

EXPERIENCE CATALYSTS AND ARCHITECTURE

Towards a New Tradition

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Abstract:

This paper describes two research projects in the field of interactive architecture, both examples of experience catalysts; Settings which allow new insights in the aesthetic constitution and perception of environments. This term can be thought of as somewhat synonymous with *artistic intervention*, but is used instead to recognize that the participants might not self-identify as artists. We are working with architectural notions of space and place, but are interested in the experience of place more than its formal structure. We wish to emphasize the dynamic and are interested in transitions not as the pauses between states but as destinations worth exploring. *Quadricone* by Selena Savic is an actual experience catalyst: a physical manifestation of a digital “material” (in this case network traffic.) The goal is less data visualization and more an attempt to understand what it means to physically experience something normally invisible. *Inter-Actor* by Andrew Sempere casts architecture as an ongoing event which might benefit from the flexibility of the digital. The idea is to create a combination of software and hardware that allows for “rapid prototyping” of interactive space. Inter-Actor is not an experience catalyst but a toolkit for creating them.

Keywords:

Interaction; Design; Flux; Experience Catalyst;

1. Introduction



Figure 1 – Anonymous street artist “Banksy of Bulgaria” reconfigures a red-army statue.
Photo by <http://www.meh.ro/wp-content/uploads/2011/06/meh.ro7687.jpg>

1.1 Why Experience Catalyst?

Our relationship to each other, to media and to our sense of place and space is changing as a result of our immersion in digital space. This alters our understanding of navigation, relationship to permanence and experience of infrastructure. It is a refrain we’ve heard before: the Internet changes everything, said so often that it’s nearly meaningless, and yet we are left with a sense of unease. How is it changing? What becomes of our idea of permanence and impact? How do we evaluate and occupy the places we live in? How do we design spaces with a shifting audience in mind? How do we navigate such spaces?

Rather than attempt to define or argue around this flux, we identify it as the defining characteristic of contemporary experience. The change itself becomes the material we work with. We are therefore concerned less with the conception of architecture and more with the consumption of architecture and infrastructure as a raw material. We are concerned with the establishment of new traditions: we take as a given that consumption has fundamentally changed, and suggest that construction should follow suit.

Therefore, our new tradition does not propose monuments to freeze time, but rather seeks to create moments along the way which influence the direction of thought. In short, we are looking to create situations where direct experience of a new kind of perception is possible. It is key to this experience that it also focuses the notion of perception itself: we are trying to reveal the edges of experience which are taken for granted in order to expose an idea for closer examination.

These are not virtual constructs but actual objects or spaces, fragile and delicate and temporary, but designed to evoke and provoke an audience response. They are by definition ephemeral and owe much to our (flawed) historical understanding of the digital/analogue dialectic, but propose that both time and physicality matter.

Because we are proposing layers intended to be placed on top of existing spaces or infrastructure we recognize that our actions are inherently political in that they privilege alternative voices and narratives about the use of space. We believe this reflects lines of desire and the politics of daily choice [1]. Similar paradigm-shifts might be catalyzed by squats or riots or direct political action, but our focus is on more subtle change, expressed quietly and simply as subjective layers on top of “official” narrative.

1.2 What is *Experience Catalyst*?

We have chosen the phrase experience catalyst in a deliberate attempt to encompass and express the spreading boundaries of practice, but if we are to move beyond the conceptual we should make an effort to make these ideas more concrete. We will now switch our focus to architecture and what this means for the experience of structure and space.

1.3 The Experience of Architecture

Architecture is a broad discipline that covers numerous design and engineering practices – from interior design to urban master plans; from lightning and furniture design to challenging, large scale constructions.

In our tradition we would like to discuss both place and space, but shift the focus from architecture as a design process - the activity which occurs prior to the construction of a building - towards the life of a site or building as a whole. We are looking to include not just construction, but also consumption. We propose the construction of space is a midpoint rather than an endpoint. Architecture is a means of communication, defined as much by the movements as by the walls [2]. While Tschumi argues for the recognition of the role of the ‘event’ in creating space, de Certeau’s appropriation of space through practice is a similar process of negotiation between existing physical structure and its enactor [3]. We could say that this is an interactive process where both actants [4] strongly influence one another. It is important for us to recognize this active potential of space in the context of experience actuation. Layers of narratives created in this way allow for different interpretations of what the tradition of architectural design is.

