Validation of the Steady State Topography methodology

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Context
Steady State Topography (SST, see http://en.wikipedia.org/wiki/Steady_state_topography) is a methodology for observing and measuring human brain activity that was first described by Richard Silberstein and co-workers in 1990 [1]. In a typical SST study, brain electrical activity (electroencephalogram or EEG) is recorded while participants view audio visual material and/or perform a psychological task. Simultaneously, a dim sinusoidal visual flicker is presented in the visual periphery. The sinusoidal flicker elicits an oscillatory brain electrical response known as the Steady State Visually Evoked Potential (SSVEP) [2,3]. Task related changes in brain activity in the vicinity of the recording site are then determined from SSVEP measurements at that site. One of the most important features of the SST methodology is the ability to measure variations in the delay (latency) between the stimulus and the SSVEP response over extended periods of time. This offers a unique window into brain function based on neural processing speed as opposed to the more common EEG amplitude indicators of brain activity. Three specific features of the SST methodology make it a useful technique in cognitive neuroscience research as well as neuroscience-based communication research.

The SST methodology has been used to examine normal brain function associated with visual vigilance [1,4] working memory [5,6], long-term memory [7,8], emotional processes [4,9,10], as well as disturbed brain functions such as schizophrenia [11,12] and attention deficit hyperactivity disorder [13].

Goal of the project
The goal of the project consists in reproducing and then confirming or invalidating the results presented in the papers.

Prerequisites and relevant literature
The project is very challenging as it requires from the student thinking out of the box (a bit of engineering to create the experimental setup) and not only strong programming skills, but also some experience in signal processing and statistics.


