

Project title: Visuotactile Orientation Perception

Project: Ongoing non-project-based study in the field of psychophysics, multisensory integration, sensorimotor neuroscience

Project description

This project explores the integration of visual and tactile information in human orientation perception, focusing on how visual and tactile stimuli are combined to influence our perception of spatial orientation. The study aims to understand the underlying neural and cognitive mechanisms involved in multisensory integration, specifically in the context of orientation perception. This research has implications for the development of advanced sensorimotor systems and applications in robotics, virtual reality, and assistive technologies for individuals with sensory impairments.

The project involves an ongoing study in the field of psychophysics, multisensory integration, and sensorimotor neuroscience. The primary focus is on how tactile orientation perception is biased toward cardinal axes (vertical and horizontal at 0 and ± 90 deg) and how these biases are modulated by visual cues. The study will use state-of-the-art sensorimotor labs to design and develop tasks that measure psychophysical responses to combined visual and tactile stimuli.

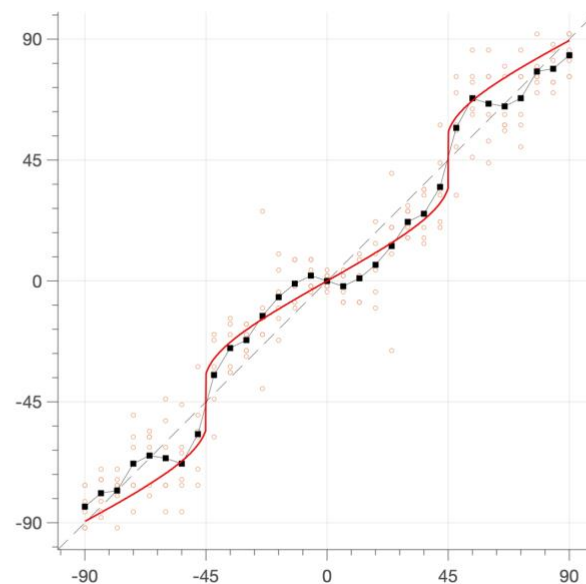


Figure 1. Perception of tactile orientation. Perception of tactile orientation is biased toward the cardinal axes (vertical and horizontal at 0 and ± 90 deg). Red open circles indicate responses, black connected squares indicate average response (deg), red line indicates Bayesian model prediction.

Project Alternatives

- Vestibular Orientation Perception
- *Clinically oriented (Medical Biology, Biomedical Sciences)*: individuals with Glaucoma, blind individuals with cortical implants
- *Modelling oriented (Physics or AI)*: Modelling integration (e.g., Optimal Cue Integration, Bayesian Causal Inference)
- *Thesis/Article Review/Research Proposal*: How can the brain make sense of the senses?

Key words

Humans | Tactile | Haptic | Visual | Multisensory Integration | Orientation | Psychophysics | Perception | Sensorimotor system | Bayesian Inference

Relevant literature

- **Verhaar, K. et al. (2021)**. Bayesian causal inference in visuotactile integration in children and adults. *Developmental Science*.
- **Van Beuzekom, A.D., & Van Gisbergen, J.A.M. (2000)**. Properties of the internal representation of gravity inferred from spatial-direction and body-tilt estimates.
- **Ho, C., & Spence, C. (2007)**. Head orientation biases tactile localization. *Brain Research*.

Tasks & skills

You will become familiar with psychophysics. At the end of this internship, you will be able to:

- Design and develop multisensory orienting tasks in state-of-the art sensorimotor labs
- Measure psychophysical responses
- Analyze data in Matlab (through regression, generalized linear models)
- Write a report in the form of an academic paper (IMRaD)

Background

Master Cognitive Neuroscience: Perception and action track

Bachelor/Master Biology/Sciences/Physics: Psychophysics I and II, Neurobiophysics, Neural Basis of Cognition and Perception, The Auditory System

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Collaborating Researchers: dr. Timo van Kerkoerle, prof. Dr. Richard van Wezel

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