IMAGE SAMPLING

Glenn Goldman and M. Stephen Zdepski
School of Architecture
New Jersey Institute of Technology
Newark, New Jersey 07102

ABSTRACT

"History is that which reveals the nature of man. What is has always been. What was has always been. What will be has always been." Louis I. Kahn, 1971

Analogous to music sampling, in which sounds from the environment are recorded, distorted and used in unique ways to create music, "image sampling" is the visual equivalent of a sound bite used to create new visual forms, textures, patterns and types of architecture.

Through the use of image sampling, a designer can accurately record and digitize images from the existing visual world: from the physical (built or natural) context of the site, from history (a specific building type or a significant architectural monument) or from previous work produced by the designer. The digital scanning process makes design information equal and uniform, as it converts all images to dot patterns of varying color. As a result the image can be transformed through numeric operations (even when the algorithms are transparent to the end user). The recorded images can therefore be fragmented, combined, distorted, duplicated, tweened, or subjected to random automated operations. Because computer images are digital, they facilitate modification and transformation, unlike their analog counterparts.

Merging video and image processing capabilities with three-dimensional modeling permits the designer to collage visual information into new and readily editable architectural proposals. Combining image samples into new architectural concepts expands the scope of potentials available to the architect and also raises fundamental questions about issues of originality, creativity, authenticity, and the nature of the design process itself. What is original work, created by the designer, and what is merely re-used? The discussion of new digital imaging eventually leads to questions about design theory and ethics, in addition to those associated with computer technology and architectural form. As one works in any new medium, including the digital environment, many questions are raised about its impacts on design. Much of what is presented in this paper are early speculations on the implications of the digital technology and its influence on architecture.
"Music, also, the architect ought to understand so that he may have knowledge of the canonical and mathematical theory, and besides he may be able to tune ballistae, catapultae, and scorpiones to the proper key."

Vitruvius, First Century BC
(translation, 1914)

The advent of digital recording has permitted the world of sound and music to transform the methods by which music is created and edited. Musical sounds are no longer solely based upon instrumentation. Audio samples from the environment and/or totally synthetic samples are combined, analyzed and modified to create the musical experience. The creation of music is no longer constrained by performance, the talent or skill of the performing musician, or acoustical setting. Musical styles and structure from all periods are readily combined. Musical instrumentation from throughout the world is accessible. There are many parallels between the world of music and architecture, especially when both use a digital design process. The creation of architectural images are no longer limited by the manual skills of the designer. Unbuildable concepts can appear photorealistic, fictitious materials can be assigned to building elements, contexts can be easily modified. In the computer, images and samples are equal to their reproductions. Images from numerous styles may be readily combined. Cross cultural images and, in fact, any piece of visual information, may become source material.

Using digital graphics as the principal medium for design has a significant effect on conceptual design as it adds new and detailed visual material at the earliest stages of the design process. Design activity is no longer characterized as leading from abstract, conceptual images to detailed realistic images. Diagrammatic images can include small-scale representations of activity (people, furnishings, etc.) or fragments of building elements (windows, doors, structural elements, etc.). The process of designing with electronic graphics assists in the rapid evolution of ideas and their associated images. It also facilitates a high degree of interaction between idea generation and what is discovered by observing visual phenomena (drawings, models, etc.). The design medium becomes the luminous screen through which a fluid architectural image is transformed by a wide variety of editing techniques including colorization, blending, tinting, stamping, rotating, smearing, etc.
The expansion of what is possible, the expansion of one's accessible visual library, and the creation of new image types rapidly fills the designer's world. While one would like to assume that this will lead to better buildings, it is not necessarily so.

**DRAWINGS**

"The artist's (architects) choice of medium, his way of handling materials, the [visual] language with which he expresses his thoughts, his manner of representing his world, all add up to a vocabulary of symbols and images that define his individual style."

*William Fleming, 1968*

Personal drawings, or "notes to oneself," have traditionally been a method used to start the formal architectural design process. Manual sketching was the primary means of generating and transforming ideas into building concepts and form. Drawing permits the interactive recording, storing, manipulation and communication of ideas to express the pictures the designer generates in imagination. Image sampling adds a new form of visual information in the beginning stages of idea development. The process permits the designer to electronically brainstorm with the aid of a wide variety of visual sources. On the one hand, fragments of images can be collected and viewed as abstract and ambiguous notes to oneself, and as visual stimuli. On the other hand, due to the potential for apparent "completeness", conceptual or abstract notions can be illustrated by detailed information which can go beyond the pencil or charcoal sketch. Depending on the individual designer, digital images may either become a valuable supplement to traditional personal drawings, or become a complete substitute for them.

