branching nature of that decision. In addition to seeing the short-term effect of their actions, participants were reminded of their actions when they were referenced again later in the story.

The experiment was conducted in three phases. In phase one, all participants played the full branching story. After a week of data collection, we determined which branch of the story received the greatest number of playthroughs by players. We then took that branch and created the two non-branching versions of the story: one with immediate textual feedback acknowledging player choices and one with little to no textual feedback. This proceedure enabled us to control for the effects of story content on players' perceptions of agency. The non-branching stories are highlighted in Figure 4. In phase two, participants were randomly assigned to one of the three stories. After data collection, we ran a Chi-Square analysis on the demographic distributions and found that women participants disproportionately selected one particular branch of the story in the branching version. In order to account for this bias, in phase three we reopened the experiment and collected more data to enable a sensitivity analysis. In total, there were 42 men and 37 women during phase one, 60 men and 24 women during phase two, and 79 men and 28 women during phase three.

The first non-branching story is shown in the bold part of Figure 4. The dashed parts were story elements that were not included in this non-branching version. In this version of the story, the participants were still presented with both choices at each decision point and given the feedback choice that corresponds to their choice; however, at each decision point, regardless of their choice, the participant experienced the same subsequent story event. Thus, at the "choice of location to visit" decision point, if the participant chose the forest, they received this feedback text:

> You trek through the dense forest to the north of town. It is menacingly quiet. After several hours of hiking, you come to a place along your path where it is completely blocked and impassible.

and then moved on to the "choice of how to get through blockage" decision point; however, if the participant chose the mountains, they received this feedback text:

> You trek through the mountains to the east of town. You take the narrow, windy path that crosses through the mountains. After several hours of hiking, you come to a place along your path where it is completely blocked and impassible.

and still moved on to the "choice of how to get through blockage" decision point. This story gave participants immediate feedback based on their choices, but their decisions did not affect outcome of the story. Additionally, after the immediate feedback, their choices at the decision points were never mentioned again.

We were interested in determining if this non-branching story with immediate textual feedback could be used an an easier-to-author substitute for a fully branching story that still preserved the player's sense of agency. We had two hypotheses we designed the study to test.

Hypothesis 1: Story one, a branching story with immediate and long term decision feedback, and story two, a non-branching story with only immediate decision feedback, will result in participants reporting similar senses of agency.

If hypothesis one is true, then it may be the case that simpler non-branching stories that provide players with immediate feedback on their interactions can yield a similar sense of agency as more authorially intensive branching stories.

We wanted to show that it was the immediate decision feedback that afforded the players the same sense of agency as the true branching story. Therefore, as a baseline, we created another non-branching story that does not have any immediate or long-term feedback. Our theory was that this story would evoke a weaker sense of agency than the story with the feedback. This story was similar to the first non-branching story, using the same story content. The difference was the lack of immediate or long-term feedback that the players received. Instead of a descriptive paragraph describing their choice, the users received the same, minimal, non-descriptive feedback regardless of their choice. For example, when the users were presented with the "choice of weapon" decision point, either decision resulted in the feedback:

> You grab your weapon and head out.

Their choices were not referenced later in the story. Our second hypothesis was:

Hypothesis 2: Story three, a non-branching story with no immediate or long-term feedback, will result in participants reporting a weaker sense of agency when compared to the reports of participants in a non-branching story with immediate decision feedback.

If both hypotheses are true, then we know that a non-branching story is not sufficient to preserve agency, but rather the inclusion of immediate feedback specific to players' decisions that is responsible for their reported sense of agency.

5 Results

In total, we had 79 participants read through the branching story. To control for the effects of story content on player responses, in this evaluation we only consider the 52 participants who explored the story path that we used to create the non-branching stories. There were 54 participants who played through the non-branching story with feedback, and 44 people who played through the non-branching story with no feedback. A summary of participant demographics can be found in Table 1. Because participants were not required to answer all questions on the exit survey, not all questions have the same number of responses.

Table 1. Gender and age information for participants in all three version of the story. The "Downselected Branching Story" line indicates the gender of participants who chose the branch of the story we ultimately used for the non-branching versions in phase two of the study (which is highlighted in Figure 4).

	Male	Female	Mean Age +- St. Dev.
Branching Story	42	37	27.2 +- 9.2
Downselected Branching Story (Story 1)	20	32	27.0 +- 7.1
Non-Branching Feedback (Story 2)	47	7	27.9 +- 8.5
Non-Branching Minimal Feedback (Story 3)	33	11	25.1 +- 6.1

To evaluate our hypotheses, we examined the ratings provided by participants in exit survey. For each question on the survey, we used the Wilcoxon Sum Rank test for unpaired samples [19] to see if there is a statistical difference in the responses that participants gave across all three stories. Since you can only compare two populations at a time using this test, stories were paired such that all combinations of stories were tested: Story 1 vs. Story 2, Story 1 vs. Story 3, and Story 2 vs. Story 3. The survey was created to characterize agency as it relates to story through player choice. We examined participants' responses to questions at each of these levels separately. Because we controlled for story content by creating the non-branching stories using one of the branches from the branching story, we are able to make direct comparisons between story-level participant responses as well as choice-level participant responses.

A complete summary of all story-level comparisons of player responses is found in Table 2. A significant result is that participants felt a higher sense of agency in the branching story (Story 1) in every question when compared to the non-branching story (Story 3) with minimal feedback ($p = 0.05$). This implies that reduction from a branching story to a non-branching story without feedback about the player choices does not preserve the player's agency.

