Semester/Master project: Movement Distortion Out of the Focus Attention in Virtual Reality.

Main Objective:
Design an application in Virtual Reality (VR) according to a protocol already established to evaluate a Break in Embodiment (BIE).

Background:
Slater et al (Slater and Steed 2000) have introduced the concept of the "Breaks in Presence" (BIP) to denote a break of the feeling to "being there" leading to a poor VR. Different ways exist to evaluate this Presence, but they are all subjective measurements. Thus, we are looking for new methods to get objective measures. (Burns and Brooks 2006) have implemented a way to avoid any penetration of a virtual hand inside a virtual object in a VR environment and preserving this sense of presence thanks to a distortion of the user movement. Indeed, the hand when colliding an object, will stay tangent to the virtual object.

Project Idea:
The idea of this project is to analyze the user behavior when a system preventing interpenetrations is used on body parts that are out of the focus attention of the user. Indeed, we want to adjust the user posture to avoid interpenetrations with a virtual object. One key aspect of the study is that we want to study whether the user is sensitive to such adjustments when they are performed on body parts that are not currently within the focus of attention of the user. If such an adjustment elicits a BIE, it means we cannot distort the user movement without degrading the VR experience. Now, in order to measure this BIE in an objective way, (Padrao, et al. 2016) have managed to use EEG signal. Therefore, we will integrate this approach in our experiment to evaluate a BIE.
First, you have to take charge of the protocol already established and adjust it if needed with your assistant. Then, an application in VR will have to be implemented according to such a protocol. Finally, some pilots will have to be conducted to test the application.

For a Master project, on top of the pilots you will have to conduct a user study to assess the presence.

**Goal:**
- Implement an Application in VR for an experiment (record data).
- Adjust the protocol according the feedback from the pilots.
- Master project: Assess the presence through a user study.
- Provide a Notice to run the experiment

**Requirements:**
- Unity (scripting in C# DLL in C++)
- 3D geometry and quaternions (Vectors, cross products, rotations)
- Matlab/R (statistical tool).

**Information, materials and resource:**
Unity3D game engine: http://unity3d.com/learn

The Protocol established.

**References**

**Contact:**
Thibault.PORSSUT@epfl.ch , INJ 139
Ronan.BOULIC@epfl.ch , INJ 141