ABSTRACT

New types of control devices for videogames have emerged and expanded the demographics of the game playing public, yet little is known about which populations of gamers prefer which style of interaction and why. This paper presents data from a study that seeks to clarify the influence the control interface has on the play experience. Three commercial control devices were categorised using an existing typology, according to how the interface maps physical control inputs with the virtual gameplay actions. The devices were then used in a within-groups experimental design aimed at measuring differences in play experience across 64 participants. Descriptive analysis is undertaken on the performance, play experience and preference results for each device. Potential explanations for these results are discussed, as well as the direction of future work.

Categories and Subject Descriptors

K.8.0 [Personal Computing]: General – games.

General Terms

Measurement, Performance, Experimentation, Human Factors.

Keywords

Control Device, Natural Mapping, Play Experience, Videogames.

1. INTRODUCTION

The interaction between the player and a videogame has always been mediated via control devices. Recently, devices have emerged that employ naturally mapped control interfaces (NMCIs), which take advantage of a player's understanding of objects and the actions that can be used to control them in the real world. Both traditional controls and NMCIs come in different forms, with variance in how tightly physical control actions can be coupled with virtual control mechanics. Despite the rapid expansion of technologies facilitating new control devices, and the growing pool of researchers studying games, little is known about the role controls have in supporting or preventing an optimal play experience. This paper reports on an initial study that examines how three different types of control devices affect the videogame play experience. The study forms part of a program of research designed to better understand the relationship between control devices, players, game genres and resultant player experiences.

Previous research investigating the impact of various control devices for games began by measuring differences in performance and/or preference amongst study participants [3, 4]. More recently games researchers have sought to establish a way to categorise different types of interfaces in order to generalise about their impact. Game control interfaces have been classed by the amount of body movement required for interaction [7], as well as the type of mapping used in the interface: for example natural/realistic versus non-natural/symbolic [6, 10]. Skalski et al. expanded on this work by providing a typology of NMCIs, with four types each representing a different level of natural mapping [11]. In the order of least to most naturally mapped the NMCI types are: directional, kinesic, incomplete tangible, and realistic tangible.

Directional natural mapping takes place when there is a ‘correspondence’ with direction between physical control and virtual result, such as when a control stick makes a character move forward when pushed up or turn left when pushed left. Kinesic natural mapping occurs when natural body movements are captured and translated into equivalent actions in the game world without a tangible component, as is possible with camera-based devices such as Sony's PlayStation Eye and Microsoft's Kinect. Incomplete tangible natural mapping is when the player is provided with a physical object to manipulate that 'partially simulates' the form of the equivalent virtual object, such as when using Nintendo’s Wii Remote as a racket in a tennis game. Realistic tangible natural mapping takes place when the tangible object looks, feels, and is manipulated like the real world tool being simulated in the game, as with a spring loaded leather-bound steering-wheel controller used in a racing game [11].

Skalski et al. hypothesised that the realistic and tangible NMCIs will sit at the top of the scale of perceived controller naturalness, provide a greater sense of spatial presence, and in turn predict videogame enjoyment [11]. Their research, testing controllers falling into different categories in their typology for both a racing and a golf game, failed to fully support this hypothesis, but nevertheless found natural mapping to powerfully modify responses to videogames. Other research has challenged the assumptions about body movement predicting game involvement [5], highlighting the need for further work exploring the relationship between NMCIs and play experience across gaming contexts.

Games researchers are also developing instruments designed to measure people’s experience while playing videogames. Ryan et al. present an approach to measuring the motivation for videogame play based on the satisfaction of psychological needs [8, 9]. Their work is based on Cognitive Evaluation Theory
some time, and so advocate the use of a multi-method approach.

Positive Affect. Ijsselsteijn and colleagues argue that no single construct: Competence, Sensory and Imaginative Immersion, to distinguish between seven different proposed play experience constructs: Competence, Sensory and Imaginative Immersion, Flow, Tension/Annoyance, Challenge, Negative Affect, and Positive Affect. Ijsselsteijn and colleagues argue that no single play experience measure or model is likely to gain consensus for the player's freedom of choice is perceived to be voluntary and that the remaining PENS components is that: Autonomy is high when the player's freedom of choice is perceived to be voluntary and uninhibited; Competence is high when the player perceives their skills/abilities are being challenged and successfully demonstrated; Presence is high when the mediating technologies disappear and the player perceives themself to be in the game world; and Intuitive Controls (IC) is high when the controls make sense and do not interfere with game involvement. The PENS implementation asked participants to think about their time playing the game with the most recently used control device and rate their agreement on a seven-point Likert scale between ‘1-do not agree’ and ‘7-strongly agree’.

The other play experience measure used was the 33-item core module of the GEQ. For the GEQ, Competence is comparable to the PENS description, and the Tension/Annoyance and Negative and Positive Affect subscales are understandable from their titles. The Challenge subscale includes items around effort, challenge, and pressure; the Sensitive and Imaginative (S&I) Immersion subscale around exploring, imagination and story; and the Flow subscale around transportation, concentration and becoming occupied with the game. The GEQ implementation asked participants to indicate how they felt when playing the game with the most recent used control device and rate each item on a five point scale between ‘0 – not at all’ and ‘4 – extremely’. Item order for both measures was randomised upon presentation to participants, and the scores for each of the components calculated as the average of its items.

