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# Motion capture

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Motion capture systems have mostly been developed to record the movements performed by human beings. The main use of these systems is in computer animation, for the creation of animated characters in video games or in movies, but these systems are used too for therapeutic purposes or for professional sportsmen/women.

The measure of the movement is generally performed thanks to sensors that are fixed on the body of the performer, or thanks to markers, which position in space in easily discriminated from environment by the sensing system. Position and orientation of each of the sensors is sampled over time, and can be obtained in a three-dimensional space immediately after the measure, or after post-processing.

The measures obtained can feed computer models for the generation of the movement of a synthesized character. However motion capture data are seldom used directly. Most of the time they are processed to recover the postural state of the underlying skeleton. Errors can be introduced due to the deformation of soft tissues between the markers and the skeleton bones [Menache, 1999].

Various technologies are used for motion capture.

**Optical systems.**

Optical systems are largely used in motion capture applications. They exploit infrared camera with either passive reflective markers, or active LED markers. Nowadays most professional systems for the analysis of human movement are optical systems with passive markers. Systems with active markers are more recent and tend to be more and more adopted.

**Magnetic systems.**

This solution is similar to optical systems, but the sensors are sensitive to magnetic information instead of light information. The main advantage of this solution compared to optical systems is that the capture of movements is still possible even if one marker is visually occulted from the sensor by a part of the actor's body or by another actor. However, this solution is not as widely used in motion capture as the two first ones.

**Exoskeletons.**

The actor is equipped with a light exoskeleton attached to its body and that will follow its movements. Most of the time, sensors fixed on the exoskeleton directly record the angles of the articulations. Data processing allows for the reconstruction of the position of the limbs of the actor from the angles measured.

**Video-based systems.**

The movement of the actor is extracted from the analysis of the image and is performed by a computer either after performance, or in real-time during performance. This solution is costly in terms of computational resources especially for real-time applications, but allows avoiding the use of markers on the actor, and can lead to several other uses (for example shape recognition). This technology is also widely used by people working especially on the animation or motion of human faces. The expression motion tracking is mostly used in the field of computer vision, where the video stream from one or more video cameras is the input data. In this context many alternate input data types are exploited to obtain a higher precision and/or performance [Moeslund and Granum, 2001].

Other systems have been developed for very specific uses (thus very limited), but which cost is limited as compared as the technologies cited above. During some time, it had been possible to buy puppets representing faces of the character to animate, equipped with a small control panel connected to a computer, which is providing control on the face's motion. The user can directly manipulate the puppet, which, combined with pre-programmed reactions of the puppet, will create a realistic animation. For example, if the user moves the mouth of the puppet, the computer will make moving the eyes and the cheeks of the puppet, thus providing a realistic facial movements and expressions. This kind of motion capture system seems no longer to be commercially available currently.

## References

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