脳情報通信総合研究所
脳情報解析研究所

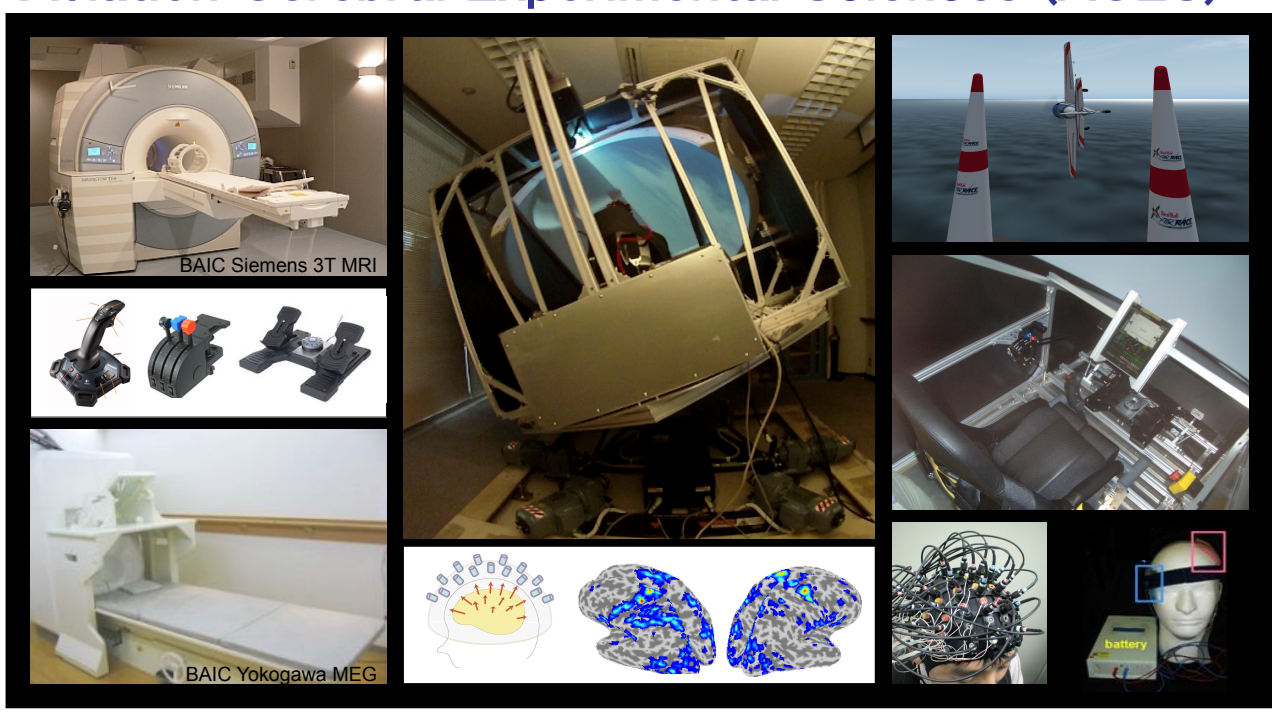
フライトシミュレータで実環境の脳活動を調べる

Multimodal Investigation of Complex Real-World Tasks (Flight Simulation)

Background

The primary goal of Aviation Cerebral Experimental Sciences (ACES) is to investigate human perceptual and motor processes under a very rich and ecologically valid set of conditions. This is accomplished by utilizing as rich and engaging an experimental environment as possible providing visual, auditory, vestibular, proprioceptive stimulation and recording/manipulating brain activity via multiple methods (fMRI, MEG, EEG, NIRS, TDCS, TMS, GVS).
A key challenge to this research is the development of multimodal brain imaging techniques (e.g. Variational Bayesian Multimodal Encephalography VBMEG) to investigate continuous real world behavior in very rich, noisy, and potentially unconstrained environments.

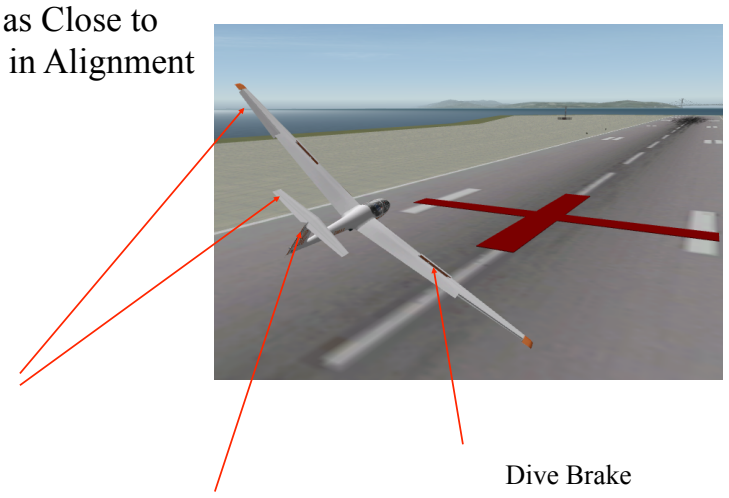
Aviation Cerebral Experimental Sciences (ACES)

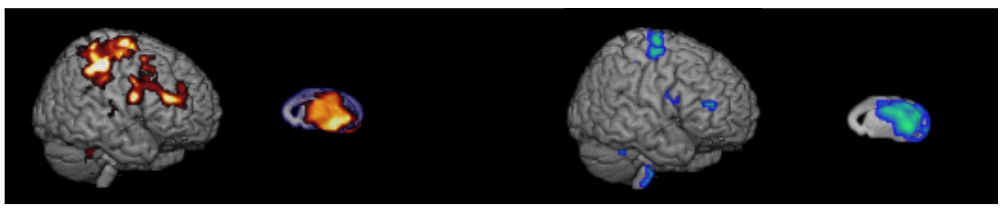


Experiments

Neural Processes Involved with Complex Perceptual Motor Control on a Glider Landing Task

Task: Land the Glider as Close to The Red + as Possible in Alignment With the Runway.

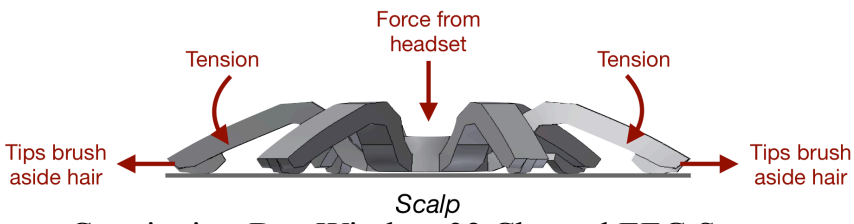




Increased Activity in Action Planning Area Predicts Landing Performance During Task

Decreased Spontaneous Activity in Action Planning Areas Predicts Landing Performance Before Task

Real-Time Recording of Localized Brain Activity using Dry-Wireless EEG in Real World Environments



Cognionics: Dry-Wireless 32 Channel EEG System

Relevance and Future Directions

・Thee results show that performance related activity can be predicted both while caring out the task and even by attentionally modulated activity before the task begins. Analysis in real-world environments can be carried out using dry-wireless EEG system.
・ Implementation of experiments using fully immersive visual presentation and motion will allow for development of new analysis techniques investigating real time spatial-temporal features of multimodal brain imaging data. These techniques can be utilized for real-world implementation of brain-machine-interface that will enhance the user's performance, efficiency, safety, and enjoyment.
・This research has implications for monitoring and enhancing human performance under extreme conditions such as air and space operations. It also is relevant for rehabilitation and enhancing quality of life for individuals with disabilities.

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