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Theatrical Performance as Experimental Architecture

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This paper discusses by way of the authors' recent projects how improvised live dance performance, architectonic composition, and sensing technology converge and inform new opportunities in architectural experimentation. We first lay out the theoretical basis of technology in architectural experimentation in "new rationalities" of technologically augmented aesthetic work. We then briefly describe two projects, X-Change Room and RaumSubsTANZ and the motives behind them. X-Change Room deals with /non-verbal/ ambient display of information and interaction through envelope threshold. RaumSubsTANZ, a short interactive dance composition that highlights the ephemerality of architectural composition augmented by interaction devices. Through the two small projects we attempt to explore a specific technological milieu and reflect on the potentials and challenges of experimentation in architectural composition. The paper presents design methods and techniques that incorporate theories of perception and semiotics by way of an umbrella concept, "ambient displays" and interactive composition. Ultimately, we explore non-verbal communication and theatrical performance as architectural informant that augments semiosis and cognition that pertains to the role of technology at the intersection of primordial senses, cerebral technology, and place-making.

Keywords: *Ambient, Bauhaus, Cybernetics, Sensors, Society, Theater*

Architectural performance concerns, in large measure, the surplus or *excessivity* (Taylor 1990) of the sum of parts: a sense of "sublime," (Kant 2007) or at least of out-of-the-ordinary experience that is beyond the necessity of a well-functioning building or economy of construction. Performance embodied in a work of architecture pertains not only to the physics and technics, but also, and more importantly, to the "functional scaffolding" of semiosis (Hoffmeyer 2008) of built environment. Architecture accommodates one of the most dominant forms of semiosis, the actual quotidian environment, while the theater as environment represents the virtual, fictitious, and fantastic. Both bears on the cultural *milieu* that influences the formation of human subjectivity.

In recent past, the modernist architects sought to align architecture with technological advances as well as social equity. Since the turn of the century, the creativity motivated by computational technologies pushed forward new experimental opportunities. Regardless of the era, experiments in architecture stand for the desire to venture beyond the conventions by pursuing little tested ideas, tools and techniques. In each of the facets, we find one feature

in common: experimental and risk-taking approach to architecture that embraces and actively explores what lays outside of the safe conventions of disciplinary bounds.

Since 1990, digital technology, underpinned by personal computing and the World Wide Web, has advanced at an exponential rate. The complexities of technology behind architectural work have vastly increased as well. Such transformative technological innovations compel the re-examination of architecture's disciplinary conventions and open up new opportunities for experimentation. Digital technology has increased quality and efficiency of construction and encouraged experimental designs. But they fall short of the experimental aesthetics in cultural and environmental dimensions. As significantly, they also bring into question the position of architecture as carrier of ideas, expression, and meaning in the process of aestheticizing technology and technologizing aesthetics.

Algorithmic devices that are networked have produced intermodality of cultural production and distribution. They have radically transformed media and agency in all facets of human society. For example, one type of content on a sheet of paper might be scanned and digitized, viewed on a computer screen, and printed back onto paper. This flow raises the potential for a range of distortions, the "slippages," (Hayles 1993) compared to what might be considered to be the original. Intermodality characterizes the media device that can contain, present, and distribute various types of content and then be used to access them again. These can range in scale from a wristwatch to an entire building façade. Each media-device presents a particular modality because of its own distinctive mode of existence and operation in hardware (the machine) and software (the encoding) combination. Creating content that can seamlessly traverse across these platforms, with all the intermediate scales, represents the quintessential state of intermodality.

As a speculative discipline that deals with the future of built environment, architecture inherently carries the risks of what is yet to happen. Historically we have witnessed seminal moments when risk-taking by experimentation contributed great advances in architecture to the fabric of human environment. In various building traditions, we find numerous such instances that exemplify experimental risk-taking driven by cultivated speculation to break new grounds in the art of architecture.

We can sum up the relevance and importance of experiments, however small they may be, in one clear line of thinking: experimental concepts, tools, techniques, technologies and, ultimately, ideation open up "a new field of rationalities." (Foucault 1980) We cannot emphasize enough what the experiments in architecture contributes to the discourse of architecture and how they open up new frontiers and venues of disciplinary discourse of architecture at large. Experimental architecture problematizes and helps expand the consciousness of human milieu, thereby enriching our built environments.