3. RESULTS AND DISCUSSION

Race percentage complete averages for each control device revealed that generally participants performed better with the controller (64.8%), followed by the Speed Wheel (63%) and then the Racing Wheel (58.8%). Initial descriptive analysis has been undertaken on the play experience survey results, with subscale means calculated for each control device. As shown in Figure 1, the control device impact on Presence validates the order expected for spatial presence according to the existing typology [11] – the more naturally mapped a device’s interface is the higher the average ratings of presence. A new finding for NMCIs in the results is that this ordering also aligns for both Autonomy and IC. Generally, the more naturally mapped a device’s control interface is the more participants felt it satisfied their psychological need for free and unconstrained choice, and the less they felt it interfered with their involvement in the game. The order for IC response can be partially explained, given expectations for perceived naturalness was also part of the original typology. The clearly ordered results for Autonomy were not expected, however, and potentially represent a new dimension to define the play experience impact of NMCIs.

2. METHODOLOGY

2.1 Procedure

Sixty-four participants (21 female and 43 male) voluntarily took part in a within-groups study design aimed at testing the play experience impact of three control devices in the racing game Forza Motorsport 4 (Turn 10 Studios, 2011). The study was conducted with participants individually and took about an hour to complete. Participant age ranged from 17 to 76, with an average age of 29.7 years. Each control device tested represented a different NMCI type: a standard Xbox 360 controller was used as an example of a directionally mapped device, the U-shaped accelerometer based ‘Wireless Speed Wheel for Xbox 360’ as an example of a device using incomplete tangible natural mapping, and the ‘Xbox 360 Wireless Racing Wheel’ as an example of a device using realistic tangible natural mapping.

Participants first completed a questionnaire designed to capture relevant demographic attributes along with their familiarity with the game and control devices used in the study. Following this they played a set linear track in the game with a specific car using one of the control devices. Their goal was to perform as well as they could before the researcher stopped the race at four minutes and recorded their race percentage complete. Two play experience surveys were then administered before conducting an interview aimed at capturing qualitative feedback on the devices. The above process was then repeated using the remaining two control devices. The order with which participants encountered the control devices was counterbalanced within age brackets.

2.2 Measures

The first play experience measure used was an 18-item version of the PENS instrument. The component of ‘relatedness’ consisting of three items was removed due to its lack of relevance to the gameplay of a single player racing game. A basic description of the remaining PENS components is that: Autonomy is high when the player’s freedom of choice is perceived to be voluntary and uninhibited; Competence is high when the player perceives their skills/abilities are being challenged and successfully demonstrated; Presence is high when the mediating technologies disappear and the player perceives themself to be in the game world; and Intuitive Controls (IC) is high when the controls make sense and do not interfere with game involvement. The PENS

Figure 2 shows the GEQ results, with small differences for Tension/Annoyance and Negative and Positive Affect. The results reveal similar trends to the PENS results for game involvement measures such as Flow; the Racing Wheel scored highest (3.45), followed by the Speed Wheel (3.31) and then the Controller.
The results for S&I Immersion also show the more naturally mapped devices clearly scoring higher: the Speed Wheel scored the same as the Racing Wheel (3.03), while the Controller elicited a lower response (2.77).

Figure 2. GEQ Component Results by Control Device

The component with the largest difference between devices for GEQ results was Challenge, showing that players perceived the Racing Wheel to be the most challenging (3.03), followed by the Controller (2.42). In contrast, the Speed Wheel (2.65), and then the Controller (2.42). In contrast, the controller had the highest level of perceived competence (3.23), followed closely by the Speed Wheel (3.2), with a lower response for the Racing Wheel (2.97). These findings for subjective ratings of competence align with the objective measure of performance (percentage of race completed). As such, generally people experienced greater competence and less challenge with more traditional (and less naturally mapped) devices than they did with devices that attempt to achieve realistic mapping. Conversely, the more naturally mapped a device was, the higher results were for measures intended to capture perceived levels of game involvement (i.e. Presence, IC, Flow, and S&I Immersion). This is a particularly interesting finding; people’s positive response to the play experience seems to be related to the degree of natural mapping of the control device and not to their performance or capability with that device. In short, people seem to respond positively to more naturally mapped interfaces even when they perform more poorly with them.

Data from the final qualitative interview further confirms this finding. Almost half (45%) of participants chose the Racing Wheel as their favourite device, followed by the Speed Wheel (34%) and then the Controller (20%). Participants felt more challenged and less competent with the more naturally mapped devices yet still preferred them. It’s possible that the greater sense of challenge experienced by players is related to the higher game involvement ratings in terms of presence, immersion and flow. Another possibility (suggested partly by participant responses during the interviews) is that the more naturally mapped devices create an expectation of fidelity or ease of use amongst players. If the control device fails to meet these expectations, participants might then experience lower levels of perceived competence and higher levels of perceived challenge. It is also possible player characteristics, such as familiarity with the interface, are influencing the results.

4. FUTURE WORK

The next step for the current study is to conduct inferential statistical analyses in order to confirm the trends and patterns identified in this paper. Additionally, we intend to explore the impact of player characteristics, such as demographics and familiarity, on the range of play experience measures taken. Future work will be aimed at strengthening understanding of the play experience impacts of different NMCI types by conducting tests using emerging control devices across game genres and player populations.

5. REFERENCES


