Silent Mutations: Physical-Digital Interactions in Spaces

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ABSTRACT
Many installations research efforts today explore how to engage participants with embedded digital content and applications in interactive environments. Yet the interactive design is largely determined by the constraints and requirements of the underlying sensing technologies. Such constrains result in a limited dialog between the user and the interactive installations. Silent Mutations is an interactive installation that is controlled by participants/users moving throughout the space. The installation has been conceived as a material and immaterial reflection of our relationship with physical environments and embedded technologies. The goal of developing the installation was to offer a valid questioning of the current responsiveness of interactive installations and advance a designed interactive environment towards engaging narrative conversations of people with physical spaces. Between analog and digital, using simple hardware systems coupled with sensing technologies, a cognitive space was created with conversational emerging behaviors for human communication.

Author Keywords
Interactive environments, tangible interaction, design, sensing technologies.

ACM Classification Keywords
H.5.3. [Information Interfaces and Presentation]: Group and Organization Interfaces—Collaborative computing;  J.5 ARTS AND HUMANITIES, Arts, fine and performing;  H.5.2 User Interfaces, Prototyping;  F.1.2 Modes of Computation, Interactive and reactive computation.

General Terms
Design, Experimentation

INTRODUCTION
Sensing technologies have been able to seamlessly blend in our physical world, which confront us with new communication styles and interpretations of our performance with the existing environment. As our spaces become more technology mediated, all physical surfaces become as an opportunity to facilitate and moderate conversations among people with and within the built environment. Influential in their questioning the relationship between computer and human, previous installations have materialized some aspect of the conversation between the two worlds. In Access, Marie Sester creates a space in which an elaborate surveillance system brings attention to a single person by literally spotlighting them [1]. Another piece that brings light to one's existence, or shadow for that matter is Snibbe's Shadow Bag [2] in which a viewer has the chance to interact with his unpredictable shadow. Though these two pieces’ crucial element is a matter of light play, Rafael Lozano-Hemmer has chosen to physicalize the conversation between computer and human with his Standards and Double Standards [3] by using an array of fastened belts that hangs at waist level and turn in response to human presence and interaction. Andres Muxel uses its own simple program logic that react to each other because of the physical connections [4]. This example produces complex behavior, although its structure and rules are very simple. Hylozoic Soil is another example and series of work where the artist explores techniques and materials, interactive geotextiles and reflexive and responsive membranes, networks of actuated objects, and canvases composed of primitive interactive systems. All aforementioned installations are of inspiration for designing digital-physical interactions with the built environment. Yet, the interactive design of surfaces and spaces is largely determined by the constraints and requirements of the underlying sensing technologies. Moreover, constrains result in a limited dialog and physical-digital interaction between the user and the space.

ARTIST STATEMENT
Silent Mutations has been conceived as a material and immaterial reflection of our relationship with physical environments and embedded technologies. It is a design exploration in the physical-digital interaction of user with spaces questioning of the responsiveness of technologies in the built environment. The installation was designed with the goal of advancing a perspective towards generating conversations of people with spaces and embedded technologies. Through its physical properties, the installation influences and moderates user behaviors in the space. As such, between analog and digital, using simple hardware systems coupled with sensing technologies, a
cognitive space was created with conversational emerging behaviors for human communication.

When people are in the space, their presence affects the piece by creating arrays of experiences. Surfaces made of textiles attached to ceiling fans mutate into different typologies to generate different physical responses that influence human behavior in the space. The installation creates a space for conversation when ceiling fans are on, thus pushing the textiles to move upward (active). Similarly, the installation closes the space and forces user’s movement in the space when ceiling fans are off pushing textiles to move downward (inactive). As a result, Silent Mutations opens and closes spaces for human-space and human-human communication in spaces.

TECHNICAL SPECIFICATIONS
The Silent mutations hardware consists of 9 fan controllers and one interface board used to communicate with a laptop. Each of the fan controller boards contains the circuitry needed to dim the lights of a ceiling fan, and choose between the 4 speeds of the fan motor. This is implemented using one triac as a PWM dimmer, one triac as a power switch for switching power on and off to the primary winding of the fan's induction motor, and two additional triac's to switch out loading capacitors on the secondary winding of the induction motor for speed control. All of this is managed by a microcontroller. Finally, the 9 fan controllers communicate on a shared I2C bus with the interface board. A laptop plugs into the interface board via USB, and uses the interface board as a USB serial port. A simple command structure allows the laptop to read motion sensor readings and control the fan speeds and light levels. From there, a program running on the laptop can provides the logic of any interaction based on movement, and can log the movement for later review.

They also have four motion sensor inputs, allowing up to four pyroelectric motion sensor modules to be wired to them. These modules are similar to the motion sensors used in security systems, and will only detect changes in temperature. Thus, the motion sensors can recognize people under the ceiling fan, but not the movement of the fabric suspended from the fan blades.

CONCLUSION
Silent Mutations is an installation piece that challenges users to understand the role of sensing technologies in products and spaces creating a new aesthetic of interactions. It allows people to see more than it is visually available by becoming a portal of experiences with the physical properties of the built environment.

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REFERENCES