C Arrouet, M Congedo, J- Marvie, F Lamarche, A Lécuyer, and B Arnaldi (2005). Open-ViBE: a 3D Platform for Real-Time Neuroscience. Journal of Neurotherapy 9(1).

Abstract: When the physiological activity of the brain (e. g., electroencephalogram, functional magnetic resonance imaging, etc.) is monitored in real-time, feedback can be returned to the subject and he/she can try to exercise some control over it. This idea is at the base of research on Neurofeedback and Brain-Computer Interfaces. Current advances in the speed of microprocessors, graphics cards and digital signal processing algorithms allow significant improvements of these methods. More meaningful features from the continuous flow of brain activation can be extracted and feedback can be more informative.

Borrowing technology so far employed only in Virtual Reality, we have created Open-ViBE (Open Platform for Virtual Brain Environments). Open-ViBE is a general purpose platform for the development of 3D real-time virtual representation of brain physiological and anatomical data. Open-ViBE is a flexible and modular platform that integrates modules for brain physiological data acquisition, processing, and volumetric rendering.

When input data is the electroencephalogram, Open-ViBE uses the estimation of intra-cranial current density to represent brain activation as a regular grid of 3D graphical objects. The color and size of these objects co-vary with the amplitude and/or direction of the electrical current. This representation can be superimposed onto a volumetric rendering of the subject's MRI data to form the anatomical background of the scene. The user can navigate in this virtual brain and visualize it as a whole or only some of its parts. This allows the user to experience the sense of presence ("being there") in the scene and to observe the dynamics of brain current activity in its original spatio-temporal relations.

The platform is based on publicly available frameworks such as OpenMASK and OpenSG and is open source itself. In this way we aim to enhance the cooperation of researchers and to promote the use of the platform on a large scale.