WHAT IS REQUIRED FOR EFFECTIVE HUMAN FIGURE ANIMATION?

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ABSTRACT

Computer graphics has not yet delivered fully convincing animations of the human figure. When we are able to do so many wonderful things with graphics, why has this particular problem been relatively elusive? The answer has several facets, including:

* The weakness of existing three-dimensional modeling schemes to give a convincing human form.
* The physical variability and joint limitations of the human form.
* The difficulty in describing human figure positions.
* The lack of computational models to create "proper" motions for the figure.

We will examine each of these issues in turn, showing possible solutions based on research at the University of Pennsylvania and elsewhere.

Perhaps the single most important reason to investigate methods of human motion synthesis is that we can use graphics to verify that a representation is adequate to describe motion phenomena. Often a motion representation is selected by convenience rather than careful study. Such representations may exhibit notable failings when they are asked to reconstruct (draw, animate, describe, control) what they purport to represent. Research in computer graphics, robotics, and expert systems is now confronting these representation questions directly by requiring the understanding and implementation of the semantics underlying a motion representation system. Our representations can no longer be just instruments of convenience; rather they must be rich enough to simulate a reasonable slice of reality.

A system called TEMPUS is outlined which is being developed to simulate graphically the task-oriented activities of several human agents in a three-dimensional environment. TEMPUS allows a user to interactively:

* Create one or more human figures which are correctly scaled according to a specific population, or which meet certain size constraints.
* View the human figure in any of several graphical modes: stick figure, line or shaded polygons, or shaded BUBBLEPERSON.
* Position the figure in any admissible position within joint angle constraints, and with the assistance of a robotics reach positioning algorithm for limbs.
* Combine the figures with three-dimensional polyhedral objects derived from an existing CAD system.
* Create shaded graphics images of bodies in such environments.
* Use all TEMPUS features in an extensible and uniform user-friendly interactive system which does not require any explicit programming knowledge.

Other features of TEMPUS and differences between TEMPUS and other available body modeling systems are also discussed.

KEYWORDS: Motion understanding, motion representation, human figure animation.