Buildings and sites form a core around which activity crystallizes. They provide a critical function as stage and framing for activity, but the narrative of a site is co-authored by the architects and the subsequent residents of the site. We believe this happens naturally as a matter of course, but by making it explicit (and creating tools to explore these ideas further) we can explore the issues of flux and co-authorship more deliberately.

1.4 The Architecture of Experience

Architecture is used most frequently to refer to physical structures, but can also be used to describe a wide array of ideas and practices which can broadly be described as organized information. *Hardware and software architecture* refers to the structure and behavior of technological systems. *Systems architecture* seeks to describe complex systems in terms of algorithms. *Website and information architecture* describes the cataloging and organization of information, and *cytoarchitecture* refers to the arrangement of cellular structures.

The connection is not merely linguistic. Our systematic approach to understanding and modeling our world digitally directly impacts contemporary architectural practice in the design of buildings. This is perhaps most visibly demonstrated by what is called *parametricism* (an idea we will shortly explore more thoroughly) but our common experience of all of architectural forms is an encounter with the ordered.

Styles change, but architecture seems fundamentally to be about systematic arrangement of elements. While we wish to continue in this tradition of organization and delineation, our approach is to focus on the architecture of experience, not limiting ourselves to the space in which the experience occurs. It is perhaps not surprising, then, that we draw heavily on the fields of human-computer interaction, interaction design and what is now being called “user experience” design.

In the late 1980s, Xerox PARC researcher Mark Weiser coined the term *ubiquitous computing* (or *ubicomp*) and outlined its general principles, suggesting that the computer act as a “quiet invisible servant” and that technology should “recede calmly into the background of our lives.” Since then, we have seen the rise of the ubiquitous GPS aware personal mobile device. As our relationship to these devices normalizes (ushering in the “quiet” phase of technology), it leaves in its wake a fundamental change in our relationships to each other and to space.

The approach Weiser proposed early on, well before we reached current state of information saturation, was an emphasis on focus switching [5]. This eventually gave way to the development of interaction design as a discipline for shaping this focus switching [6]. In a sense, the early days of interaction design were about attention management and mindset: using the visual language of the screen to offer users the same sort of guidance an architect might offer a user of their building: A hallway for traversal, a window for framing a view, a doorway for transitioning between place.

In terms of experience catalyst, then, we recast “user” or “audience” as *experiencer* [7], from a passive observer to an individual engaging in an active and meaningful relationship with the system. This relationship itself becomes the site of interest.

2. Design Strategies

In modernist practice, space is an objective unit of thought. This space is by itself empty, to be filled, organized and put to use by architects. Straight line and right angle are part of a universal language of architecture which privileges functionality as a means to generate the forms which then define the aesthetic. [8]

Schumacher wrote in his *Parametricist Manifesto* on the importance of Parametricism's ability to actively deal with contemporary complexity of urban processes. He emphasized its opposition to the previous, modernist approach based on the concept of universal and mono-functional space, distinguishing the concepts of (empty) space and (full) fields [9]. The ability to make sense of complex input information and even more the capacity to generate diversity of forms and relationships is what aligns Parametricism with our interests.

Parametricism exhibits many of the properties of the “digital” that we are also seeking to employ. As Schumacher states, it offers “...a superior capacity to articulate programmatic complexity.” (Schumacher, 2009, pp 15). Parametricism even offers a prototypical experience catalyst. Schumacher writes: “Parametric variations trigger ‘gestalt-catastrophes’, that is, the quantitative modification of these parameters triggers qualitative shifts in the perceived configuration.” (Schumacher, 2009, pp 17)

What we are seeking is a way to embrace the computational while also maintaining conceptual and literal flexibility: an architecture which does not treat form as static. We therefore suggest a slight modification to the notion of parametricism by stretching the time domain the practice covers. We accept the formulations parametricism offers to the design phase and seek to extend it past the construction of a building or site and on into its life and perhaps afterlife.

