Semester project: Mocap Calibration Tool for Virtual Reality (two Students).

Main Objective:
Develop a tool to increase the skeleton calibration quality and ease its process for the operator.

Background:
Motion capture (Mocap) is the technology, which allows us to track several body parts of a user in real-time. In our laboratory, we are working with two type of technologies:

- **PhaseSpace system**: is an effective professional Mocap system. It is an optical tracking system, e.g. the system uses several cameras, which get the signal emitted from LED. Thus, we can detect position and orientation of these LED in the tracking space.

- **Lighthouse system**: is an effective low cost tracking system. It is an optical tracking system, e.g. the system uses several emitters that send a laser signal received by photo sensors. Thus, these sensors send their position in the tracking space.

Project Idea:
In the laboratory, we are developing a calibration system working with the Lighthouse system and the Phasespace system. In order to have the best user experience possible, the calibration need to be excellent. To this end, a semi-automatic calibration need to be performed by an external operator. Thus, we want to develop a calibration tool. This tool will be used to select different points or lines around each joint of user in order to find the center of these joints. To this end, the best tool has to be chosen to measure precisely these information on the user. Then, the tool has to be calibrated in order to work with the two mocap technologies. Finally, the calibration process to compute the user joints center from the tool has to be implemented. Then, the results has to be compared with another method from orthopaedics to determinate these joint centers ; this alternate method is more tedious but known to be more precise and can be used as a ground truth.

Goal:
- Design the proper tool to identify/build the user’s joint centers.
- Implement a calibration process to enable the tool with the two technologies (Phasespace and Lighthouse).
- Implement the avatar calibration according to the orthopaedic method.
- A Unity plugins ready to use has to be produced.

Requirements:
- Unity (scripting in C#/DLL in C++)
- 3D geometry and quaternions (Vectors, cross products, rotations)

Information, materials and resource:

Unity3D game engine: http://unity3d.com/learn

Final IK: http://root-motion.com/

Vive Tracker Project Example: https://github.com/JamesBear/vive_ik_demo

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