An innovative Neurofeedback for children with ADHD using Virtual Reality

Victor Delvigne[1,3], Thierry Dutoit[1], Laurence Ris[2], Hazem Wannous[3], Jean-Philippe Vandeborre[3]

[1]ISIA Lab, Faculty of Engineering, University of Mons, Belgium.
[2]Neuroscience Department, Faculty of Medicine and Pharmacy, University of Mons, Belgium.
[3]IMT Lille Douai, Villeneuve d'Ascq, France.

Context

Nowadays, ADHD is the most prevalent neurodevelopmental disordrer in childhood (around 5% in Europe). The diagnosis is based on questionnaire (DSM-V which presents controversial aspects). The main treatment is medication (methylphenidate intake), however other methods have also been considered and present encouraging results, e.g. behavioural treatments and **neurofeedback** [1].

Methods

Physiological Signal

Records in the virtual environment

- Electroencephalography (EEG).
- Physiological tests results (Sustained an Selective Attention Tasks).
- Gaze direction (HTC Vive Pro Eye).

Signal Analysis

Signals analysis to assess attention with two methodologies:

- State-of-art methods, e.g. bandwidths analyses, temporal pattern detections [2].
- Machine learning-based methods with differents architecture, e.g. convolutional or recurrent neural networks.

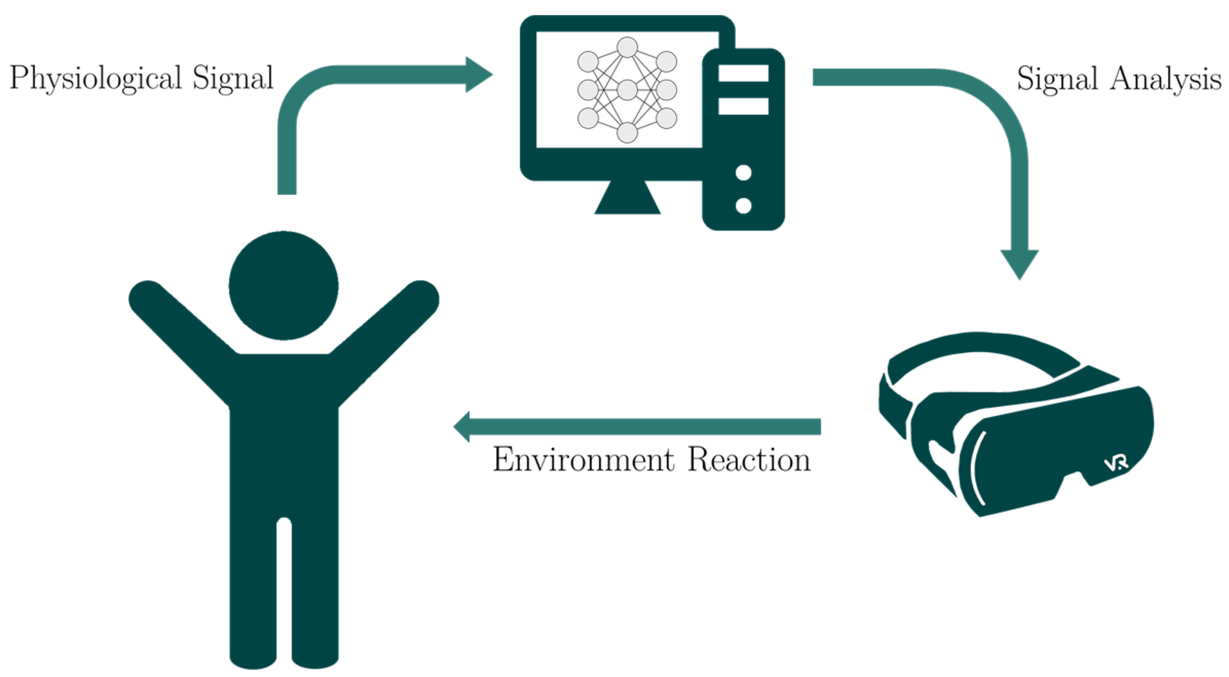

Figure 1:Overview of neurofeedback for children with ADHD

Environment Reaction

Environment modification in virtual reality in function of the attentional state. Stimuli vary with environments:

- Animals mooving in the forest
- Balloon flying in amusement park
- etc.

Timeline

Links

VR Envs: `http://bit.ly/HBPSC`

[1] F. Blume et al, *"NIRS-based neurofeedback training in a virtual reality classroom"*, Trials, vol 18, 2017.

[2] F. Lotte et al., *"A review of classification algorithms for EEG-based brain–computer interfaces: a 10 year update"* , J. Neural Eng., vol. 15, 2018.

victor.delvigne@umons.ac.be