In our work on interaction design and environment prototyping, we developed two distinct projects. Each of them demonstrates a way to evoke and invoke emotional and intellectual response to a particular spatial and sensual setting. The first project works with wireless networks as a material, giving their presence a physical manifestation. It is not an attempt to map or visualize wireless network traffic in the form of a sculpture; rather it plays with the possibility of allowing a physical, spatial experience of invisible traffic, combining the inputs from passive network users and active installation 'experiencers'. The second project facilitates an experience of space which reconfigures according to the actions of a user. Light and sound are used here as building blocks for an invisible labyrinth; they are a physical material in that they impact the body, but virtual in that they are moldable and mutable, capable of changing the atmosphere in a space as quickly or slowly as the creator wishes.

2.1 Quadricone

Most of the information we access daily is served wirelessly using radio waves – from FM radio, through satellite signals and mobile phones, to wireless Internet. Wireless communication at the same time occupies and distributes in public space. Instead of a dark room with a screen, mouse and keyboard, we are more likely to be online in a café, scrolling on a smart phone.

Adrian Mackenzie calls this presence *wirelessness*. According to Mackenzie, there is "a sensibility attuned to a proliferating ethos of gadgets, services, opportunities, and enterprises that transmit and receive information via radio waves" [10]. One of the important things Mackenzie recognized in our experience of wirelessness is that people adjust themselves to signal availability. Are we developing a particular sensibility to the presence of wireless signals? Do we really only experience their presence through technology or is our experience of spaces changed with the need/habit of being online?

With the intention to tackle these questions, as well as to offer a 'theatrical' setting for an experience of 'wirelessness' we developed two interactive prototypes within the Quadricone project. Quadricone is an interactive structure made of stretchable fabric which acts like an architectural 'skin'. It reshapes the space it entangles according to the activity of surrounding wireless networks. It does so in an attempt to render the experience of existing, yet invisible wireless communication, physical. With the interest in the hybrid space that is created on the intersection of technology and physical space where it is contained, Quadricone explores potential architectural qualities of wireless signals.

Quadricone is a canopy-like cover whose shape is reconfigured by four 'cones' which dynamically grow or shrink at four points of the 'skin.'



Figure 2 – Quadricone: Stretchable fabric fixed above the visitors, who could interact with its form indirectly, using wireless network traffic

The following reaction chain (Figure 3) connects the elements and participants of the setup: four points on the Quadricone react to the activity of four wireless access points in the surrounding. This activity can be generated by the visitors present in the space or not. Accommodated by high stretchability of the fabric, the shape of the fabric modifies, creating obstacles for movement of visitors under the Quadricone 'skin'. Visitors react by modifying their browsing activity (usually trying to generate more network traffic) to the desired effect they want to have on the 'skin' (making the space more comfortable or claustrophobic).



Figure 3 – Interaction or reaction chain: (1) Visitors use access points, the fabric reacts to this - (2) it reshapes according to the amount of traffic, creating obstacles for movement of visitors under the 'skin'; (3) visitors adapt their browsing activity to reshape the fabric

2.2.1 Structure and Interaction

In the period from October to December 2012 we produced two Quadricone prototypes. The first prototype was a scaled model, 1m long and 50cm wide with hooks picking up the stretchable fabric from above (Figure 4). The second prototype was a 7m long, 2.5m wide and 2m high installation with the hooks pulling down the fabric at four points. In both cases, servo motors controlled by an arduino were used to control the shape of the skin (Figure 5). The movement of motors was controlled by a microcontroller receiving commands from a computer.