What we call *milieu* (or *Umwelt*) and the conditions that question the position of human subjectivity in this world should motivate us to question and disrupt the status quo. The word "experiment" (as well as experience, expert, expertise, etc.) originates from the Latin meaning trial, risk, and danger. It relates to the Latin expression *ex periculum* meaning *from danger*. From the etymology, we derive a perspective that to experiment means to try and risk what may prove dangerous and learn from it. Untested, risky, and dangerous ideas motivate great works of architecture and ultimately enrich the discourse of/on/by architecture in both practice and theory. Architecture as a discipline should continue pursuing dangerous ideas, especially when confronted with the manufacture of spurious valorization that commoditizes what/whom architecture is expected to serve. This is crucial to maintaining the rigor of the discipline itself as well as the relevance of architecture's raison d'etre at large.

X-Change Room (hereafter **XR**) was conceived as a simple drapery-like personal space that responds to motion and touch. It provides an isolated in-

dividual scale of space that facilitates aural and visual experience by triggering sound and light in response to the occupant's movement and touch. Next, we discuss **RaumSubsTANZ** (hereafter **RST**), a short interactive dance composition that highlights the ephemerality of architectural composition. within technological milieu and reflects on their potentials and challenges toward experimentation in architectural composition. The paper presents design methods and techniques built around **threshold devices** (XR) and **interaction systems** (RST).

X-Change Room

Threshold devices and interaction systems complement the conventional thresholds as borders and boundaries. Technical devices and infrastructural amenities such as intercom, face recognition or automated door openers regulate people and environmental elements (e.g., air, water, light, etc.) that permeate the tectonic structures of architecture and circulate within. Because of its multiple meaning, how to shape the threshold makes an essential architectural and spatial problem. XR turns the envelope-threshold into an interactive ambient display. When we look at an object, we acquire specific information about it, such as location, materials, shape, size, color, texture, and so forth.

We first conceived XR as a curtain in the sense that its is in essence a *membrane* that reflect subtle yet distinctive ambient information between foreground and background of senses. (Ishii et al. 1998) It may be translucent and let in filtered light during various hours of the day; *reflect* or otherwise indicate outside conditions; and changes its shape when the air around it moves. At the same time, a curtain may act as an indicator of unknown *affordances*. (Gibson 1977) In XR, the curtain takes on the role of an active informant that creates its own ambient by the occupant who interacts with the curtain. The ambient information in XR consists of visual, aural, and haptic stimuli, [Figure 1] and according to the stimuli, the envelope threshold changes the configuration of the envelope-threshold. [Figure 2] XR is in part inspired by the novel *Elective Affinities* by Johann Wolfgang von Goethe centered around a metaphor for the romantic relationships of the protagonists: "Like the alkalis and acids whose behavior captivates the novel's protagonists, words and images, though apparently opposed, may also display a remarkable affinity." (Goethe 2009)

XR focuses on the relationship between the discursive surface and the occupant inside and spectators outside facing it. The installation is framed around the human body. The design utilizes geometrically rational, uniform surface that can transform its configuration while maintaining a degree of aggregate rigidity. We chose the equilateral triangle module as the basic geometrical shapes in order to keep the physical structure simple and stable, while maintaining the potentials for changing configuration in three directions. In the version we presented during the festival in Kronach [Figure 3] we assembled triangles cut from 3mm-thick plywood and incorporated speakers, lights, vibration motors, and Arduino-based controllers in individual modules. Various sensors are connected to the controllers that trigger motors pulling or releasing the strings to change the shape of the membrane and fire sound and light both inside and outside the room described by the membrane. Presence of an occupant inside or a spectator outside of the room will initiate changes and the membrane turns into a medium of non-verbal communication.

