

Smart screening of the cortex by robotised TMS/EEG coupling

Introduction

Transcranial Magnetic Stimulation (TMS) established itself as a powerful technique for probing and treating the human brain. Major technological evolutions, such as neuronavigation and robotized systems, have continuously increased the spatial reliability and reproducibility of TMS, by minimizing the influence of human and experimental factors (Fig. 1). By taking advantage of robotized TMS, our team has developed a probabilistic Bayesian model (AutoHS) that allows an automatic mapping of the motor cortex (Harquel et al, 2017), and a new functional neuroimaging technique by combining it with EEG (Fig.2, Harquel et al, 2016). **This technique, known as “functional cytoarchitectonics”, could help the early diagnosis of several neurological pathologies.**

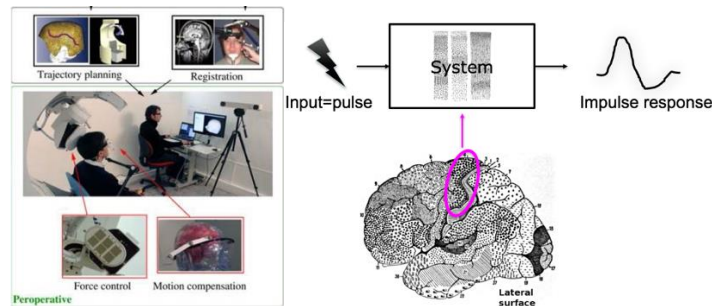


Figure 1: Axilum's robot allows to plan a trajectory of stimulation in patient's MRI and controls the coil position, despite patient's motion, by the means of a series of imbricated motors.

Figure 2: Active probing of brain states and excitability by applying short perturbation to neuronal activity and recording by EEG the impulse response (input: TMS pulse, output : EEG response).

Current project

The Bayesian framework of *AutoHS* will be extended to take into account both subject's neuroanatomy and EEG readouts in order to develop a smart and automated screening of the cortex by TMS/EEG coupling. The proof-of-concept will be tested on healthy subjects, before being potentially applied to *de novo* Parkinsonian patients in upcoming studies (parts of the *Neurocog* project). The student will learn basis of electroencephalography (EEG), navigated and robotized TMS, as well as Bayesian modelization.

Team and **Contact:**

The student will have to work with members of the LPNC (S. Harquel and A. Chauvin) and of the team “*Stimulation Cérébrale et Neurosciences des Systèmes*” of the GIN (O. David).

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References

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