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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 bear the acting and live direction in 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 trivial 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.

Our group set out to test and evaluate this technology on a live CG animation project and discover how it can actually contribute to the animation production workflow. The project is called “Teleram” and it is a short animation produced entirely by MoCap. It is a hinting reeling of the myth of Icarus.

Types of Motion Capture

There are several methods of motion capture. There are optical methods, such as Vicon, where white spots are applied to the body at the joints. Their movement across the visual planes of a camera are tracked and analyzed computationally in order to define a motion path for each joint in 3D space. This is widely used in the industry, but has the significant disadvantages of producing noisy data and being limited to movements that take place with the frame of a static camera or set of static cameras.

There are mechanical methods that are attached to the body and measure the rotation of the joints. This is a fairly accurate method of data capture but has the unfortunate effect of influencing the actual movements of the actor who wears it. The method we used is based on the Xsens motion capture suit which uses inertial sensors attached to the body. This method avoids the major problem of the other methods. It is relatively unobtrusive to the actor movement allowing a large range of movement both in the frontal plane and the large scale up to a radius of 150 metres. The disadvantages are the sensors which are subject to electromagnetic interference and absorption. So the data produced is affected by interference and noise. Also physical disturbance of the sensors causes errors in the data. e.g. if they are knocked out of position in vigorous actions. These problems aside the Motion Capture suit method appears to offer the most flexible system for acquiring natural movement.

The limitations of the MoCap suit are that it records only the limbs and some movements, there is no data for finger movement or facial movement. The Xsens suit does not log any information in the vertical dimension relative to the ground. This is widely used in the industry, but has the significant disadvantages of producing noisy data and being limited to movements that take place with the frame of a static camera or set of static cameras.

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 suit took time and a certain amount of understanding of how it is supposed to work. The sensors need to be in the right locations and well fitted 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 is transmitted wirelessly and represented on screen as a standard animation skeleton. Calibration involves the actor taking up predetermined poses and performing controlled predetermined gestures. This allows the software to calculate the relative positions and relative rotation of the sensors. This is further constrained by manually inputting 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 filmed film shoot. We produced a lot of movements that were needed to tell our story. The source was set up using predefined props to match the intimate movements dictated by the contents of the story. We also had to be aware of the layout and ground planes 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 stairwells 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 continuous they are even when we are at rest there are small rotations of the joints. It’s use with the 3D computer animation process liberates a lot of animator’s attention and time from tedious frame by frame animation rigging. The product of the Motion Capture data processing is a partially driven character rig, which gives a base animation that is free and for the intent of the creative story. This is a significant aid in accelerating the process of 3D CG animation.

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