THE *5th DIMENSION* ANIMATION SYSTEM

Nadia Magnenat Thalmann
University of Geneva
Geneva, Switzerland

Daniel Thalmann
Computer Graphics Lab
Swiss Federal Institute of Technology
Lausanne, Switzerland

The 5th Dimension Project is a large research project in three-dimensional animation and visualization. The main objective of the project is the animation of synthetic actors in their environment, which involves a number of related areas of computer animation and scientific visualization. In particular, the following applications are being developed:

- animation of articulated bodies based on mechanical laws
- vision-based behavioral animation
- hair rendering and animation
- object grasping
- facial animation
- personification in walking models
- synchronization in task-level animation
- deformation of flexible and elastic objects
- cloth animation with detection of collision

To coordinate efforts and allow good communication between the various applications, a toolkit of high-level dynamic graphical classes, both two and three dimensional, has been constructed. This toolkit, called the *5th Dimension Toolkit* uses a uniformly object-oriented design for all its data structures, resulting in a high degree of integration between various applications.

The *5th dimension* animation system is intended to offer to the animator a full 3-D interaction including the possibility to enter into the virtual world and to communicate with synthetic actors. The hardware used is composed of 21 Silicon Graphics IRIS workstations including three Powervision (VGX). Most *5th Dimension* applications take advantage of visual 3-D interfaces using the various 3-D devices available in our laboratories: two datagloves, several SpaceBalls, an EyePhone, a 3-D Polhemus digitizer, a living video digitizer, a StereoView station and a synthesizer keyboard controlled by a NeXT Cube workstation.

In the current version, 6 applications provide a user interface based on 3-D devices:

- the sculpting program SURFMAN
- the Muscle and Expression editor in the SMILE Facial Animation system
- the cloth design software
- the hand gesture recording system GESTURE LAB
- the program to create 3-D paths for cameras, objects and light sources
- a communication program animator-actor (in development)

The first three programs, are mainly based on the ball and mouse metaphor described in the next Section. SURFMAN may also take advantage of StereoView and the 3-D Polhemus digitizer. Hand gestures are recorded using the DataGlove and 3-D paths are mainly generated using the SpaceBall. We are developing a way of creating camera paths based on the EyePhone. The communication program animator-actor uses the Living Video Digitizer to capture the animator face.

Other applications in the *5th Dimension* system are only based on mouse interaction. They include:

- an interactive system to design individual walking
- the BODY-MOVING human keyframe animation system
- a hair modeling and rendering program

Slides

1. Hand animation, frame from the film *IAD* by R.Laperrière, N.M. and D.Thalmann, University of Geneva and Swiss federal Institute of Technology

2. Cloth animation, frame from the film *Flashback*, by B.Lafleur, N.M. and D.Thalmann University of Geneva and Swiss federal Institute of Technology

3. Frame from the film Still Walking by A.Paouri, R.Boulic, N.M. and D.Thalmann University of Geneva and Swiss federal Institute of Technology

4. Hair rendering by A.LeBlanc, A.Paouri, N.M. and D.Thalmann University of Geneva and Swiss federal Institute of Technology