Fusing Movement, Sound, and Video in *Falling Up*, an Interactive Dance/Theatre Production

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ABSTRACT
Falling Up is an evening-length performance incorporating dance and theatre with movement-controlled audio/video playback and processing. The solo show is a collaboration between Cindy Cummings (performance) and Todd Winkler (sound, video), first performed at the Dublin Fringe Festival, 2001. Each thematic section of the work shows a different type of interactive relationship between movement, video and sound. This demonstration explains the various technical configurations and aesthetic thinking behind aspects of the work.

KEYWORDS
Dance, Video processing, Movement sensor, VNS, Very Nervous System

INTRODUCTION
Falling Up explores themes of gravity, flying and many related metaphors. Inspired by inventors and pioneers, such as the first pilots, astronauts and digital explorers, we examine moments in the 20th Century where technology enabled us to achieve something previously impossible and changed how we think forever. We also speculate on future technologies, enabling the body to be transported, modified and projected.

These concepts are illustrated through a new kinesthetic vocabulary refined and inspired by live video and sound processing. The choreography is enhanced through use of the Very Nervous System (VNS), a device designed by artist David Rokeby, which uses a video camera to report the on-stage location and speed of the performer to a computer [1]. Movements are identified and mapped in software to play and process sounds, or to alter the performer's own video image using real-time video processing software (NATO). The performer's movements are, in turn, influenced by the resulting sounds and images. A video monitor, set on stage facing the dancer, serves as a mirror, allowing her to respond to her own processed image. The choreography is somewhat open, so that the distorted and delayed video images are as much a suggestion for new types of movement, as the movement is for creating abstracted projections.

This tightly coordinated relationship between movement, sound, and image are used to illustrate different thematic sections of the work. These ideas are further developed through the use of video clips taken from historical film footage and science fiction films. As it turns out, some of the early attempts at flight were just as imaginative--and unbelievable--as many of the far-fetched ideas found in science fiction films. Some of the themes explored in the work include: the first attempts at flight, travelling to the moon, space walk, stunt flying, time travel, black holes, and anti-gravity.

TECHNICAL DETAILS
VNS tracks the performer's movements across the stage. VNS is a SCSI device running on an Apple G4 computer (a newer version, softVNS, runs without specialized hardware). A stationary, black and white video camera is used to send the image of the stage to the computer. VNS detects changes in the image by comparing adjacent frames, running at 30 fps. VNS software, which shows up as an object in the Max programming language, is used to define various regions within the video image as "active," reporting presence and speed for each area. The configuration for "Falling Up" changes during the performance and may include a 4 x 4 grid to precisely identify 16 active regions, or a 1 x 1 grid to look at activity changes over the entire stage.

The live video processing requires a camera operator to follow the performer, with the video feed going to the computer. The processing uses NATO software (a collection of video processing objects running within Max). The processes may be static or contain parameters that may be controlled by movement-analysis data or automated by the computer. The computer is configured with three video cards. One is for the computer monitor to control various aspects of the performance, and two are used as separate video projections: one on a large black screen, and the other on a smaller white screen. The black screen shows no edges, and is used for space walk and futuristic sections where the body appears to be floating in space. This video feed is also split and sent to the front of the stage for the performer. For NIME, we will demonstrate these techniques using one screen.

Sound processing and playback is controlled primarily by Max/MSP, which is used for movement-controlled sample playback and processing, as well as, to play back short speeches and automated musical elements. Algorithmic processes create infinite variations that contain specific parameters open to influence by movement data. Specific locations on stage may be used to start or stop various musical functions, trigger specific sounds or cue video events. Continuous data, representing speed, is used in the audio realm for such things as timbre shaping via filters, sample playback speed or delay. In the video realm, continuous data may be applied to image offset, color, luminance, or distortion.

EXAMPLES OF RELATIONSHIPS BETWEEN MOVEMENT, SOUND AND VIDEO

"Nine Screen" is a section of the work about time travel. The live performance is projected as a composite image made up of nine video panels, each delayed differently in time. The movement is designed to show relationships and patterns among the nine different versions, in a 3x3 configuration projected on screen. Specific audio samples are triggered by location, while speed alters parameters of pitch shifting and flanging. Texts describing concepts of time travel, plus percussive sounds with corresponding delays, are heard.

In "Pod" the performer appears, on screen, as an abstract pupa, hanging and swinging from the inside of a faint circle. The low humming sound of a spacecraft is heard in the background. General speed and activity are used to trigger a collection of insect sounds that are further transformed and processed. A distorted human figure finally emerges from the pupa, and does a triumphant dance, only to get sucked down into the center of a "black hole," an effect caused by the flat video image being wrapped inside a three-dimensional cone.

In "Flying Cube," a warped image of the dancer appears inside and outside of a three-dimensional cube, spinning and floating through space. The orientation and position in space of the cube is carefully choreographed. The segment finally ends with the dancer trapped inside the cube, and shoots off into space, only to return with a trapped video loop of the Wright brothers first filmed flight. The images are accompanied by very low rumbling sounds and high ethereal sounds. These sounds continuously change using several filters, in response to the dancer's speed and proximity to the sensing camera. This section takes advantage of the 3-D features of Open GL on the Macintosh system, using NATO's Open GL objects.

"Stunt Flight" uses a visual score of actual stunt-flight choreography as the starting point for the dance. VNS causes the performer to "fly" up on screen with faster movements, while a loud engine-like sound dips and dives, with audio processing simulating Doppler effect and engine thrust. The distorted voice of a control tower operator narrates part of the dance. Later, the performer fades away and finally disappears at "light" speed, only to rematerialize on a different part of the screen.

"Bubblehead" shows a close-up of the performer's face, who appears to be wearing a space helmet and has the look of old NASA transmissions. As she sits calmly in a chair, she responds with facial expressions to a speech, delivered by the computer, which describes in scientific detail the impossibility of human flight (taken from an 1897 engineering text). Her small facial movements, via VNS, cause the text to stutter and repeat.

In "Moon Tag," the image of the dancer is composited with historical footage of the Neil Armstrong's first moonwalk, and they end up dancing together. This is accompanied by an audio montage combining original NASA transmissions with sci-fi voiceovers discussing travelling to the moon.

CONCLUSION

Falling Up incorporates imaginative interpretations of movement with video and sound processing, while bringing disparate elements together under a unifying theme. The ideas of invention and flying are integral aspects of both the technology and the choreography, fusing aspects of the physical body with the extended possibilities of the electronic body. The fact that these systems are now able to run on a single computer shows that this is just the very beginning of what promises to be a fascinating future for media convergence.

REFERENCES

[1]. Rokeby,David. Personal website. February 8, 2002. http://www.interlog.com/~drokeby