PULSA: The Affective Art of Novel Intelligent Environments

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Most histories of digital design in architecture are limited, and begin with the initial investigations into artificial intelligence by the Architecture Machine Group at MIT during the 1960s, and end with a mention of the Evolutionary Architecture at the Architecture Association during the late 1980s and early 1990s. However if one was to examine many of the artworks created during this time, several artists were working with similar ideas, concepts, and technologies on artificial intelligence. This paper is a media archaeology of responsive environments in contemporary practice. It endeavors to discover the historical and theoretical genealogy of affective, experiential, collaborative work of emerging, contemporary, transdisciplinary groups such as UNITED VISUAL ARTISTS. It does so by revisiting some of the projects by the 1966 artist collaborative, PULSA: People Using Light and Sound Artistically. Both the historical and contemporary examples presented here serve as examples in which the discipline of architecture can expand and take on multi-disciplinary collaborations, and the experience of architecture can transform into one which more fully engages the human senses.

RESPONSIVE ENVIRONMENTS: UNITED VISUAL ARTISTS

A seemingly novel genre of designers has recently emerged on the contemporary scene, combining a range of disciplines such as lighting design, live performance, installation art video, projection, and architecture, with each field contributing a multiplicity of visuals and sounds. These projects create multi-sensorial environments designed for a collective group of users. One such group is the British London-based art practice of United Visual Artists (UVA). Founded in 2003, this collaborative group consists of three founding principles from different backgrounds: Matt Clark started in Art Direction and Design, Ash Nehru began in Software Engineering with a specialization in the game industry, and Chris Bird worked in technical production. Implementing a multi-disciplinary, collaborative approach, UVA works on projects which are media-infused environments seeking to connect technology with human interaction; demonstrating how technology adapts to human interactions and evokes emotion.

Their work is usually spatial in nature yet wired programmatically to interact with the viewers/users to form the final work of art. They design the stage sets for the UK's music group Massive Attack, which features a sound-driven light and text generator. The art installation, *440Hz*, is a 2016 interactive work by UVA commissioned for the *On the Origin of Art* exhibition held at the Museum of Old And New Art (MONA) in Tasmania, Australia. It consists of a sculpted round room that responds directly in real-time with the movements of the visitors, moving around the circular structure, and in turn, generating a composition of corresponding lights and sounds through the artistry of computer programming and a strategic arrangement of sensors.

Artificial intelligence is defined as "the study and design of intelligence agents able to perform tasks that require human intelligence, such as visual perception, speech recognition, and decision-making."[1] However the works developed by PULSA and UVA are "weak AI"; meaning that the projects cannot replicate complex human thought, but merely translate basic information from the environment and communicate that information to other machines producing light or sound. These works by UVA and PULSA can be considered to contain some artificial intelligence as they are able to 'hear' or gather data, created by movement, and respond in a visual and aural way. As a means to develop an expanded and alternative history of artificial intelligence in architecture, this paper refers to the experimental artistic practices of the 1960s since many of these works contain a prescient anticipation of contemporary concerns regarding AI and the built environment.

PULSA: PEOPLE USING LIGHT AND SOUND

Much earlier than UVA came onto the scene, a group of seven artists from Oxford, Connecticut started the artist collaboration PULSA. Initiated by the filmmaker David Rumsey, he joined two painters from the Yale School of Art and Architecture, Michael Cain and Patrick Clancy. A year later, Bill Crosby, an artist making light-sound pieces, became a member of the group along with Paul Fuge, a photographer, and the electrical designer Peter Kindlmann. The final addition to the collaborative was Bill Duesing, a photographer and engineer-physicist teaching at Yale, who at

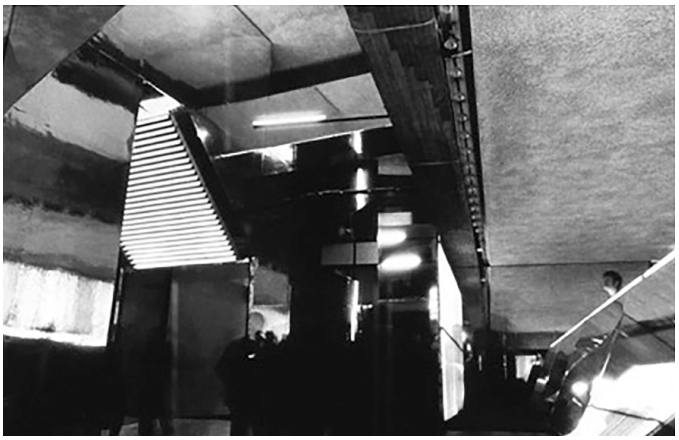

Figure 1: Project Argus: An Experiment in Light and Sound Environment, installation, 1968, C. Moore, K. Bloomer, and F. Drury and PULSA

one time studied architecture there. All of these artists came together to create what they called "programmed environments" – mediated fields that collected information from the built world, the surrounding context, and exhibition participants through various equipment in the age of early computing. The information gathered was treated as environmental feedback, and would, once processed through the computer, create corresponding sounds, color, and lights.

