A Study on the Simulated Surface Effect in Contemporary Architecture: The Relationship between Simulacra and Digital Fabrication Technology

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Abstract

Contemporary architectural surfaces created by various pattern and image formations have become possible with the advancement of computer simulation technology and through fabrication that allows the effective production of repetitive and variable materials. These architectural surfaces are perceptively stimulating and individualized in urban settings. Digital technology generates architectural surfaces with simulated images that reflect today's consumer-oriented society. This research represents an attempt to demonstrate the appropriateness of digital technology as a tool for the active creation of simulated surface effects in urban environments. This connection establishes the association between images of superficiality and the human sensory experience in architectural surfaces. Contemporary architectural surfaces overcome the "old school" formula that links reality with its representation. With the utilization of digital fabrication technology to produce simulacra, modern day architects have reconfigured the perceptions about architectural surfaces, thereby enhancing their performance in urban settings.

Keywords: surface effect; digital fabrication; simulacra; superficiality; perception

1. Introduction

Exterior surfaces of buildings have expressed the unique styles of each era through the appropriate application of social, cultural, and technological backgrounds. An exterior surface articulates important subjects such as material characteristics, surface treatment techniques, and productivity. Surface expression reflects the desire to form geographical and cultural representations of each period's customs. The International Style, representing modern architecture, incorporates white walls and repetitive parts as a major surface expression. White walls symbolize purity and the uniform (i.e., repetitive) wall represents mass production, which was facilitated by the Industrial Revolution. Problems in symbolism in modern architecture have resulted from an excessive preoccupation with purity, which has led to a failure to represent societal preferences and technological advancement adequately. This conflict between production and representation is intrinsic to the technology of mass production.¹

As a result of technological development at the end of the 20th century, a new paradigm appeared in which advanced media images and advertisements sparked the new phenomena of artificial and virtual designs on architectural surfaces. Contemporary architectural surfaces are covered with images that evoke sensory stimulation, which is characteristic of the modern age of information technology, a consumer-oriented culture, and widespread use of public and social media. French philosopher Jean Baudrillard described the focus on consumerism in terms of the phenomenon of simulacra, in which images appear to supersede reality.² Thus, objects are transformed into symbols, and these symbols produce endless images, which are illusions of reality that seem more realistic than reality itself.

Innumerable images are applied to architectural surfaces with emerging new media, advanced technology related to surface fabrication, and new materials.³ Current digital fabrication technology allows the effective analysis, simulation, fabrication, and assembly of virtually constructed architectural images. Notably, this technology reconstructs the unit information of materials and then removes the individual characteristics and identity of each material to simulate an image. Thus, the desired surface effect is achieved with the use of virtual images.

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Especially in metropolitan commercial districts, images appear on architectural surfaces as expressions of capitalistic mass production and transformation. In these areas, reproduction (cloning) follows a certain production code. In architecture, the exterior surface is created through restructuring and building of the cloned parts.

This process allows an image to be simulated with a 3-D modeling program; the image instantly appears on a surface through the reconstruction of individual parts. Thus, digital design technology brings the surface into the real world by creating a virtual image that can be perceived with the human senses. The surface creates a virtual depth, and the image is consumed with the formation of simulacra. In summary, architectural surfaces characterized by virtual imagery and dematerialization are created through digital technology.

This research demonstrates that in contemporary architecture, digital technology is an appropriate tool for the active creation of popular surface images. Furthermore, changes in production levels as they relate to architectural surfaces, representation of images, and the use of symbols are discussed, especially in terms of the influence of today's consumerist society on architectural trends. The corresponding surface effect identifies the architectural purpose of stimulating human senses through simulacra. Further, the connection between images of a consumer-oriented society and the human sensory experience is achieved through simulated effects produced by digital fabrication technology. The increasing influence of simulacra has provided new meaning to building surfaces by reconfiguring the primacy of images over technology.

2. Methods
2.1 Surfaces of Modern Architecture and Representation

International Style, an iconic name for modern architecture, typically employs methods that eliminate visual sensitivity and appeals to recognition. The style has been understood as a standard of modern architecture that uses abstract and geometric spaces and surfaces without ornamentation. Buildings constructed prior to the era of the International Style represented and reproduced outside elements and narratives through architectural media. However, modern architects refuse to rely on mere representation; instead, they have denunciated and reorganized the principles of interior composition.

