Haptic Touch Amplification in Virtual Reality Environments

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**Haptic** (def.): relating to the sense of touch
What are **Dynamic** Haptics?

Touch Amplification Device Feedback Loop
Examples of Touch Amplification Effects

Touch Amplification in a Virtual Environment

Original 2D Projected Interface

Virtual Reality Prototype
Implementing virtual reality components

**Hardware:**
- Oculus Rift VR Headset
- Leap Motion hand tracker
- Touch amplification system

**Software:**
- Development in **Unity - C#**
- Using Leap Motion **Core + Interaction Engine Assets**

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**Haptics + VR System**

- Leap Motion Hand Tracker
- VR Engine
- Oculus Rift
- Piezo Sensor
- Haptic Engine
- Actuator
Prototype Demonstration

Experimental Question: Does dynamic haptics in a 3D environment affect user preference? Is it empirically more “immersive”? 
Simon VR Game Application

• Goals:
  • Using **proxy objects** to make static objects more interactive and lifelike.
  • Showing only one of the many possible applications for haptic touch amplification in VR.
Hypothesizing increased user interactivity with haptics in VR

• User pilot study:
  • Playing game in VR, **with** and **without** touch amplification.
  • Standard survey methods: 7 point Likert scale “preference” and “presence” questions
  • **Tangibility, naturalness, accuracy, responsiveness, and entertainment.**

7 Point Likert Scale Survey: Presence Questionnaire

**Sample Question:**

Responsiveness:
1. How responsive was the environment to actions that you initiated (or performed)?

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Looking forward ...

• Continue **working on paper** until September.
  • Submitting to *SIGCHI Conference: Human Factors in Computing Systems*

• Build more applications, focusing on the use of **proxy objects**.
  • Demonstrate the device’s diverse capabilities.

• **Optimize** current applications.

Special thanks to ...

Anzu Kawazoe  
*Mentor*

Prof. Yon Visell  
*Principal Investigator*