Their work may, at first glance, seem like very elementary installations of light and sound, however on closer inspection, PULSA's works can be understood, from our current, 21st-century perspective, as early experiments in intelligent, responsive environments and the origins of contemporary innovations such as Smart cities. Moreover, unlike the well-known SEEK project by Nicolas Negroponte at the MIT Architecture Machine Lab – which merely modeled artificial intelligence by creating an object-based habitat of blocks, gerbils, and a primitive robotic arm – the PULSA collaborative interpreted the systematic, atmospheric nuances of the term 'environment' and designed them at full scale with some intelligence.

This paper will re-visit three works by PULSA from 1968 to 1970 in an attempt to demonstrate that these artists and their work can be considered pioneers of intelligent, programmed environments within the field of architectural history and precursors to designers such as UVA. Indeed, this paper further endeavors to claim that an architecture of artificial intelligence in architecture needs to be comprehended as a mediated experience through the ephemeralization of infrastructure and the spatialization of information.

PULSA was a group of designers interested in creating programmed intelligent systems, yet they are not usually considered by history as part of creating intelligent, responsive environments. At the beginning of their formation, the seven PULSA artists came together, based on a collective belief about the significance and purpose of their work to transcend single-sensory inputs and composing visual and non-visual media such as light and sound to create interact environments. Another basic understanding of their approach was to work on the spatial interfaces of both natural and human/artificial environments.

ENVIRONMENT AS MEDIA

At the same time of PULSA's formation in 1966, the term "environment" began appearing within architectural discourse. It is believed that the word arose as a means to understand architecture from the point of view of the postwar vision of systems theory applied to architecture and urbanism. This conception formed the basis of many programs and schools of architecture at this time, such as Berkley's College of Environmental Design and the Masters of Environmental Design initiated at the Yale School of Architecture in 1965. By 1969, when the first Environmental Design Research Association (EDRA) conference was founded, 'Environmental Design,' was defined and coalesced into two main streams of understanding. The first entailed the addition of other, alternative ways in which to assess and comprise the atmosphere of space, this included an understanding of cognitive, behavorial, and semiotic aspects of the human-environment interface. The second field of new research strove to develop the means in which computation could be best applied to design problems. This included the implementation of simulations and game-playing.[2]

As the art critic and curator Jack Burnham explained in a 1969 article, "Real Time Systems," for *Art Forum*, known examples of spatialized, networked, computer environments included such examples as SAGE, the first computer-driven air defense system; Project Mercury, the first real-time digital support system for space flight; Telefile, the first online banking system; and SABRE, the first computerized airline reservation system.[3] Here Burnham defines the use of 'environment' as it relates to the contemporary art scene of the 1960s in his article, "The Aesthetic of Intelligent Systems:"

"The word 'environment' has recently been used to define a popular alternative to painting and sculpture … Many environments are paintings or sculptures, or a combination, structured to fill a room-sized space. If we consider this accepted form of art environment regarding our previous discussion of a computer environment, we come to some interesting conclusions. First, most art environments are pre-eminently contrived. Second, if computer environments are just now becoming the means by which we extend our senses to increase our knowledge of an environment and, perhaps, to establish a dialogue with elements of that environment, then we should not expect too much as yet from artists."[4]

Burnham's insight into computer environments describes the work of PULSA, as the group described the computer, echoing the theory of media theorist Marshall McLuhan, as "an environmental sensing device for structuring human participation in the environment." Moreover, these programmed environments were not static, but dependent upon the participation and interaction with exhibition visitors to create what they termed at that time as 'responsive environments.' Burnham, furthering his definition of computer environments, assigns responsive environments some degree of intelligence. "We speak of intelligent organisms, but we must acknowledge that environments possess a level of intelligence too, depending upon the richness of ecological channels of communication."