Architects associated with the International Style include Walter Gropius, Mies van der Rohe, and Le Corbusier. Their influence on modern architecture has caused frivolous and excessive surface design to become taboo. As a result, use of colors, patterns, and surface areas as media for communication has declined, and the use of pure volumetric silhouettes and silent surfaces has become more widespread. With ornamentation removed and representation denied, the silent surface in modern architecture was seemingly understood without the attachment of meaning or content. The surface of modern architecture has been influenced significantly by modern objects including impressionist paintings and machinery. In modern architecture, the elimination of ornamentation has led inevitably to a focus on surfaces. White walls and regular surfaces can be viewed as lacking visual symbolism or representations. However, surfaces of modern buildings can be interpreted as visualizations of the period's technology and images.

Through the metaphor of machinery, Le Corbusier used white geometry that was pure and without ornamentation. In the artist's Villa Stein, materials and structures are hidden, yet they are expressed through abstraction. The white façades and the side elevations of early residential buildings do not reveal the internal structure or material components; instead, they represent modernity by revealing elements of modern civilization or modern life and culture. Clearly, the aesthetics of modern architecture represent modernity by mimicking its elements (Fig.1.).

The white surface of modern architecture, which seems devoid of ornamentation, is a medium for advertising that reflects the perspective of fashion (Wigley, 2001). In modern architecture, symbolism is disguised as silence; thus, architecture plays the role of a medium of silence. Modern architecture's white mask promotes modern production, technology, logic, and abstract concepts (Colomina, 1996).

Fig.1. Villa Stein by Le Corbusier, Garches (1927)

Fig.2. Seagram Building by Mies van der Rohe, New York (1958)
Building surfaces of modern architecture have been subjects of intellectual interpretation, rather than of visual or tactile appreciation. Productivity is not a target of expression, but rather a technological and economic issue that guarantees efficiency (Fig.2.).

In modern architecture, advanced productivity significantly influences the appearance of a building's surface. When architectural expressions are applied to buildings to reflect the mass production era, visual effects are pursued to escape the monotony resulting from modular and vacant repetition.

In contrast to white expressionism and regular surface patterns characterizing the International Style's repetitive productivity, later trends in modern architecture demanded retrieval of the architectural function of visual and tactile appreciation. Many attempts have been made to expand the range of expression through productivity, as honesty of material is expressed in this way. Surface expressions that appeared with the development of the International Style reflect a willingness to reinterpret modern customs geographically and culturally.

To disguise the white surface, there have been attempts to expand the range of expression through emphasis on the honesty and tactile usage of materials. Consumer societies tend to provide familiar visual services for their audiences and express the pictoriality of a surface through materials and productivity.

2.2 Simulacra and Superficiality

Since the modern period, mass production has facilitated the formation of a consumer culture that is characteristic of contemporary society. The modern period emphasized productivity, but the contemporary period focuses on consumption. In a consumer-oriented society, vision has become the most important human sense. Movies and television, which appeared at the end of the 19th century and mid-20th century, respectively, and various visual media that continue to develop, have generated the term "Society of the Spectacle" (Debord, 2006).

In the Society of the Spectacle, images rather than objects are consumed (Fig.3.). Determining how to express oneself by consuming specific objects is an important consideration in contemporary society. The importance lies in the image rather than the function of the object. Baudrillard suggested that contemporary society is ruled by images and symbols of consumerism (i.e., simulation).

Simulacra and simulation are best known as images and signs that represent present reality. Baudrillard claimed that modern society has replaced all reality and meaning with these symbols and signs, suggesting that the human experience is a simulation of reality expressed in four stages: reflection of image, denatured image, absence of image, and no relation to reality. The simulacra that Baudrillard referred to reflect the influence of culture and media in creating perceived reality (i.e., hyperreality). The philosopher believed that society had become so reliant on simulacra that it had lost contact with the real world (Baudrillard, 1995).

Andy Warhol was significant for depicting Baudrillard's concept of simulacra. Warhol's repetition of silkscreen prints of Marilyn Monroe (Fig.4.) initiated the dissolution of old identities that would be replaced by simulated objects. In this era of the simulacrum, which is not related to reality, an image is hyperrealized, going beyond its own limitations and leaving no essence of itself (Baudrillard, 1995).

