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Integration of Motion Capture into 3D Animation Workflows

Introduction
Motion Capture (MoCap) is a technique for gathering data of the movements of the human body. With the intention of using this information to drive the movements of 3D models in computer generated animation, MoCap offers significant advantages for producing natural and believable movement in 3D animation and opens up the possibility of bringing to ear acting and live direction to the animation process.

Some major Animation studios expect an output from their animators of around 1-2 seconds of footage per day. So any enhancements to the efficiency of this work are welcomed. At the glance MoCap technology looks like a brilliant way of automating the labour intensive and very highly skilled process of manually animating 3D characters. However it is worthwhile to think that MoCap can replace animators with actors.

In Practice
In practice, we required three people-the actor and a minimum of two people to tend the kit and operate the software. Setting up the kit took time and a certain amount of understanding of how it is supposed to work. The sensors need to be in the right location and well settled before calibrating the suit.

The MoCap software provided the makers of the suit gives live feedback of the data readings. The data from the sensors are transmitted wirelessly and represented on screen as a standard animation skeleton. Calibration involves the actor taking up pre-determined postures and performing controlled pre-determined gestures. This allows the software to calculate the relative positions and relative rotations of the sensors. The sensor information is manually inputting to simulate the physical dimensions of the actor. In the first sessions this process took several hours, but with practice we gained an intuition for how the software calibrating and the process could be completed in a few minutes.

The animation process meant that we had to plan the capture session quite carefully. In a process that is quite similar to a simplified film shoot. We produced lots of movements that were needed to tell our story. The source was set up using priorised props to match the movements of the actor with the content of the story. We also had to be aware of the lay of the land and ground plan of the scene so that the actor’s movements in real space match the architecture of the 3D model set.

The degree of freedom offered by the Xsens MoCap suit allowed a lot of latitude for improvisation in the use of space. E.g. we used the underside of stairwell to simulate the character climbing upside down along a girder.

The data gathered of these acting sessions is remarkably sensitive, seeing the representation of the movements on the skeleton reveals how subtle our movements are and how hard it is even when we are at rest are small rotations of the joints. It is this subtlety of movement that gives the unconscious sense of believability that is missing from much computer animation.

The Clean Up
The data in raw form contains errors of various types.
- There are spikes in the motion curves caused by radio frequency interference
- Enormous static rotations caused by the sensors slipping out of position after the calibration
- Fluctuations in the motion paths, caused by signal interference
- Interpolation errors, caused by inappropriate interpolation of data by the MoCap software in instrumental instances of signal failure.

Many of these errors are just a few frames in length and can be fixed quite simply deleting to data held on the problematic frames and creating an appropriate interpolation between the good data the surrounding it. This is a painstaking and labour intensive process. Longer errors not worthwhile repairing as it is less work to retake the shot or manually animate later on in the process.

The MoCap data is restructured onto a control rig which is standard forward kinematic and inverse kinematic rig in Motion Builder software. This means the rotations and translations are applied to the rig. Thus applied, the errors in the data are more easily read and corrected. This is an industry standard animation control rig for driving 3D characters. The rig is often applied over multiple bones of the body including fingers, jaw, axes etc. The MoCap data drives motion of the parts of the animation rig that has data for and leaves the rest unchanged. These will be animated manually later.

The animation control rig then has a 3D character model applied to it. The model is moved by the rig and the rig is used in animation software to drive and adjust the final movements of the designed characters.