Figure 4 – The scaled model: Stretchable fabric fixed to a wooden board, 100x50cm; four motors are mounted on metal frames at equal distances along the longer side of the model; plexiglass arms are attached to the fabric, pulling it up when there is more traffic

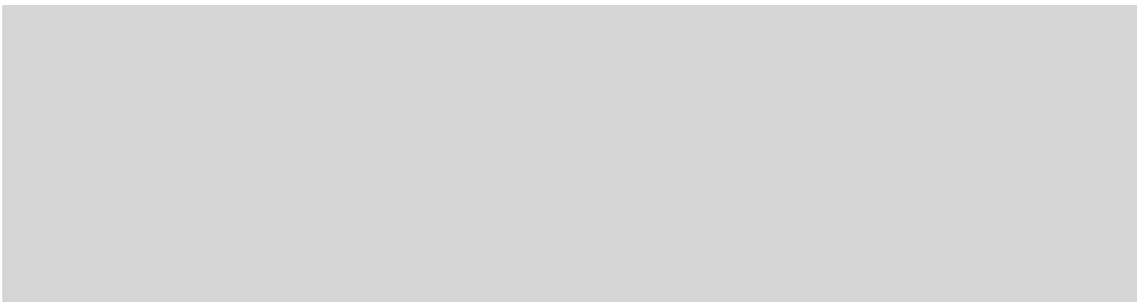


Figure 5 – The setup: Stretchable fabric, 7x2.5m fixed between the walls and enforced with wire; four motors attached to heavy weights and hidden in boxes on the floor, pulling the fabric down in four points

The overall network traffic in the space is scanned, using the open-source Aircrack-ng software. The results are logged and fed to a custom-made script written in Python, which is reading the number of packets for each network. The program scans four most active networks and makes the decision on the movement of motors accordingly. The reaction ranges from doing nothing (none or too small change), small movement of about 3cm, slightly bigger movements of 5 to 8cm, to extreme movement of about 10cm. Because motors could turn continuously, they could theoretically roll on full length of a rope,

pulling the point where it was attached down by 2m. In practice, they were limited by their strength and the overall pressure in the fabric pulled from four sides to lengths of about 30-40cm.

With the Quadricone, we wanted to test the hypotheses that a reconfigurable, three-dimensional 'skin' can create an immersive spatial experience when its form is connected to a particular behavior of the visitor or 'experiencer' (for example, when one's browsing activity is related with the shape of this 'skin'). How can the visitors make the connection between their actions (i.e. watching an online video) and the reaction of the installation; once they understand the interaction principle, do they change their behavior to achieve a particular impact on the installation (i.e. try to generate more or less traffic)

The tests done with the model were very successful in demonstrating the behavior of wireless network traffic. During a presentation with audience which was more or less prepared for this interaction, it was soon clear that high traffic on one network makes one peak go up high. The conditions for this presentation were very favorable, as there were several available networks in the space, and one more piece which was using Wi-Fi to communicate between its different parts. Thus the audience could interact with the model using one of the available networks, or observe the traffic generated by this piece. Because of this richness of input, the changes in the fabric were very dynamic, producing an interesting dynamic form (Figure 6).

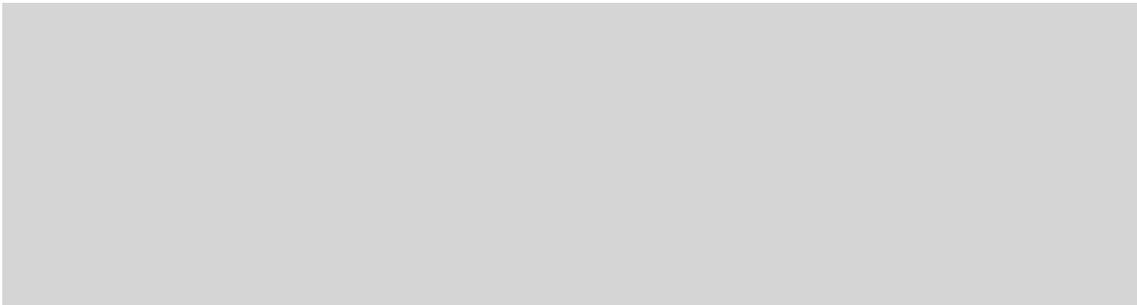


Figure 6 – The changing of the form depending on the network traffic

The scale of the model did not allow for conclusions on the 'immersiveness' of the structure and the possible influence this change in shape would have on someone experiencing it from the inside. This was tested with the second prototype, the interactive installation set up in a large space of an exhibition room

The installation was very responsive to the presence of wireless networks in the exhibition space, reacting visibly to each change in traffic. The movement of the 'cones' was clearly visible to the visitors who would stand under or next to the 'skin'.

