

Archival and Interactive Dance through Unobtrusively Embedded Technology

Tyler Walters and Martin Brooke
Duke Dance, and Electrical and Computer Engineering

I. Project Description

Duke University Assistant Professor of the Practice of Dance, Tyler Walters, and Associate Professor of Electrical and Computer Engineering, Martin Brooke, seek funding from the Vice Provost for the Arts and Council for the Arts Collaborative Arts Grant, to explore technological approaches to dance archiving and interactive live dance performance. In collaboration, the applicants will evaluate and construct technology with the potential to be embedded unobtrusively into the live dance performance environment to record the dancers' 3-D movements and provide an opportunity for the dancers to use movement to interact with technologically enhanced elements of the dance environment and each other.

II. Rationale

Archiving Dance

Currently there is no convenient way to record dance performance in an archival fashion suitable for later reconstruction of the performance by practitioners. Musicians have widely accepted music notation and Midi electronic recording to capture completely nuanced performance, in a fashion that can be studied and used to recreate performances in detail later. Although dance notation exists its complexity has prohibited wide spread use with many accomplished dance performers not skilled in its use. For some time digital motion capture has been used in cinematography and the technology has been applied to dance in the past. However, the state of the art involves very obtrusive body instrumentation (dots visible to a camera) and requires multiple cameras locations surrounding the performers. The applicants believe that recent advances in RFID technology coupled with micro accelerometers used in devices like the Wii controller will enable a much less obtrusive instrumentation for motion capture.

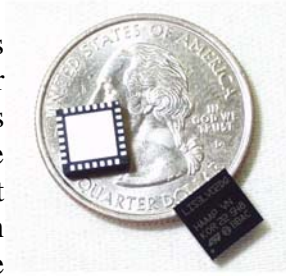
Interactive Performance

Dance performance involves movement. With the development of an unobtrusive method of knowing each dancers 3-D location and movement, the possibility now exists to communicate that information to the performance environment to create an interactive dance experience. Many possible forms of interaction can be envisioned and it is clear that a process of repeated experimentation with collaboration between performers and technologists over a long period will most likely be needed to develop interactive dance techniques that are more than just gimmicks. To this end, the applicants propose to incorporate interactive dance technology into the classroom. The recent revision of the Electrical and Computer Engineering curriculum to include more project-oriented offerings provides an ideal scenario to implant this long-term collaboration. One of the applicants (Brooke) currently teaches ECE 51 a project oriented introduction to microelectronics, this would be an ideal class to engage the technologists in an experimental development of interactive dance technology.

III. Outcomes

Unobtrusive “wired” Leotard development

Considerable work will be devoted to development of specifications and technology for a dance leotard that will contain the hardware for dance interaction and archive. Devices, such as the micro 3-axis accelerometer in the figure at right, can be embedded on flexible micro circuit boards as part of the leotard. Passive RFID technology that can be sewn into garments, such as that in the figure at left, can be used to provide interactivity for dancers and stage props.



Long term involvement of Dance and Engineering Curriculum

To ensure continued development of this project it is proposed to create a curriculum interface between Dance and Engineering undergraduate education. Specifically the applicants will seek to engage engineering undergraduate students in dance related projects that are evaluated by dance students who will attempt to utilize the devices in creative live performance. By using the feedback of the dance students for problems and desired enhancements, successive engineering projects can refine the prototype systems and identify challenges for new project development.

Choreography

Begin to outline choreographic directions and project(s) that would employ this enhanced interactivity in a way that expands the range of creativity at the intersection of dance and technology.

IV. The Participants

Tyler Walters: Associate Professor of the Practice of Dance was a leading dancer for the Joffrey Ballet for more than a decade and has been featured in performances around the world. Tyler has danced a wide range of roles that spans the breadth of the Joffrey's eclectic repertoire. He has appeared on international television and on the "Dance in America" series for public television. He is currently Artistic Director for the Carolina Ballet/UNCW Summer Intensive and Residency. Choreographic honors include the Choo-San Goh Award, and a fellowship from the New York Choreographic Institute. He has created over 40 dances including eight commissions for Carolina Ballet, and works for Oregon Ballet Theater, ABT Studio Company, and the Joffrey Concert Dancers. Tyler is Director of Duke Ballet Repertory Ensemble.

Martin Brooke: received the B.E. (Elect.) Degree (1st. Class Hons.) from Auckland University in New Zealand in 1981. He received the M.S. and Ph.D. in Electrical Engineering from The University of Southern California in 1984, and 1988, respectively. He is currently an Associate Professor of Electrical Engineering at Duke University. Dr. Brooke was the Georgia Tech Outstanding Thesis Advisor Award winner in 2003. He has graduated 23 Ph.D. students from his research group and has six U.S. patents awarded. He has published more than 120 articles in technical Journals and Proceedings, and articles on his work have appeared in several trade publications. Dr. Brooke is a senior member of the IEEE.

Budget

Income

Duke University Council for the Arts Collaboration Development Grant \$3,000.00

Class Budget for ECE 51 -- \$1,000

Total Income \$4,000

Expenses

Travel

- Technology demonstrations and training
- Conferences to presents results
- Dance performance

Materials

- Leotards
- Accelerometers
- RFID tags
- RFID readers
- Flexible Printed Circuit Board fabrication
- Development system for radio link to accelerometers
- Stage Prop construction

Total Expenses \$4,000.00

Request from Council for the Arts Collaboration Development Grant \$3,000.00