Luminous Kite Lanterns: Spatially responsive audio-visual field

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Luminous Kite Lanterns is an interactive sound and light field that responds to the natural forces of the site and the movement of people as they walk through it. Designed and fabricated by a team of architects, computer scientists, and digital sound artists at Virginia Tech, it was installed at Blacksburg Farmers Market for the American Institute of Architects Blue Ridge Chapter design exhibit from September 14 to 17, 2012.

Wind- and light-catching kites made of mulberry paper and bamboo are connected on kite lines and suspended from lightweight metal chains. 52 strings of kites are hung beneath 3,000 square feet of the Market timber frame pavilion to sway and rotate together in response to the wind. Multiple mockup's of the kites were made to test different paper dimensions, the apertures in the paper, and the connection detail to the chain to determine the appropriate level of movement and constraint so that they would respond to the wind but remain stable under a gust of wind.

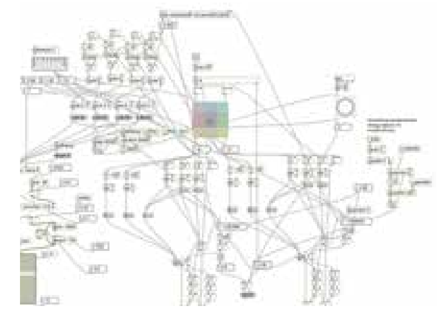
During the day, the kites capture the sunlight and cast shadows on each other. At night, the kites are lit with LEDs to create a luminous outdoor ceiling. The color of lights shift from warm white to light red as people enter the space and become intense red as the occupants' motion increases. Each bay is assigned a set of pitches that harmonically relate to the neighboring bays. As each bay activity produced by human presence and motion increases, so does the aural activity within that bay.

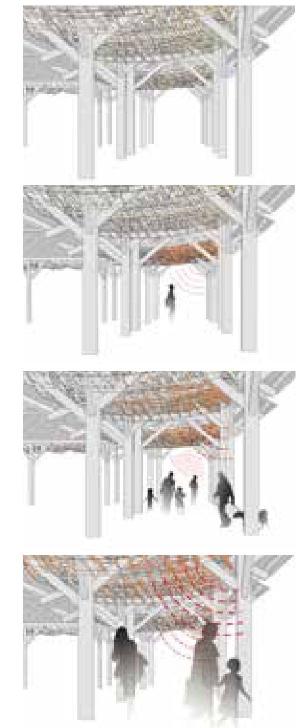
Sound and light interaction was designed collaboratively with computer scientists and digital sound artists using Max/MSP, a visual dataflow program for the production of interactive environments. A speaker, sensor, and LED fixture are mounted at each bay, and as the sensor captures the presence of people, the ambient sound of reverberant wood chimes is heard and the color hue becomes activated. Input to the interaction comes from computer vision processing of streams from a series of webcams mounted along the length of the pavilion. Each camera detects and counts "blobs" of bodies that enter the space, and the total motion within the camera shot is calculated. These inputs are used to trigger ambient chime sounds as well as shifts in the hues of the LEDs.

The same input is also used to drive pendulum simulation to determine reverberating aural pattern output based on the kinetic energy observed in each bay. The observed "blob" activity is translated into virtual kinetic energy. The energy is infused into the pendulum, pushing the pendulum away from its point of rest. As the pendulum touches upon four edges it generates a pitch. The greater activity within each area results in more kinetic energy and consequently greater pitch density.

Over the days following the reception event, the sound caused people passing by to turn their heads and stop. Some stayed longer to experiment with how they might alter the soundscape with their bodies. This experimental project points to other possible applications of communal interactive technologies that use space as an interface.

Motion sensed in the bay triggers change in light and ambient sound as one performer starts a dance (far left), the color and sound intensifes as she is joined by the second performer, and finally they slowly fade as they move away from the bay (far right).

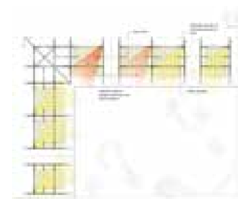




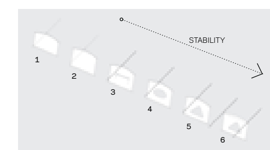
Max/MSP dataflow map of interactive sound environment. Pendulum simulation determines reverberating aural pattern output based on kinetic energy observed in each bay.

Color shift and sound is heard and are intensified as more people occupy the space

Camera in each bay detects and counts "blobs" of bodies that enter the bay, and calculates the total motion within the camera shot. These inputs are used to trigger ambient chime sounds as well as shifts in hue of LEDs.



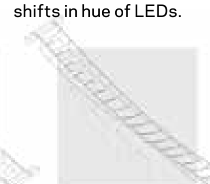
Site plan indicating LED light hue change in response to occupants' movement



Kites' response to wind

No wind

Forewind



Tailwind