This lateral application of systems theory to other fields relating to technology and communication instigated other interpretations of

Figure 2: PULSA, untitled (view of sound-light installation, Boston Public Gardens), 1968.

the term, blurring boundaries between various scales of design - from industrial design of objects and machines to urban and regional planning. 'Environment' soon emerged as a phrase for McLuhan to explain the realm of media. It is not by chance that an article by McLuhan, titled "The Invisible Environment," was published in the Yale School of Architecture Journal, *Perspecta 11* shortly after the Argus installation. Writing about the computer in society at that time, he states: "I think the computer is admirably suited to the artistic programming of such an environment, of taking over the task of programming the environment itself as a work of art, instead of programming the content as a work of art." Here the new invisible environments brought about through new technologies will reveal the old environments, and in the process, create works of art.[5]

THE ARGUS PROJECT

One of the first projects conducted by PULSA took place at the Yale School of Art and Architecture in 1968 and was a facet of *Project Argus An Experiment in Light and Sound Environment*. The Argus was a two-story structure designed by the Dean of the Yale School of Architecture, Charles Moore, along with faculty members Kent Bloomer and Felix Drury and students. It was a structure that spanned diagonally across the second-floor atrium space and was designed to "provide an "open-ended experimental atmosphere" for a "mind-bending esthetic (sic) environment" using a variety of media such as lights, sounds, and serve as a 3-dimensional projection screen for multiple films.[6] The structure, covered in reflective, metallic mylar, included PULSA's pulsating display of fluorescent tube lights. Joel Katz, writing the on the multi-media Project Argus for an issue of the *Yale Alumni Magazine* described the PULSA installation as,

"[A] continually shifting, total environment of light and sound. Banks of fluorescent bulbs glow softly, punctured occasionally by a stabbing strobe light. Light dances uncertainly up and down the fluorescent tubes and moves across walls with apparent abandon. The physical boundaries of the exhibition space dissolve; the security of every inch of floor space is unsure, and the limits of the room and ceiling are ambiguous. Beneath everything is the pulsation of electronic sound, responding to the same signals as the lights and seeming at times to have a physical presence."[7]

The PULSA apparatus for the exhibition included an abundance of fluorescent lights, a metallic mylar-covered plywood structure, large speakers, an intricate control panel and seven movie projectors displaying loops of film from the recently acquired Yale Griggs Film Collection. One visitor to the exhibition described the work: "What they're getting at here is time through rhythm. Not the tap-your-foot kind of rhythm, but a visual rhythm of light. If you hang in long enough, you begin to lift off."[8] The artists explained that the primary purpose of the installation was to experiment with the ways that light and sound can create and shape a space. "You feel the rhythm by creating spaces that weren't there before. We could rotate a ping through ten different speakers in sequence to achieve such an effect. The concern is not what the sound is but what shape it makes."[9]

LIGHT-SOUND INSTALLATION, BOSTON PUBLIC GARDEN

Later in October 1968, PULSA conducted another project described as a sound-light interface installed at the Boston Public Garden based upon two specific aspects of sound and light activity in the city at night. It noticed the overall static and silent nature of sources of light on urban structures accompanied by the noise of automobiles crossing the landscape in striated vertical flows. The project consisted of fifty-five xenon strobes (used in submarines) submerged into the park's four-acre, dumbbell-shaped pond, and fifty-five speakers dotted along the perimeter. Each night of the installation, using analog and digital computers, the lights and speakers were programmed using different variations of processing: a punch-paper tape reader, a signal synthesizer, and magnetic tape. One reviewer, John Chandler in his article, "Art in the Electric Age," for *Art International*, described the installation as "a symphony had come to town" which performed "several [different] pieces each night for twenty nights without repetitions, and moved on."[10] However, Chandler astutely noted that the installation was also site-specific. "Unlike a symphony, it cannot set up in another city and perform the same pieces, as part of its ingredients were the ambient lights and noises of the Boston Public Gardens at the specific hours of the performance."[11] Similar to the function of the metallic mylar in Project Argus, in this project, the garden pond visually echoed the light flashes from one end to the other. The light display accompanied the natural sounds of chirping birds, croaking frogs, and crickets. At other times, the sounds and lights changed which were like "Memorial taps with nonsynchronous echoes across the pond."[12]

Figure 3: PULSA, untitled , "Programmed Environment," (view of sound-light installation, Boston Public Gardens), 1968.

The intention of this work, according to the artists, was to "integrate technological activities which characterize the functioning of the city with the city's physical structure."[13] The group attempted to demonstration how public art should address all parameters of the urban and technological environment as "potential media for artistic expression in order to introduce these concepts on a large scale" and be realized as important factors when architects, urban designers, and planners design cities.[14]

MOMA SCULPTURE GARDEN INSTALLATION

The Sculpture Garden project, held at the Museum of Modern Art in January – February 1970, was described as an "abstract sensorium."[15] This installation was part of a larger exhibition, *Spaces*, curated by Jennifer Licht, and premised on the notion that the garden at MOMA could perform as a sort of oasis within the dense, built up urban environment of Manhattan. Licht's exhibition attempted to "have artists create encompassing spatial experiences within a museum."[16] Separating the show from previous works of art about space, Licht claimed the current show did not merely represent or render the illusion of space in painting or sculpture, but rather the *Spaces* exhibition strove to depict space as "an active ingredient, not simply represented, but shaped and characterized by the artist."[17] The artists used the spatial, audio, and visual cues directly from this city context and also added into the mix the participation of exhibition visitors. The PULSA artists insisted that the entrance to the exhibition be free, and visitors provided with free access to the garden confines. In order to protect the artwork, visitors were required to take off their shoes and wear a pair of paper slippers.

