Multidisciplinary efforts that have shaped the current integration of multimedia into architectural spaces have primarily been conducted by collaborative efforts among art, engineering, interaction design, informatics and software programming. These collaborations have focused on the complexities of designing for applications of multimedia in specific real world contexts. Outside a small but growing number of researchers and practitioners, architects have been largely absent from these efforts. This has resulted in projects that deal primarily with developing technologies augmenting existing architectural environments. (Greenfield and Shepard 2007)

This paper examines the potential of multimedia and architecture integration to create new possibilities for architectural space. Established practices of constructing architecture suggest creating space by conventional architectural means. On the other hand, multimedia influences and their effect on the tectonics, topos and typos (Frampton 2001) of an architectural space (‘multimedia effects matrix’) suggest new modes of shaping space. It is proposed that correlations exist between those two that could inform unified design strategies.

Case study analyses were conducted examining five works of interactive spaces and multimedia installation artworks, selected from an initial larger study of 25 works. Each case study investigated the means of shaping space employed, according to both conventional architectural practices and the principles of multimedia influence (in reference to the ‘multimedia effects matrix’) (James and Nagasaka 2010, 275-285). Findings from the case studies suggest strong correlations between the two approaches to spatial construction. To indicate these correlations, this paper presents five speculative integrative design strategies derived from the case studies, intended to inform future architectural design practice.
1 Introduction

Recent projects using multimedia in spatial applications have been a catalyst for ideas that consider not only how people experience and interact with a space, but also how a space can benefit people by sensing and interacting with them. In these developments, theoretical connections between multimedia art and architecture are emerging, suggesting compatibilities that are mutually beneficial to advancing both disciplines.

With these theoretical insights in mind, this paper is positing that multimedia influences and their resultant effects in an architectural context are compatible with architectural design principles. The aim of this paper is to present initial efforts made to translate this theoretical knowledge into a future outline of practical integrative design strategies.

1.1 AREA OF RESEARCH

This research addresses an emerging area of study at the intersection of art, informatics, multimedia technology, interactive design and architectural design. Recent developments in architecture are investigating environments that interact or respond with people or the surrounding environment and tangible interactive elements that are an integral component of a building. While built examples have mainly resulted in experiments in facade applications, a growing number of architects are exploring areas that are closer to pure art. Their works often deal with technologies situated in an existing environment to create exhibit spaces, art installations, and experimental public spaces. In informatics and interactive design, people are considering the design of computational components embedded in physical environments, the nature of people’s interactions with these components and their potential social and physical manifestations.

Of particular relevance to architecture are the progressive works of multimedia installation artworks and interactive spaces. These works have the freedom to experiment and explore new ideas that are not necessarily shaped by the same pragmatics of a conventional architectural project. While architecture typically involves static physical elements that compose a constructed form and a resultant space, multimedia installations and interactive spaces involve dynamic elements that respond to and interact with people, the surrounding environment and data inputs to define a resultant space. The site-specific nature of the works and emphasis on the human experience of a space make multimedia installation art and interactive spaces particularly relevant to architectural design.

Within the wider topic of contemporary approaches to spatial design, this research addresses the common ground that involves practices in both multimedia installation art and architectural design. This common ground is preoccupied with the equal desire of both parties to create spatial experiences.

2 Method

2.1 ‘THE MULTIMEDIA EFFECTS MATRIX’ AS AN ANALYTICAL TOOL

Works were selected for analysis from the set of case studies used in establishing the ‘multimedia effects matrix’ (James and Nagasaka 2010). Five examples of multimedia installation art and interactive spaces were chosen to illustrate innovative approaches to shaping space with multimedia. Works include Entramado by Pablo Valbuena, Homographies by Rafael Lozano-Hemmer, Weather Project by Olafur Eliasson, Save Avone by Graffiti Research Labs, and The Grand Tour by London National Gallery. This analysis was used to investigate principles regarding the manner that multimedia shapes space with respect to the specific context of each case.

2.2 A COMPARATIVE ANALYSIS OF PRINCIPLES OF SHAPING SPACE WITH RESPECT TO PRINCIPLES OF CONSTRUCTING ARCHITECTURE

To assess the compatibility of the two approaches in designing space, the chosen multimedia examples were referenced to established principles of constructing architecture for a comparative analysis.

The grounds for this comparison are qualitative influences of multimedia on architectural space and the architectonic significance of their resultant effects as defined in the ‘multimedia effects matrix’. The qualitative influences and resultant effects of multimedia in an architectural space established the relevance of multimedia in an architectural context and provide a method of gaining a structured insight into relationships between designing space with multimedia and architecture.
The ‘multimedia effects matrix’ suggests principles of shaping space with multimedia that indicate correlations with established principles of constructing architecture. Through an investigation of the principles of shaping space with multimedia identified in the five case studies with respect to the principles of constructing architecture, this paper aims to establish correlations between these two sets of principles and suggest compatible integrative design strategies for multimedia in architecture.

