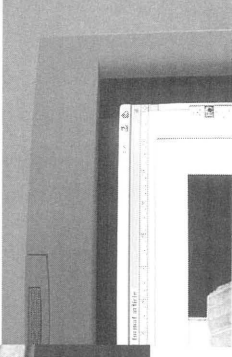
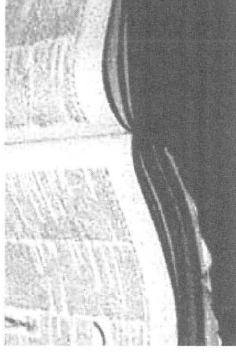


Dis[appearances]: Representational Strategies and Operational Needs in Codexspace and Screenspace

Katie Salen and Sharyn O'Mara



The transition from book to screen requires careful analytical comparison. The structure of the book cannot be simply translated to the space of the screen without consideration of new spatial practices afforded by hypermedia architecture. Unlike the book which appears whole and physically delimited, hypermedia embraces a realm of disappearances where issues of form and navigation undergo redefinition. By asking what concepts are shared by digital and printed document alike we are led to an investigation of possible models for understanding their differences and exploring the implications of the digital document as a textscape.

Department of Art and Art History
University of Texas at Austin
Austin, TX 78712
zed@mail.utexas.edu

Kansas City Art Institute
4415 Warwick Blvd.
Kansas City, MO 64111
somarra@gvi.net
Visible Language 31.3
Salen & O'Mara, 260-285

© Visible Language, 1997
Rhode Island School of Design
Providence, Rhode Island 02903

A man sets out on a journey to a place he has never been before. Another man comes back. A man comes to a place that has no name, that has no landmarks to tell him where he is. Another man decides to come back. A man writes letters from nowhere, from the white space that has opened up in his mind. — Paul Auster

disappearances

They say that you should write from what you know. We are book designers and, as such, we know about books. And text and typography, paper and ink, space. White space, page space, book space. *Communication by document*. We are also writers, so we know something of beginnings and endings and ways of getting from one to the other. *Journeys. Landscapes of connection. Time*. As designers and writers in the age of hypermedia we are acutely aware of disappearances: of the object, of control, of space and of time, of place and of possession, of edges. Center and periphery no longer visible as distinct concepts. Suburban sprawl meets the tidy grid. *To drift*. Appearance and reappearance but in a different anyplace that you have, in fact, never left.

definitions

representational plane the formal anatomy of an information structure as articulated through materials of expression: typography, paper, ink, pixels, light, etc.

operational plane spatial practices or navigational strategies implied by any given information structure: alphabet order, index, menu, button, etc.

document the combination of information and structure.

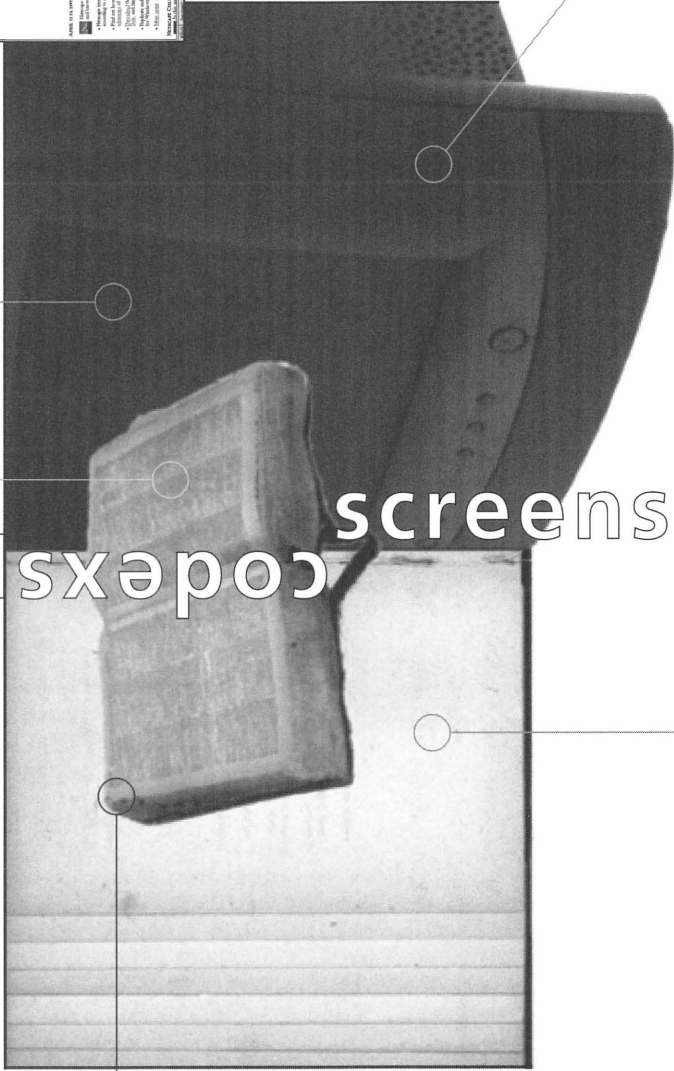
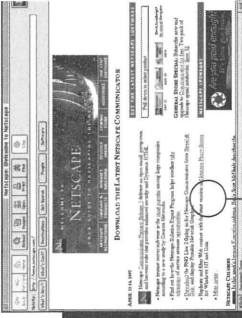
In addressing this realm of disappearances several fundamental questions are raised as to the ways in which a document—whether printed or digital—is experienced as a form or idea, an object or encounter. Vastly different in their approach to the articulation of form (referred to here as the *representational plane*), and navigation (the *operational plane*), each offers varied experiences of form, of information and of roles for navigation. As such, consideration must be given to the shifting relationship between a document's representational qualities and its operational, or navigational, needs. In asking what concepts are shared by digital and printed document alike we are led to an investigation of possible models for understanding their similarities and differences: the digital document—temporal, shared and infinitely adaptable, and the printed document—quantifiable, fixed and beloved for its sense of permanence, possession and personal encounter.