Contemporary society is faced with the existential condition associated with simulacra in which one is surrounded by images that replace and take precedence over reality (i.e., the hyperreal). An important condition for consumption in contemporary society is the expression of oneself through images provoked by objects. According to Baudrillard's analysis, the value of a cultural sign/symbol is greater than the functional value or preference value of the object represented. If an object is a symbol, and if its meaning and function are to be analyzed without contradiction, the concept of consumption must be understood as well. Rather than supplying necessities, producers manufacture objects that stimulate consumers' desires (Baudrillard, 1998). As production is controlled by consumer logic, public media create symbols to provoke such desires. In the past, symbols represented objects or reproduced them. Today, however, symbols represent themselves and create, rather than reproduce, objects. Therefore, reality matches its symbols. This relationship is potentially encoded by the organizational strategy of a mass-producing consumer society. A symbol becomes more real than reality (i.e., hyperreal) as it passes through the four stages of simulacra. Through the processes in which hyperreality surpasses natural reality by symbolism and the distinction between nature and artificiality is eliminated, simulation creates a superficial phenomenon visually and perceptually (Fig.5.).
Often, superficiality is discussed as a characteristic of a consumer culture. The term has a double entendre of surface exposure and lack of depth. Superficiality implies that, aside from the exposed meaning, any hidden message is no longer important. The contemporary visual culture is based on such superficiality, which brings everything to the surface. Consequently, this culture that tends to expose things externally has seeped into architectural fields. Invisible elements have been called into visible realms. The desire to visualize every element has made the distinction between internal and external realms meaningless. People have maintained an unaltering interest in the external surface of architecture. In the contemporary visual culture, aside from the outwardly exposed building surface, any hidden meaning is of no interest. Although industrial production of economic commodities was central in modernity, simulation creates superficiality as a model that leads today’s social order. Fantasies of hyperreality, unfounded beautification, and dramatization of reality have become prevalent. Prada Aoyama by Herzog and De Meuron in Tokyo (2003) uses a combination of convex and concave glass walls to reflect and distort images of neighbors, and the glass surface mediates the phenomenon of simulacra (Fig.6.).

The surface design of simulacra, which appears as the transformation of superficial images, is based on a combination of immaterial and unrealistic characteristics; thus, the distinction between the real and phantasmal is vague. Simulacra also signify instantaneous events that occur without changing objects or reality. Regarding the creation of form, simulacra can be explained as formal expressions of time, movement, and vector force that move toward creating a space where events occur continuously. In other words, simulacra can be interpreted as ever-changing.

The contemporary recognition of simulacra reflects the object system formed through mass production. Capitalistic production is no longer the production of unique objects, but rather a systematic production following a certain code. Thus, production occurs as reproduction and cloning.

The simulacra surface, as a medium composed of the immaterial, dismantles the conventional binary distinctions between reality and simulation, between real and imaginary, and between science and art. The contemporary surface implies the mixing and synthesis of imaginary and real, and science and art, whose boundaries have become indistinguishable. Here, the basic category of mimesis substituted with simulation.

If mimesis bridges reality and imagination as well as essence and simulation when such binary distinctions exist, then simulation acts without such distinctions in the technological media.

2.3 Digital Fabrication and Surface Generation

Digital design technology, which has taken a major step forward recently, is foundational to various changes in architecture. Since early digital technology began with the virtual presentation of architectural design using 3-D graphics, it has been utilized actively as a tool for reproducing irregular architectural forms with the advanced surface design functions of graphic software. A recent important development includes the virtual reproduction of design through simulation tools. Current digital technology can link simulations in the virtual reality realm.

The advent of the fabrication system created opportunities to apply data of repetitive mass production technology to architectural design. Virtual design ideas could be interpreted directly in actual construction. Current computer modeling software can be used to apply diverse pattern and material variations created by encoding images on the surface. Complicated dimensional architectural forms are integrated into a surface on which various elements with material characteristics can be built. Since the introduction of computer-aided 3-D applications, automated construction machines and lighter, cheaper composite materials have promoted economic feasibility, leading to the active construction of architectural surfaces.

In the contemporary process, a new surface is constructed through the repetition of dynamic combinations of various distinct components. Repetition makes it possible to organize variations manually, control, and construct them with a simple procedure. With the rise of digitally oriented materiality, the frontier between systems and variations has been renegotiated, and architecture now connects diverse and complementary logic. Rather than directly transferring the identity or material characteristics of each component, simple materials are individualized to form a visually stimulating surface from previous materials (Figs.6., 7.). The surface material is encoded on an image through visual interference, and the roles and characteristics of digital technology as a production method are visualized. At the same time, they represent architecture as a commodity. Materials gain new physical properties with digital technology, and it is possible to reinterpret the relationship between the properties of each material. The Gantenbein Vineyard Façade by Bearth and Deplazes (Fig.7.) is a fabricated brick surface with programmed wall construction by R-O-B Robot. Differences in hardness cause varied degrees of transformation, and brick materials are part of the light veil creation, rather
than a conventional solid and hard design method. When material loses its identity, seriality is indicated. The stage at which intuition becomes rationalized through the senses is eliminated; instead, intuition leads directly to action. Simple materials are recomposed, creating a new surface effect that stimulates desire.

