FENS Forum 2010 - Amsterdam

- Posters: to be on display from 8:00 to 13:15 in the morning and from 13:30 to 18:45 in the afternoon. Poster sessions run from 09:30 to 13:15 in the morning and from 13:30 to 17:30 in the afternoon. A one hour time block is dedicated to discussion with the authors (authors should be in attendance at their posters as from the time indicated.)
- For other sessions, time indicates the beginning and end of the sessions.

First author Dal Maschio, Marco (poster)

Poster board B12 - Wed 07/07/2010, 11:15 - Hall 1
Session 192 - Network interactions 2
Abstract n° 192.12
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Title Targeted optogenetic stimulation to study the computational properties in neuronal ensembles recorded by multi-electrode devices

Text

Micro-electrode array (MEA) technology has been exploited as a powerful tool for providing distributed information on learning, memory and information processing in cultured neuronal tissue, enabling an experimental perspective from the single cell level up to the scale of complex biological networks. An integral part in the use of MEAs involves the need to apply a local stimulus to stimulate or modulate the activity of certain regions of the tissue down to the single neuron level. Currently, this presents various limitations due to the low spatial resolution of the electrical stimulation.
The recent development of optogenetic probes enables for the opportunity to switch from a full electrical paradigm to a combination of a reliable optical stimulation, including excitation and inhibition, coupled to large scale recordings based on MEA.
In order to take full advantage from the expression of such optical tools, the capability of properly shaping the optical stimulation pattern has to be developed to fit at the same time either the single neuron targeting or multi site/large area stimulation. The design of a versatile patterned light projection device is an essential step towards this goal. Digital micro-mirrors devices (DMDs) spatial light modulators became recently available a tools for spatial mapped fluorescence measurements, photo-patterning, molecule uncaging and high resolution imaging.
Here we describe a two-wavelength spatial light projection system for real-time closed loop modulation of neuronal activity, which is able to trigger a specific protocol of optical stimulation (space, time, wavelengths) by properly configuring the DMD upon detection of typical patterns (space and time) of electrical activation recorded with MEA. By adopting such an approach, it will be possible to better understand the fundamental mechanisms underlying the propagation and processing of the information in distinct neuronal subareas or subpopulations and their specific roles within in-vitro or ex-vivo neuronal networks.

Theme B - Excitability, synaptic transmission, network functions
Network interactions - Signal propagation