digital space

printed document

digital document

monitor:
apparatus for viewing;
separate from the digital
document as an
information structure



codespace screenspace

book:
information and
apparatus for
viewing share
some physical
structure

print space

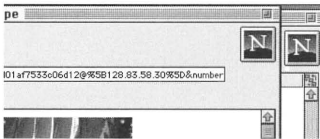
1

representational planes and operational strategies

Rumor has it that a web year is currently at three months and new media are unveiled daily, largely reinforcing the notion that the printed document is a traditional means of *communication through document*. Perhaps the first written documents were inscribed by the Babylonians on clay 2,000 or more years before the Christian era, followed by papyrus rolls, scrolls and eventually the codex in the mid-fifteenth century with the advent of moveable type and the printed text. Taken in the evolutionary context of its predecessors, the printed book is actually of relatively recent origin (Diehl, I-3), though we are not likely to consider it a new invention in communication. However, the printed book has been the primary method of recording and transmitting information for centuries, and our experience of the textscape has been almost exclusively book-based. While there is a tendency in many digital applications to utilize metaphors about the book in an attempt to better convey information through digital means, often this serves only to remind the viewer of what the digital document is not; for example, the use of the term *webpage* to represent an entire body of work, or the use of a *bookmark* as a digital locating device. We, on the other hand, are interested in what the digital document *is*, and what it might be. Therefore, we reference the book as a primary printed document from which to ponder the matter of the digital document. [see figure 1]



Holding a book, we evaluate its physicality: size; weight; proportion; scale; quality of paper, printing, images, typography. These materials of expression provide some clues to the potential of the text; while material aspects are never foolproof indicators of the quality of the content within, they do begin to establish a sense of the identity of the object. Flipping through the book, we can deduce almost immediately: how lengthy is the text? how dense? how well annotated, illustrated and organized? In short, we can gather a brief sense of what is to come based upon information revealed by the physical structure of the printed book.



The matter of the book is not difficult to isolate; we have been familiar with these materials since early childhood, and likely, they are largely transparent to us now. When at first we seek to define the material aspects of the digital document, our hands inevitably come up empty.

We begin by turning our attention to a discussion of the *operational plane* as a way of exploring the relationship between a document's representational strategies and its operational needs. First, it must be understood that the anatomy, or representational plane, of the document contributes to a reader's overall experience by providing an identity, or precise concept of form, for the document. The term *identity* as it is used here refers to the the reader's recognition of a specific relationship between the anatomy of a document (as articulated through visual form), and the organizing principle structuring that form. Following, the term *form* refers not only to ideas about the visual representation of information within a document but to concepts surrounding the organizing structures that determine the way in which the information can be navigated. When a document's form gains identity (again, through cognitive recognition on the part of the reader) its value as an *object* is established. This concept of "object" refers not to any specific delineation of physical edges but to an acknowledged integrity between the information and the description of its manipulation.

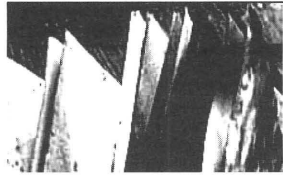


The organizational structure of the book is generally known to the literate viewer, and has influenced how we present and perceive information. While slight sequential variations may occur in the textblock, there exists a generally accepted set of component parts which help to orient the viewer to the text. This linear progression leads the viewer to and through the information along a well-planned path. While one can certainly diverge by skipping pages, the closed system of the printed book offers a largely singular experience: the reader, and the environment may change, but the printed text itself remains intact and unaltered with the exception of any reader's notations.

The size of this document is not felt with the hand, but is measured in the weightlessness of bits and bytes. Based on the preferences of the viewer its proportion and scale are flexible. The visual quality of the document depends upon many variables: the speed at which it can be rendered, the resolution of the text and images it contains, the color, brightness and contrast of the screen on which it is viewed, and the quality of detail as it is rendered in pixels.

