Brukel vs Brukel: Impact of Game Fidelity on Player Experience In Gaminiscing Games

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***Abstract*—High-fidelity game development could be advantageous for improving player experience. However, it often comes at a price—labor costs, monetary investments, and lengthy development processes and it is challenging to balance between game fidelity and development cost. This work focuses on a specific genre—gaminiscing games, that are designed in a narrative way to archive and recreate personal oral history. Our study aims to explore the potential possibility of low-fidelity game design but without significantly, or even at all, sacrificing the player experience. Concretely, this paper explores whether a game design with higher fidelity and a specific type of scene would always correlate with a better player experience. An experiment with 42 participants was conducted using a commercial gaminiscing game called Brukel. Results show that it is not the case that both fidelity and scene would always significantly affect the overall experience of the game. This finding could shed light on practical game design, where game designers can choose the level of production that best aligns with their game's objectives.**

Keywords—Game Design, Interactive Storytelling, Gaminiscing, Player Experience

I. Introduction

In game design, fidelity refers to the extent to which the virtual environment emulates the real-world [1]. A high-fidelity design could somewhat improve player experience [2], but it also comes with a long development time and high-cost [3]. As a result, it is difficult for people with smaller budgets, e.g., educators, reminiscers, health practitioners, and historians, to develop meaningful and compelling games that would still be appealing to experienced gamers. This paper aims to provide a starting point in the research on the extent to which high fidelity is needed for cost-effectively designing compelling and engaging games.

The purpose of this paper is to explore whether games, with lowered fidelity, could still achieve a relatively high player experience. The focused genre is gaminiscing games--"the use of game technology to archive and recreate personal oral history as an engaging experience" [4, 5]. Gaminiscing allows younger audiences to re-establish connections to older adults' past, especially in the context of empathizing with a reminiscing older subject. Compared to other genres, like casual games [2, 6], gaminiscing games follow a narrative and story-telling style. This work explores gaminiscing games' potential that a relatively low fidelity does not prevent a game from rendering a high player experience.

This study aims to explore fidelity and scene types' impact on player experience in gaminiscing games. A commercially released high-fidelity gaminiscing game, Brukel, was adopted in the study, and a low-fidelity version was developed. We conducted an exploratory study, and results imply that fidelity has a limited effect on player experience, measured via Player Experience Inventory (PXI) [7]. Our findings provide insights for gaminiscing game designers to strike a better balance between the fidelity necessary to render the game compelling and engaging, and the costs within the development process.

II. Related Work

Previous research in casual games has found that fidelity leads to improvements in some, but usually not all, elements of player experience. Gerling et al. [2] developed two casual games with different mechanics and dynamics, and compared player experience in abstract low-fidelity and stylized high-fidelity graphics. Results show that fidelity levels could influence player experience, more so in challenging and demanding mechanics, but the game could still be enjoyable with lower fidelity. Hicks et al. [6] investigated visual embellishments, which are design elements supporting information conveyed by other means but not tied to system functionality. Their studies suggested that visual embellishments improved the perceived visual appeal games, but had a limited influence on the underlying player experience. Sim et al. [3] focused on prototype games for user testing and found limited effects of fidelity on user experience.

By contrast, this paper focuses on gaminiscing games, that prioritize strong immersive, historical, and educational components, which is different from casual games that prioritize cognitive abilities and entertainment value.

III. Towards A Research Verison of Brukel

This section provides an overview of the main research question – exploring the relationship between fidelity and player experience. First, Sec.III.A briefly discusses the implementation of high and low fidelity in a gaminiscing game. Then, Sec.III.B introduces scene type as another factor that could influence the player experience. Finally, Sec.III.C proposes the main research question.

A. High Fidelity and Low Fidelity

This study adopted a commercially released high-fidelity game, Brukel, and a low-fidelity version was recreated. In the High Fidelity (HF) version, visual elements are created in 3D using the Unreal engine to be realistic and vivid. By contrast, the

Low Fidelity (LF) version is developed as an interactive fiction, also called a text-based game, where players interact with a virtual world purely through textual natural language, without any visual elements [8]. The LF game was implemented using the Twine engine, a platform supporting the creation of interactive stories with branching narratives and variable states [9]. With these two game versions, this work aims to investigate how fidelity would affect the player experience, measured via Player Experience Inventory (PXI) [7].

