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  
**Fonction**: 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 translates 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 project aims at 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:**


Skills
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.