Digital Media and the Language of Vision

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Digital media are transforming the practice and teaching of design. Information technologies offer not only better production and rendering tools but also the ability to model, manipulate, and to understand designing in new ways. This paper outlines a thirteen-step methodology used in a seminar that teaches design students how to see, think, and form space using both digital and physical media.

The paper describes a systematic approach that follows the tradition of the Bauhaus principles of craftsmanship and visual perception. Precedents are drawn from the use of light, color and texture in the visual arts such as the glass collage assemblages of Albers and Moholy-Nagy’s camera-less photogram. References are also drawn from Kandinsky’s diagrammatic analysis of still life drawings and Kepe’s idea of the language of vision.

The focus of the paper is how digital media and physical material can be used interchangeably as instruments in a design environment. The investigation centers on developing teaching methods for seeing, thinking and making of spatial design. A sequence of experimental exercises stimulates students’ intuition and powers of analytical observation. This systematic approach helps students explore how space can be perceived and informed by using types of media that are significantly different in their nature. The methodology explores the concerns and techniques of making and exploring space through the use of light, shadow, motion, color and transparency.
Introduction - design in the digital age

The development of digital media not only provides new production methods such as computer rendering and modeling, but also expands our abilities to create, to see, to express, and to compose space. We are interested in how digital media and physical materials can be used interchangeably as instruments in a design environment. The question we are asking is can one develop a rigorous design process as a systematic approach or interplay between space and light? We view design as a laboratory for experiment, interpretation, and play. Our investigation focuses on developing teaching methods for seeing, thinking, and making of spatial design. Several experimental exercises stimulate students' intuitions and analytical observation skills. We use this systematic approach to explore how space can be informed and perceived by using types of media that are significantly different in their nature.

A previous work, "Between Digital & Analog Civilizations: The Spatial Manipulation Media Workshop" (Neiman and Bermudez 1997), described a three-day design workshop that employed both analog and digital media. We use "analog" to refer to physical artifacts and the physical representation of design, such as tracing paper, ink, pencil, drawing, sketching, and various physical model-making materials. By "digital" we mean using computer information technologies, such as scanning, video capture, image manipulation, and modeling. The workshop involved a five-stage transformation process alternating between making physical artifacts and computer image manipulations. The workshop intentionally did not use any CAD software as a strategy to break down students' preconceptions of computer technologies and to shift the focus to an alternative analog-digital dialogue depicting space. The present effort follows this model of design, augmenting it with new devices such as the use of modeling software and physical relief compositions. The result is a thirteen-step design method that uses techniques involving both analog and digital media. In the following sections, we present the idea of an analog-digital language of vision. Section 2 reviews precedents of systematic approaches toward design from the Bauhaus teachings. Section 3 describes a sequence of thirteen exercises with examples of student work. Section 4 summarizes our approaches to using computers as a tool for composing space.

Bauhaus precedents - manipulation and analysis of form

Our systematic approach follows the tradition of the Bauhaus principles of craftsmanship and visual perception. Below we briefly review works exploring the use of light, shadow, color, and texture in the visual arts, such as Albers's glass collage assemblages and Moholy-Nagy's camera-less photographs. We also draw references from Kandinsky's diagrammatic analysis of still life drawings and Keppel's idea of the language of vision. We review these methods of design thinking, and the background for making physical artifacts, to teach students how to achieve visual and spatial effects using digital media.

The Bauhaus teaching philosophy centered on the study and use of materials. Focusing particularly on color, light, texture, and materials, Josef Albers explored the assemblage of found objects. Albers picked up a variety of discarded, colored glass fragments, transforming these materials into unexpected compositions. Through these improvisational experiments, Albers advocated the idea of the studio as a laboratory or workshop where students discover and invent artifacts through seeing, exploring, and situated thinking (Albers 1988 & 1994).

In the early 1920's, Laszlo Moholy-Nagy developed a technique called the photogram or camera-less photograph (independent of Man Ray), to record the temporal movements of light. He employed a moving light source as a creative agent to capture images of nature (Moholy-Nagy 1969). This technique was derived from a rational attempt to paint the penetration of lights through planes. The black, white and gray values of the photograms revealed the spatial quality constructed by traces of light. Moholy-Nagy used these "light-compositions" or "light-phenomena" to help us see the world with a new vision. His Light-Space-Modulator was a
kinetic sculpture that produced a "light chronology" with rotating metal and glass parts. Moholy-Nagy considered his film of this light machine (Light Display: Black-White-Gray) more important than the device itself because it revealed unexpected motions, reflections, projections, and rhythms of light and shadow (Moholy-Nagy 1969). Moholy-Nagy’s optical synthesis, through the production of photograms and the light display film, documents space with superimpositions of objects and the interplay between light and shadows.