3 Analysis of Integrated Design Strategies

‘Constructing architecture’ describes the process of translating the planning of a project to its realization as a built work. Material vocabulary (‘modules’ of architecture), constructive grammar (‘elements’ of architecture) and structural syntax (‘structures’ of architecture) are the mechanics of architecture and they compose the technical and structural basics of construction principles in architecture (Deplazes 2005, 10). These mechanics function as a set of tools that are logical in themselves, but can be fragmentary and unrelated until they are incorporated into a project for constructing architecture (Deplazes 2005, 19). Within the context of multimedia, the matrix can be understood to describe the mechanics of multimedia in architecture that establish the principles for shaping space with multimedia.

3.1 CONSTRUCTING WITH VISUAL MEDIA: PROJECTED VISUALS SHAPING TECTONIC STRUCTURE

In constructing architecture, tectonics can be understood to always incorporate ‘the conceptual connection of the physical assembly and the metaphysical architectural space, and all of the mutually interacting, transforming and influencing aspects’ (Deplazes 2005, 10).

In Pablo Valbuena’s Entramado installation, projected geometric lines and shapes trace the form of benches and trees that compose an exterior public space. These visuals coordinate with a dynamic grid pattern projected on the ground plane. The animations create geometrics that highlight the tectonics of the space in a manner that resembles a virtual 3D CAD environment. (Figure 1).
In this case, visual media transforms the static tectonic structure of the space with a dynamic visual structure composed of light. In this form of transformative tectonics (James and Nagasaka 2010) visual media becomes a transforming component of the tectonics (Figure 2). Animated lines of projected light trace selected physical forms to influence the visual hierarchy of the space and emphasize the geometric form of the selected elements. Gridded geometries projected on the ground plane to give a sense of human scale and visual structure to the space and to suggest its extent. Media here represents a form of transformative topology (James and Nagasaka 2010). (Figures 1, 3). Hence, visual media exhibits the ability to act as both a surface material and an integral component of the tectonic structure of the space.

Sensory perception plays a critical role in this strategy. The sense of sight and touch are commonly understood as the primary senses that influence one’s perception of a space (Tuan 1977). In this case, the visual structure influences the perceived physical and material quality of the space. Concrete tectonic elements that are expected to be stable and static based on previous experience, take on a dynamic semblance that blurs the distinction between the physical and virtual. (Figure 2). People, as a component of the space, are able to mediate between the integrated structures as their cast shadow reveals the physical structure behind the visual one. (Figure 4).

A secondary function of the visual structure illustrates a form of temporal typology (James and Nagasaka 2010). Illuminating and visually activating the space, the visual media functions as architectural lighting that accommodates evening use of the space.

While intangible, visual media offers means of structuring dynamic spatial configurations and multiple functionalities for structure, independent of physical enclosures. The use of visual media as a structural component of a space enables the introduction of temporary changes in perceived spatial configurations according to changing programmatic needs. Visual information augments the function of physical elements and transforms the perceived hierarchy of the space.

3.2 CONSTRUCTING WITH INTERACTIVE MEDIA: INTERACTIVE ELEMENTS CREATING A DYNAMIC SOCIALIZING TOPOS

The Homographies case study by Rafael Lozano-Hemmer illustrates new conceptions of topological function and wayfinding. This installation is set in a large interior space where a grid of fluorescent tube lights equipped with motion sensors is mounted on the ceiling. Each light is capable of rotating independently on a centre axis point. Motion sensors detect the position and movement of people in the space. The lights are programmed to rotate collectively to indicate the location of individuals in the space and their position relative to other individuals in the space. The visual pattern of the rotated lights resembles magnetic forces and appears as lines of light responding to the changing positions of people in the space.

An array of apparently standard tube lights, double as an interactive structure that transforms the ceiling into a dynamic motion-sensing device. When inactive, the lights orient themselves in a conventional, static configuration and seemingly function only to illuminate the space. (Figure 5). Activated, the lights become a dynamic, interactive, social, way-finding system. The volume of space loosely defined by the extent of the lighting array and surrounding tectonic enclosure becomes a spatial interface for the system. Occupying a position or moving in this space, serves as an input. The lights respond collectively to inputs and rotate accordingly to indicate the position of people in the space and suggest pathways between them. (Figure 6). With many people present, light orientations become more chaotic and seem to indicate human activity rather than specific pathways. The result of these interactions is a dynamic socializing topos that illustrates a form of interactive topology (James and Nagasaka 2010). This spatial way-finding system constantly adjusts to the actions of people. In
comparison to conventional modes of way-finding where paths defined by tectonic structure connect distributed spaces, here, flexible paths communicated by interactive elements connect people to other people. The interactive array of light tubes introduces a social-spatial element that encourages interactions between people, a form of interactive typology (James and Nagasaka 2010).

