Time Translations

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ABSTRACT
"**Time Translations**" is an interactive video installation originally designed for the World Financial Center's Southern Pedestrian Bridge in New York, beside Ground Zero. The installation was commissioned and produced by the World Financial Center Arts & Events and ran continually from May through October of 2005. The work uses multiple cameras and computers to stream pedestrian movements to video projectors and plasma monitors spanning two portions of a 200+ foot long bridge. The resulting real time visualizations capture specific patterns of the daily urban commute through the World Financial Center (WFC). The artwork experiments with folding live motion into architectural surroundings – drawing a kinetic history for a unique site.

Author Keywords
Kinetic, time-oriented computing, interactive public art

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
"**Time Translations**" is an interactive video installation exploring rhythms and rituals of urban motion. It transforms daily activities into choreography. Human traffic determines the shape and flow of each display. Motion visualizations appear at varying scales in real and recorded time. Erratic pedestrian behaviors are woven into an intricate thread of dances that reflect the complex traffic patterns of urban public space [1,2].

CONCEPT
"**Time Translations**" is part of a series of works using interactive design to investigate the inherent contradiction between how we perceive movements -- physically, in an instant -- and how we conceive of them -- constructing our understanding through the varied modalities, memories and representations of the mind's eye [3].

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The series of works are designed to shift our attention and, therefore, our experience of movement. Facilitated, non binary interactions draw viewers into a dynamic relationship with their surroundings, using actions, not just images[4]. In passing by, each person's movements create a new visualization and a new point of view. The participant experiences the physical effort of inscribing his/her movements into the space, and the graphic visual result. Interactive design in these works, cue both an internal, kinetic representation of the body in motion and a visual imagination of it.


Figure 1 & 2. World Financial Center South Bridge

ARCHITECTURAL SITE: WORLD FINANCIAL CENTER
Most people don't think too much about how they move as they make their way to work in the morning. Your path does not necessarily appear related to your neighbor's, nor do your tracks appear to impact your immediate surroundings. New York commuters became the subject of "**Time Translations**", when it was set up as an installation in Lower Manhattan at the World Financial Center. The southern pedestrian bridge at Liberty Street was transformed into an animated performance space, through this interactive installation, designed for the walkway that runs alongside Ground Zero. Partially destroyed in the terrorist attacks of September 11, 2001, the walkway was rebuilt of corrugated metal, exposed to the elements and lit with dim fluorescent light.

Interactive System
Multiple cameras are placed at key "hot spots" along the pedestrian walkway. Live video feeds are processed to extract specific, kinetic features. Nothing is recorded. Instead, the motion visualizations are projected back into the bridge along floors, walls, and overhead. In the original installation at the World Financial Center, live visualizations were also juxtaposed with pedestrian

movement tracked and transformed seconds, minutes or days before, looping continually on the plasma screens throughout the complex. Movements appear to mark the space as real-time ephemeral drawings, transforming human reactions into two-dimensional shadow play.

Figure 3. Sample Projections "Time Translations"

Pedestrian Participation

As a person moves along the walkway, the projections change according to the walker's momentum, direction and speed. In peak traffic times, the flow of pedestrians appears like a white-hot streak, whereas in low-traffic periods it is cooler and softer. Every second, the projected graphic is refreshed using information about the number of people in the space, the character, mass, scale and speed of their movements. An individual can shape the dynamic pattern to some degree but cannot dictate the whole composition at any one time. The individual's gestures and direction contribute to a latticework of paths that emerge as a pattern of fluctuation throughout the day.

Figures 4 & 5. Sample Projections "Time Translations"

Software Design: Motion Visualizations

Real-time video footage is processed to extract kinetic features using time-oriented computing. The processing is designed to examine movements by considering their scalar and vector properties. The author worked with MIT engineers, Aleksander Zlateski, Bobby Ren, and previously with Research Scientist, Jonathan Bachrach, to develop software that combines 'movement-centric' parameters to extract perceptual features of motion from video. Designed effects modules enable highlighting of specific dynamics that characterize movement along the bridge at different times of day. Specifically, the visualizations isolated changes in momentum and the timing of individual paths that shifted at peak traffic hours. Fire wire cameras, combined with the software, enable activity within the space to be captured and represented according to how people are using that space in a given instant.

Participatory Design

People's everyday passage along the South Bridge created the dynamic design of "**Time Translations**". The bottleneck of human traffic provides a physical environment for imaging fluctuations in our daily commute. The daily activity of walking to work is visualized as a kind of democratic dance in which pedestrians become performers, and cycles of time converge along the bridge.

Figure 6. Sample Visualization "Time Translations"

CONCLUSION

The interactive design of "**Time Translations**" capitalizes on a viewer's participation in order to enhance their kinetic and visual understanding. The system relies on activation of different modalities, visual and physical, to represent human movement. In this way, our inner eye, our sensorimotor skills, our motor and visual processing [7] all come to bear on what we understand as movement. Our own passage plays a critical part. An individual's idiosyncratic gestures might contrast or flow into a group dynamic. The work is an effort to celebrate the personal and collective movements of each day.

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