Christian Jacquemin (fr)
LIMSI-CNRS and University Paris 11
Professor
Christian.Jacquemin@limsi.fr

Benjamin Lee Martin (fr)
Artist
benjiart@gmail.com

Interactive Animation of a Large Scale Crowd for Art Installations: the Case of Humanography

The animation of large crowds is very appealing for interactive digital art because it offers a realistic representation of a public space through its social and affective life. We present an architecture for a sprite-based rendering of a crowd of silhouettes and its external control through behavior scripts. This architecture is illustrated on an installation of Benjamin Lee Martin called Humanography that depicts a collection of humans in their every-day environment performing easy-to-identify activities. Humanography is an interactive art installation that shows a world where everything has become transparent, everything but humans. We humans are the only visual markers in an invisible world, our world, earth. [Fig 1]

Fig. 1: Humanography artwork by Benjamin Lee Martin, overview of the animated crowd

Humans are accomplishing routines related to ordinary life such as walk, sit, run, work on a computer, or dance. If an animation is interrupted to be followed on by another one, an intermediary animation is triggered to allow for smooth transitions. A global parameterization of the installation is possible according to external events such as human control, measures of the ambient data, or remote data transmitted through the network. These parameters control how long humans stay in a loop in average, they control the distribution of humans on their activities, the speed of the loops, and the distribution of male and female avatars.

Humanography raises issues in digital art that are related to the complexity of animating a large number of virtual avatars with a high frame rate and soft animations. These issues concern rendering, animation, and control.

Fig. 2: Texture of predefined pauses used in sprite-based animation

Rendering

When dealing with complex structures (complex geometries with complex dynamics and physics) such as smoke, clouds, or fire, computer graphics calls for image-based rendering. It consists in replacing the rendering of a 3D model by an image obtained by an off-line rendering of the 3D model in a similar position or by the camera capture of a real object. In Humanography we use as images, silhouette renderings of Poser generated 3D models of humans. These images are stored on large textures, in which each RGBA channel carries a set of pauses (silhouettes are black and white). The silhouettes are rendered by Virtual Choreographer on so-called sprites: rectangles textured by these silhouettes and always facing the camera whatever its position inside the crowd. [Fig 2]

Animation

When dealing with complex animations such as the human body, computer graphics uses motion capture. The problem with motion capture is that it is restricted to the reproduction of the gestures that have been recorded. To alleviate this problem, animation in Humanography is based on loops that

repeat a sequence of gestures until another sequence of gestures is likely to happen. Through intermediary animations the avatar performs a continuous animation between the two different loops. Each animation is based on the motion of a naked Poser 3D model based on keyframes obtained from motion capture. Only the silhouette of each video frame is used and stored in large textures of frames.

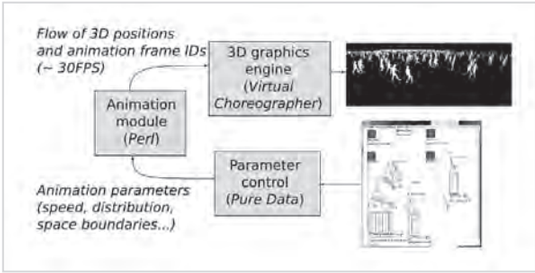

Fig. 3: Architecture for interactive graphic rendering

Control

Animation parameters (duration, distribution of the animations among the avatars, speed of animation...) are used by an external animation module in Perl to control the loops of the avatars and their displacements on the virtual floor. The animation module ships the data for the animation of the avatar through the network. It receives parameter values from a control program in Pure Data that can link the parameter values to any source of information such as the visual analysis of a real crowd, temperature, wind, light, manual control, music analysis. [Fig 3]

References

- Barczak, J. , Tatarchuk, N., and Oat, C. (2008): GPU-based scene management for rendering large crowds. In ACM SIGGRAPH Asia Sketches.
- Dobbyn, S., Hamill, J., O'Conor, K., and O'Sullivan, C. (2005): Geopostors: a real-time geometry/impostor crowd rendering system. In Proc. SI3D '05.
- Martin, B. L. (2009): Humanography. [Benjamin Lee Martin Website. Retrieved from: http://humanography.com/]
- Galvao, R, Laycock, R., and Day, A. (2010): Dynamic Animation of Large Crowds. In Proc. CASA 2010.