Sampling permits the construction of an image through the placement of increasingly smaller scale environmental fragments in a manner analogous to photographically "zooming in." Through the layering, rescaling, and placing of image samples, one develops an architectural illustration sequentially from sky to far context, to site, to building, to people and furnishing, plant material. Eventually, detail fragments include hats, shoes, telephones, signs, belt buckles, expansion joints, etc. In this manner, the superimposition and combination of images enhances the designer's awareness and control of the numerous scales of architectural design, working from environmental to personal scale. Furthermore, at any point in the process, fragments may trigger a conceptual change or new idea as the designer reacts to new observed patterns and information.
By sampling fragments of different materials - whether or not they are parts of buildings - a new construction palette is created. The technically impossible becomes possible as earth or plant materials can be duplicated, blended, tinted, and texture mapped around a proposed form. If the resulting visual image is pleasing to the designer, there is a great temptation to make the building actually reflect the image. Rather than selecting a material and investigating the consequences of the selection (eg. the nature of brick: color, texture, construction, structural properties, etc.) the designer may endeavor to paint the building with an abstracted visual texture. Building designs can interactively change from wood and steel to linen and paint, to plant materials and fragments from other media. While these transformations can be fascinating visually captivating, they require great self-restraint to be truly useful as material choice. Architecture, unlike most visual arts, exists in the world of what is buildable.

Drawings used to communicate with others also play a significant role in the architectural design process. Traditionally, "rendered" drawings have been a primary means through which architects express their completed design proposals. Each architect develops a style of drawing which, collectively, best represents the character of the building and professional image that the designer wishes to communicate. Image sampling greatly expands the types of images available for formal communication, while at the same time folding architectural graphics into the increasingly more sophisticated imagery of print, film and television.

EVALUATION

"It must not be forgotten, in drawing out a plan, that it is the human eye that judges the result."

Le Corbusier, 1927

The life-like precision of digital imaging may encourage acceptance of inappropriate architectural solutions. It is possible to make the imaginary look real by using real elements in imaginary constructs. In some cases it is virtually impossible to distinguish between an unenhanced photograph of a building, a modified photograph, or an image entirely created digitally. When a designer selects an entire building for a new context, even if it is the designer's original work, is the designer able to remain sufficiently unbiased by it's "finished" graphic quality to recognize its inappropriateness for an avenue for further design investigation? How often is the designer seduced by the 'glossy' quality of the image?
Frequently, architectural concepts develop in concert with increased representational detail. The automated rendering processes of shadow casting, light source modeling, material and texture mapping permits even the most tentative of conceptual designs to appear refined. The superimposition of existing visual material, lends further "credibility" to the digital image. The ability to quickly paste together a proposal can lead to refined images of unrefined (or ill conceived) ideas. On the other hand, automated processes may give the designer access to immensely greater visual refinement of early architectural concepts permitting greater experimentation for the "appropriate solution." The greatly enhanced detailed character of digital images, combined with the automatic generation process, may instill a greater degree of objectivity in the early design stages by reducing the expenditure of effort to create the image. Photorealistic conceptual sketches may amplify the differences between what is and is not appropriate in architecture. The silly, highly personal, not site specific, or simply ugly architectural solution, may more easily be recognized and terminated at the early stage of design.

There is a substantial increase in the variety of graphic styles that are available with the introduction of digital graphics into the design process. Images from the fields of graphic design, advertising, and fine art may be merged with architectural illustration. In a pluralistic architectural culture, it becomes difficult to know the appropriateness of selecting a Post Modern pastel palette over the primary colors employed by the De Stijl movement or one found in a Cezanne painting. It becomes more difficult to distinguish between appropriate historicism or contextualism and eclecticism and mimicky. The evaluation of appropriateness becomes even more difficult when image sampling makes it easier for a designer to accurately replicate buildings, building elements, or colors. Critical judgement becomes contextual; the focus is on the relationship between the pieces rather than on the pieces themselves.

Historically, individual architects have chosen their own, single graphic style and medium (or limited selection of media) as their means of expression. This preference for a single medium may be as much the result of the time it takes to master the medium as personal/artistic preference. Computer imaging can transform individual style from a single performer to the role of conductor. The architect may now select, orchestrate, and conduct various visual material into a cohesive image, from any print medium, video or photographic source, or other computer based images. The digital image does not limit the graphic style, but instead makes all accessible.
The traditional process of moving from one medium to another is not necessarily linear. Moving from napkins at a dinner table, to yellow sketch paper, to vellum, to mylar or poster board, is no longer the norm. With the computer, every image sample is an "original" and can be modified or duplicated without degradation anywhere along the design route. The earliest work is "identical" to the final work. Original sketches, or fragments thereof, can find their way into final designs and presentations. Paper drawings, photographs of models, live video images of people and places are merged at any time in the design process resulting in a "graphic equality" among multiple visual media.

