

# Movement and the Machine

## Intersections Between Live Dance Performance and Structured Sets of Rules

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### **Introduction**

A possible starting point for the intersection of generative algorithms and live dance performance is the comparison of Busby Berkeley's work - complex ornamental geometries using large numbers of showgirls and algorithmically generated kaleidoscopic effects. In this paper however, we are not interested in painstaking rehearsal processes resulting in exact geometrical patterns that evolve over time in dance performances (see for example Busby Berkeley's choreographies, square dancing, college band and cheerleading dancing). Rather, we explore choreographic systems that are based on simple rules, which in emergent processes yield complex movement patterns. The end result of such a choreographic strategy is greater than just the sum of its parts. Specifically in this context we will introduce our new collaborative work "Dolly" that premiered at Purdue University on February 26, 2010. Furthermore, this presentation also introduces conceptual opportunities in moving generative algorithms off the screen and into human space.

### **Limited Set: Early Conceptual Dance Performance**

In the late 1960s and early 1970 several dancers were inspired by limited sets of rules for the development of dance choreography, parallel to the first exhibitions of computer-based artworks that used sets of rules in their programs (*Cybernetic Serendipity* curated by Jasia Reichardt at ICA London, 1968 and *The Machine as Seen at the End of the Mechanical Age* curated by K. G. Pontus Hulten at MOMA in New York, 1968) and the emergence of instruction-based artworks in the Visual Arts (Fluxus and Conceptual Art). Sol LeWitt's *Wall Drawing 51* from 1970 is one such example in which a rule-based visual organization of space ("All architectural points connected by straight lines") [5] can be directly related to the negotiation of space in movement-based performance and dance. Choreographer and dancer Trisha Brown developed a rule-based strategy for the choreography of her work *Locus* (1975) in which the drawing of a cube, matched with a numbered sequence of the letters of her name resulted in instructions for the movement of three dancers. Lucinda Childs' *Congeries on Edges for 20 Obliques* resulted in complex spatial interactions of five dancers following simple rules of traversing the space on diagonals in different combinations as outlined by a carefully prepared drawing. Anthony Howell and Fiona Templeton's book *Elements of Performance Art* [2] features a series of potential exercises for performers based on workshop experiments of England's Ting Theatre of Mistakes. These exercises highlight the groups' structure-based approach to performance and simple rules for movement choreographies (for one example see *Going* (1978)). Being influenced by abstract writing as a source for the organization of a performance, Anthony Howell also realized early on in the work of The Ting that rule-based performances have the potential to become extremely predictable to the audience. The Ting countered this element of predictability by introducing "mistakes", as Anthony Howell explains in an interview with Nick Kaye: "Although you could read the structure of a performance like *Going*, you wouldn't be able to predict where the mistake would occur. The mistake would act as the *punctum* to the performance. But, equally, you see, the mistake was highly rehearsed." [3]

### **Movement and the Machine 01: Loop Diver**

The following section will introduce the computer as an instrumental part in the generation or execution of limited sets of instructions for live dance performers as a