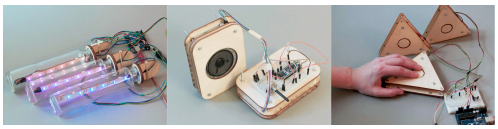

Figure 1
Sensory modules
(Photo by Authors)

Figure 2
Surface distortion
(Photo by Authors)

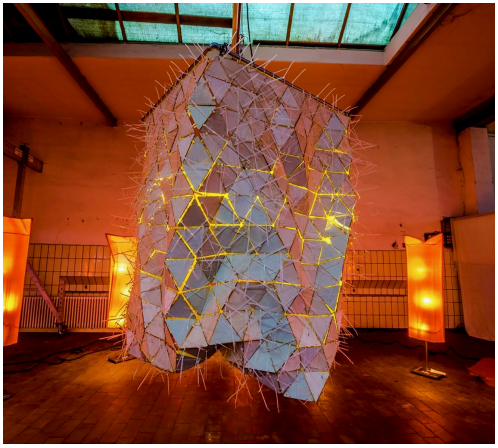

Figure 3
X-Change Room installation during the festival Kronach Leuchtet, Kronach, Germany, 2017 (Photo by Gregor Schreiber ©)

RaumSubsTANZ

Upon invitation by the Bauhaus Dessau for its 2017 Bauhausfest, we staged an architectural performance entitled "RaumSubsTANZ" (heareafter RST) that features a performer interacting-dancing with a three-dimensional drawing, a modular construction system, and the interactive moving objects we call cube puppies. RST allowed us to connect with the theater of the Bauhaus (Gropius and Wensinger 1961) leading to the contemporary playwrights/dramaturgs such as Richard Foreman and Robert Wilson as interactive information-driven composition. We also explored how sensor-driven technology may contribute to the perceptual disposition of theater as architectural space.The project served as on one hand a modest homage to the Bauhaus theater, and on the other an occasion to bring theatrical interactivity pioneered by Richard Foreman in Ontological-Hysteric Theater (Davy 1981) to digital age.

Bauhaus masters created environments in which they required individual viewers to knit together a diverse range of experiences toward a coherent sense of the world around them. During the conceptualization phase, we intend to assemble together the elements of the theatrical language, the circus. From a cast of protagonists - László Moholy-Nagy, Xanti Schawinsky, and Oskar Schlemmer, and extending to John Cage - RST weaves together complex threads of historical narratives of the Bauhaus tradition. The conceptualization of the RST performance hinges on one question: "How do we augment human agency in interactive performance?"

The RST is a participatory performance and the audience plays a crucial part. The primary objective of this phase is to design interactive performance that offers a wide range of audience participation, rather than linear story-telling. We started with a graphic score from our collaboration with a jazz musician for a sound composition **Plan_B**. [Figure 4] From the graphic score, we extracted a three-dimensional drawing composed of crisscrossing aluminum rods and rubber lines constructed inside a cage-frame. We designed and programmed the attractor-repellant interaction system comprising an Arduino controller controlling motors with pulleys triggered by sensors for proximity, movement and light in order to enable both the performers and the audience to choose what to do in relation to the dance performance.

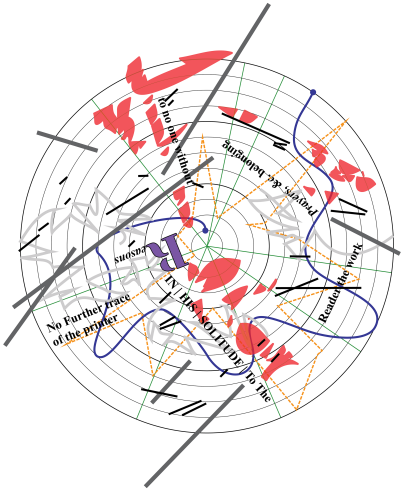

Figure 4
Graphic score for sound composition Plan_B, 2010

The lines of the 3d drawing are connected to Arduino-controlled motors, changing their configurations according to the dancer's movements and the

audience response by motion and light. [Figure 5] The performer becomes a part of the drawing. They are also able to choose how to navigate the media environment with different ways of interpreting and engaging with the performance.

