A Multimodal Interaction Design Guidelines for VR Foot Reflexology Therapy Application

Hector Chimeremeze Okere, Computer and Information Sciences Department, Universiti Teknologi PETRONAS, Tronoh, Malaysia
Suziah Sulaiman, Computer and Information Sciences Department, Universiti Teknologi PETRONAS, Tronoh, Malaysia
Dayang Rohaya Awang Ramli, Computer and Information Sciences Department, Universiti Teknologi PETRONAS, Tronoh, Malaysia
Oi-Mean Foong, Computer and Information Sciences Department, Universiti Teknologi PETRONAS, Tronoh, Malaysia

ABSTRACT

The proliferation of multimodal interaction research have presented numerous advantages which include enhancement of realism, increased efficiency in user task performance and the achievement of an interactivity that is relatively identical to the conventional human to human interactions. Haptic, visual, and aural interactions have been widely utilized and applied in various domains ranging from military and scientific visualization realms into more multidisciplinary areas, such as art and culture, education, archeology, and complementary medicine. In Virtual reality stress therapy application particularly in the proliferation towards the virtualization and simulation of the traditional foot reflexology therapy, little is understood on the haptic, visual and aural interactive nature of the therapy and to what extent they contribute in the patients’ relaxation and stress relief, which hinders the system developers from obtaining the appropriate system design requirements for foot reflexology virtual stress therapy applications. This paper presents an exploratory study that examines from both the patients’ and practitioners’ perspective, the haptic, visual and aural interactive nature in foot reflexology domain since the practices promote relaxation and stress relief. The study explored 2 traditional foot reflexology sessions; audio recorded semi-structured interview was used to collect data from the participant’s while the session was going on for analysis. The study findings presented the haptic, visual and aural interactive nature involved from the patients’ and practitioners’ perspective, and a higher level design requirements for the haptic, aural, visual and general interactivity extracted from the study findings as well as from literature. Implications for future research are also discussed.

KEYWORDS

Aural Interaction, Design Guidelines, Haptic Exploratory Procedures, Haptic Interaction, Interaction Model, Multimodal Interaction, Traditional Foot Reflexology (TFR), Visual Interaction

1. INTRODUCTION

The Oxford advanced dictionary describes “Interaction” as reciprocal action or influence of two objects. It is a kind of action that occurs as two or more objects have an effect upon one another. The idea of a two-way effect is essential in the concept of interaction, as opposed to a one-way causal effect. The feedback during the operation of machines such as a computer or tool, for example, the interaction between a driver and the position of his vehicle on the road: by steering the driver influences this position, by visual observation this information returns to the driver.
Multi-modal interaction in HCI focuses on the essence of interaction by which users can carry out tasks on an interactive system using various modalities such as visual and/or aural tools or elements, then this interactive system provides feedback to the users by representing the results of the tasks the users performed haptically, visually and/or aurally. Multi-sensory interaction can also be referred to as “Multimodal interaction”, which can be inferred from Dumas, Lalanne, and Oviatt, (2009) and Sarter, (2002) as the equipping of users with multiple choice of modalities to interact with a system that interprets and reacts to users’ inputs from more than one sensory and interaction channel, be it through aural, gestural, gaze, facial expression, body movement, touch, etc. Oviatt, (2003) explained that “Multimodal interfaces process two or more combined user input modes (such as speech, pen, touch, manual gesture, gaze, and head and body movements) in a coordinated manner with multimedia system output. They are a new class of interfaces that aim to recognize naturally occurring forms of human language and behaviour, and which incorporate one or more recognition-based technologies (e.g. speech, pen, vision) ». Reeves et al., (2004) explained that the two main aims of multimodal interactions are to achieve an interaction closely similar or identical to the natural human-human interaction style, and to increase the interaction’s robustness through the use of redundant of complementary information.

Visual interaction in HCI specifically is the most common and most important modality of interaction. Its significance cannot be overemphasized. For instance, operating Microsoft Windows calculator with a mouse, it is surely very user-friendly and easy to use. Now try the same operation with your eyes closed, only then would you begin to comprehend how frustratingly difficult computational life can get without visual interaction, despite this task not being so different from dialling a touch tone phone which for most of us can be completed comfortably closing both eyes.

Haptic/touch is the most vital and dominant interaction involved in most complementary massage therapy that promotes relaxation and stress relief. Some of these complementary massage therapies include, acupuncture, lomi-lomi, reflexology and so on, are mostly haptic dominated. Several studies (Okere, Sulaiman, Awang, & Foong, 2014a; Sherman, Dixon, Thompson, & Cherkin, 2006) have highlighted the dominance and significance haptic interaction has on these therapies. But for the therapy in question “reflexology”, is haptic interaction the only modal interaction involved in this therapy that influence the therapeutic effects the users perceive? There has been little or no attention from literature that attends to this. This paper hence looks to identify the visual and aural interactive nature involved in the therapy that influences the relaxation and stress relief the users perceive.

This paper presents its introduction in Section 1, the literature review in Section 2, containing relevant domains, significance, relevance, and application. Section 3 presents the study, method, analysis and results. This is then followed by discussion, conclusion, and future works.

2. LITERATURE REVIEW

In Virtual Reality Stress Therapy (VRST), which are applications or technologies that allow users to enter computer-generated worlds or explore interactive interfaces or applications through visual, aural and/or haptic interactivity enabling them to combat stress (Okere et al., 2013). The application of VRST can be seen in the Nakajima et al’s VR Relax-Refresh system that applied VR technology in body massage (Nakajima, Nomura, Fukusima, & Ojika, 1994). The VR Relax-Refresh system consists of a massage lounger that vibrates and massages the body (haptic stimulation), a head-mounted-display (HMD) for visual stimulation, a standard VCR for aural stimulation, and an interface circuit that gears the massage chair and generates stereographic images as presented in Figure 1. These three multimodalities were combined by the designers, exploiting the advantages offered by each modality
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