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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 into 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 robots.

Our group set out to test and evaluate this technology on a live CG animation project and discover how it actually contributes to the animation production workflow. The project is called “Telenoid” and it is a short animation produced entirely CG. It is a haptic-relating of the myth of Icarus.

Types of Motion Capture

There are several methods of motion capture.

There are optical methods, such as stroboscopic, 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 within the frame of a static camera or set of static cameras.

There are mechanical systems which use inertial sensors or electromechanical transducers to capture the movements of the body. They also have the drawback that the data is collected and analyzed after the capture, requiring long post production. The sensors used on the MoCap suit are embedded in a three person team.

The method we used is based on the MoCap suit which uses inertial sensors attached to the body. This method avoids the major problem of the other methods. It is a relatively unobtrusive to the actor movement allowing a free range of movement at both the close range of the body and the large scale up to a radius of 150 metres. The disadvantages are the sensors need to be recalibrated for electromagnetic interference, and absorption. So the data produced is affected by unexpected local noise. Also, the degree of freedom offered by the MoCap suit is that it records only the limbs and some movements, there is no data for finger movement or facial movement. The MoCap suit does not log any information in the vertical dimension relative to the ground. This must be applied manually afterwards.

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 seated 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 screens 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 rotations of the sensors. This is further constrained by manually inputting the physical dimensions of the skeleton. The sensors were set up using predetermined props to match the movements of virtual animation in the scene. We also had to be aware of the layout and ground plans of the scene so that the actor movement in real space match the architecture of the 2D model sets.

The degree of freedom offered by the MoCap suit allowed a lot of latitude for improvisation in the use of space. The MoCap suit is also being used in various other contexts such as medical analysis of pathological movements caused by injury or deformity. Also for ergonomic simulations of human behaviour.

The MoCap suit is a technology that necessarily cross-disciplinary. Film direction methods and acting techniques are brought to bear and the MoCap suit is extended into capturing facial movements and hand movements. As well as other kinds of movement, perhaps finest extracted from video data. However it is debatable as whether brilliant accuracy is required for animation purposes.

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CG animation is an enform that allows the visualization simulation of impossible things. What 3D animation requires of this technology is a reference basis to work from, elaborate upon, enhance and extend from.

It’s use with the 3D computer animation process allows to a lot an animator’s attention and time and tedious task by freeing attention on the whole figure and enables a focus on the communicative gestures.

Conclusion

With a small amount of experience and practice it is possible to produce very good quality motion capture data from the Xsense motion capture sensor.

The product of the Motion Capture data processing is a partially driven character rig, which gives a base animation that is refitted with the personality of the character. The MoCap data is retargeted 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. This rig offers control over every part of the body including fingers, jaw, eyes etc. The MoCap data drives to movement 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 2D 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.

References:

- Dr Eryl Unver, Dan Hughes, Bernard Walker, Ryan Blackduin, and Lin Chen. 3D Digital Design and Spatial Design, School of Art Design and Architecture, University of Huddersfield.