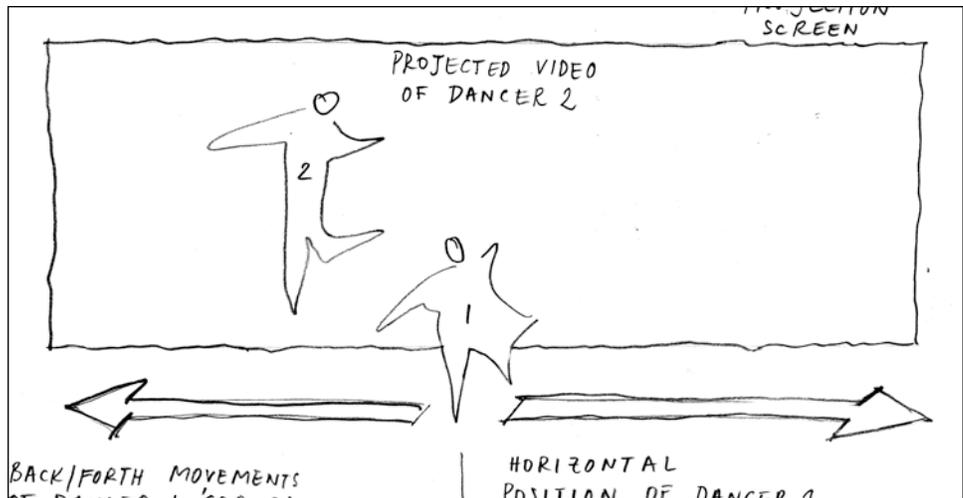
logical consequence of earlier experiments in conceptual dance in the 1960s and 1970s. Dance-tech.net, initiated by Marlon Barrios-Solano, a US/Venezuelan dancer, media artist and educator, is a comprehensive website dedicated to showcase the diversity of this field. [1] However, to keep this paper concise and focused on the influences of our work *Dolly*, we will discuss only two related works in the following sections. The first of these examples is Troika Ranch's 2009 work *Loop Diver* (Troika Ranch will perform at the Dance Center of Columbia College Chicago March 4, 5 & 6, 2010). A 6 minutes long complete dance performance was transformed by a computer program (Isadora) into a 60 minutes choreographic score, based on the concept of loops as a pervasive cultural structure emerging from the computer. This 60 minutes video was the source from which Troika Ranch then generated the live choreography. The intriguing quality of this work arises from the direct linking of computer-based algorithmic structures (the loops) and their translation into human movements in a live performance context. As Troika Ranch's project description states: "While the digital materials (video, sound, light) maintain the absolute precision and perfection of the computer, the learned choreography is necessarily imperfect due to human interpretation." [6]

### **Movement and the Machine 02: 100d11A0n1C00E1**

Since 2003 Carol Cunningham-Sigman has been drawn to creating dynamic dialogues in live performance between dancers and virtual environments. Her collaborative works with artists and technologists explore a variety of digital technologies where the dancer controls and responds to visual and aural media in real-time. The opportunity to react to the real-time virtual environment allows the performer to express emotions and engage in rich spatial and temporal relationships through movement. In *100d11A0n1C00E1*, five onstage live performers interacted with virtual images driven by an off stage performer wearing a motion capture Gypsy 3.0 exoskeleton. The five dancers performed with the images generated by the motion capture system as they were formed, drawn and projected on three large onstage screens. Live video feedback was used off stage to enable the dancer driving the virtual image to interact with the onstage dancers. The dancers and virtual performer exchanged movements conveying emotions through expressive interactive visual language. Playfulness, curiosity, tension, and fear, drove the movement and expressions of the choreography.

### **Movement and the Machine 03: Dolly**

*Dolly* is new collaborative work between Fabian Winkler, Carol Cunningham-Sigman and Rebecca Bryant. It is influenced by the ideas outlined above: conceptual performance and rule-based choreographies; the introduction of mistakes as a counterpoint to the predictability of rule-based performance systems and the possibilities of real-time computer systems for generating meaning in movement-based performance. The structure of this new media dance performance is stunningly simple: a computer- vision system tracks the vertical position of a live performer in front of a screen. Horizontal movements of the dancer directly control the playback of a video recording of another performer on the screen: the virtual playback head of the projected video follows the live dancer like a shadow. At the same time the live dancer constantly responds to the movements of the projected dancer. It is in this sequence of positive feedback that new movements are created interactively in this duet between the live and the screen dancer. As Mitchel Resnick, Professor of Learning Research at the MIT Media Laboratory writes in his book *Turtles, Termites and Traffic Jams*: "Positive Feedback isn't always negative." [4]



