2021-04209 - Engineer position F/H: developing passive Brain-Computer Interfaces systems and experiments with the OpenViBE platform

Type de contrat : CDD
Niveau de diplôme exigé : Bac + 5 ou équivalent
 Fonction : Ingénieur scientifique contractuel

A propos du centre ou de la direction fonctionnelle
Potioc designs, develops and evaluates new approaches that exploit multimodal interaction to promote a stimulating user experience. In particular, we explore approaches based on mixed reality (AR, RV), tangible interaction, brain-computer interfaces, and physiological interfaces. The main areas of application we are targeting are education, well-being, art, and accessibility.

Contexte et atouts du poste
The hired Engineer will join European project BITSCOPE (2022-2024) – a CHIST-ERA type project which stands for “Brain Integrated Tagging for Socially Curated Online Personalised Experiences”. This is a project led by Prof. Tom Ward (from Dublin City University, Ireland), in collaboration with France (Inria Bordeaux Sud-Ouest, team Potioc), Spain (Universitat Politècnica de Valencia (UPV)) and Poland (Nicolas Copernicus University). The BITSCOPE project presents a vision for brain computer interfaces (BCI) which can enhance social relationships in the context of sharing virtual experiences. We envisage a future in which attention, memorability and curiosity elicited in virtual worlds will be measured without the requirement of “likes” and other explicit forms of feedback. Instead, users of our improved BCI technology can explore online experiences leaving behind an invisible trail of neural data-derived signatures of interest. This data, passively collected without interrupting the user, and refined in quality through machine learning, can be used by standard social sharing algorithms such as recommender systems to create better experiences. Technically the work concerns the development of a passive, hybrid BCI (piBCI). It is hybrid because it augments electroencephalography (EEG) with eye tracking data, galvanic skin response (GSR), heart rate (HR) and movement in order to better estimate the user experience (UX). It is passive because it operates covertly without distracting the user from their immersion in their online experience and uses this information to adapt the application. It represents a significant improvement in BCI due to the emphasis on improved denoising facilitating operation in home environments and the development of algorithms capable of taking inter- and intra-subject variations into account. We leverage our preliminary work in the use of deep learning and geometrical approaches to achieve this improvement in signal quality. The user state classification problem is ambitiously advanced to include recognition of attention, curiosity, and memorability which we will address through advanced machine learning, Riemanian approaches and the collection of large representative datasets in co-designed user centred experiments.

Mission confiée
As part of this research, the goal of this Engineer position would be to work on the implementations of the protocols and real-time algorithms (EEG denoising, EEG UX classifiers) as part of the free and open-source OpenViBE BCI software (http://openvibe.inria.fr). He/she will also ensure these implementations are documented and disseminated. More precisely, the engineer will conduct R&D work in order to both:

- support the research work and experiments conducted by the PhD student to be hired at Inria Bordeaux on the same project, notably to help developing and running the BCI experiments of this PhD student; He will also support the development of the other project partners for their experiments based on OpenViBE
- Develop, maintain and improve the OpenViBE platform so that it suits the project needs, and integrate in it the new methods and results that will originate from the project.

Principales activités
- implementing in OpenViBE new signal processing and machine learning tools designed offline by the PhD students from the project to estimate UX from both EEG and physiological signals, and to denoise such signals
- Connect OpenViBE to the stimulus presentation tools to be developed by UPV to present artworks in virtual worlds
- Making OpenViBE able to record and process various physiological signals (HR, GSR, eye tracking, movements)
- Contributing to maintaining the OpenViBE software and updating it with current software technologies, and contributing to the animation of the OpenViBE community (forum, mailing lists, etc.)
- Contributing to various EEG and BCI experiments run in the project based on the OpenViBE platform.
- Releasing – in collaboration with the other OpenViBE engineers (from other projects and teams) – new versions of OpenViBE, including the new developments made in the BITSCOPE project.

These developments will be mostly in C++, and a bit in Python. An understanding of Matlab would also be required.

Compétences
- Strong skills and experience in C ++ programming
- Comfortable with versioning software and working with a large existing software (OpenViBE – about 300,000 lines of code)
- Python / Matlab programming

Informations générales
- Thème/Domaine : Interaction et visualisation
- Instrumentation et expérimentation (BAP C)
- Ville : Talence
- Centre Inria : CRI Bordeaux - Sud-Ouest
- Date de prise de fonction souhaitée : 2022-01-01
- Durée de contrat : 3 ans
- Date limite pour postuler : 2021-12-31

Contacts
- Equipe Inria : POTIOC
- Recruteur : LotteFabien / Fabien.Lotte@inria.fr

A propos d’Inria
Inria est l’institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 200 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3500 scientifiques pour relever les défis du numérique, souvent à l’interface d’autres disciplines. L’institut fait appel à de nombreux talents dans plus d’une quarantaine de métiers différents. 500 personnels d’appui à la recherche et à l’innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneurs qui impactent le monde.

Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 180 start-up. L’institut s’efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l’économie.

L’essentiel pour réussir
There you can provide a “broad outline” of the collaborator you are looking for what you consider to be necessary and sufficient, and which may combine:

- tastes and appetencies,
- profile and qualities,
- personality or character traits,
- cross-disciplinary knowledge and expertise.

This section enables the more formal list of skills to be completed and “tightened” (reduced) to:

- “Essential qualities in order to fulfill this assignment are feeling at ease in an environment of scientific dynamics and wanting to learn and listen.”
- “Passionate about innovation, with expertise in Ruby on Rails development and strong influencing skills. A thesis in the field of “...” is a real asset.”

Consignes pour postuler
Thank you to send:
- CV
- Cover letter
- Master degree

Sécurité défense:
Ce poste est susceptible d’être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L’autorisation d’accès à une zone est délivrée par le chef d’établissement, après avis ministériel favorable, tel que défini dans l’arrêté du 03 juillet 2012, relatif à la PPST Un avis ministériel
Able to speak, write and work in an English speaking environment
Knowledge in signal processing and machine learning a strong plus
Experience with ElectroEncephaloGraphy (EEG) and/or BCI experiments is a plus (but not mandatory)

This position is for a young graduated Engineer, with a Master degree or equivalent.

**Avantages**
- Subsidized meals
- Partial reimbursement of public transport costs
- Possibility of teleworking and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

**Rémunération**
2562€ per month before taxes