Vassily Kandinsky developed a visual language that consists of point, line and plane (Kandinsky 1947). He considered the spirit of art to lie in the comprehension and "vision" of element movements and silent melody (Kandinsky 1947). He developed a method of analytical painting that breaks a still life into diagrammatic forces to express tension, geometry and repetition. These analyses illustrate the concepts of balance, rhythm and motion in graphic forms (Poling 1986). These schematic diagrams provide a method for students to examine and analyze the implications of element placements in a scene. This technique transforms the viewing of pictures from natural depiction to diagrammatic analysis through a process of dynamic discoveries.

Gyorgy Kepes's Language of Vision (Kepes 1944) provides a primer for learning basic design principles. Kepes argued that the perception of a visual image needs a process of organization. The experience of an image is "a creative act of integration" (p. 13). He explained that a two-dimensional picture has a spatial field because the different positions of the elements in the picture plane create a dynamic field of movement. Any composition, whether it is a photograph, a painting, or a pencil sketch, can represent the manipulation of objects in space. The play of transparency, superimposition, lines, colors and light all contribute to a specific sense of space. Kepes further argued that one could derive visual awareness through the process of examining and making spatial configurations of objects. He also stressed the value of experimenting with artificial light sources to model the experience of an environment or a space.

**Digital language of vision - a thirteen-step methodology**

With these precedents, we developed a thirteen-step methodology that explores the concerns and techniques of making space through the use of light, shadow, motion, color, translucency and transparency. Following the Bauhaus teaching philosophy and the "Digital and Analog" example (Neiman and Bermudez 1997), we focus on the question of how one can incorporate digital media into traditional design techniques. Our focus is the development of a pedagogy for experimentation and a language of evaluation for the techniques themselves. We extend the conversation between analog and digital to be a design exercise using different materials. We report our design teaching as an example of how creative vision can be expanded through digital tools.

This digital language of vision methodology is developed in a process of thirteen sequential exercises described below in detail. The designer begins by photographing a series of dynamic scenes, and printing them on transparent films. These semi-transparent planes are strategically combined and captured by means of video cameras (the analog spatial manipulation device). Video frames are captured and the digital images are manipulated and diagrammed using graphic software. The resulting images are then manipulated in a computer-modeling program (the digital spatial manipulation device) to represent a combination of planes using light, shadow, color and transparency to re-create the effect of spatial quality depicted from the transparent films.

**Exercise 01 - analog space capture:**

In the first exercise, student teams investigate and photograph the spatial nature of two distinct kinds of places (the subject matter varies) that illustrate the ideas of "space within a space." Students are instructed to pay special attention to spaces that have a contrasting quality of foreground and background (or inside and outside) separated by a partially or totally opened threshold such as a window or a door. This exercise requires students to use a traditional 35mm camera and their eyes. A person’s per-
ception of a physical space comes from experience. Asking students to capture images of space in their everyday life forces them to examine their experience closely. They learn to use the camera as a device to flatten a representation of spatial qualities. In this exercise, design is the transcription of a spatial experience by selective framing and interpretation.

**Exercise 02 - analog spatial manipulation device:**

This exercise engages students in material management and photographic craftsmanship. Equipped with the analog space captures, each group creates a "spatial manipulation device" using transparent materials. The photographs (five from each space for a total of ten) are transferred to clear acetate films. Each group fabricates five, one-half inch thick acrylic panels that serve as armatures for the acetate images. They place acetate films on two sides of the acrylic panels, experimenting with the spatial concepts extracted from the photographs. The thickness of the acrylic creates a spatial quality that allows students to see images with overlapping planes. Images with spatial qualities are translated from photographic to transparent surfaces creating a conceptual space for media experimentation. In this exercise, design is the transformation and construction of instruments prepared for their roles in an analog performance.

**Exercise 03 - analog performance:**

This exercise employs an analog medium (a video camera) to dynamically document the
Figure 3. Analog performance: video recording of dynamically juxtaposed model configurations.

Figure 4. Digital performance: scanned acetate combinations.