B. Active and Passive Embodying

Within this game, we selected two types of scenes with different player interactions that could potentially influence the player experience and refer to them as "active" and "passive" scenes in this study. In the active scene, the player takes on the role of a narrator performing the memories she is speaking about through gameplay. By contrast, in the passive scene, the player takes on the role of an outsider who reflects on the narrator's memories without experiencing the memories through gameplay. The classification of active and passive scenes is subject to revision in our future work.

C. Research Question

This work contributes an exploratory user study investigating the relationship between fidelity and player experience, using both HF and LF versions of a gaminiscing game. Unlike previous research where LF games have simplified visual elements [2, 6], the LF game in this study is purely text-based without visual elements. In addition, this study also explores scene interactivity to examine whether an active scene, where the player plays through the narrator's story, has a greater effect on player experience than a passive scene, where players only hear the narrator's story instead of experiencing it.

Thus, the research question of this study is the following:

Does fidelity improve player experience in gaminiscing games? If so, would different scenes affect the relationship?

The study has three hypotheses, stated as follows:

H1: High-Fidelity (HF) improves the player experience compared to Low-Fidelity (LF).

H2: Active scene improves player experience compared to passive scene.

H3: There is an interaction effect between high- and low-fidelity and scene types on player experience.

IV. Research Methods

This section provides an in-detail introduction to the game implementation and user study. First, Sec.IV.A introduces the implementation details of the low-fidelity game based on the original high-fidelity game, and the selection of active and passive scenes. Then, Sec.IV.B discusses the user study design and protocols alongside the participants' demographics. Sec.IV.C introduces the measurements of the player experience, in the form of post-questionnaire.

A. Low-Fidelity Game Design

This work implemented an LF version of the HF game, Brukel. The LF game was created through an iterative process.

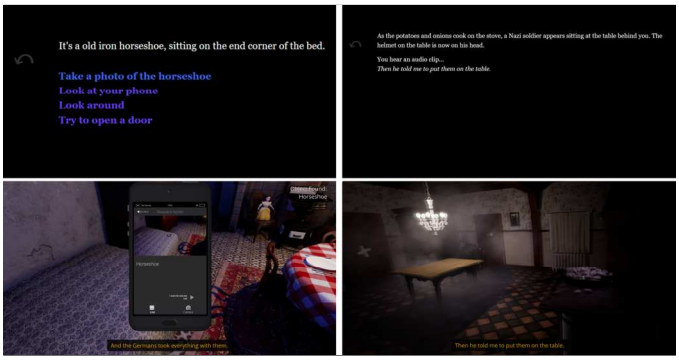

Fig. 1. Brukel screenshots. Top left: LF with passive. Top right: LF with active. Bottom left: HF with passive. Bottom right: HF with active.

First, the selected HF Brukel scenes were played and phenomenologically documented as an experience. Then, the LF version of Brukel was created by reversing the Mechanics,

Dynamics, and Aesthetics (MDA) lens [10], starting by viewing the aesthetics of the HF game and designing the experience to replicate dynamics through the mechanics of interactive fiction. The above steps are followed by discussing essential details and iterating with playtesting, to carefully replicate the core choices of the HF game.

This iterative process is necessary as the 3D game contains much more details than the details necessary for communicating the lived experience of playing HF Brukel. To faithfully document the entire visuals of the HF Brukel, rather than only the phenomenological experience of play, each text-based passage of the LF Brukel would be unwieldy and unfaithful to the gameplay: describing the texture, specific colors, pixels, every object and rendering within a 3D space. Instead, the goal of the iterative process was to replicate the gaminiscing essence by faithfully capturing the feeling and play of Brukel.

For both HF and LF games, our work selects the same active and passive scenes. There are four scenes in total: an active HF scene, a passive HF scene, an active LF scene, and a passive LF scene (Fig. 1). In the passive scene, the player takes on the role of an outsider who reflects on the narrator's memories without directly experiencing the narrator's story through gameplay. Mechanically, the player was given a camera to take pictures of objects in the scene. Every time the player takes a photograph of some object, the narrator's audio of that object will be played.