POSSIBILITIES

"The Machine, as it exists in every important trade, should without delay be put, by way of capable Artist interpreters, into student hands—for them, at first, to play with and, later, with which to work."

Frank Lloyd Wright, 1930

Within the profession of architecture, the transition from abstract ideas to the physical environment is complicated by ever-changing circumstances including new sites, building functions, construction systems, and environmental contexts. It is often difficult to evaluate to what degree the "actual building" accomplishes the expectations of the designer. In part, to respond to this complexity, the history of architecture is typified by highly defined and constrained set of architectural styles, and/or highly abstracted and simplified physical forms. Styles provide the strict formula through which building forms, images and details evolve. Although occasionally "regional" they generally do not provide the rules to respond to specific sites or surrounding buildings. Abstract forms, be they plain or decorated, tend to keep the architectural design process isolated from specific sites and contexts. The digital merging of building model and site at the outset of design interrupts the traditional process of design. Concepts no longer need to be abstract, nor are the primarily verbal.

Perhaps, because of the highly realistic nature of rendered computer images and image sampling, the focus of architecture will shift, giving increased importance to designing in context. If the visual image is realistic, does the designer therefore more accurately understand the future environment? Are they less surprised when they walk through the building? Are their clients better able to envision the implications of initial design ideas and schemes? The placement of a proposed building into its context has (or should have) a significant influence on the designer. The project becomes more responsive and
responsible. The design options, when considered carefully, become more restricted and directed.

On the other hand, the immense variety within the new visual medium may fracture stylistic norms permitting visual diversity within the context of available building technology. The "all is possible" nature of the new medium may further separate an architectural image from its context. Wrapping a building in a sampled "Pepsi Label" texture becomes as viable as wrapping the building model in a sample of brick, wood or steel.

It would appear that digital image sampling amplifies the need for a clearly articulated architectural concept, an appropriate formal structure through which to develop the building, and an awareness (as well as control) of the image making process.

**ORIGINALITY**

"Michelangelo built the first skyscraper. I suppose, when he hurled the Pantheon on top of the Parthenon. The Pope named it St. Peter's and the world called it a day, celebrating the great act ever since in the sincerest form of flattery possible. As is well known, that form is imitation."

Frank Lloyd Wright, 1930

If a digital image is created through sampling, what percentage of the "original" must be retained, or how recognizable (or unrecognizable) should the source be. Must the image be stamped with the creative style of the designer? Clearly, image sampling allows for enormous flexibility in interpreting images and personalizing designs. However, ethical and legal questions arise from the use of materials from other sources. Architects and manufacturers are grappling over copyright issues for "signature" fragments appearing in buildings and in furniture. Although almost any medium permits duplication, digital design enhances the ability to exactly reproduce existing fragments, with or without modification (random or systematic), and is seemingly less personal because a designer isn't physically copying by hand. The "de-personalization" of the process may remove some inhibitions on the part of the designers who are using the available technology. The digital capabilities, and the speed with which they are finding their way into the profession, makes what was once an issue for a limited number of cases, a far more pervasive problem. Issues of originality, however, remain complex.
Although sampling from other sources can provide a new system for the design of buildings, it can also be the pedagogical method through which design issues are artificially focused. As the musician first works with the musical scales and works of the masters, the architectural student may now also "directly" work with landmarks of history. Replicating historical precedents (either in entirety or in part) in new contexts can enhance a student’s understanding of a particular building, building type, or its relation to context. (And, if not carefully presented, it can foster "copying.") Sampled images can readily permit the design process to degenerate into silly/humorous architectural caricatures, critical or cynical images, uncontrolled eclecticism, or highly responsible proposals. The extremes are more readily accessible.

CONCLUSION

“We cannot divide the world into ourselves on one side of the screen as spectators, and everything else as a spectacle on the other side, which we remotely observe.”

Jacob Bronowski, 1970

Although architects have often designed through analogy, they are now able to transform analogous visual material into architectural concepts and buildings. The increased ability to produce numerous and sophisticated images increases the need for measurability. The emphasis becomes one of self-criticism, selection, and evaluation rather than pure creation. The question of "why" something is done becomes increasingly important. Although we may pretend otherwise, what we design can be created and built out of the context of time, place, material, and use. Computer graphics, especially image sampling, necessitates a high degree of design responsibility, insight, and informed judgement. The domain of architectural design has expanded once again and become potentially more complex.

REFERENCES