Figure 5. Digital space captures frames grabbed from the videotaped performance.
models in various positions. Students are encouraged to search for unexpected spatial viewpoints, challenging and provoking their spatial perception abilities. While some students move and compose configurations of the acrylic and acetate films, other students explore positioning the video camera in various viewpoints and lighting conditions to record the sequence, transitions and spatial manipulations. The physical choreography of the analog model compositions reappears in a flattened analog medium (videotape). The camera lens acts as a filter for the observers’ intentions and evaluations of the spatial quality in the physical model. In this exercise, design is the documentation of change and movement of different viewpoints in space.

**Exercise 04 - digital performance:**
In a simultaneous imaging exercise, two or more of the acetate films are directly overlaid into different combinations. Students superimpose, move, rotate and superimpose their image transparencies until they discover interesting and suggestive spatial qualities. This exercise requires students to use a digital scanner to document ten experimental combinations. With conceptual reference to the original spaces, new spaces are created by physical simulation, documented into digital media. These images become layers of information that interpret the situations of the photographed physical space. One can access and evaluate a space by a combination of careful observations and playful discoveries. In this exercise, design is the perceptual manipulation of image composition to create transparency and spatial ambiguity.

**Exercise 05 - digital space capture:**
With a digital frame grabber, students examine the interpretive potential of the video image as a dynamic design tool. Students perform a frame by frame analysis of the videotaped analog model performance. They evaluate and select several spatially provocative still frames and capture them into digital media, saved as image files. They present their selections of images in class and discuss their discoveries. Space is now represented in a series of digital, experiential still frames. In this exercise, each captured image is a new interpretation of spatial meaning from the model.

**Exercise 06 - analog-digital vocabulary:**
Starting with this exercise, each student generates an analog-digital vocabulary by isolating, selecting, and cataloguing a series of significant fragments or parts from the analog space photos, the digital performance scans, and the digital space captures. Students distill and extract a variety of elements, shapes, textures, and colors by following the existing contours found in the image. Image processing software (Photoshop) is required for this exercise. In this exercise, design is a hybrid analysis and synthesis of previ-
Figure 7. Radical reconstruction enhances and transforms spatial qualities from the analog-digital vocabulary.

Figure 8. Analog schemas: analytical diagrams extracted from a radical reconstruction image (top-left: source image; bottom-left: figure-ground schema; left-to-right: geometric grid, tension diagram, and interpretive representation).

Previously generated visual material.

Exercise 07 - radical reconstruction:
In this exercise, students use image manipulation software to explore and enhance the spatial qualities of the analog-digital vocabulary. They explore different parameters of color hues, opacity, and a limited set of graphic filters such as blur, pinch, and sharpen. They edit and transform these spatial elements. Digital media is used to enhance the inherent spatial qualities already conveyed. The capability of image manipulation in digital media enables a designer to explore endless possibilities. Simple operations such as repetitions, distortions, rotations and inversions help transform the analog-digital material into a new, alternate spatial reality. In this exercise, design is the creation of new space by extracting spatial qualities from a variety of hybrid materials.

Exercise 08 - analog schemas:
In this exercise, students create a series of critical and analytical diagrams from a selected "Radical Reconstruction" image. Pen and paper is the medium for diagrammatic thinking and analysis. They overlay tracing paper on top of their source image to study the geometry, ten-
sion, interpretive representation, and underlying schema, employing varying line weights (thin or thick), line types (solid, dashed, dotted), line forms (curved, angled or straight), and object types (line vs. colored zones). These diagrams are digitally scanned and combined with the source radical reconstruction. The seeing and making of schematic diagrams facilitates the understanding and interpretation of the spatial construct embedded in the radical reconstruction. In this exercise, the process of diagramming brings the essence of spatial quality into the foreground of representation.

Exercise 09 - digital tracings:

After the exercise of hand tracing with analog material (paper), students experiment with digital tracings in modeling software. Radical reconstruction and schematic diagrams are imported as underlays in the "draft mode" of formZ. Closed shapes are created by selectively tracing elements from the underlays. Students draw different diagrams in different layers and line colors to represent different systems. They explore composites of these layers to create an interpretive spatial analysis. The editing processes create formal ambiguities. In this exercise, design is the selective line reinterpretation of the composite image.

