

# Brain-Computer Interaction

BrainMedia group,  
Human Media Interaction,  
Faculty of EEMCS,  
University of Twente

Contact person:  
D. Oude Bos  
[d.oudebos@ewi.utwente.nl](mailto:d.oudebos@ewi.utwente.nl)

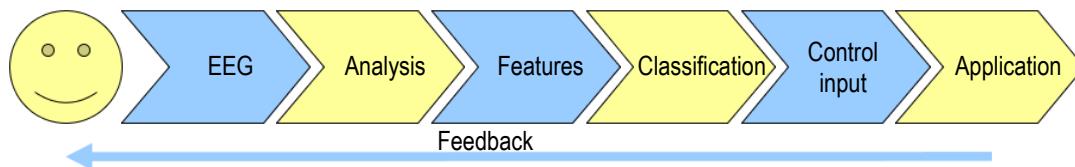


## What is BCI?

Human-Computer Interaction is the study of interaction between people and computers. Brain-Computer Interaction (BCI) is a specific subfield where the interaction does not take place via conventional input devices, but is the result of brain activity.

We record brain activity by EEG, using electrodes mounted in a cap such that they make contact with specific locations on the head. These electrodes register the voltage differences that are the result of brain activity. EEG is a popular method to use for healthy subjects as it is non-invasive, relatively cheap, and portable.

After analysis and classification of the data, the detected mental states are sent to a computer application, which can then execute the intended command or in some other way react to the brain activity of the user.



A lot of information that can be derived from recorded brain activity. Here are a couple of examples of mental input that is already being used at the moment in BCI applications (the numbers refer to the images on the right):

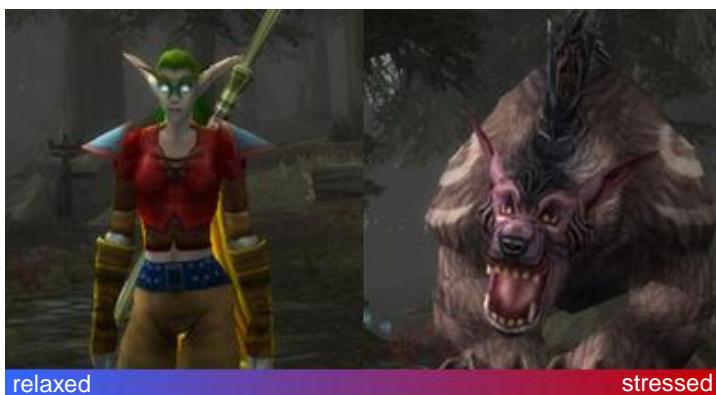
- **Imaginary and actual movement:** imagine you are moving your left hand (or right hand, foot, or tongue) [1&4]
- **Mental state:** relax [2]
- **P300:** pay attention to rarely occurring flashes [3]
- **SSVEP:** look at a flickering chequered flag [5]



## What is $\alpha$ WoW?

$\alpha$ WoW (alpha-World of Warcraft) is a demonstration of how you can control a character in the virtual environment of the popular videogame World of Warcraft, just by using your brain.

In the videogame you play a druid. You are very close to nature and can also make use of its magic. In your human form you are very capable of casting spells, but you are also more fragile. You can change into your bear form, which is naturally more suited for claw-to-claw combat. Each form requires a unique style of play.



The brain activity is analyzed for alpha activity, which is brain activity within a very specific frequency band (8-12Hz). Different frequency bands have been linked to specific mental states. Alpha activity is, for example, related to relaxation.

A short period of stress will trigger the bear form which is great for dealing with enemies in close-combat, while being relaxed will revert you to your human shape in which you can use your mind to cast useful spells.

## Try it Yourself!

Test your own mental skills at our demonstration right here. Just let us know you would like to try it out.

We will measure your head so that we can find a cap that fits and position it correctly. A little bit of conductive gel will be inserted in the electrode holes used, after which the electrodes themselves will be added. You will immediately start to play in the World of Warcraft environment. There is no training required. You can watch your stress level on the orange bar below the standard bars with your character portrait in the top left of the screen.



### Tips and tricks

As alpha activity is related to relaxation, try to relax to get the stress bar low enough to elicit your change into the elf form. Breath slowly, relax your muscles.

Getting the stress bar to increase deliberately seems to be a little bit more difficult. Starting a fight with one of the harmful creatures in the environment usually has a stress-increasing effect, but these things seem to differ from person to person.

Try out a few things for yourself to see what works best for you.