Semester project: Assessment of an Augmented Reality Skeleton Calibration System.

Main Objective:

Evaluate our new calibration system based on the Augmented Reality technology and compare it with other calibration systems .

Background:

Meta 2 is an Augmented Reality (AR) headset made by Meta. It allows users to add some virtual information inside the real world around them. this is not possible with a Head Mounted Display (HMD) in Virtual Reality (VR) as it is not possible to see the real world. Ar and VR systems exploit different tracking solutions. The AR system use an Inside-out tracking with several cameras mounted on the headset while the VR systems use an Outside-in tracking with external cameras (or emitters). The complementarity of these two types of displays allows to develop new a new approach to address the problem of calibrating the virtual skeleton of a user immersed in a VR environment as detailed below.

Project Idea:

In the laboratory, we are developing a simplified human skeleton calibration system for our motion capture system. The user needs to be able to check in real-time if the calibration is sufficiently good and to be able to adjust it if necessary. Thus, a previous project has implemented a new calibration system based on the combination of the AR headset and the VR headset.

The subject to calibrate is immersed in a virtual world with an HMD while a second person, the experimenter, is using the AR headset to view both the virtual skeleton of the subject to calibrate superimposed to the subject in the real world. The experimenter has to tag the user joints with 3D virtual objects in order to compute the limb segment lengths of the user. Then these measures are used to adjust a 3D avatar to the subject measurements.

This tools needs to be evaluated before being used for an actual experiment. For this purpose, an assessment protocol has to be developed and conducted for some subjects of different body height and morphology.

Then, the results got from this evaluation needs to be compared with the performances of an alternate calibration system also previously developed in our lab. The two main criteria will

be the precision of the joint location, the time it takes to obtain the calibrated skeleton and the efforts each approach requires from either the subject or the experimenter.

Goal:

- Design a protocol and evaluate an AR+VR calibration system.
- Compare the AR+VR calibration system with another calibration system developed in the lab.

Requirements:

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

Information, materials and resource:

Untiy3D game engine: http://unity3d.com/learn
Meta: The material will be given
Final IK: http://root-motion.com/
The project of our new calibration system (Unity project and Notice) will be given

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