Exercise 10 - digital templates:

By copying and pasting between layers, and employing different editing operations, students create a series of variations on the previous studies. They use digital modeling (formZ) to generate a unique set of template diagrams. A template diagram is a collection of two-dimensional vector shapes created with Boolean operations such as union, difference, and intersection. In this exercise, design is the selective expansion of formal possibilities, through additive and subtractive processes.
Exercise 11 - digital reliefs:
Based on the digital templates, students make three-dimensional objects from the two-dimensional shapes. This exercise teaches students to construct a digital relief model by systematically applying thickness and height to different shapes in the flat templates. A digital projection of the templates transforms the exercise into a beginning three-dimensional study. The extrusion of linear forms provides a transitional study between the two-dimensional and three-dimensional worlds. In this exercise, design is the creation of three-dimensional objects derived from analytical, diagrammatic templates.

Exercise 12 - digital spatial manipulation device:
Once digital objects are created, their locations can be reconsidered. In this exercise, students use the modeling software as a "digital manipulation device" to explore variable locations of the digital reliefs in space. Space is accessed and re-evaluated through the intention of the screen of a computer. Three unique model configurations are created as an interpretive transformation of the relief studies. For each model configuration, students generate a single, one-point perspective view as a compressed series of spaces within spaces. The spatial program is in the following sequence: a foreground space; a
middle ground as singular or multiple framings (open or partially open; transparent or translucent); a background as space(s) with an aperture (full or partial) to another view beyond (to an inside or an outside). Students refine their final views, experimenting with solid, void, color, lighting, shade, shadow, transparency, translucency, and reflectivity. The images evoke a sense of not only the "radical reconstruction," but also the spirit of the original "analog space captures" (photographs), the "digital performance" scans (acetate overlays) and the "digital space captures" (video). In this exercise, design is the interpretive arrangement and composition of objects in digital space.

Discussion and conclusion

We argue that for digital media to be useful and effective in design teaching, it should converse with traditional, analog, design media. The conversation should be interactive, reciprocal, deliberate (controlled and based on an established pedagogy), cyclical, recordable, and reproducible. The experiment needs to be explorative, in which play is followed by interpretation. We found that by using these elements in the process of design, students become engaged and enthusiastic.

The projects and methods described above are not intended as completed works, but serve as sketches for the development of a teaching method. Most importantly, they act as vehicles for testing various sketch-design techniques through the iterative use of digital and analog media. Our methodology promotes the act of design as a discourse, where execution precedes conception. The studio is a laboratory or a design workshop where students can discover and invent space. Ultimately, the pedagogy is about how students can learn to see, to project, to manipulate, and to design. The experiments involve photographic capture and physical craftsmanship, digital manipulation of two-dimensional images and construction of three-dimensional geometry.

This method has been applied in undergraduate...
courses conducted over several semesters including digital design seminars and upper level design studios. The curriculum is an example of integrating the computer into studio in an effective manner, in aiding design without dominating or ignoring successful analog methods. Students explored the poetic potential of using computers in a space making exercise, where digital media become a design instrument. Photographic images, collage, and assemblage became the potential sites for design. Students learned that computers can be used for more than just drafting and modeling, but as a vehicle for developing and expressing visual ideas. The design strategies, tactics and techniques stimulate their intuition and reasoning abilities. Furthermore, our thirteen step methodology provides a platform to guide students through a process where they learn to see, to appreciate and to create spatial qualities by manipulating different media. Our methodology is a carefully thought out exercise with digital and analog media as a vehicle for teaching a language of vision.

Figure credits

Figure 1. Analog Space Capture: Pierson Jones, John Selke (two left); Frank Cauthen, Claire Imatani, Tracy Meese, Shelley Block (two right).

Figure 2. Analog Spatial Manipulation Devices: John Houck, Brendan Byrne, Brad Nelson.

Figure 3. Analog Performance: Tony Benecke.

Figure 4. Digital Performance: Frank Cauthen, Claire Imatani, Tracy Meese, Shelley Block.

Figure 5. Digital Space Capture: Claire Imatani (top), Frank Cauthen (middle), Pierson Jones (bottom).

Figure 6. Architectonic Vocabularies: Pierson Jones.

Figure 7. Radical Reconstructions: Pierson Jones.

Figure 8. Analog Schemas: Claire Imatani.

Figure 9. Digital Tracings: Taylor Akin.

Figure 10. Digital Templates: Taylor Akin.

Figure 11. Digital Reliefs: Taylor Akin.

Figure 12. Digital Spatial Manipulation Device: Taylor Akin.

Figure 13. Analog Extrapolation: Kelly Barr.

References