By contrast, in the active scene, the player takes the perspective of the narrator, where the story happens directly to the player as the player embodies the story being told in the audio. Mechanically, the player performs tasks in tandem with the narrator's story, moving to certain locations, and acting with objects, rather than documenting and listening. If they perform the correct click or positioning, the story continues.

For each active and passive scene, both the HF and LF versions share the same gaminiscing voice-over audio of the narrator in Dutch. These voice-over audio pieces are supplemented with the same subtitle text in English. These audio clips are heard with the same comparable actions. Moreover, both the HF and LF games contain the same important audio, such as camera clicking when the player takes photographs in-

game. One clear divergence is the presence of footstep sound in the HF game, but not in the LF game. The LF game is an interactive fiction where the player has no ability to walk within a virtual space. As the footstep sounds are an auditory response to the in-game character's movement, there was no way or need to replicate the sound in the LF game.

B. Study Design and Participants

The study was designed as a two-factor between-subject experiment. Four conditions were created in the following

- Condition 1: LF with passive scene (10 participants)
- Condition 2: LF with active scene (9 participants)
- Condition 3: HF with passive scene (12 participants)
- Condition 4: HF with active scene (11 participants)

Participants were recruited by posting recruitment flyers on university bulletin boards and emails to students. In total, 43 participants were recruited. However, 1 participant didn't complete the questionnaire due to technical issues, resulting in a final pool of 42 participants. Our study was approved by the institutional review boards of the university.

The sample consisted of 17 (40.5%) participants aged between 18 and 24, 24 (57.1%) participants aged between 25 and 34, and 1 (2.4%) participant aged between 35 and 44 years. Among the sample, 14 (33.3%) participants identified as female, 27 (64.3%) participants as male, and 1 (2.4%) participant as non-binary. All participants do not speak Dutch. As compensation, each participant received a $10 gift card and a Steam code for redeeming the full version of the game.

The study was an in-lab study held at the university. The experimenter reviewed the consent form and experiment steps with each participant, answered their questions, and asked whether they agreed to participate. Upon agreement, the participant signed the consent form. Each participant was randomly selected to play one of the conditions of Brukel but was not informed of the conditions. After going through the research protocol, each participant completed a pre-game questionnaire about their background and demographic, played a tutorial scene, and finally played the assigned experiment scene. In the end, each participant completed a post-game questionnaire and performed a short interview.

C. Measures

To measure participants' player experience, the post-game questionnaire adopted ten measurements from PXI [3]. Five constructs measure the level of psychosocial consequences (meaning, curiosity, mastery, immersion, autonomy). The other five constructs measure the level of functional (ease of control, goals and rules, challenges, progress feedback, and audiovisual appeal). All constructs are in 7 Likert scales from 0 (strongly disagree) to 6 (strongly agree). With each construct containing three questions, PXI has a total of 30 questions.

V. Results

This section reports the ANOVA analysis of each construct within the post-game questionnaire (PXI), where hypotheses were tested at a level of significance, α=0.05. Tab.1 reports the means, standard errors, ANOVA F-scores, and P-values.

Meaning, Curiosity, and Mastery. Neither the fidelities nor the scene types had a significant main effect, and there was no significant interaction between these two. These results suggest that there is no evidence supporting that fidelity or scene had an impact on the player's senses of meaning, curiosity, and mastery derived from gameplay.

Immersion. There was no significant main effect of scene types. However, there was a marginally significant main effect of fidelity ($F(1,38)$=3.225, p=0.080), which suggest that, participants playing the HF game experienced a marginally significantly higher sense of immersion (mean=4.672, SE=0.236), than the ones playing the LF game (mean=4.042, SE=0.260). There is a marginally significant interaction effect between fidelity and scene types ($F(1,38)$=3.517, p=0.068), implying that HF game's effect on immersion is manifested mostly in the passive scene.