The new composition of materials through digital technology eliminates the identity of individual materials and produces simulated images. In parametric fabrication, the physical property of materials is not important, whether a creation is an original or a clone. Quantity production in a consumer-oriented society may be characterized by improvements, even though surfaces contain images rather than actual materials with physical properties.

The New Museum designed by SANAA is clad with an expanded aluminum wall surface; its deformation creates depth between double skins. The surface effect of lightness resulting from the technological expression of methods creates immaterial images, or simulacra (Fig. 8). Unit areas can be recomposed through computer programming and fabrication technology; ultimately, new surface effects can be created. Economic feasibility and multiple expressions are possible. Further, the identities of individual materials are lost to simulated images.

Creation of contemporary architectural surfaces has moved beyond the conventional mimesis method of altering and reinterpreting given objects to a world of self-reference simulation. Physical properties of materials become insignificant, and only fantastic images exist on the surface. In other words, only simulated effects remain. Digital fabrication technology is not mimicry of another subject, but rather a creative process of simulation that produces models. The virtual surface created through this simulation process is no longer related to its reference in the real world. Liberated from its original state, new realities are created through the liberal use of symbols. Here, the distinctions between reality and virtual reality, essence and simulation, originals and clones, and meanings and symbols disappear, and they become integrated to generate a massive simulated world.

2.4 Simulated Surface and New Sensuality

Electronic media, which appeared after the Industrial Revolution, transformed the paradigm of sensory perception and reproduction; in fact, they have had the most significant influence on the visual system since the invention of the linear perspective during the Renaissance. Since the invention of photography and electronic media, "seen" images in the human sensory environment have been developed through science and technology. Some balance was restored to the human sensory system with the advent of television, which demands use of multiple senses. Clearly, entertainment and concurrent experiences through audience participation and interaction influenced changes in the media and sensory experiences.

Simulacra have transformed capitalistic production from the production of one-of-a-kind objects to mass customization controlled by codes. Production is carried out in the form of reproduction (cloning), according to a certain code. The effects on building surfaces change the human sensory experience. Such effects are known as virtual media, the visualized representation of media technology.

Modern ocularcentrism, a western concept, has been criticized from several perspectives. Some architecture focuses on the simultaneous interaction of the senses. To achieve this effect, architecture focuses on the surface properties beyond the 3-D depth of the perspective drawing, stimulating the emotional sensitivity unique in humans.

Senses have been reinstated in today's society, and sensory images have been revived. Various sensory images that beautify life are not unique characteristics of contemporary culture. At the end of the 19th century, when rapid industrialization was being propelled, city life had been invaded by various images from a multitude of images produced technologically. Images have a close relationship with sensual lives, and the transition into the world of sensual images signifies breaking away from opposing reason-centered worldviews. The Trutec Building by Barkow Leibinger Architects contains reflected glass surfaces produced with 3-D laser cutting technology, representing a
visual transition from reality to hyperreality through exaggeration of the reflection effect over time. (Fig.9.)

The conventional philosophy of the past dismissed sensual lives as shallow and substandard. Further, they were regarded as representative of clouded awareness. Sensual lives were controlled under a hierarchical order, created for transparent and rational causes.

Hyperreality produced by digital fabrication technology produces architectural surface effects that are tactile and perceptive. They provide multisensory experiences through the sensory relationship created by the effects on related surfaces and specific perceptive experiences. Interactive relationships are formed between humans and architectural surfaces, and a new kind of perceptive experience has emerged in the contemporary consumerist city. Simulated surface effects are expressions of productivity, and architecture is a commodity that creates virtual simulacra.

Constructing surfaces display continuously moving images over time. Although the sensual image of reality may be foundational to a design, distortion and transformation create a virtual surface that seems more real than reality. The Blur Building designed by Diller and Scofidio in Yverdon-les-Bains (Fig.10.) features a man-made fog surface designed by a programmed vapor nozzle. Its form changes and blurs boundary continuously according to environmental conditions. This virtual building is based on imagination, and it depicts images freely. Such virtual imagery appears as a new reality without reference to another; however, it is a reproduction of reality in the sense that it elicits similar sensory and emotional reactions to those elicited when facing something real. Simulation can be characterized by the ability to visualize specific situations through the concept of time. The exploitation of potential surface effects generated by simulacra and the expansion of architecture's sensory spectrum to include non-optical stimuli has transformed architecture into a surface organizer of a novel form of perceptive experiences. Interactive relationships are created for transparent and rational causes.

