Towards Brain-Machine Interfaces:

Inference of hand movements from population activity in monkey and human sensorimotor cortex

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In monkeys, activity of multiple single neurons related to arm movement can be employed to control an external actuator. Based on this work, there is an increasing interest in designing implantable brain-machine interfaces (BMI), enabling real-time control of neuroprosthetic devices. Such movement inference has recently been demonstrated in humans, but little is yet known about the possibility to decode information for the control of reaching and grasping from different sensorimotor areas activated by hand movements. Evidently, specificity and long-term stability of the recorded signals is essential for successful brain-machine interface applications. Thus, a promising novel approach for robust neuro-interfacing is based on neuronal population activity, instead of multiple single neuron activity. We recently demonstrated that local field potentials from monkey primary motor cortex can be as efficient as single neuron activity for decoding arm movements[1,2]. I will give an overview of these results and present recent findings from ongoing work in our laboratory[3,4], aimed at studying the feasibility of inferring hand movements in humans from single-trial population activity measured with electrodes on the cortical surface.

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