

Brain-Computer Interface Project

Group 7

Advanced Brain-Computer Interfaces

11th June 2019

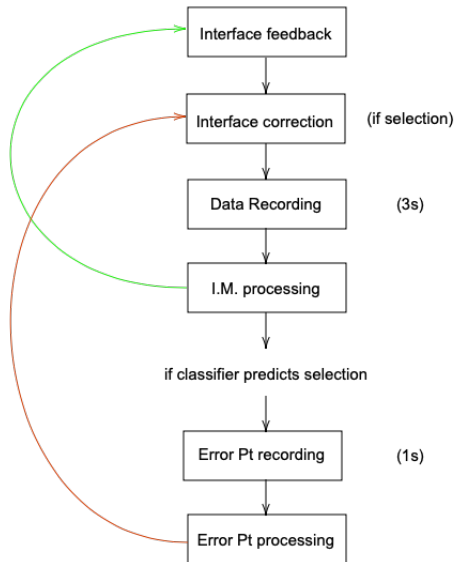
Signals

- ▶ Imagined movement, use of hand movement to navigate an interface
(Induced)
- ▶ Error selection, for detecting and correcting possible errors
(Evoked)

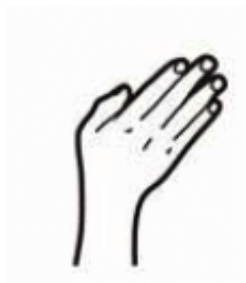
Objective

Using imagined movement to navigate a menu where the subject can select which option prefers

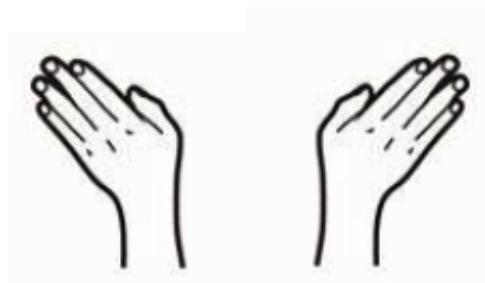
Flow chart













Non BCI specialist explanation

To move around the menu the user imagines moving his hands, the system will detect changes in the signal from certain parts of the brain and the algorithm will interpret them, telling the interface to update its state.

In case of an error being made by the classifier, the system also records the brain signals and looks for an error potential which would return the system to its previous state

BCI specialist explanation

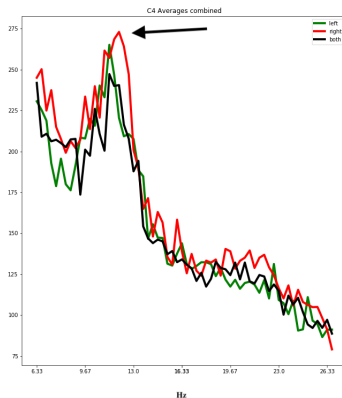
To move around the menu the user imagines moving his hands, The EEG system will look for changes in the power spectrum of the channels, most likely **C3**, **Cz** and **C4**, which are the channel available for us in the set which overlap best with the primary motor cortex, and seem to have the highest correlation with the IM activity. Even though we will use the spectrum of all channels to train the classifier

After it has been sent to the classifier as a long array, it's trained to identify activity for each hand independently, whose results are combined and sent to the interface

Signal view(1)

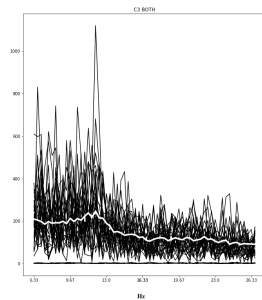
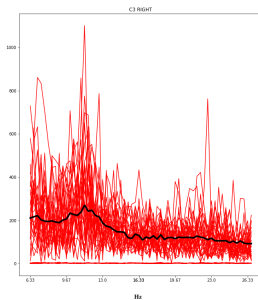
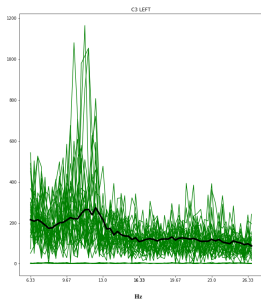
Example: Average of the power spectrum for the C3 and C4 channels over several trials, with data for left, right and both hands.

A peak can be seen for left and right hands in each of the spectrums



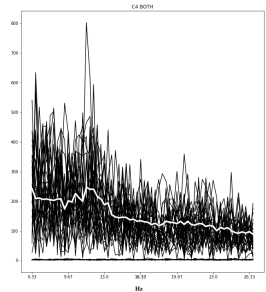
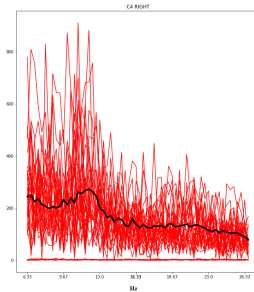
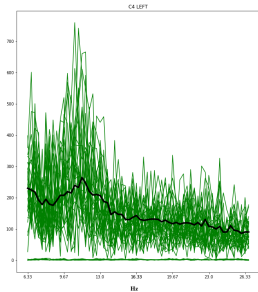
Signal view (2)

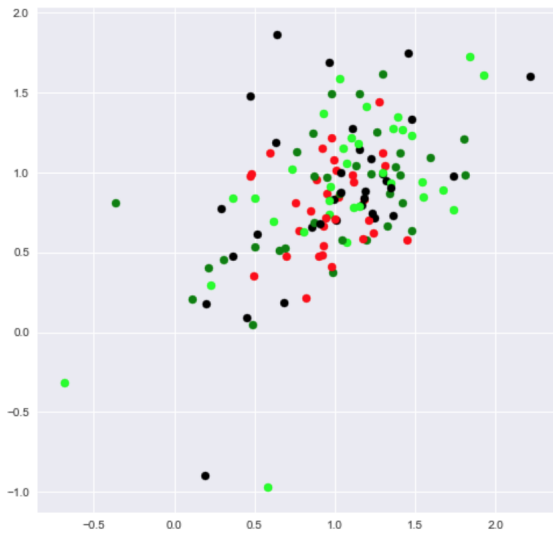
All events put together for C3



Signal view (3)

All events put together for C4





Metrics

Metrics for the **Imagined Movement** and **Error Potential** classifiers

IM classifier

Metric	Value
Accuracy	.6

ErrP classifier

Metric	Value
Accuracy	.87