Immersive Virtual Reality and Affective Computing for Gaming, Fear and Anxiety Management

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1. Introduction

Video game developers are enthusiastic about creating novel interaction approaches that yield a better gaming experience; such interactions are usually built with physical and emotional immersion in mind. Technologies such as Wii®, Kinect®, and Playstation Move® focus on the physical movement of play to encourage seamless and natural behaviors during gameplay. On the other hand, technologies such as biofeedback are not yet being utilized to any large degree in the commercial industry and could be used to gain further knowledge of player's behavior and emotions. Biofeedback refers to technologies that provide awareness of human physiological functions through signals in order to control a system or improve those functions. This technology was primarily developed for clinical purposes to treat diseases such as headaches, high blood pressure, and epilepsy. The patients obtain the skill to control functions associated with aforementioned diseases by being exposed to equipment that measures and displays their bodily functions such as brain waves, heart rate, and galvanic skin response (GSR). This enables them to observe those senses through visualization and exert control over their physiological response over time.

Numerous biofeedback technologies have been widely utilized to develop video games for entertainment and medical purposes - this is also known as affective gaming that accounts for player's emotional state to affect the gameplay [Kuikkaniemi, et al 2010]. GSR (aka skin-conductance level and electrodermal activity is a type of biological signal that is used to measure psychological arousals such as fear, stress, and fatigue by applying electrical current to the skin and measuring the resulting electrical conductance. The level of skin conductance changes with respect to sweat glands activities, i.e., different levels of sweating cause the electrical conductance vary on the skin and the more intense the psychological arousal is, the more skin conductance would be. Shaw et al. created a biofeedback virtual reality environment for chronic pain patients to manage their pain by well-known mindfulness meditation. The environment uses GSR obtained from the participant to drive the meditation session and inform the participants of their progress [Shaw, et al. 2007]. Nacke et al. introduced a biofeedback approach to directly control games using GSR and eye gaze [Nacke, et al. 2011], for example.

2. Our Approach

We are developing a horror biofeedback game that implicitly manipulates game elements utilizing a player's emotional state (figure 1). Fear experienced during gameplay triggers emotional arousal that is visible and measurable via GSR sensors and can be used to affect gaming experience accordingly. Additionally, to provide more exciting and pleasurable gameplay, it is played and partially controlled using an immersive head-mounted display (HMD).

Furthermore, we eventually seek to teach players to develop strength against fear by practicing relaxation techniques. Using biometric feedback such as GSR in game development creates a direct emotional link between the player and the game, allowing the game to "intelligently perceive" what the player is experiencing and enable it to change events in the game space accordingly. Additionally, using HMD technology along with biofeedback can extend the means of immersion, potentially resulting a more realistic experience and sense of presence. The result of this practice could also be utilized to help patients with specific phobias to face their fears and develop skills to exert control over such disorders.

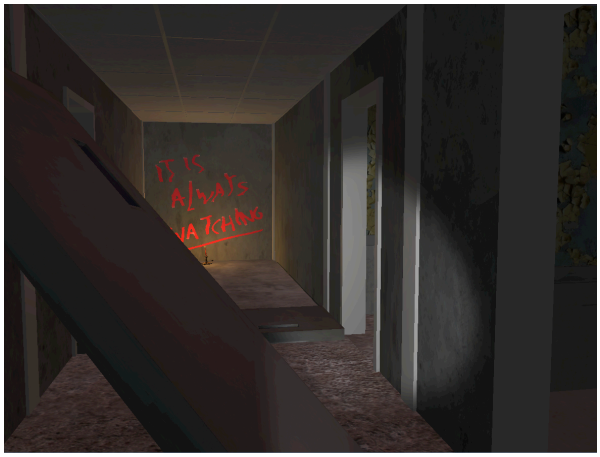

Figure 1. *A screenshot of the environment in early development*

By using an escalating sense of fear with the horror genre, we hope to capitalize on the dramatic theories of Catharsis to help players control their fear responses in a safe, fun and familiar way.

References

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SIGGRAPH 2013, July 21 – 25, 2013, Anaheim, California.

ACM 978-1-4503-2261-4/13/07