We divided the design of the project as follows:

Responsive Sensor System:. An essential feature of RST is the sensor system among the performers, costumes, and stage set, and the audience. How to incorporate this new form of interactivity into the performance is the key feature of the design. To measure the ambient information we used simple LDR (Light Dependent Resistors) and ultrasonic distance sensors. The sensors are embedded in the dance set and can be controlled by the performer's improvisation of movements and by the audience shining light on specific sensors. Each sensor's input is then processed by the controller that turns a specific motor in specific dgrees to change the configuration of the aluminum lines. The configuration of the line thus changes constantly in relation to all three participants (the dancer, the audience, and the set) in the performance.

Construction and Rehearsal:. Based on the design of the sensor network system and the performance structure, we construct the set in a simple rectangular wood frame. [Figure 5] It consists of varying lengths of aluminum rods that are connected in tensegrity configuration using rubber ropes. The frame contains movement sensors for the dancer and light sensors for the audience. The ends of the aluminum rods were connected to tension threads that can be pulled and released pulleys and motors controlled by an Arduino processor. minimal interactive objects that contain sensors and effect devices such as motors, pulleys, lights, reflectors, speakers, etc. We design the set as a three-dimensional drawing as an architectural composition of lines, planes, and volumes. The performers interact with/in the composition and the signals from the performers and the audience will change the configuration of the composition.

Figure 5
Dance set for RaunSubsTANZ, Bauhausfest, 2017 (Photo by Authors)

Performance Structure:. The sequence of the scenes will be based on actual, real-time responses between the performers and the audience. We ask the audience to actively participate in the performance as the nature of performance depends largely on the audience participation. The performers determine the opening scene. [Figure 6] Even though we put together a rough outline program, the performance can develop and conclude in several different directions. The environmental information consists of the audience response: their movement and sound/noise, and the room temperature. A select number of audience are asked to carry a small flashlight and/or a mirror to trigger certain sensors. [Figure 7] The design of the stage set incorporates the above elements and the audience's potential responses in order to provide engaging interactive tectonic theater experience.

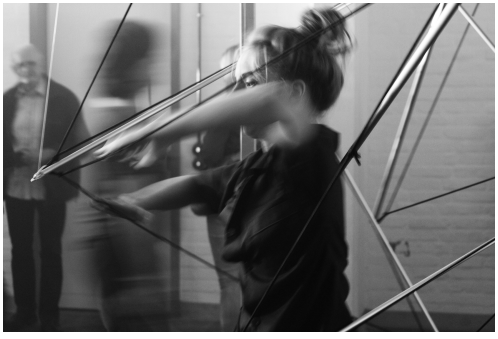

Figure 6
Dancer performing in the set of RaumSubsTANZ (Photo by Marnie Schulze ©)

Figure 7
Audience participation with mirrors (Photo by Marnie Schulze ©)

The Next Iteration:. We have yet to implement the configurations that simultaneously reflect several sensor data at the same time, as well as other elements expressed in the graphic score. In the the next iteration of RST, forthcoming as a part of the Bauhaus centennial events in 2019, we will incorporate biometric sensors in the performers' costumes as a part of a more active interaction system and additional compositional elements in the set. The biometric input consists of the performers' physical state such as muscle movement, heart rate, body temperature, perspiration, and so forth.

Epilogue

The algorithmic apparatus-centricity and eventual apparatization have produced a new kind of human environment where the novel sensorial affectation overrides the material actualization and ontology. The evolution of algorithmic apparatuses, most notably through the Internet and its W3 standardization, brings us ever closer to "ubiquitous computing" (Weiser 1991) that envisions the availability and use of computers as common as paper and pencil and, with it, ubiquitous affectation. Ubiquitous computing and affectation agglomerate new kinds of semiospheres (Lotman 2005) and power dispositifs (Foucault 1980). The projects we presented so far remind us that iit is crucial to be able to maintain a perspective that architecture is performance that creates theatricality of environment. It includes not only the technological perspectives, but also the cognitive dimensions that affect our aesthetic sensibilities. Along with the new technological capabilities that connects imagination directly with production, the combination of technologically encoded aesthetics and aesthetically framed technologies points to the kind of performativity (theatrical or architectural) and the affordances of human environment that has yet to be articulated.

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