The augmented function of the ceiling is a peripheral one as it is above people’s horizontal line of sight. Peripheral function is an important aspect to consider when integrating multimedia and architecture. It addresses the evolution of multimedia from applications on computing devices where it was the central focus of an experience, to physical spaces where media does not have to dominate the experience of a space in order to be purposeful (Redstrom 2001).

This strategy suggests an approach to architectural design where spaces can actively respond to changing conditions such as light quality, patterns of usage, the presence of people, etc. The interactivity supported by multimedia allows for alternative approaches to conventional purposes in addition to novel modes of spatial function where people can play an active role in influencing their physical surroundings.

3.3 CREATING TEMPORAL ENVIRONMENTS WITH VISUAL MEDIA

The material quality of an architectural structure plays an important role in defining one’s experience of a space. Visual media introduces another dimension to conventional concepts of architectural material that deals with temporality and the perceived sense of time experienced in a space.

The Weather Project installation by Olafur Eliasson is set in a large interior space. Monochrome, amber colored lights arranged in a circle on the wall appear like a giant sun. The amber light renders everything in the space monochromatic to the human eye, similar to the light conditions at late afternoon in summer (Figure 7).

The large scale of the space accommodates the feeling of an exterior environment with the amber light source as its sun. Monochrome light reflects off interior materials resulting in a glowing surface that influences the perceived temporal state of the space, illustrating transformative tectonics and transformative topology (James and Nagasaka 2010). Artificial smoke creates a hazy quality in the air and a mirrored surface suspended from the ceiling bounces light throughout the space. The resulting interior environment simulates the atmosphere of an exterior space in a constant, late afternoon state, representing an example of temporal topology (James and Nagasaka 2010).

The temporal influence of multimedia emphasizes the dimension of time in shaping the experience of a space, an aspect of topos often overlooked. In response to the temporal environment that was created, visitors gathered informally as they would in a park on a summer afternoon. Many chose to lie on the ground or sit and chat with friends as they faced towards the artificial sun. Integrating visual media with architectural structure an environmental and temporal atmosphere can be transformed and in turn influence the way in which a space is used. This kind of strategy considers the influence of visual media on physical materials and visual cues that influence one’s perception of time in a space.

3.4 CONSTRUCTING WITH INTERACTIVE VISUAL MEDIA: MODULATING SPATIAL FUNCTION IN REALTIME RESPONSE TO EXTERNAL STIMULI

Although the creation of space is the first and highest objective of architecture, it primarily occupies itself with the physical material limiting the space. Architecture obtains its spatial power and its character from this material. (Deplazes 2005,19).

The Save Avone installation by Graffiti Research Labs is sited in an everyday urban space adjacent to a building facade. A person holds a laser pen device and is invited to draw whatever they wish on the facade, using the laser pen. Their drawing gestures are translated in real time into projections that simulate spray can graffiti across the surface of the building facade.

Visual media, in this case, presents a novel surface material that obscures and reveals the built structure in real time response to the actions of participants in the space. While the structure is predetermined by the existing building facade, the interactivity of the media allows participants to decide the form and emotional quality of the visuals. Here, the expressions conveyed through participants’ drawings influence the experience of the space.
Large-scale projections of graffiti writing transforms the building facade into a canvas for artistic impression, a form of transformative tectonics (James and Nagasaka 2010). People influence the character of this canvas using writing gestures, a form of interactive tectonics (James and Nagasaka 2010) (Figure 9). The people engaged in the space, and the graffiti imagery they create, temporarily transforms a mundane urban space into an interactive space for artistic expression: a form of temporal typology (James and Nagasaka 2010). Similar to the Entramado installation, this case uses visual media to define the extent of the installation space. (Figure 8). The space activated by the visual media and the people interacting with it, loosely defines the installation's extent. This illustrates the power of multimedia to define space and augment its programmatic function without the necessity for physical enclosure. Here, an overlooked urban space can quickly and easily afford functions that could offer civic value to local residents with minimal physical intervention.

