The Body Language of Fear: Fearful Nonverbal Signals in Survival-Horror Games

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ABSTRACT
In this paper, we present an exploration of players' nonverbal body expressions when playing survival-horror games. We compared physiological signals and body expressions of 16 participants playing two games: a survival-horror game (Slender: The Eight Pages) and a custom-built baseline game with the same map and controls (Treasure Hunt). We show that the *hard fun* style of Survival-Horror games makes full body expressions an unsuitable modality for affect recognition, but scary game events are clearly expressed by their physiological signals.

Keywords
Affective Gaming, Body Expressions, Survival-Horror Games

INTRODUCTION
Recent advances in affective computing technology made it possible for computers to estimate users' psychological states. The motivation behind work in this area is that by recognizing the user's emotions and moods, the computer can simulate empathy and adapt its behaviour to match those states (Picard, 1997).

One application domain in which it is particularly interesting to know these states is gaming. Recognising not only the players' explicit control input, but also their affective states would open up a new dimension of dynamic content creation in game design. Further, the recent "Let's Play" phenomenon has made the emotional reactions of players to games an important aspect of the social nature of gaming. This genre is called Affective Gaming, defined as a game "where the player's current emotional state is used

Proceedings of DiGRAA 2015 Conference: Inclusivity in Australian Games and Game Studies.

to manipulate gameplay" (Gilleade et al. 2005). Possible applications include nudging the difficulty when the game detects disengagement; communicating affective states to fellow players by reflecting them in the in-game avatar; and non-player characters' reacting to the player's affective state by tweaking their dialogue or behaviour. A recent commercial example of an affective game is the up-coming survival-horror title Nevermind (Reynolds, 2015), which becomes more difficult as the player gets more stressed or scared.

Previous works have explored different modalities for recognizing affect. The most well understood ones are video, audio and physiological signals, such as electro-dermal activity and heart rate (Zeng et al., 2009). However, all of these modalities present challenges for inferring affect in survival-horror games. In order to maximize their scariness, these games are often played in the dark, making it difficult to capture video data for facial expression analysis. Audio is also unsuitable, as most of these games are single-player, in order to maximize the feeling of isolation, so the user seldom has any reason to speak. Although it has been demonstrated that electro-dermal activity correlates with arousal, it is strongly affected by artefacts caused by the players' movement. Heart rate has been shown to be a suitable modality (Vachiratamporn, 2013), but it requires the user to wear a monitor, which can be cumbersome for a gaming scenario.

This led us to look for alternate, unobtrusive ways of capturing emotional information. In particular, for survival-horror games, we are interested in detecting fear. Research in Psychology suggests that when feeling fear, our bodies engage in a fight-or-flight behaviour that is expressed in our body language. If so, we could possibly detect this behaviour using a depth camera, since they are becoming more accurate and available by default in several consoles, and they can track users in the dark.

Figure 1 – Between landmarks in the two games: Slender (left) and Treasure Hun (right)

In this presentation, we discuss how fear is manifested by our bodies when playing survival-horror games. We recorded motion and physiological data from 16 participants playing the game *Slender: The Eight Pages* and examined how their bodily behaviour changes as compared to playing *Treasure Hunt*, a custom-built non-scary game with the same map and controls as Slender, but without the fear factor (see Figure 1). Participants were recorded with a full body motion capture suit, a Kinect sensor, an ECG sensor and a GSR sensor and controlled both games with an Xbox controller (Figure 2).

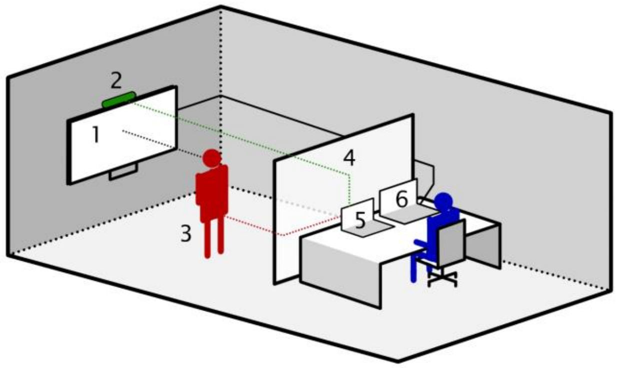

Figure 2 - Experimental setup: 1) TV screen displaying the games; 2) Kinect camera; 3) Player, outfitted with motion capture suit, physiological sensors and Xbox-controller; 4) Vision screen; 5) Laptop receiving and logging all sensor data; 6) Laptop running the game.

Our results are twofold. First, we show that our experimental setup successfully elicited the desired fearful emotional response and this is reflected in participants' physiological signals. As shown in Figure 3, the beginning of the game is relatively uneventful, but as soon as scary game events are introduced (indicated by the red lines), players generate clear spikes in their galvanic skin response, which are not present in the baseline game.

Second, we found little difference between conditions in terms of players' body movements and postures. We propose two explanations.The Xbox controller caused players' hands to be locked holding the device, which effectively prevented any expressive arm movements. Also, in order to elicit frightful responses, Survival-Horror games often require a *hard fun* style of gaming (Lazzaro, 2004). As identified by Bianchi-Berthouze, in this style of gaming, players tend to demonstrate fewer affective expressions, and more small controlled movements, which is a challenge for affect recognition.

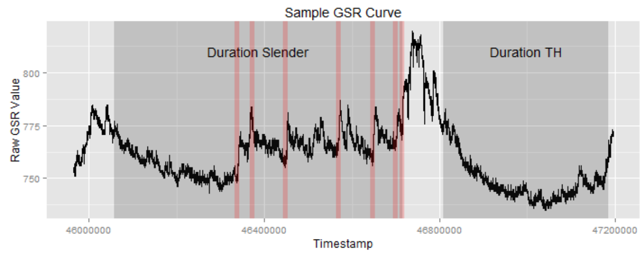

Figure 3 - A sample GSR curve: X is time, Y is raw GSR value. The red vertical lines indicate scary game events. Slender gameplay is on the left and Treasure Hunt is on the right.

Based on our results, we suggest that future research on Affective Survival-Horror games should focus on using physiological signals or in exploring input devices that require more expansive movements, such as the Wiimote or the Kinect.

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