IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

Internship offer

4-6 months

Lab-STICC

Title

Perceptual Alterations in Augmented Reality Affordances

Contacts and supervision

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Keywords

Augmented reality, Affordances, User study, Interaction, Perception

Location

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Details

Augmented Reality (AR) allows overlaying digital content onto physical environments, blending real and virtual information. By doing so, AR can change how users perceive objects and the way they interact with them.

Affordances refer to the action possibilities that an object offers, directly perceived through its structure and context. For example, a handle may suggest pulling or pushing depending on its shape and orientation.

The subject of the ANR project **PAEIAR – Perception of Affordances and Embodied Interaction in Augmented Reality**, and therefore of this internship, is to study how the use of AR impacts the affordances of real or mixed objects. In particular, this stage focuses on how visual augmentations (neutral vs. meaningful) influence user perception and behavior when interacting with simple physical objects such as cubes, handles or buttons. The internship will be supervised by Etienne Peillard, with the active participation of PhD student **Yutaro Tanaka**, who is working on the same topic and will contribute to the daily supervision and guidance of the intern.

The intern will design a set of AR stimuli in Unity (using a headset such as Meta Quest 3), and create experimental conditions where objects are presented with three levels of augmentation:

- **Real object without AR**
- **Object with neutral visual additions** (e.g., simple images, logos, or abstract symbols without functional meaning) to test the impact of AR alone on affordance perception
- **Object with meaningful cues** (e.g., spikes, color, shape, motion, highlighting) acting as signifiers that suggest new affordances

The internship will be structured in the following steps:

1. **Literature review**: identify existing work on affordances, signifiers, and perceptual biases in AR to define a solid experimental basis.
2. **Design of stimuli**: create a set of simple physical objects and implement their augmented versions in Unity, ensuring both neutral and meaningful conditions.
3. **Experimental protocol**: define perceptual tasks (judgment: e.g., “Would you grasp or push this object?”) and motor tasks (reaching, grasping, pushing), prepare questionnaires for subjective evaluation.
4. **Pilot study**: test the experimental setup on a small group to refine tasks, stimuli, and data collection methods.
5. **User study**: recruit participants, run the experiments under the three conditions, and collect both behavioral data (reaction time, error rate, gesture type) and subjective data (clarity, confidence, usability).
6. **Data analysis**: analyze behavioral and subjective measures to identify how AR cues enhance, conflict with, or override real affordances.
7. **Iteration and refinement**: if time allows, improve stimuli and protocol based on first results and conduct additional analyses.

8. **Reporting**: prepare a final report and presentation summarizing the methodology, results, and perspectives for future research.

This internship is both a development project, involving the use of new AR systems and programming in Unity, and a laboratory research experience where experimental design and data collection are central. It is inherently multidisciplinary, combining computer science with cognitive sciences, and it also offers potential openings toward international research collaborations. The internship is thus an opportunity to gain technical, scientific, and cross-disciplinary experience while contributing to an emerging research field.

References

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