**figure 1.** Fabian Winkler. Initial concept drawing for *Dolly*, March 2009.

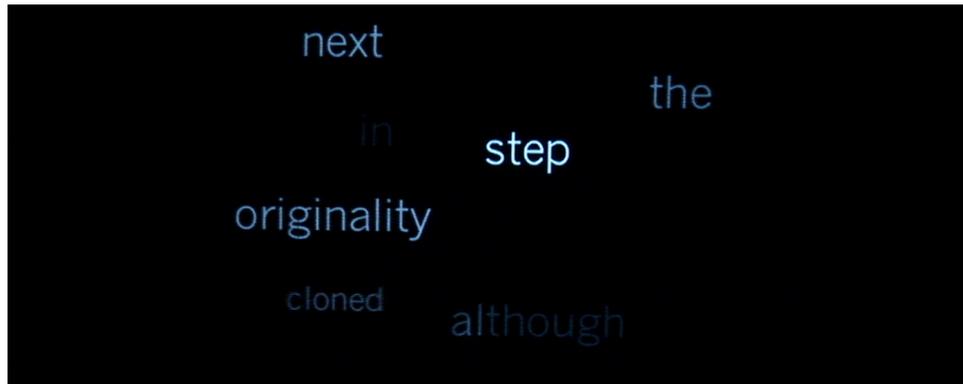
Applied to *Dolly*, the creation of new movements is only possible through positive feedback. Of course the system also includes negative feedback - by standing still, the live performer stops the playback head of the projected video and thus the movements of the projected dancer. Feedback is an important aspect of this work as it also refers historically to the idea of feedback in a cybernetic system as outlined in Norbert Wiener's 1948 book *Cybernetics*. [7] Even though the rules for control and responsiveness in this performance are simple the resulting interactions between the two performers generate a highly complex inventory of movements that cannot be recreated in a traditional duet of two live dancers. On a conceptual level, the work raises questions about the illusion of creating another self – an external self that is placed in the history of cloning, geminoids and doppelgängers.



**figure 2.** still from *Dolly* premiere, Purdue Dance Studio Theatre, February 26, 2010.

The source material in *Dolly* is comprised of extremely short video samples of choreographed movements (a total of 5 clips of no more than 1:30 minutes in total length) and a 5 seconds loop of the recorded breathing of the performer that is slowed down and controlled by the velocity of the live performer's movements. Scenes of direct interactions between the source material and the live performer are

enhanced by video excerpts investigating further the concept of duplication: through images, abstracted text and sound.



**figure 3.** Abstract text in *Dolly* referencing step-by-step instructions on reproductive cloning.

Furthermore, we use a strategy of integrating mistakes, similar to the Ting Theatre of Mistakes approach of “rehearsed mistakes” to counter predictability in our deliberately limited set of rules. For example, in one of the interactive movement scenes in *Dolly*, a double exposure of the onscreen performer appears for a short moment. This double exposure (visual duplication) references both, the beginning of the performance with the video performer walking across the screen but it also consciously integrates a serendipitous mistake from one of our rehearsals in which the double exposure emerged on the screen due to a programming mistake.



**figure 4.** Double exposure as “rehearsed mistake” in *Dolly* performance.

### **Predictability, Control and Frustration**

The strategy of positive feedback in *Dolly* creates movement and movement responses but also deliberately frustrates the live performer, in their desire for predictable control, which is not fulfilled by the system. On a conceptual level, the origin of the technological framework used - computer vision and surveillance hardware - is critically reflected in these competing reactions: a desire for control and initial feelings of frustration. The same movement in front of the screen almost never results in the same response from the video dancer, only if it were to be

made in exactly the same position on the virtual x-axis. Also, since only horizontal movements trigger video responses, jumping up in front of the screen does not make the video dancer jump. In addition, the live performer interacts with the on screen performer similar to a dance duet. However, unlike a traditional duet neither performer is able to touch or make physical contact with the other. Even though frustrating at first, the system yields extremely rewarding results for the live performer. After she/he overcomes the expectations of a traditional dance duet, the interactive system used in *Dolly* is highly liberating. Moving along harmoniously with the on screen performer and the real-time generated sound track creates a rich and satisfying sensation in the live performer. *Dolly* offers a and complex space for visual and aural interactions between the two dancers, a space that allows more improvised movement to happen and one that furthers the conceptual development of *Dolly's* main theme: the illusion of creating another self through duplication.

### References and Citations

- [1] Barrios-Solano, Marlon. *Dance-tech.net*. Retrieved March, 2010 from <http://www.dance-tech.net/>
- [2] Howell, Anthony and Fiona Templeton. *Elements of Performance Art* (London: Ting Books, 1976).
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- [4] Resnick, Mitchel. *Turtles, Termites and Traffic Jams: Explorations in Massively Parallel Microworlds* (Cambridge, MA: MIT Press, 1997).
- [5] Singer, Susanna, ed. *Sol LeWitt Wall Drawings* (Amsterdam: Stedelijk Museum, 1984).
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- [7] Wiener, Norbert. *Cybernetics, or Control and Communication in the Animal and the Machine* (New York: J. Wiley, 1948).