

# Synesthesia Suit : the full body immersive experience

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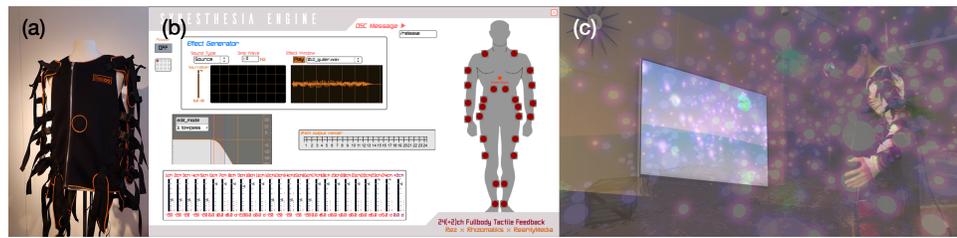


Figure 1: (a)Synesthesia Suit, (b)Synesthesia Engine, (c)Demo Scene

**Keywords:** Vibro-tactile, Haptic Design, Synesthesia

**Concepts:** •Human-centered computing → Haptic devices;

## 1 Introduction

The Synesthesia Suit provides immersive embodied experience in Virtual Reality environment with vibro-tactile sensations on the entire body. Each vibro-tactile actuator provides not a simple vibration such as traditional game controller, but we designed the haptic sensation based on the haptic design method we have developed in the TECHTILE[Minamizawa et al. 2012] technology. In haptics research using multi-channel vibro-tactile feedback, Surround Haptics [Israr et al. 2012] proposed moving tactile strokes using multiple vibrators spaced on a gaming chair. And then they also proposed Po2[Israr et al. 2015], which shows illusion of tactile sensation for gesture based games by providing vibrations on the hand based on psycho-physical study.

We originally developed the Synesthesia Suit for promoting a game called "Rez infinite", which has been developed for PlayStation VR, and we have presented Rez infinite and the Synesthesia Suit only for the press at the PlayStation Experience in December 2015. We designed the haptic sensations in accordance with the world of "Rez". People who experienced this suit were immersed by haptic sense as well as 360 degree 3D vision and music, so that they felt as if they got into a groove. However, at that time, the interaction was limited only on the PlayStation controller, so that we designed more active full-body interaction with virtual reality environment as shown in Figure 1(c) for SIGGRAPH Emerging Technologies.

## 2 System Components

**Synesthesia Suit** (Figure 1(a)) provides vibro-tactile sensations on the entire body through 24 channel voice coil actuators. The suit was designed to be easy-to-wear and available for various body-size. The actuators are put on the shoulder, upper arm, lower arm, back of the hand, hip, thigh, knee, shin, instep, stomach and back.

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**Synesthesia Engine** (Figure 1(b)) controls the 24 tactile channels in real-time according to the interaction with the user and the VR environment. We made the haptic effects by recording tactile signals from the real environment or modulating pre-recorded sound effects. The haptic effects inundate the user's entire body by designing the spatial pattern based on the phantom sensation phenomena.

## 3 User Experience

The Experience of Synesthesia Suit consists of two parts. One is synesthesia between music and full-body haptics. Tones of the musical instrument from BGM are mapped on each part of the body and the user feels as if the sounds run through the body. The other one is embodied interaction with the VR environment, there are various type of items with different haptic sensation. The user can touch or bump onto various objects by actively using its entire body. According to the user experiment in PlayStation Experience 2015, we confirmed that the user could feel as if they dived into the virtual world and enclosed by variety of texture of the sounds, and then they felt that they came back from the another world when they finished the suit experience. So, this is, they said, an unknown experience beyond words.

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