The space where the installation was tested proved to be quite poor in network traffic. There were numerous access points visible in the scan, but none of them had a significant number of packets going through. Further on, we had no access to any of the networks in the space, making interaction impossible for visitors. Because of this, a decision was made listen to the beacon frames instead of packets. Beacon interval depends primarily on router settings (defaults at 50 or 100ms) but in case of very low signal strength not each one is received. This number was used to display the activity and availability of different access points in the space of the installation.

Continuing the work on Quadricone prototypes, we will focus on two main 'extensions'. Scanning of WiFi network traffic proved counter-intuitive for visitors using 3G smart phones and Internet access provided by their mobile operators. Because of this, we will focus on opening up the range of types of wireless communication that the installation will react to. Secondly, a feedback system measuring the actual stretching of the 'skin' will be implemented.

2.2 Inter-Actor

In keeping with the idea of experience catalyst, we do not believe that simply discussing the idea of flux or "architecture as interface" is sufficient: you must experience it. And in keeping with our notion of a flattened authorship (the experiencer as co-author) we need to lower the bar to entry for the creation of experiences. The Inter-Actor project is an attempt to do this: to create a toolkit which allows us to

construct such experiences in as close to realtime as possible, moving us from the abstract (programming) to the concrete (experience).



Figure 7 – Lightbox installation built with Inter-Actor

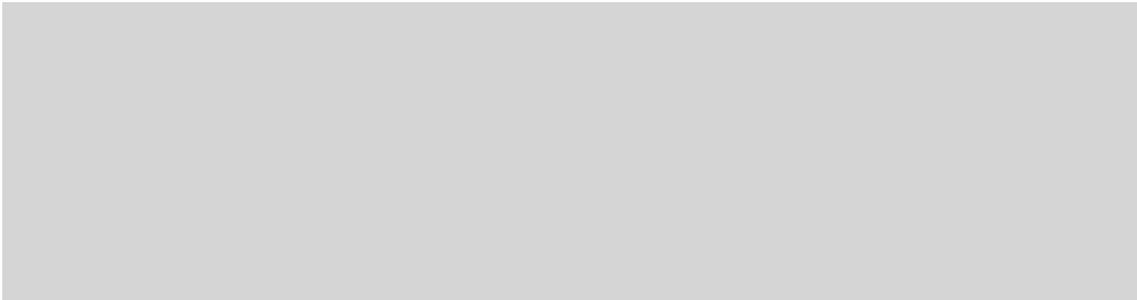


Figure 8 – Screenshot of Inter-Actor prototype showing skeleton tracking

Inter-Actor consists of custom written mac-based software which supports a network of Microsoft Kinect cameras for user tracking. The software interfaces with the Enttec DMX controller box as well as sending OSC and MIDI signals for integration with other existing software and hardware. It is primarily concerned with controlling DMX (the standard for theatrical control for lighting and other hardware) and with the creation of interactive soundscapes.

Because of our research lab's relationship to theatre, an emphasis has been put on supporting theatrical technologies (DMX, lighting, smoke machines, projection). In principle, however, the system supports standard communication protocols (MIDI, OSC and DMX) and could be adapted to control any environmental factors which can be addressed digitally. In addition, theatrical technologies provide exactly the material you want for the creation of sensory experiences. We thus consider theatre an ideal laboratory for controlled modeling of the "real world."