Autonomy. There was no significant main effect of fidelities or interaction between fidelities and scene types. However, there was a significant main effect of scene type ($F(1,38)$=5.109, p<0.05). These results suggest that participants playing the active scene felt a significantly higher sense of autonomy (mean=3.727, SE=0.380) during gameplay than the ones playing the passive scene (mean=2.541, SE=0.362).

Ease of Control. There was no significant main effect of fidelities or interaction between fidelities and scene types. However, there was a significant main effect of scene type ($F(1,38)$=4.310, p<0.05). These results suggest that participants playing the passive scene found the game significantly more intuitive to control (mean=4.956, SE=0.229), than the ones playing the active scene (mean=4.265, SE=0.241), potentially due to the less freedom to explore around in the passive scene.

Goals and Rules. There was no significant main effect of scene types or interaction between fidelities and scene types. However, there was a significant main effect of fidelities ($F(1,38)$=8.445, p<0.01). These results suggest that participants playing the HF game found the overall game objective and rules significantly clearer (mean=4.613, SE=0.276), than the ones playing the LF game (mean=3.417, SE=0.304).

Challenges. There is a marginally significant main effect of fidelities ($F(1,38)$=3.226, p=0.080) and a significant main effect of scene types ($F(1,38)$=10.161, p<0.01). There was no significant interaction between fidelities and game types. Post hoc analysis showed that the HF active scene is significantly more challenging than the LF passive scene (p=0.006). And HF active scene is marginally significantly more challenging than HF passive scene (p=0.067). These results suggest that participants playing the HF game found the game difficulty matched their skill level (mean=3.725, SE=0.273), significantly more so than the ones playing the LF game (mean=2.996, SE=0.300). Participants playing the active scene found the match (mean=4.007, SE=0.294), significantly more so than the ones playing the passive scene (mean=2.714, SE=0.280).

Progress feedback. Neither fidelities nor scene types had a significant main effect, and there was no significant interaction between these two. These results suggest no evidence to support the idea that fidelities or scene types had an impact on the player's experience of understanding the progress of the game.

TABLE I. MEAN (STANDARD ERROR), F-SCORES (DEGREE OF FREEDOM OF THE MEASURE, DEGREES OF FREEDOM OF THE RESIDUAL), AND P-VALUE FROM ANOVA, BASED ON THE AVERAGED LIKERT SCALE OF QUESTIONS IN EACH PXI CONSTRUCT, FOR HIGH AND LOW FIDELITIES, AND ACTIVE AND PASSIVE SCENES.

	Low Fidelity		High Fidelity				
PXI	***Active***	***Passive***	***Active***	***Passive***	***F-scores of Fidelity***	***F-scores of Scene Type***	***F-scores of Fidelity * Scene Type***
Meaning	3.148(0.570)	3.167(0.467)	3.879(0.478)	3.556(0.458)	$F(1,38) = 1.292$, $p = 0.263$	$F(1,38) = 0.095$, $p = 0.759$	$F(1,38) = 0.121$, $p = 0.730$
Curiosity	4.667(0.441)	4.701(0.360)	4.940(0.237)	5.222(0.226)	$F(1,38) = 1.611$, $p = 0.212$	$F(1,38) = 0.255$, $p = 0.616$	$F(1,38) = 0.156$, $p = 0.695$
Mastery	3.704(0.331)	4.234(0.282)	3.939(0.554)	4.667(0.239)	$F(1,38) = 0.780$, $p = 0.383$	$F(1,38) = 2.766$, $p = 0.104$	$F(1,38) = 0.069$, $p = 0.795$
Immersion	4.483(0.397)	3.601(0.466)	4.455(0.313)	4.889(0.230)	$F(1,38) = 3.225$, $p = 0.080$^	$F(1,38) = 0.409$, $p = 0.526$	$F(1,38) = 3.517$, $p = 0.068$
Autonomy	3.666(0.521)	2.166(0.505)	3.788(0.499)	2.916(0.541)	$F(1,38) = 0.691$, $p = 0.411$	$F(1,38) = 5.109$, $p = 0.030$*	$F(1,38) = 0.357$, $p = 0.554$
Ease of Control	4.409(0.376)	4.967(0.304)	4.122(0.371)	4.945(0.275)	$F(1,38) = 0.216$, $p = 0.645$	$F(1,38) = 4.310$, $p = 0.045$*	$F(1,38) = 0.159$, $p = 0.693$
Goals and Rules	3.369(0.349)	3.466(0.572)	4.032(0.442)	5.193(0.230)	$F(1,38) = 8.445$, $p = 0.006$**	$F(1,38) = 2.354$, $p = 0.134$	$F(1,38) = 1.677$, $p = 0.203$
Challenge	3.592(0.260)	2.400(0.406)	4.423(0.325)	3.027(0.505)	$F(1,38) = 3.226$, $p = 0.080$^	$F(1,38) = 10.161$, $p = 0.003$**	$F(1,38) = 0.063$, $p = 0.804$
Progress Feedback	3.332(0.364)	3.401(0.397)	3.789(0.505)	4.112(0.472)	$F(1,38) = 1.656$, $p = 0.206$	$F(1,38) = 0.186$, $p = 0.669$	$F(1,38) = 0.078$, $p = 0.781$
Audiovisual Appeal	3.111(0.430)	2.301(0.377)	4.303(0.370)	4.694(0.280)	$F(1,38) = 24.636$, $p = <.001$**	$F(1,38) = 0.336$, $p = 0.566$	$F(1,38) = 2.768$, $p = 0.104$

