2018-00772 - R&D Engineer position to implement brain signal processing tools and Brain-Computer Interface applications in the OpenViBE software platform

Contract type: Public service fixed-term contract
Renewable contract: Oui
Level of qualifications required: Graduate degree or equivalent
Function: Temporary scientific engineer
Level of experience: Recently graduated

About the research centre or Inria department

The Potioc project-team explores new approaches "beyond the mouse" in the field of Human-Computer Interaction. More specifically, we are interested in approaches that favor rich interactions, both regarding interaction possibilities and perceptive feedback. Our objective is to increase immersion and engagement of users with regard to the interaction tasks. Final goals are the stimulation of creativity, improvement of learning or contribution to the well-being of people. For achieving these goals, we focus on the design, development and evaluation of new methods for "popular interaction" targeted at a large variety of users.

Context

Brain computer interfaces (BCI) are communication and control tools that enable their users to interact with computers by using brain activity alone.

A prominent type of BCI is Mental Imagery (MI) BCI, that translate changes in brain activity due to mental imagery tasks performed by the user (e.g., imagination of movements or mental calculation) into control commands for a computer. Using a MI-BCI requires dedicated training, and the more the user practices the better he/she will get at it, i.e. the user's mental commands will be more often correctly recognized by the system.

Current BCI are rather unreliable, and one current hypothesis to explain this lack of reliability could be inappropriate user training. We are thus currently conducting researches to understand this user training to then improve it and make it suitable.

Some of these researches are conducted as part of ANR (French National Research Agency) project REBEL (https://team.inria.fr/potioc/fr/rebel) - Principal Investigator : Fabien Lotte) at Inria Bordeaux Sud-Ouest, France, in team Potioc (https://team.inria.fr/potioc/).

This projects aims are redefining MI-BCI feedback and user training, in order to use them for motor impaired and healthy users alike.

Assignment

As part of this research, the goal of the engineer would be to implement and validate various tools for BCI into the OpenViBE software (http://openvibe.inria.fr). OpenViBE is a free and open-source software for the design and use of BCI, which we use for all our BCI experiments. The engineer will have to:

1) implement new brain signal processing tools for BCI, in particular based on Riemannian Geometry,
2) implement interfacing tools to be able to connect various BCI developed into OpenViBE to a number of assistive software and accessible videos games, e.g., applications based on one single switch (ex: http://www.oneswitch.org.uk/).

These developments will be mostly in C++, and a bit in Python. An understanding of Matlab would also be required. In addition to this implementation works, the engineer will also contribute to helping in the implementation of other BCI studies conducting in the team, as well as helping with running the experiments.

Main activities

1) implement new brain signal processing tools for BCI, in particular based on Riemannian Geometry,
2) implement interfacing tools to be able to connect various BCI developed into OpenViBE to a number of assistive software and accessible videos games, e.g., applications based on one single switch (ex: http://www.oneswitch.org.uk/).

Related literature:


F. Yger, M. Béra, F. Lotte, "Riemannian approaches in Brain-Computer Interfaces; a review", IEEE Transactions on Neural System and Rehabilitation Engineering, vol. 25, no. 10, pp. 1751-1762, 2017


Skills

General Information

- Theme/Domain: Interaction and visualization
- Town/city: Talence
- Inria Center: CRI Bordeaux - Sud-Ouest
- Starting date: 2018-09-01
- Duration of contract: 12 months
- Deadline to apply: 2018-07-31

Contacts

- Inria Team: POTIOC
- Recruiter: Lotte Fabien / fabien.lotte@inria.fr

About Inria

Inria, the French National Institute for computer science and applied mathematics, promotes "scientific excellence for technology transfer and society". Graduates from the world's top universities, Inria’s 2,700 employees rise to the challenges of digital sciences. With its open, agile model, Inria is able to explore original approaches with its partners in industry and academia and provide an efficient response to the multidisciplinary and application challenges of the digital transformation. Inria is the source of many innovations that add value and create jobs.

Conditions for application

Please send CV and cover letter to review your application.

Defence Security :

This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorization to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy :

As part of its diversity policy, all Inria positions are accessible to people with disabilities.

Warning - you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.
Skills required:
- Strong skills in C++ programming
- Skills in Python programming
- Comfortable with versioning software and working with a large existing software (OpenViBE – about 300,000 lines of code)
- Skills in signal processing/machine learning and/or human-computer interaction (in particular accessibility) a plus
- Able to speak, write and work in an English speaking environment
- Experience with ElectroEncephaloGraphy (EEG) and/or BCI experiments a plus (but not mandatory)

Benefits package
- Subsidised catering service
- Partially-reimbursed public transport

Remuneration
Between 2562€ and 2936€ according to experience.