Real Time Virtual Interface For Walking on CAVE

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Abstract

This paper presents a detailed description of the process of foot motion capture, whereby sensor information from a performer is transformed into a hands-free navigation in the virtual environment. We believe that hands-free navigation, unlike the majority of navigation techniques based on foot motions, has greatest potential for maximizing the interactivity of virtual environments since navigation modes are more direct for the feet. This outline process involves a robust statistical estimation of the size of the skeleton and desired joint angle trajectories.

1 Proposed Method

We describe the process whereby sensors information transformed motion movements from the legs of the human body. Our emphasis is on the data collection and processing that goes into determining the sensors position and Motion capture in order to find the suitable and accurate process for the generation of human motion and movement. This process is popular for the generation of human animation.

Human motion capture techniques were categorized according to the intended degree of abstraction imposed between the human actor and the virtual counterpart. Highly abstracted application of motion capture data analogous to puppetry, are primarily concerned with motion character, and only secondarily concerned with fidelity or accuracy. Human motion depends on limiting the degree of abstraction to a feasible minimum.

2 Primarily Data

Mainly we used Motion Capture System for identifying the sensors position and location. Our typical capture configuration relies primarily on the lower legs, for each of these, six DOF's before they were captured. These body segments were chosen for the degree to which they define the position and posture on the body and for their comparative advantages as anchor points for the sensors. We realize that lower legs provide superior surfaces for immobilizing sensors relative to the skeleton. For the lower legs, the flat surface of the tibia just before the patella is used.

3 Sensors placement and Data Transformation

Calibration constants were found by placing the sensors into known poses of the foot such as figure 1. The most convenient poses were pure bends and pure twists. Poses should cover both polarities of bend and of twist, and it was best in general to include more than one magnitude of each pose. The result was a matrix of calibration constants for each sensor position, with a gain change in voltage and the change in curvature for each quadrant.

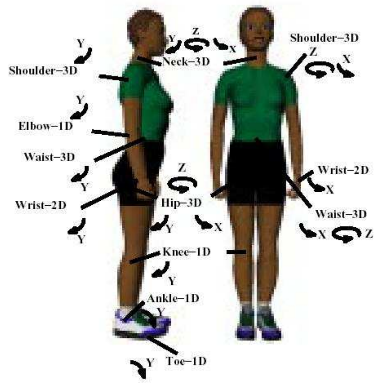

Figure 1: The direction of the arrows indicates the positive direction of rotation for each degree of freedom.

The calibration constants resulting from the characterization step were used in real time to calculate bend and twist from incoming raw sensor voltages. Shape signals were linear with curvature, so the equations were of the form:

A) Bend = B1*v1 + B2*v2

B) Twist = T1*v1 + T2*v2

where Bs and Ts were bend and twist calibration constants respectively, and v1 and v2 were voltages from top and bottom members of a pair of sensors on the tape, relative to their voltages.

4 Conclusions

Since the design of this new interface is based on the foot position, motion and measurement, these techniques using Motion Capture system only can give us the position and Orientation of the foot for X, Y, Z, position and not for the direction position and motion of the foot, these techniques are shown to be simple and sufficiently accurate without disturbing the visual interaction keeping freedom for the user.

References

[1] S. Barrera, H. Takahashi, M. Nakajima, A new Interface for the Virtual World Foot Motion Sensing Input Device, Conference Abstracts and Applications, SIGGRAPH 2002 Computer Graphics Annual Conference Series, San Antonio: 141.