Using UX Heatmap in Game User Experience Research

Abstract
This paper presents the application of UX Heatmap, a technique to visually represent implicit measures in conjunction with video game stimuli. It provides both temporal and spatial representation of a player’s unfiltered cognitive and emotional reactions. We used a recent game research to illustrate the potential of this approach in game user research.

Author Keywords
User experience; Games; Eye-tracking; Facial emotions; Visualization

ACM Classification Keywords
K.8.0 Games

Introduction
Academic and game industry research is mostly dominated by methods relying on the explicit measurement of users’ perception via self-reported questionnaire [1]. These methods capture perceptual factors that players are aware of and consciously willing to report to the researchers. However, explicit measures are unable to capture the constant variations of cognitive and emotional automatic reactions occurring outside of the player’s awareness during the game experience [2].
This limitation is critical for the measurement of constructs such as the gamer’s flow. Flow is a mental state in which a person is fully focused on, involved in, and enjoying the task at hand. The flow state is defined as an optimal experience in which “the person feels simultaneously cognitively efficient, motivated, and happy” [3] (p.277). The player’s feeling of flow is an important concept since it is an important predictor of the intention of usage [4]. By definition, using explicit self-reported measures to capture a gamer’s flow state, one’s optimal experience has to be interrupted to capture an aggregated retrospective perception of the flow construct.

This paper builds upon previous work on the use of implicit measures for game user research [5,6,7], i.e., measures that can capture unobtrusively and with high temporal resolution, the evolution of cognitive and emotional states during the game experience. This paper presents the application of UX Heatmap [8,9], a technique to visually represent implicit measures in conjunction with the video game stimuli, thus providing both temporal and spatial representation of a player’s unfiltered cognitive and emotional reactions. Instead of reporting where on the screen users focus their visual attention as with traditional Heatmaps, UX Heatmaps show where on the screen users had stronger emotional or cognitive reactions. We used a recent game research conducted with Hibernum (http://hibernum.com/), a game development and animation studio based in Montreal, to illustrate the potential of this approach in game user research.

Illustrative example: Using UX heatmap to capture the emotional reaction within a game tutorial

The goal of this game user research was to determine the emotional reactions to a tutorial when starting to use a new mobile game. The tutorial step in a game (i.e., the step at which the player is instructed on the game’s interaction mechanisms) constitutes a critical step and can lead to high abandon rates. The goal of the tutorial in a game is to rapidly give the player the necessary skills to enjoy the game. A lengthy tutorial risks the delaying of the player’s gratification, generating frustration or boredom. A too short tutorial may make the player anxious or confused and can lower his/her feeling of competence towards game. Considering the predominance of business models based on integrated purchases (i.e., free game with the possibility of in-game purchases), it is primordial to identify measures to reduce the abandon rates when new gamers convert to the application.

UX Heatmap [10] was used in this project to identify with high temporal and spatial resolution the visual sources of emotions that are or aren’t compatible with creating an optimal experience in the game. The hypothesis that an efficient tutorial should generate emotions compatible with the state of flow and should, hence, contribute to the intention to start and eventually pursue the usage of an application is explored.

Methodology

Participants were recruited via our institution’s research panel. Based on their gaming experience (Casual or mid/hardcore players), 43 subjects were invited to take part in the experiment. The sample was composed of 15 females and 28 males. The mean age was 23 years old. The majority of the sample play video games more than once a week and often for more than one hour per
Most participants played video games once a week on their mobile phone. 19 participants were categorized as casual players, 17 as mid-core players and 7 as hardcore players. 54% of the sample declared having previous experiences with role playing games (RPG) and 49% play them on their mobile phones.

The participants were asked to use an iPad Air 2 to play the game used in the experiment. Saber's Edge by Hibernum is a Match3-RPG mobile game in which players are asked to collect series of the same items in order for one of their characters to attack the enemy team. Combination strategies must be used for different props such as shields, healing potions, or boosts to be made available. They also had to position their characters strategically in relation to the enemy team. Participants can also use the points they accumulate to purchase certain items or powers to enhance their team’s chances of winning. Subjects also have the option to make in-app purchases to have access to items they might not be able to offer with their cumulative points.

The visual behavior of the participants was recorded through the X-60 Tobii eye-tracking system (Danderyd, Sweden). Emotional reactions were measured using the Facereader system (Noldus, the Netherlands), which interpret facial emotions. In this research, the positive and negative inferences provided by Facereader were used. Measures were triangulated with the help of the experimental platform Noldus Observer XT (Noldus, the Netherlands). UX Heatmap software [10] was used to generate the positive and negative valence areas on each screen of the game.

Participants were randomly assigned to one of two experimental conditions: With a Tutorial phase (T) or without a tutorial phase (NoT). In condition T (n = 22), they were asked to go through a tutorial phase lasting a maximum of 15 minutes. For the second part of the experiment, subjects were asked to play for 12 minutes. The last part of the experiment consisted of an in-app purchasing period followed by a 5 minutes gaming period. In condition NoT, participants were asked to play the game for 15 minutes without any tutorial phase. The two other parts of the experiment were the same as for condition T. The research assistant would only intervene if the user would spend more than a minute without playing.

**Preliminary Results**

Results from the project are currently being analyzed. Preliminary results provide early evidence of the negative emotions experienced by players during the tutorial. Figures 1a and 2a (condition T) and Figures 1b and 2b (condition NoT) present the UX Heatmap of players in two screens of the game. Positive emotional valence is shown in green and negative in red. In both Figure 1a and 2a, more areas on the screen trigger negative emotions and these emotions are located predominantly on the tutorial instructions. In Figure 1b and 2b, there is positive emotion and it is located on the avatar and game control. These UX Heatmap results, in conjunction of observation notes taken during the test by the experimenters, were provided to the Hibernum design team in order for them to develop options minimizing negative emotions in such a crucial stage of the game.
Discussion and Concluding Comments

UX Heatmap provides a visual representation of the implicit measurement of the players’ unconscious states during the game experience. It provides the temporal and spatial resolution to adequately inform the game designer on the visual stimuli that contribute to elicit positive or negative user reactions. While explicit measures are important to predict the intention to adopt a new game, implicit measures can play a very important role with regards to optimizing the game’s mechanisms in order to generate emotions compatible with the emergence of an optimal game experience. With the ever decreasing cost of eyetracking technology and automatic facial recognition softwares, we argue that new ways of visualizing game user experience, such as UX Heatmap, are likely to become useful tools for game designer.

References


