

Cute Helper: A Study on the Effect of Virtual Character Expressions on Players’ Engagement in a Game for Collecting Artwork Descriptions

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Abstract—This study implements a virtual character as a moderator in JUSTIN, a game designed and developed for collecting descriptions of ukiyo-e artworks on a live-streaming platform. The game has shown to be effective. However, the repetitive nature and the necessity to play JUSTIN many rounds make its players less interested in continuing the game. Hence, we examine if a virtual character can improve the player’s enjoyment and engagement experience. To conduct a control experiment, we develop a prototype that simulates JUSTIN, but with only one player playing the game at a time, and run an experiment with it. Our preliminary results show that a virtual character that changes its expression according to the game situation is promising in promoting the enjoyment and engagement of JUSTIN players.

Index Terms—GWAP, APG, Ukiyo-e, Crowd-sourcing, Game Live Streaming, virtual character

I. INTRODUCTION

A recently developed game called JUSTIN [1] has shown to be effective in solving the lack of descriptions for ukiyo-e artworks and gathering meaningful descriptions for general people, comparable to captions generated by ukiyo-e experts. However, the repetitive nature and the necessity to play it many rounds inevitably make its players less interested in continuing to play the game. As a result, some measure is needed to keep the game interesting. Inspired by a previous study reporting that adding a virtual character can improve the player’s engagement [2] in an educational game, we examine in this work if adding a virtual character as a moderator to JUSTIN can solve the aforementioned issue, which is our research hypothesis. In particular, we aim to investigate if JUSTIN players’ experience will be improved if a character presents three emotions on the screen depending on their activity.

II. RELATED WORK

A. APGWAP and JUSTIN

Nguyen et al. [1] introduced a new concept called Audience Participation Game with a Purpose (APGWAP) that combines Audience Participation Game (APG) with Game with a Purpose (GWAP). This allows an APGWAP to reach many audiences, thanks to the popularity of live streaming

platforms such as Twitch, while providing fun elements and social interactions. They also developed the first APGWAP, JUSTIN. JUSTIN has three sessions per round: 1) describing session where audiences describe ukiyo-e artworks, 2) voting session where another group of audiences votes for the best description-artwork pairs, and 3) result session where the winner describers and the winning descriptions are shown. As done in their work, we call such audiences “players” in our work.

B. Virtual Characters

A study by Lu et al. [3] reported that Virtual YouTubers (virtual 2D or 3D avatars voiced by humans, also known as Vtubers [3]) are trendy among people interested in Japanese culture, so deploying virtual characters may be highly beneficial to our research. Another study by Takagi and Terada [4] found that users tend to be more cooperative with the system when a character on the screen changes its facial expressions in agreement with an action of the user. As described earlier, the inclusion of a virtual character has the potential to increase user engagement [2].

III. SYSTEM OVERVIEW

Following the design we recently proposed [5], we implemented a virtual character in JUSTIN by building a prototype¹ using a Live2D model². In this prototype, we use three facial expressions for the virtual character: neutral expression (the initial expression), positive expression, and negative expression, respectively. The prototype simulates the describing and voting sessions in JUSTIN to test our research hypothesis before actually implementing a virtual character in JUSTIN.

We set key design elements to be the same as JUSTIN. Namely, the describing and voting sessions last for the 80s and 30s, respectively. In addition, three images are displayed in a session; each participant can describe each image once, but up to three photos, and vote for the best image-description pair once. During each session, the character changes its facial expression from the neutral one according to the game situation:

¹Demo video : <https://tinyurl.com/ymb43tdh>

²<https://www.live2d.com>

if the player is active, the character’s facial expression will become more positive; otherwise, the expression will become more negative.

As we have three images in a session, we decided the duration for the character to maintain its current expression before changing to the more negative expression in case of no input from the player to be the session duration divided by three. We did it this way with the expectation that the player would try to continue describing non-described images to keep the positive expression of the character, as mentioned in the study by Takagi and Terada [4].

However, some people may be very good at describing ukiyo-e artworks, so they may be able to quickly describe all three images and still have plenty of time left, which lets the expression drop to the opposing side. The same issue is especially obvious in the voting session, where the player has 10s to vote before the expression drops. Even if the player votes quickly, the expression will drop to a more negative one. To solve this, we decided to freeze the expression once the player cannot do any new action (having already described the three images or finished the voting) until a new session starts, at which the expression is reset to neutral.

