message. A good place to start is the Informational Graphic, and build further upon the work of Neurath and Arntz (the Vienna Method). We consider Brain Stimulation as a means to that end too. We will present our research and first results with confidence and enthusiasm.
Keywords: language, understanding, progress

P2.059

PATTERNED STIMULATION LEADS IN–VITRO NETWORK INTO NON-BURSTING STATE

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Abstract
Spontaneous synchronized neuronal activity is found in the neocortical areas of the developing as well as epileptic brain. Synchronized neuronal activity can also be found in dissociated neural networks in vitro. To study the mechanistic origin of this behavior, we built a simple and fast computational model of large network of approximately 80% excitatory and 20% inhibitory neurons. Our model precisely matched the spike times and spike frequency adaptation of cortical pyramidal neurons obtained via whole cell recordings in confined in vitro networks. High accuracy of our model was achieved by implementing an AHP current with sigmoid dynamics that approximated Ca^{2+} dependent spike frequency adaptation. Then, we implemented short term synaptic depression of the synaptic weights. Modeling of depression was verified by matching the experimental post synaptic responses with three different frequencies of spikes evocation in the presynaptic neuron using dual whole cell recording. Investigations with this computational network were then verified in an all-optical experimental system. This experimental setup was designed by confining a cortical network with polydimethylsiloxane (PDMS), and by co-transfecting the neurons with channel-rhodopsin 2 (ChR2) and jRgeco1a. Patterned stimulator with spatial resolution of somatic compartment (approximately 15 μm) was used to excite individual neuron in a 2D confined network consisting of approximately 300 neurons confined to an area of about 1 mm^2. We explored different stimulation paradigms in silico and in vitro to achieve a burst free neuronal network of different size by activating different numbers and patterns of input neurons. Action potential adaptation of each spiking excitatory neuron and the short term synaptic depression of each activated synapses could lead the network into a non-bursting mode. Distributed stimulation method that was developed in this work could potentially be used in suppressing epileptic seizures.
Keywords: burst free network, patterned stimulation, optogenetics, synaptic depression

P2.060

COMBINED BILATERAL FRONTAL + CEREBELLAR TDCS AS A POTENTIAL INTERVENTION FOR TREATMENT-RESISTANT DEPRESSION

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Abstract
Background and Aims: Depressive disorders are one of the leading causes of disability worldwide, as pharmacotherapy and psychotherapy often fail to achieve lasting clinical remission [1]. Transcranial Direct Current Stimulation (tDCS) is effective in improving depressive symptoms when applied to the dorsolateral prefrontal cortex (DLPFC) using bilateral montages (anodal over the left DLPFC, cathode over the right DLPFC) [2]. In light of the emerging role of the cerebellum in emotional processing and pathophysiology of depression, we aimed to study the effect of combined frontal + cerebellar tDCS in patients with treatment-resistant depression.
Methods: Our study is an observational, open-label pilot study, consisting in the simultaneous administration of bilateral frontal (anode over the left DLPFC, cathode over the right DLPFC) and cerebellar (anode over the right cerebellum, cathode over the left cerebellum) tDCS to patients (N=12) with treatment-resistant depression. Patients were assessed with the 21-items Hamilton Depression Rating Scale (HADRS) and Beck's Depression Inventory-II (BDI-II) before tDCS and after one week of stimulation.
Results: We observed a significant reduction of clinically-rated (HADRS score: p=.002) and self-reported (BDI-II score: p<.001) severity of depressive symptoms after five days (10 sessions) of stimulation. Age was strongly correlated with HADRS score improvement after tDCS (r_s=.872, p=.001).
Conclusions: Considering the significant improvement observed after just one week of stimulation, the cerebellum could represent a promising target for tDCS in younger patients with treatment-resistant depression, therefore warranting further investigation.
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Keywords: Cerebellum, tDCS, Depression

P2.061

SOFTWARE ARCHITECTURE FOR CLOSED-LOOP MULTI-LOCUS TRANSCRANIAL MAGNETIC STIMULATION

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Abstract
In the Connect2Brain project (ERC Synergy grant #810377), multi-locus transcranial magnetic stimulation will be controlled by neurophysiological feedback signals in a closed-loop mode. Because of the complicated connections between different software components, medical device regulations, and real-time requirements, a well-designed software architecture is necessary.
We present an open platform that allows seamless, extendable integration of various software components, such as neuronavigation (InVesalius Navigator), the control user interface for multi-locus TMS, and a stimulation sequence planner for designing stimulation patterns on predefined stimulation targets. We also create a domain-specific language for defining complex stimulation sequences.
The stimulation tasks enabled by the architecture include repeated stimulation with varying, pre-defined parameters, multi-pulse stimulation across multiple loci, mapping of motor areas, and automatically determining the stimulus location and direction to elicit maximal motor response.
We follow the microservice architecture principles and use Apache Kafka as the messaging platform. Later, we will extend the architecture to the closed-loop feedback-controlled stimulation, based on electroencephalography and motor-evoked potential data. Apache Kafka is a messaging system with high throughput and low latency, which are desirable features in a control system that processes real-time signals with relatively high dimensionality and sampling frequency. It includes automatic logging of the events, facilitating easy recording and playback of the experiments. Furthermore, a microservice architecture enables developing services using different programming languages, which is beneficial when developing the software in an academic setting by researchers with varying development backgrounds.
We adhere to the best practices of writing software by designing clear, well-documented application programming interfaces, ensuring modularity, and following modern development processes, such as periodic code reviews.
Our work creates an open-source infrastructure that the other researchers can use and build upon, and takes a step towards standardizing