

Beyond Usability: Exploring the Emotional and Aesthetic Factors of Desktop Virtual Reality-Based Learning Environments

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Abstract - *The capability of desktop virtual reality (VR) technology in influencing the cognitive capacity of the learners has been extensively investigated by many researchers. Nevertheless, emotional and aesthetic factors have too often been given little attention especially in the contexts of desktop VR-based learning environments. In this work, Kansei Engineering methods were used to guide the process of uncovering the emotional and aesthetic aspects of a desktop VR-based project known as Virtual Simulated Traffics for Road Safety Education (ViSTREET). This paper presents the results from the first of the three-phase Kansei experiments, which involved eight participants. Each participant was required to evaluate ten different virtual environments and rate them accordingly. The results revealed the association of Kansei to each design instance and highlighted the features of emotionally-sound virtual learning environments. The outcome of this work signifies the need to consider learners' emotional and aesthetic factors when designing VR-based learning environments.*

Keywords: Kansei Engineering, emotional design, virtual reality, learning environments

1 Introduction

In general, virtual reality (VR) can be defined as a user-computer interface that involves real-time simulation and interactions through multiple sensorial channels such as visual, auditory and tactile [1]. With its capability, VR permits users to be immersed in a computer-generated virtual world by giving techniques for user orientations in this world [2]. Though VR can be classified in many different ways, the most common distinction is immersive and non-immersive VR [3]. Immersive VR is mainly based on head-mounted display (HMD) that is capable of generating fully immersive computer graphics. Non-immersive or desktop VR, on the other hand, makes full use of desktop computer to present images in a common monitor and allows user interactions with the computer-generated images via generic input devices like computer mouse and keyboard. Due to the advancement in computer technologies, desktop VR has become

increasingly popular. The much lower costs that it incurs as compared to immersive VR has made desktop VR the preferred choice in education [4] as it does not have to depend on complex and expensive peripherals. Thus, this allows desktop VR to be widely used in various fields.

Realising its vast potentials, many studies within the VR research community in recent years have been directed towards making desktop VR systems more usable. According to Stanney in [5], after the initial excitement on the possibilities that desktop VR could bring to various aspects of our lives, many researchers began to focus on the more fundamental issues involved in evaluating and improving the effectiveness of such systems. Knowledge from the field of human-computer interaction (HCI) is widely incorporated in helping researchers to increase the usability of desktop VR. In instructional settings, most usability testing and evaluations conducted on desktop VR-based learning environments were on general usability issues such as navigation, cognitive load, and interface design. Unfortunately, these studies have shed little light on other aspects of user experience in particular the need to investigate the emotional and aesthetic factors of desktop VR in enhancing learning. While generic usability studies are still essential in designing effective virtual learning environments, it is no longer enough and should be supplemented by other user-centred approaches such as emotional design and persuasive design [6].

Therefore, in this paper, the need to investigate the emotional and aesthetic factors of desktop VR-based learning environments is addressed by incorporating Kansei Engineering methods. Specifically, this paper demonstrates how Kansei Engineering methods can be used as part of the evaluation process of such learning environments with the support of the preliminary empirical findings.

2 Review of Literature

2.1 Usability Studies on Desktop VR-Based