中文摘要

本研究主要的目的是探索如何藉由身體的移動(body movement)來增加使用者在虛擬實境 CAVE 系統(VR-CAVE)裡的存在感(sense of presence)。專就 VR-CAVE 在建築上的應用來說，設計師提出他們的設計利用固定路徑的動畫來呈現，空間的內容僅能依靠視覺來呈現，使用者不能在虛擬環境內自由的瀏覽，使用者與虛擬環境間缺乏互動。雖然在 VR-CAVE 裡視覺是最主要獲得資訊的方式，但仍有許多可能性能提高使用者在 VR CAVE 裡的存在感。若使用者透過輸入裝置來瀏覽虛擬環境，便可以增加使用者在虛擬環境的存在感。

因此，在此研究裡我們選擇利用使用者身體的傾斜來控制使用者在虛擬環境內的瀏覽行爲。研究的步驟有三個：首先，我們定義一身體運動(身體傾斜)是適合使用者來瀏覽虛擬環境；第二，以身體傾斜的操作概念實作一控制器原型，並檢驗之；第三，以步驟二的檢驗結果爲基礎，實作 VR-CAVE 的控制器原型。最後本研究有一身體的使用者介面控制器可以讓使用者在虛擬環境內進行瀏覽，以及評估使用者在 VR-CAVE 裡，使用此控制器與其他控制器所提供的存在感有何不同。

本研究的貢獻不僅提供一個使用者能很容易甚至是不需要努力學習如何控制就可以輕易的在 VR-CAVE 裡進行瀏覽，而且在進行瀏覽的同時能與實際走路的經驗直接地連結在一起，並且提供更多的存在感給使用者；而存在感的增加能讓非建築專業領域的使用者更融入虛擬環境內，讓空間的內容能更清楚的被闡述出來。

關鍵字：身體的使用者裝置、存在感、虛擬實境、CAVE、互動

Abstract

The purpose of this research is to explore how body movement can increase users' sense of presence in the virtual reality cave (VR-CAVE). Traditionally, in architectural applications, designers present their designs usually using fixed-path pre-rendered animations. The spatial context is conveyed only by visual perception. Users can't navigate space by themselves; hence there is no interaction between users and VR-CAVE. Although visual perception is the major way of presentation, there are still possibilities to enhance the sense of presence in virtual reality environment. It can increase users' sense of presence if they utilize input device to navigate virtual reality environment.

Therefore, in order to increase users' sense of presence, we designed a bodily user interface for VR-CAVE which utilized user's body movement to interact with VR. There were three steps in this research: 1.We defined a body movement (body leaning) that was fit for users to navigate VR; 2.Implemented a prototype of controller that was based on the concept of body leaning and tested it; 3.Implemented a prototype of controller for VR-CAVE that was based on step two results. In order to explore how body movement could increase users' sense of presence in VR, we used the same digital model to test on different users and settings. A user would wear goggle and the device to experience space, and then he would use other devices (joystick, keyboard) to experience the same space in the VR-CAVE. Finally, an evaluation will be conducted base on user experiences.

The contribution is not only a user can easily or effortlessly control and navigate in VR space but also VR navigation will directly link to the experience of walking in physical spaces, which provides strong sense of presence to user. Increasing sense of presence can make user who is non-architecture more immersive and make spatial context more understandable.

Keywords: bodily user interface, sense of presence, virtual-reality, CAVE, interaction