^ alpha < 0.1 (marginally significant), * alpha < 0.05, ** alpha < 0.01

Audiovisual appeal. There was no significant main effect of scene type or interaction between fidelities and scene types. However, there was a significant main effect of fidelities ($F(1,38)=24.636$, $p<0.001$). These results suggest participants playing the HF game appreciated the game's audiovisual styling (mean=4.498, SE=0.243), significantly more so than the ones playing the LF game (mean=2.706, SE=0.267).

In summary, fidelity and scene type partially improve player experience. Fidelity significantly improves players' understanding of goals and rules, and audiovisual appreciation, and it marginally significantly improves players' senses of challenges and immersion. Hence, H1 is partially supported. Scene type significantly affects players' senses of autonomy, ease of control, and challenges, so H2 is partially supported. Only one marginally significant interaction effect on immersion exists, so H3 is partially supported.

VI. DISCUSSION, LIMITATION AND FUTURE WORK

The results showed that high fidelity somewhat improved participants' sense of immersion. However, no evidence supports that fidelity and scene type significantly impacted the player's experience in sensing meaning, curiosity, mastery, or progress feedback. Gaminiscing games, including ours, focus on narrating messages through stories to players rather than entertaining visual effects. Our results, where participants didn't sense any significant difference between high- and low-fidelity games about meaning and curiosity, potentially suggest that developing compelling gaminiscing games with great player experience may be possible even without a high budget on fidelity. However, more research on other types of games is needed to provide a comprehensive picture of the value of investing in game fidelity for high player experience.

One limitation of this study is the sample pool with a relatively small size (~10 participants per condition) that only consists of university students. This study focused on the player experience solely from the view of PXI. To gain a more comprehensive understanding of the gaminiscing experience, in our ongoing study, we are conducting studies using triangulation to further analyze factors that are closely related to gaminiscing, such as empathy and player identification with the character in Brukel. Furthermore, it would be valuable to generalize the findings about fidelity's effects on player experience using other games with diverse mechanics. Future research can also explore the influence of individual components, such as sound design, on player experience.

VII. CONCLUSION

This study aims to investigate fidelity and scene types' impact on player experience in gaminiscing games. A high-fidelity game, Brukel, was adopted in the study, and a low-fidelity version was developed. Results demonstrate that fidelity and scene type (marginally) significantly affect only some, but not all, measures of player experience. More importantly, no statistically significant evidence supported that fidelity and scene type affects players' senses of meaning and curiosity. These findings imply that audiovisual fidelity does not need to be a priority for gaminiscing games, where narration is the focus. This work provides guidance for game designers, to develop games with an appropriate level of fidelity and great player experience in a cost-effective way.

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