Semester project: Combine Two Finger Tracking Systems to Get a System Robust to Occlusion.

**Main Objective:**
Combine two different finger tracking systems in order to get a robust finger tracking system with a reduced number of cameras. Then evaluate this combination in terms of efficiency, embodiment and presence through a user study.

**Background:**
PhaseSpace system is an effective professional Mocap system. It’s an optical tracking system, meaning that it uses several cameras which get the signal emitted from LEDs. Thus, we can detect the position of these LEDs in the tracking space. This system is very flexible and allows us to track several objects as well as the entire body. However, this system, which is optical, has some occlusion issues. That’s why we need a certain number of LEDs and Cameras to reduce these risks but it’s not enough in some cases. ManusVR is a pair of glove with flexible sensors to track the finger rotation according only one axis and an IMU for the thumb. So the system will not have occlusion issues but the position of the fingers is obtained only indirectly.

**Project Idea:**
In our case, we have used an advanced machine learning method to track the fingers in order to deal with many occlusions in a robust way with the Phasespace technology. However, this system used fourteen cameras. This is way too high if we plan to export this technology out of the lab. So a way to reduce the number of camera while keeping the same robustness to occlusions and the same precision needs to be found. That is why the combination of the Phasespace technology and the Manus VR has been decided. The Manus VR allows to solve some issues when the Phasespace is be able to see the markers. First, you will find a nice way to fuse the data provided by the two systems. Then, you will have to evaluate the performance of this system and compare it with the configuration with fourteen cameras (without the Manus VR).
Goal:
- Combine different finger tracking system (ManusVR, Phasespace).
- Design a protocol to evaluate our current system and the new proposed approach.
- Master Project: Evaluate this combination in terms of efficiency, embodiment and presence through a user study.
- Provide a Unity plugin

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

Information, materials and resource:
* Unity3D game engine: http://unity3d.com/learn
* Phasespace active tracking system: [www.phasespace.com/](http://www.phasespace.com/)
* Machine learning: C. Bishop: *Neural Networks for Pattern Recognition*

*The project with our finger tracking system (Unity project and Notice) will be given*

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