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# CORTICO 2024

## Neuromarkers of real touch vs. illusory touch

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Haptic feedback allows virtual reality (VR) users to physically interact with virtual content. However, due to the limitations on haptic technology, delivering haptic feedback is still challenging [1]. To overcome such limitations, alternative methods leverage visual dominance to induce haptic illusions [2].

A few studies investigated the effects of tactile stimuli on user perception through EEG in VR, such as for texture discrimination [3] or to study social touch [4]. However, there is room for understanding the brain activity during the perception of tactile stimuli within Virtual Environment (VE) [3].

This abstract describes an experimental protocol, which aims to investigate the brain activity in response to the anticipation and perception of physical and virtual touch, and the impact of the virtual body representation.

During the experiment, users will be immersed in a virtual environment replicating the real environment, including a desk, their body, and a robotic arm. Touch stimulation will be generated haptically, a gentle physical touch on the back of the hand using a robotic arm (see Fig. 1), and/or visually, a visual stimulation matching the motion of the robot in VR. The experiment will have two within-subjects factors. Touch stimulation, either coherent visual and tactile touch feedback or just visual touch; and body representation, realistic human avatar or geometric body representation, as we hypothesize that body representation and ownership will alter the user's perception.

We will study the impact of our design on two aspects:

- Anticipation of touch: Brain activity preceding touch using contingent negative variation
- Perception of touch: Somatosensory cortex response with somatosensory evoked potential and mirror neuron system activation

Our results could provide insights about perception and anticipation of illusory and real touch by observing relevant neuromarkers.

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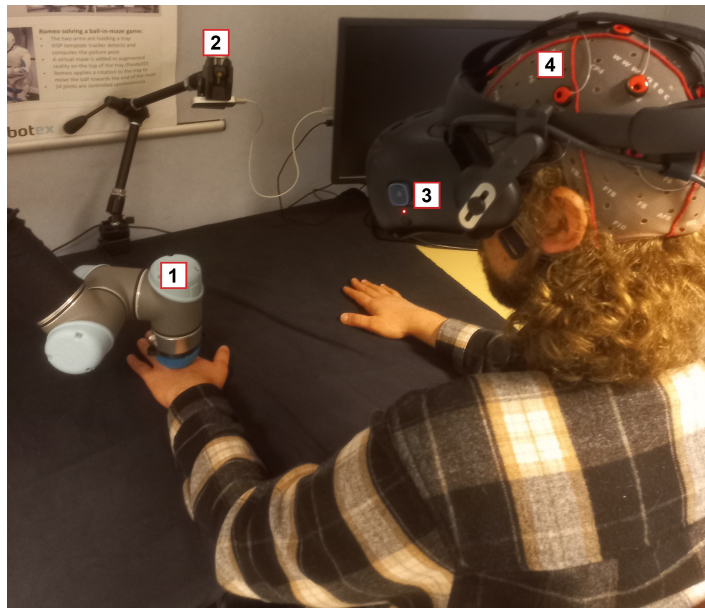


Figure 1: Experimental setup. 1: 6-axis collaborative Universal Robot UR5. 2: Leap Motion for hand tracking. 3: HMD VR headset. 4: EEG headset.