In the reconstruction of the surface by digital technology based on various examples, the mass production instantly encodes image data on the surface; individual elevation elements are removed; and then the modules are reordered through sequential changes by seriality. Physical properties surpass actual attributes to produce a dispersion effect, and the surface dematerializes. In the image codification process, the physical properties of each material are changed so that superficial images emerge. Such changes are attributable to relationships, movement, and time, rather than texture and surface characteristics. This concept in which a surface effect enables visualization of invisible realms is illustrated in Fig.11.

3. Conclusion

Various formations of patterns and images appear on contemporary architectural surfaces based on the following factors: social changes reflected in methods used by media, advancements in computer simulation, and fabrication technology through computer-aided manufacturing (CAM), which allows effective and streamlined production and serial use of materials. Rather than conveying the identity or physical property of each component, each material is individualized and transformed onto a visually stimulating surface. Additionally, a contemporary architectural surface is virtual, superficial, and immaterial. In contrast to the silence represented repeatedly in early modern architecture and the technological and physical representation of later modern architecture, contemporary digital fabrication technology minimizes the representative role of the architectural surface and emphasizes its own virtual effect. Thus, the perceptive gap between production and reality is overcome by the simultaneity of simulacra and the digitally fabricated surface. Digital technological representation has transformed building surfaces through simulated images that paradoxically offer true sensory experiences.

Virtual effects are created on the architectural surface, describing and reproducing reality for sensual re-perception/reinterpretation of the city. Digital fabrication technology goes beyond visualization of the invisible—it is used as a tool for existential exploration (i.e., an area not yet perceived in existence). Contemporary architectural surfaces are no longer functional or symbolic; instead, they are strategic for exploring and interpreting the surrounding urban environment. Advances in digital technology have been incorporated in architectural technology, enabling the creation of a new reality based on reinterpreted symbols. Surfaces' simulated effects overcome disparities in essence and virtuality, in reality...
and truth, and in the original and the reproduction. The architectural surface has been transformed into a strategic medium for symbolic creation, bringing to the surface images of superficiality that fathom the embedded. Simulacra engender a response of the human senses to the perceptive surface. Therefore, digitally fabricated simulation effects on the architectural surface connect digital design fabrication technology and human sensory perceptions.

Through the reestablishment of the relationship between simulacra and digital technology, construction of the sensual architectural surface is encouraged. Through the architectural surface, digital design technology contributes to forming a closer existential relationship among humans, technology, architecture, and the cities.

The digital design technology explored in this paper is rapidly spreading in modern architecture, but academically, its new concepts are still being defined. Certainly, the interpretation of the relationship between sociocultural perspectives and architecture can be analyzed through various viewpoints and complex relationships. This study has significance because the method of expressing an architectural surface using digital technology was analyzed and the theoretical relation that elucidates the relationship of this technology with modern sociocultural phenomena was introduced. In future research, application of the fabrication method based on physical reality and digital technology in architecture and an in-depth study of an external surface suitable for a particular period will be carried out to examine the relationship between the architectural external surface in the modern age and social phenomena.

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Notes

1 The conflict between production and representation in architectural practice continues to exist. Even though the mass production of building elements has led to an increasing source of materials, representations of surfaces oscillate between visual reflections of production systems and pictorial recollections of earlier styles and motifs (Leatherbarrow and Mostafavi, 2005).

2 The Latin term "simulacrum" has its beginnings in Plato's Greek dialogues, where it appears as a term we would translate as "phantasm" or "semblance." Plato sought to distinguish essence from appearance, the intelligible from the sensible, and ideas from images. Plato located the simulacrum at the end of a continuum of reproduction, which begins with the original model and proceeds to a copy, followed by less recognizable imitations (ending in the simulacrum). The simulacrum is a reproduction that differs to the greatest degree from the original but is still recognizable as a derivation from a model. Camille (1996) traced the origin and modern use of the term.

3 Building Skins by Schittich (2001) studies the tectonic and performative aspects of façade components. The Function of Ornament, edited by Mousavi and Kubo (2006), diagrams the components of performative elements of building enclosures. Digital Fabrication by Iwamoto (2013) examines a new possibility—integrating design and fabrication digitally. All of these studies focus on the concept of architectural representation based on newly applied architectural tectonics.

