

Research Profile

Brain Computer Interfaces

Communicating by thought alone is an old human dream. Modern brain imaging methods now offer the opportunity to bridge the gap between thought and action, especially in patients with progressive paralysis when other means of communication and action fail.

Subject areas covered by current and past projects:

- thought controlled writing (P300 speller, EEG)
- wheel chair control by EEG in a virtual environment
- applications of EEG based brain computer interfaces in patients

Imagery of motor actions

A main challenge for the construction of brain computer interfaces is the selection of a suitable set of mental tasks. Executing and imagining motor actions (lips, hand, foot movements) combine good localization with an excellent signal to noise ratio. The investigation of the neural correlates of motor imagery tasks is therefore crucial to fully exploit the potential of this group of mental tasks.

Subject areas covered by current and past projects:

- event-related (de-) synchronization in different frequency bands for motor execution and imagery
- development of algorithms to differentiate between motor imagery tasks and other mental tasks
- the impact of motor imagery ability on the stability of the neural activity pattern in motor imagery

Neuroplasticity

Subjects typically need practice to learn to operate a brain computer interface successfully. The investigation of the neural correlates of learning therefore directly affects the success rate of brain computer interfaces and, finally, help to make them independent from a particular user. Learning in this domain, with real-time feedback of one's brain's response, is different from other forms of learning because it is highly self-referential (neurofeedback). Learning by neurofeedback is also very promising for clinical applications.

Subject areas covered by current and past projects:

- Investigating the long-term changes induced by neurofeedback
- Improvement of motor imagery by neurofeedback
- neurofeedback and rehabilitation success in stroke patients