Forming the Dots: Live Optical Motion Capture Animation Dance

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Abstract

Bob's Palace is a multi-media dance piece for nine dancers, one video operator, two camera technicians, one motion capture animation artist/designer and one composer/musician. The subject matter of the dance revolves around panic, anxiety and everyday fears. It premiered at the Krannert Center for the Performing Arts, Urbana, Illinois, on February 4th, 2003.

The system used in *Bob's Palace* starts with a ten digital camera visible red optical motion capture (mocap) system manufactured by Motion Analysis Corporation of Santa Rosa, California (http://www.motionanalysis.com). The camera array is connected to 48 volt DC power and sends capture data to the central computer over a gigabit TCP/IP network switch. This combined (and hopefully stable) dataset is sent over a second gigabit network to a second pc with enhanced memory (1GB) and workstation-class graphics capabilities (3D Labs Wildcat 4210 graphics engine) running a commercial real-time animation program, Filmbox (www.kaydara.com). The high resolution progressive scan computer graphics output from the Filmbox computer is then sent into a Sony DSC-1024HD scan converter which outputs NTSC video compatible with the rest of the system's video capabilities.



We started to work on this project during the summer of 2002 when The Beckman Institute's Integrated Systems Laboratory was looking for a dancer to help set up their new infrared motion capture lab. The first step in this process was to start experimenting with various marker settings. Reflective markers are set on the body so that they can be recognized as triangles by the motion capture software, which then communicates with the animation software that attaches an animated figure (avatar) to the various geometric shapes. Once the marker settings were stable, we started designing various avatars. It is presently very difficult for a moving avatar to look lifelike in real time. In the movie industry, most imperfections are usually corrected during post production. Designing the body involves creating a virtual skeleton. This skeleton does not respond to dance movement in subtle ways. Contractions or undulations of the spine became lost



on the avatar, as did stretched knees. It was often difficult for us to link the two bodies together in a way that was acceptable to a dancer or choreographer. But in trying to do so, Lance came up with our beloved "distorted" avatars. Even at its most consistent, the system portrayed an inherent instability. This suggested a sense of fear or panic to the choreographer. Luc started to design the movement in relationship to the various avatars.

The multi-dimensionality of the project permits all aspects of art and technology to come together and shares the various areas of expertise of the staff at the Beckman Institute, Krannert Center for the Performing Arts, and the Dance Department that would not have been available in the past: costumes, flooring for dance, understanding the body in movement, etc. In the future, a performance designed optical retroreflective motion sensing system or possibly even a camera-based vision recognition system (not needing markers) might be more readily available to the dance world. Until that time, collaboration is the only way.

