Summary 2:

Using Brain-Computer Interface to control an avatar in a Virtual Reality Environment

Usage of VR environment can be a great way to provide patients with richer feedback on motor imagery training. A non-invasive BCI (brain computer interface) was implemented, extracting features out from pre-acquired signals to control a virtual avatar. Five mental imagination tasks, moving left and right hands, moving left and right feet, manipulating a Rubik cube with both hands, and instrumental music, were chosen as candidates to trigger the command of the avatar. In the study, 45 trials were used to train the classifier and 15 were used for validation. Each trial is 25 seconds long and consists of 5 seconds to fix attention, 10 seconds to conduce a specific mental task and 10 seconds to rest before the trial. Manipulation of the Rubik cube had the best results, with a success rate around 93.75% with 6.29% variation. This is used as input to trigger a key, making the avatar walk on a straight line in a rehabilitation room in the VR environment. This is followed by moving right hand, moving left hand, moving both feet, and instrumental music. Although this particular study was implemented using an offline model (signals processed are used later), using the motor imagery of the specific body area (specific limbs) with the appropriate VR scene, a online BCI model could be build to provide real-time specific feedback to patients in rehabilitation.

BibTeX:
@INPROCEEDINGS{6880960,
author={B. B. Longo and A. B. Benevides and J. Castillo and T. Bastos-Filho},
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abstract={The proposal of this research is to present the development of a tool that might be useful in rehabilitation, for subjects with disability, that suffer from some kind of limbs movement limitation. This tool carries a 3D Virtual Reality Environment (VRE), which emulates the movement of a healthy person, using the immersion of the subject through an avatar. To do so, and test its feasibility, pre acquired motor imagery signals were used to test the VRE as an off-line Brain Computer Interface (BCI) feedback. The subject's brain waves were captured by an Electroencephalography (EEG) equipment. For training the classifier, 45 trials, 25 seconds long, were used, and 15 trials for its validation. Five mental tasks were tested with the BCI, and the one with the best results (imagination of the manipulation of a cube) was used to move the avatar through a virtual room.},
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