IV. EXPERIMENT AND RESULTS

To evaluate the players’ experience playing JUSTIN with the virtual moderator introduced in this study, we conducted an experiment using 14 students. These participants were randomly separated into two groups where the members of each group would play two different systems with a different kind of character. The first group (dynamic group) played with a character that changed its facial expression according to the game situation. In contrast, the second group (static group) played with a character that always showed a neutral expression.

We randomly picked five sets of three images from 20 images used in Nguyen et al. [1] and showed them to each participant in random order. After playing the game, each participant was asked to fill in Game Experience Questionnaire (GEQ) [6]. In GEQ, there are seven factors measured: 1) Competence (C), 2) Sensory and Imaginative Immersion (SII), 3) Flow (F), 4) Tension/Annoyance (T/A), 5) Challenge (Ch), 6) Negative Affect (NA), and 7) Positive Affect (PA). The PA factor is closely related to the fun and enjoyment of gaming, while F and SII are closely related to the player’s engagement with the game [7].

The average GEQ factor scores for both groups in the describing and voting sessions are shown in Figs. 1, and 2, respectively. We can see that the dynamic group has a better overall game experience than the static group. In the describing session, the competence factor significantly differs between both groups. One reason for this is likely because the character expression will become more positive when the player submits a description; this change serves as immediate feedback and may be perceived as a measurement of their competence.

In the voting session, the flow factor shows a significant difference between both groups. We consider that this happens

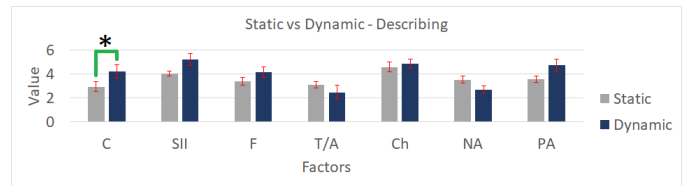


Fig. 1. GEQ factor scores in the describing session.

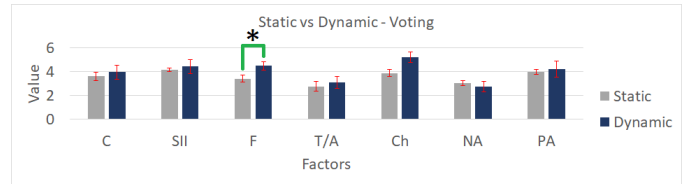


Fig. 2. GEQ factor scores in the voting session.

because the players felt that they did not have time to do things slowly, so they put their attention and focused on the system to make a vote as quickly as possible. These results show that the dynamic group has better enjoyment and general engagement than the static group.

V. CONCLUSIONS AND FUTURE WORK

This study presented a new design of JUSTIN by introducing a virtual character as a moderator. The average scores for each GEQ factor show that the dynamic group generally has a better gaming experience, especially for the competence factor in the describing session and the flow factor in the voting session, where significant differences between the two groups were achieved. The results also show that the dynamic group has better enjoyment and engagement. In the future, we plan to implement this idea in JUSTIN, test it with a larger number of participants, and compare various modifications to the virtual character.

REFERENCES

- [1] N. C. Nguyen, R. Thawonmas, P. Paliyawan, and H. V. Pham, “Justin: An audience participation game with a purpose for collecting descriptions for artwork images,” in *2020 IEEE Conference on Games*, 2020, pp. 344–350.
- [2] V. Gamage and C. Ennis, “Examining the effects of a virtual character on learning and engagement in serious games,” in *11th Annual International Conference on Motion, Interaction, and Games*, 2018, pp. 1–9.
- [3] Z. Lu, C. Shen, J. Li, H. Shen, and D. Wigdor, “More kawaii than a real-person live streamer: Understanding how the otaku community engages with and perceives virtual youtubers,” in *2021 CHI Conference on Human Factors in Computing Systems*, 2021, pp. 1–14.
- [4] H. Takagi and K. Terada, “The effect of anime character’s facial expressions and eye blinking on donation behavior,” *Scientific reports*, vol. 11, 2021, 8 pages.
- [5] R. Savchyn, P. Paliyawan, and R. Thawonmas, “Cuteness in justin: adding a virtual moderator for entertaining user in an audience participation game,” in *2021 IEEE 10th Global Conference on Consumer Electronics*, 2021, pp. 843–844.
- [6] W. A. IJsselsteijn, Y. A. de Kort, and K. Poels, “The game experience questionnaire,” *Technische Universiteit Eindhoven*, 2013, 9 pages.
- [7] K. Poels, Y. A. de Kort, and W. A. IJsselsteijn, “D3. 3: Game experience questionnaire: development of a self-report measure to assess the psychological impact of digital games,” *Technische Universiteit Eindhoven*, 2007, 46 pages.