An "output system" consisted of sixty strobe lights, twenty-eight infrared heaters, and eighty loudspeakers installed as clusters around the garden and on the surrounding walls of the courtyard garden. The intention of this piece was to demonstrate how information from the garden environment could be gathered and sent to the clusters of output systems (lights and speakers) and relayed to a computer that synthesized the information/signal from a variety of input devices. These consisted of a closed circuit television which could "read" this environmental information through a photocell, and transmit electronic information to

Figure 4: PULSA, untitled, view of installation at MoMA Sculpture Gardens, 1970.

the computer. Other input devices included: photo cells and meteorological instruments that sent information directly to a signal generator, microphones providing direct feedback to loudspeakers, and photocells in direct feedback loops with the infrared heater clusters. A primary objective of this installation to create an open, sensorial, participatory experience that was determined, and in essence, designed by, the movements and sounds of the exhibition visitors circulating and observing within the urban garden environment.

According to the artists, the Sculpture Garden project developed from several layers of feedback, which, in turn produced a "synthesis among several systems responsive to the presence and movement of an audience."[18] The exhibition operated continually for 24 hours, providing the visitor with additional audio and visual stimuli dependent upon the time of day, change in weather patterns, traffic, the passage of airplanes and cars, and changing sounds of the city. One journalist described the show as the translation of "all movement in the MOMA sculpture garden, be it a walking man or a swaying tree, into a soft clatter of squeaking sound patterns and beautiful flashing lights."[19]

Additionally, the artists understood the installation as an opportunity to exercise their intent to end of the idea of the solo artist, as this form of personal artistic expression was considered obsolete. Their programmed environment installations resulted from a collective group effort, and the input gathered emerged through the participation of visitors or the natural environment. The media enhanced courtyard performed, according to the artists, as "an abstract sensorium where people can relax their bodies and minds as the sound and light play over them."[20] The curator Licht interpreted the PULSA project as perhaps the harbinger of a new type of humanism in art, as it attempted to "incorporate man [sic] and his actions and reactions."[21]

CONCLUSION

Despite setbacks in the inability of the hardware to properly function some of the time, the PULSA group did have keen insight into the future of programmed environments. The most prophetic text communicating their ideas on the possibility of future intelligent environments was presented in a chapter of Gyorgy Kepes' 1972 book, *Art of the Environment*. In the chapter, "The City as an Artwork," PULSA predicted that our current cities would be "Superceded by global communication networks and other large-scale information systems."[22] They claimed at the time how urban dwellers were unable to see how the infrastructure of the city worked, and if the working of certain public amenities were visible to its inhabitants, informed citizens would be able to use the city in a better way by presenting a visual way to view data in real-time. Such experiments would include, "widespread read-outs of the city's resources: the availability of water, distribution of electric power, transportation flow." Other experiments of an artistic nature and could focus on generating specific sensorial experiences. These facilities, called 'sensoriums' would be public spaces, such as silent rooms for rest and meditation. In contrast to the meditation spaces, 'Super-sensory' areas would be created through the use of technology developed from research into "bio-feedback, artificial intelligence, body navigation similar to space travel to the moon, and telepathic experiments." Another urban amenity promoted by PULSA, which foreshadows the use of Big Data and the realization of Smart cities, suggested facilities with "computer storage of facts, statistics, and the special problems and history of urban evolution so that, eventually, projected developments and systems could be realized."

The sensory experience brought about by the nature of nighttime in the city was something exploited and explored according to PULSA, who claimed that the "artificial aspect of the city is most apparent and meaningful at this time, but it should be pushed further." The darkness of the urban city at night heightened one's senses, making the city a more receptive space amenable to the effects of multi-media: "[…] people can experience over views of the city, the city as spacecraft, data-gathering centers, and information outputs."[23]

Unfortunately, PULSA's many problems were bound to the limitations of the available hardware and the expense involved to develop and purchase advanced equipment. At the Sculpture Garden installation at MOMA, the artists acknowledged that many of the problems encountered with the show were dependent upon the hardware. Specifically, the computer used to synthesize all of the feedback information was an old computer reclaimed from a closed bread-making factory. Its age and condition seemed to work against the novel concepts and theories regarding cybernetics and intelligent systems that the artists aspired to create. With the emergence of faster technology, groups such as UVA are now able to design and perform the same responsive, intelligent environments that first inspired PULSA.

ENDNOTES

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22. Pulsa, "The City as an Artwork," 208.
23. Pulsa, "The City as an Artwork," 217 – 219.