The use of cameras and user tracking in theatrical context has a long and rich history. The major advantage of the Kinect over existing systems is that it uses an infrared grid. While far from perfect, this technology provides some immunity over traditional cameras that are limited in both low-light and over-lit scenes where many hundreds of watts of theatre lighting might wash out a traditional camera image. In addition, the Kinect works fairly well in other visibility compromised environments, such as a room filled with theatre smoke. Again, while the impetus for dealing with these factors was driven by our desire to create a tool for theatre, it means that we are equipped to deal with a broad range of environmental factors, making the system easy to adapt to existing architectures.

The main limitation of the Kinect is the range of the sensor. We are currently solving this problem by developing a system to stitch the data from multiple Kinect sensors into a single "stage." Once completed, the stage can be used as a canvas on which the user can create an interactive environment in realtime. The software mediates the control of the equipment in space, allowing you to compose an interactive experience. An early prototype of this system has been used to demonstrate light and sound control. Future work will focus on using this toolkit with practicing architects to explore the notion of experience catalysts in the wild.

3. Conclusion

In this paper we have described two projects and begun to outline a framework for understanding them: namely an example-of and a toolkit-for creating experience catalysts. Both of these examples demonstrate the application of architectural dynamic parametricism, an extension of parametricism that embraces its formal notions and approach to computation but extends it past static manifestation. We believe this is necessary not only to explore what is happening now (to our architecture, our environment and ourselves) but to forge new traditions going forward: to embrace the notion of flux and transition as a state of being

Inter-Actor is in the early stages of development. Although some important technical development remains, the project was created not to demonstrate technological capabilities but to explore a set of ideas. That exploration has just begun, and many questions remain around what precisely occurs when we treat physical space as interface. How do visitors “perform” their attendance at an event or presence at a location? Can the space take this performance into account? How can a location or an event itself surface the experience of the humans present? How might a space record and perform its own history?

Development work continues on the *Inter-Actor* software and we are beginning (as mentioned earlier) to engage in an iterative-design loop using the theatre as laboratory. We will continue to develop and present experience catalysts as design probes, folding the reactions of the audience and users back into the tool, making the development process a site for experimentation. The ultimate goal of this work is the development of a set of design guidelines applicable to interactive public space in general.

In the *Quadricone* project we researched the possibilities for a dynamic, spatial representation of our wireless communication. *Quadricone*'s purpose was to go further from a visual representation of these data, rendering them physical and thus allowing for an immersive experience. Environmental process are modelled here into a tangible interface for interacting with wireless communication signals. It is in this way that we can evaluate our experience of spatial presence of wireless networks and other wireless communication signals.

At the same time, *Quadricone* was an exploration of an interaction system, where physical space would interact with data, as well as with the user. One important aspect of the installation is exactly this openness to inputs from different ‘locations.’ It does not offer merely a ‘scan’ of this dynamic environment, but it allows for interaction with the users, therefore becoming a physical interface.

However, in offering a ‘flattened’ view of wireless network activity, *Quadricone* might have had misled the audience into believing the setup was a geographical mapping of networks. One very important questions for future development is therefore: to which extent does it matter who generated these signals and what are the consequences for interaction with them? What is the clarity of interaction in such a system, when the input is translated to a linear mechanical movement of the ‘peaks’? What further possibilities of interaction with wireless communication signals exist?

If we consider these questions in the light of both installations, we can see that the type of data used (wireless network traffic/movement of the body) determines the way we interact with an experience catalyst. But in both cases we are talking about tracking a particular activity and offering a physical, spatial experience of a dynamic system. What is the aesthetic value of such experience, its’ different forms manifested in the stretchable fabric or changeable light?

At the beginning of this paper we suggested that our relationship to each other, to media and to our sense of place and space is changing as a result of our immersion in digital space. We believe this is true and we believe we can best explore this through the creation of experience catalysts. This activity is inherently a hybrid practice, combining theatre, scenography, software development, engineering, architecture and artistic inquiry. Hybrid practices require hybrid practitioners: groups, if not individuals, capable of blending practices in the hopes of discovering something new.

All such practices are inherently difficult, but if we are truly to forge new traditions we need to look to new styles of engagement, new aesthetics and new ways of understanding the world. These approaches should build on the existing but remain unafraid to transgress borders in order that we might discover the world in the in-between.

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