The results also moderately support our first hypothesis, that players will feel a similar sense of agency in a branching story as a non-branching story with immediate textual feedback acknowledging their choices (Story 2). However,

Table 2. P-values and W-values for survey responses on story-level questions from Figure 2. Marginally significant ($p <= 0.1$) entries are bolded. Statistically significant ($p <= 0.05$) entries are bolded and marked with an X.

	Story 1 vs. Story 2		Story 1 vs. Story 3		Story 2 vs. Story 3	
	P-Value	W-Value	P-Value	W-Value	P-Value	W-Value
Question 1	0.141	1161.5	**0.015 X**	**1053.5 X**	0.160	1268.5
Question 2	0.223	1124.5	**0.009 X**	**1082.5 X**	**0.039 X**	**1368.5 X**
Question 3	0.123	1167.5	**0.011 X**	**1068.5 X**	0.108	1297.5
Question 4	**0.030 X**	**1233.5 X**	**0.003 X**	**1100.0 X**	0.153	1267.0
Question 5	**0.084**	**1203.0**	**0.032 X**	**1033.5 X**	0.254	1227.0
Question 6	0.302	1096.5	**0.025 X**	**1043.5 X**	**0.060**	**1344.0**

participants did feel a greater sense of agency in Story 1 when compared with Story 2 when asked the question, "I felt that the story would have been different if I had selected different choices," significant to the $p = 0.05$ level. They also felt a marginally greater sense of agency in Story 1 compared to Story 2 in the question, "I felt like I had control over aspects of the story I wanted control over," significant to the $p = 0.1$ level.

We failed to prove the second hypothesis, that players would feel a greater sense of agency in Story 2 compared to Story 3. In only one question, "I felt that my actions were important to the progression of the story," did participants feel a greater sense of agency in Story 2, significant to the $p = 0.05$ level.

6 Discussion

Three of the story decision points seemed to yield a higher sense of agency than the other three, regardless of treatment. The three higher agency questions were: the location to visit, how to attack the troll, and whether or not to free the orc. The lower agency questions were: the choice of weapon, how to get through the blockage, and how to heal. We hypothesize that the decisions in the higher agency group seemed like the consequences of failure were more severe or that they offered two seemingly distinct story paths, while the lower agency group decisions has less severe consequences or were two different means to the same end. For example, whether or not to free the orc had implications for the character's safety and might have been a moral choice, where as what kind of weapon the character chose did not seem as important. We do not have sufficient data to make decisive claims about these two categories of choices, however, so this is a potential topic for future work.

Also of interest was that a disproportionately large number (32/37, or 86%) of the women went to the forest as opposed to the mountain in the branching story before any downselection occured. Only 20/42, or 48% of the men made the same choice. This choice was the first branching decision in the story. We ran a Fischer's exact test on these values and found that the women preferred the forest branch ($p = 0.0003$). We also ran Fischer's exact test for the other branching decision, whether or not to free the orc, but found no significant difference between men and women ($p = 0.529$). A bias may have been introduced into the story that influenced the women to choose the forest over the mountain.

Hypothesis 1 being moderately demonstrated implies that players felt a similar sense of agency in a branching story and a non-branching story with immediate textual feedback. However, participants of the branching story responded to one question measuring a component of agency significantly higher. These results are still encouraging, though. Authors can achieve much of the same sense of agency with less story content. Individual designers may decide if the increased effort to author a branching story is worth the increase to player agency.

7 Future Work

We found that women preferred visiting the forest over the mountains in our branching story. It would be interesting to examine why they preferred the one path over the other, and also to explore if men and women make other story-related decisions differently.

There are several assumptions that we made that can be explored in depth.

One assumption that we made was the that choices had to be substantively different from each other. Choices included choosing a sword and shield OR a crossbow, swinging across a ravine OR climbing down, *etc.* If the choices were to choose a bow OR a crossbow, it is likely that the player would feel that these choices were essentially the same and experience a lower sense of agency.

Also, we presented the study as a choose-your-own-adventure. The nature of the genre is that your decisions affect the outcome of the story. This is an example of "psychological priming." It is likely that the participants inferred that their choices affected the outcome of the story, regardless of whether or not their choices actually did. Another way to control the study would be to present the study in this way, and also to simply have the participants take the study without calling it a choose-your-own-adventure. This would eliminate the psychological priming bias. Future work would consider these and other possible assumptions that have to be made to reduce a branching story to a non-branching story.

8 Conclusion

There is a significant authorial burden in creating branching games [2]. The typical player is not able to appreciate this rich content, since only a small amount of that content is explored; however, a few successful games, such as L.A. Noire, acknowledge the player's choice but do not have the choice affect the story. We have shown that an approach where players' actions are acknowledged but don't influence gameplay has the potential to preserve the player's sense of agency while reducing the amount of content authors must create. We hypothesized that a branching story can be reduced to a non-branching story with immediate textual feedback of the player's choice. We have shown that this reduction is possible, and that most of the player's sense of agency is preserved in this reduction. This result is promising because it offers a first step in reducing the authorial burden of games. Going forward, it will be possible to consider other factors in the story reduction from branching to non-branching such as narrative influence on the choices, qualities of the individual choices, and player expectations.

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