

MOTION CAPTURE FOR VIRTUAL REALITY TEACHING AND LEARNING ENVIRONMENTS

Motion capture is an efficient way to create complex human character animation for virtual reality teaching and learning environments. A twenty year old technology, motion capture – or mocap for short – is commonly used in computer game and movie production. A lengthy discussion of the history and state-of-the art of motion capture can be found on Wikipedia.

Mocap systems for motion picture production often run to millions of dollars. Systems for industrial applications are commonly hundreds of thousands of dollars. Now a relatively inexpensive mocap technology has emerged called Inertial Motion Capture. From the Wikipedia article:

“Inertial Motion Capture technology is based on miniature inertial sensors, biomechanical models and sensor fusion algorithms. The motion data of the inertial sensors (inertial guidance system) is often transmitted wirelessly to a computer, where the motion is recorded or viewed. Most inertial systems use inertial measurement units (IMUs) containing a combination of gyroscope, magnetometer, and accelerometer, to measure rotational rates. These rotations are translated to a skeleton in the software. Much like optical markers, the more IMU sensors the more natural the data[...] The popularity of inertial systems is rising amongst independent game developers, mainly because of the quick and easy set up resulting in a fast pipeline. A range of suits are now available from various manufacturers and base prices range from \$5,000 to \$80,000 USD.”

Cell phones today have inertial sensors virtually identical to those in mocap systems. Rotate your phone and a sensor detects speed and direction while the phone’s screen image rotates to match. Games sometimes use inertial sensors requiring players to shake, bump, and swing their phones. Inertial sensors are tiny and weigh practically nothing. With an array of these sensors strapped to legs, arms, torso, and head, we have an inertial motion capture system for a few thousand dollars or less.

Inertial motion capture rigs and harnesses are typically worn over casual street clothes like tee shirts and jeans. Movement is captured wirelessly and sent to a computer where mocap software accumulates 3D translation and rotation data for each sensor sixty to ninety times per second. This data gets married to a computer graphic character using specialized 3D animation software causing the character to move just like the person wearing the mocap rig. If you’re a movie fan then you’ve seen this many times in recent years. These days 3D modeling and animation of life-like people and animals can be so convincing it’s difficult to tell it’s CGI and mocap.

Inexpensive mocap technology is a boon to developers of virtual reality teaching and learning environments. With standard 3D models of generalized humans young and old, technical artists can create mocap animation of just about any medical procedure or technique imaginable. Visitors to a virtual reality NICU, for example, can freely move about the scene observing procedures and situations from any angle or perspective, even from otherwise impossible positions above or below the action. Bear in mind VR productions with convincing human animation require careful planning to make the most of limited budgets, despite relatively low-cost inertial motion capture technologies.

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<http://www.wilcoxmedia.com>

Motion Capture – Wikipedia

https://en.wikipedia.org/wiki/Motion_capture