4 Regarding international architecture, two authors define the aesthetic principles of International Style sequentially as follows: emphasis on volume, regularity, and elimination of ornamentation (Hitchcock and Johnson, 1997).

5 Modern surfaces have employed methods such as abstraction, colorlessness, and transparency to deny representation; yet, simultaneously, advertising ideals of purity, honesty, ethics, rationality, machinery aesthetics, and functionality have been claimed tacitly or explicitly. What troubled Le Corbusier was the way architectural constructions were designed to resemble modern objects, especially machinery (steamship, automobiles, and airplanes). Here, the problem of machinery aesthetics in modern architecture is presented (Khang, 2006).

6 Pictoriality refers to an architectural ideal that seeks the superficial effects of paintings based on structural engineering and the characteristics of industrial materials. Superficial effects can be defined as surface texture and the associated images achieved by the application of color, light, and material characteristics (Lim, 2000).

7 The important concept of simulacra was originally employed by M. McLuhan in the 1960s and extended by Baudrillard in discussions on art and popular culture. From McLuhan's quote, "The Medium is the Message," it can be assumed that media had so far been considered as empty vessels for delivering messages. However, what is significant is the transformation of the social environment and patterns of human perception caused by the introduction of media. This concept is in accordance with the intellectual takes of French philosophers, who stressed symbolism more than meaning (Jin, 2003).

8 Baudrillard's (1990) Seduction associated surfaces and appearances with the seduction of the "superficial abyss." He argued that the "seduction of the signs themselves is more important than the emergence of any truth—which interpretation neglects and destroys in its search for hidden meanings…. Seduce us in the literal sense, and render it seductive, is its very appearance, its inflection, its nuances, circulation of signs at its surface."

9 According to Benjamin (1969) regarding the relationship between art and technology, technology never surpassed its role as subsidiary to art, at least until the 19th century. However, with the development of print technology and the appearance of new media such as photography and film, the meaning of fine art became dismantled in the conventional sense. As works of art lost their inherent "aura," media began to mediate between technology and art. Media art (Medienkunst), which is characterized by an immaterial state, was born. With the spread of technology reproduction, perspectives on textual "information" were incorporated into "works" of art. As a result, media facilitated the convergence of transcendental art and ordinary communication.

10 "Surface generation" is a more accurate term than "surface production." It is associated with the method of production controlled by the contemporary computer, rather than handicrafts of various parts in modern architecture.

11 Today, modeling software is surface-driven, compelling architects to create designs that exploit the thinness and complexity of design in superficial environments by folding, contouring, texturing, coloring, and deforming. Traditional tectonic operations are being replaced.
As architecture promotes human engagement and interactions, the Martin Jay has commented in his book Digital materiality is not rooted solely in the material world and its SHoP architects suggest use of the new term "versioning". Materials and surfaces have their own language. Stone speaks of its distant geological origins, its durability, and the inherent symbolism of permanence; brick makes one think of earth and fire, gravity, and the ageless traditions of construction; bronze evokes the extreme heat of its manufacturing process, the ancient processes of casting, and the passage of time as measured in its patina. Wood speaks of its two existences: time and scales (Pallasmaa, 2000). SHoP architects suggest use of the new term "versioning" in reference to a set of conditions organized into a menu or nomenclature capable of being configured to address particular design criteria. The primary source is constructed from a series of detailed types indicated by a menu; it is organized around a collection that evolves parametrically to produce specific effects or behaviors.

Digital materiality is not rooted solely in the material world and its physical laws such as gravity. Neither is it solely based in material property, its processual nature, or calculated precision. Digital order intensifies the particularities of materials. Materials do not appear primarily as textures or surfaces; rather, they are exposed and experienced according to their depth and plasticity.

Martin Jay has commented in his book *Downcast Eyes* on the denigration of vision in 20th century French thought. The writer traced development of the modern vision-centered culture through the invention of the printing press, artificial illumination, photography, visual poetry, and the new experience of time. He also analyzed the anti-ocular positions of many of the seminal French writers, such as Henri Bergson, Georges Bataille, Jean-Paul Sartre, and Maurice Merleau-Ponty etc. (Pallasmaa, 2005).

As architecture promotes human engagement and interactions, the visual and sensual reading of a well-crafted material effect is often quite powerful. Material effects are performative; we can verify how materials work by sensing how they perform physically and perceptually within architecture (Eisenman, 1992).

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