3.5 STRUCTURING TOPOS WITH MEDIA COMMUNICATIONS LINKS

This strategy introduces a wireless media communication system as a structure linking distributed spaces. This in turn addresses the relevancy of physical proximity when defining topos. Media communication can be understood as a set of tools for the storage and delivery of information or data. In particular, the forms of digital telecommunications that enable information in varying content formats to be conveyed to people irrespective of location, such as wireless internet. Integrating physical spaces with media communication systems, makes it possible to connect distributed spaces by communication links rather than physically constructed links. The content that people can access about each space and their relation to other spaces provides a spatial structure that is constructed from information rather than physical materials.

The Grand Tour installation presented by the London National Gallery is set in the exterior spaces of a dense urban environment. Framed reproductions of painting masterpieces were hung on exterior walls or facades. Accompanying each painting was a panel with a written description of the painting and a cell phone number that people could call to listen to a more in depth description of the work. A URL was also provided, to a website where people could view location maps of other paintings and listen to or read descriptions of each work. From the website people could choose the paintings they were interested in and create their own itinerary through the city to see the works, or select from a variety of themed itineraries.

The extent of each exhibit space is loosely defined by the depth of the sidewalk and the width of the exhibited painting. Each painting, its correlating sidewalk space and the supporting multimedia with communication links, define this installation system. The distributed exhibit spaces are linked using audio and visual information to indicate the locations of other exhibits and the urban passages that physically interconnect them (Figure 11).

Hence, a series of individual spaces are linked to construct a conglomerate construction that relies on a structure of communication links rather than a physical tectonic structure to define its extent (Figure 12). The network of city streets running between the linked spaces is co-opted as connecting passageways for the museum topos. People are able to decide the extent of the topos for themselves based on the paintings they choose to see and the urban passages they take between exhibits. (Figure 13).

4 Discussion and Conclusion

The manner that multimedia influences a space to produce a particular architectural effect suggests the principles of shaping space using multimedia closely correlate with the principles of constructing architecture. To verify this, a case study analysis of five examples of installation art and interactive spaces was conducted to apply the effects matrix as an analytical tool to gain an integrated theoretical insight of the cases. This resulted in five hypothetical design strategies that integrate multimedia and architecture.
1) Integrating visual media with physical tectonics extends the potential for spatial definition in an architectural context: In an architectural composition of physical tectonics and visual media, visual media can inform a sense of scale and visual structure and also define the perceived extent of a physical space. It can emphasize particular elements, aspects and features, and give them dynamic character or provide a means of illuminating the space. Yet, intangible in nature, visual media provides this flexibility in spatial definition and augmented functionality with little or no physical intervention.

2) Interactivity advances wayfinding: interactive media can suggest pathways through space without conventional built corridors or volumes. This could inform innovative approaches to wayfinding responsive to changing conditions or programmatic needs, giving increased functional flexibility to a space. This strategy also affords the exploration of new modes of spatial function possible with interactive multimedia systems.

3) Visual media and physical tectonics defining the ambient of a space: Visual and haptic characteristics of materials influence its experiential ambient. With visual media it is possible to introduce temporality as a manipulable dimension of a space to experience. A sense of time can be evoked by creating different ambient experiences. This illustrates a new approach to addressing typos made possible with multimedia, where an environmental and temporal atmosphere is created with the integration of visual media.

4) Visual media and physical materials augment the functional potential of physical tectonics: Visual media wraps around physical elements like a layer of surface material without physical depth, yet it provides a wide range of functional capabilities. Commonly, a space is defined by a physical enclosure, but interactive visual media is able to loosely redefine space and augment its programmatic function without the necessity for physical enclosure. This could prove valuable in defining a sense of architectural space in unconventional locations that do not easily lend themselves to conventional forms of construction.

5) Media communication links establish structural connections among distributed spaces: Although conventional structures rely on constructed passages to link spaces. Distributed spaces can be linked by communicating their location, purpose and content. Intermediary spaces can be co-opted as passageways between the spaces and define the extent of the topos. When linked, a series of individual spaces form a conglomerate construction that relies on a structure of communication links rather than a physical tectonic structure. As technology enables communities to become increasingly dispersed from urban city centers, architecture integrating multimedia could provide a network of flexible small-scale centers for outlying communities that merges the wide breadth of digital resources available from the world’s great cultural centers with a physical space in communities for people to share knowledge and experiences.

This research emphasizes the necessity for an updated conception of architectural design that includes the architectonic qualities of multimedia achieved through transformative, interactive and temporal influences of multimedia, together with an updated conception of multimedia as a functional component of architectural space. The strategies presented are just an initiative to introduce new possibilities into conventional architectural functions and architectural space design with applications that are yet to be fully realized.
References


Referenced Installation Works

Note: All webpage addresses were successfully viewed on May, 30, 2011.


Fig. 13

Creating conglomerate constructions with multimedia communication links.