Post-Doctoral position

REEGAR: Is that Real enough? EEG markers of real vs virtual objects for an enhanced AR-BCI setting

Research Team: IMT Atlantique Brest, Inuit (INFO) and BRAIn (MEE) teams

Funding: 11 months (starting February 2022)

Keywords: Augmented Reality, Electroencephalography, Brain Computer Interfaces, Perception of Virtual Objects

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Job Description

  The INUIT and BRAIn team at IMT Atlantique are seeking a highly qualified young researcher with experience and motivation in Augmented Reality(AR) and/or EEG signal processing.

  This position is open by IMT Atlantique Brest (France). At the interface between AR and Brain Computer Interfaces (BCI) research, the project REEGAR aims at studying the impact of visual appearance of virtual objects on visual perception but also interaction capabilities with the help of EEG signals.

  AR/VR presents itself as a direct way to connect the user with digital content. However, the presentation of this content still has many flaws, especially on the visual rendering. It remains quite easy to distinguish a real object from a virtual one: the latter will appear brighter, transparent, potentially badly bound to its environment, lacking shading and light reflections. In general, the realism of virtual objects is still an important issue in AR/VR. Moreover, it is possible that the realism of a virtual object, even very close to reality, negatively impacts its perception. In the same way as the Uncanny valley (Mori's theory that the more similar an android robot is to a human being, the more disturbing its imperfections appear to us), a virtual object whose appearance is close to that of a real object may be more disturbing than a purely virtual object. Indeed, since we cannot interact in the same way with a real object as with a virtual one, this blurred boundary could disturb the user.

The general objective of this project is to define this boundary between real and virtual in an AR environment. Using EEG, we will aim at recognizing the nature of the object considered by the user. In the longer term, this recognition could allow to overcome the evaluation paradigm of objects in AR and thus 1) to improve the rendering of virtual objects in order to bring them closer to real objects in a way that is acceptable to the user and 2) to improve the interaction of the user with the objects by detecting in advance the nature (real or virtual) of the object with which he wishes to interact.

As very limited knowledge is currently available in the field, and the project is mainly exploratory.

The selected candidate will collaborate with the other members of the teams and their collaborators to 1) design an experimental protocol and AR environment 2) perform EEG signal acquisition in an AR setting 3) analyze multichannel EEG data to identify brain activity markers or correlates of virtual vs real objects.

Research Environment

IMT Atlantique is a technological university and offers very competitive salary packages, with postdoc wages corresponding to a junior assistant professor level. Successful candidates will also benefit from 49 days of annual paid holidays.

The BRAIn team is a reference for its work at the intersection between deep learning (Vincent Gripon, Mathieu Leonardon) and neuroimaging (Giulia Lioi, Nicolas Farrugia). The Inuit team is specialized in Virtual-Augmented Reality and 3D interaction and involved members (Etienne Peillard, Guillaume Moreau) specialize into understanding the perception of virtual and augmented environments.

Applicant Profile

The Ideal applicant should have:

- ❖ Theoretical, technical and practical knowledge in signal processing
- ❖ Strong programming skills using Python and Unity
- ❖ Ability to work in a team
- ❖ Autonomy
- ❖ Mastery of English

As this project is at the intersection of the fields of AR and EEG, candidates will need to have expertise in one of them and enough curiosity and autonomy to train in the other.

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How to apply

Applicants should send their complete application package by email to one of the contacts that includes:

- ❖ Motivation letter
- ❖ Complete CV with publication list
- ❖ PDF of one representative paper (or slideshow) of the candidate in connection with this project.
- ❖ Recommendation letters (preferably directly sent by the mentor)

References

1. Lotte et al. 2012 - Combining BCI with Virtual Reality: Towards New Applications and Improved BCI
2. Vortmann et al. 2021- Real or Virtual? Using Brain Activity Patterns to differentiate Attended Targets during Augmented Reality Scenarios
3. Mori et al. 2012 - The Uncanny Valley
4. Roe et. al. 2013 - Engaging the Brain: The Impact of Natural versus Urban Scenes Using Novel EEG Methods in an Experimental Setting