The first structural aspect of the book as object is the cover. Added historically as protection to extend the life of the textblock, it has evolved into a sophisticated graphic and typographic advertisement for the contents. Inside covers offer a teaser of the information contained within, followed by the traditional false-title, or bastard-title page, which offered protection to the subsequent full-title page in an early era of the codex when the printer simply wrapped the gathered sections of the textblock and sold it unbound; only the wealthy could afford the bindery. Copyright information, including ISBN numbers and publishing information, is located on the verso of the title page. Preceding the table of contents, which provides the reader with a method of locating particular subject matter or topics within the larger body of the text by specifying a page number, can be any combination of dedication; foreword: a short introduction offered by an authority in the field of the book's topic, or knowledgeable about the author; preface: the author's statement of reason for writing the book; and acknowledgments, which are often combined with the preface. The introduction may be either preceded or followed by a half-title page, which simply repeats the bastard-title. The body of text follows in a clear hierarchy; divided into chapters, it is punctuated with many visual cues to guide the reader along this linear path: heads and subheads, folios, running feet, pull-quotes, footnotes and annotations.

Figure 1



In the printed document the information and the apparatus for viewing share the same physical structure; as a result, the economics of print production are tied directly to the boundaries of the physical object.

document driven
user driven

[*textscape*]

document driven
user driven

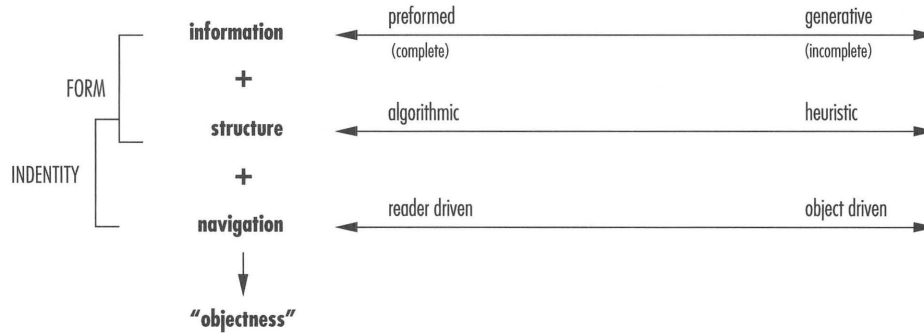


In the digital document the information must be considered separately from the apparatus on which it is viewed; the economics of production are tied to the viewing apparatus but do not constrain the information in the same way that the printed document is limited by the cost of physical materials.

PRINTED DOCUMENT		DIGITAL DOCUMENT
<p>Limited by economics of print production.</p>	<p>• color</p> <p>• images</p>	<p>• Document specified; constraints of monitor affect document specifications; user may change within limitations of technology or choose not to render.</p>
<p>Typography is specified based upon content, page size, margin size and density of text. The economics of print production result in limitations in the potential page size, number of pages and typographic layout which directly affect the form of the printed document.</p>	<p>• typeface</p> <p>• type size</p> <p>• leading</p> <p>• margins</p> <p>• line length</p> <p>• type orientation [FL, etc]</p>	<p>• Document specified; user may change within limitations of technology or default to other configurations which may alter the readability and meaning of the text.</p>
<p>Document guides through both sequence and operational cues; user determines the sequence [may skip chapters or pages] and pacing through intention. Hierarchy is spatially based.</p>	<p>• • sequence</p> <p>• • pacing</p>	<p>• Document provides visual cues in the form of user interface; user determines sequence and pacing based upon intent. Hierarchy is temporally based.</p>

Second, such a discussion assumes as its basic premise the recognition of the document as an articulated object in the mind of the reader. What are the conditions and criteria that make this recognition possible? Here we will argue that one quality of “objectness” in the mind of the viewer is dependent upon his/her perceptions of the relative **completeness** or **incompleteness** of the document as determined by potential changes in form and information. A second quality can be found in the type of organization, or set of devices for organizing behavior by structuring the document. A third quality can be seen in the navigational role assumed by the reader as s/he experiences the document. Later we will outline several models for navigation as determined by the relationship between identity (form) and constraint (structure). (See *figure 2*).

figure 2



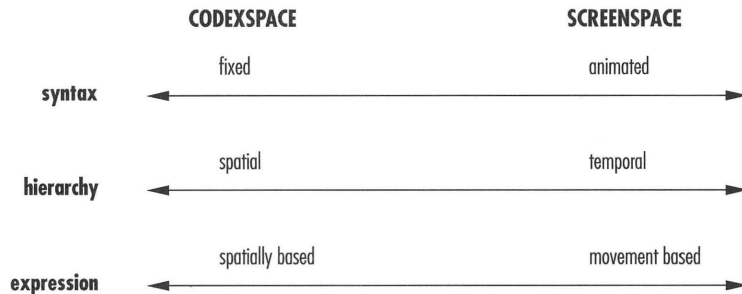
Yet, in order to proceed, further inquiry is needed. Initially we must ask whether or not our working definition of “document” requires the assumption of a closed system where information that may not be fixed in either space or time is known, at least, to be “available” within the system. In such a scenario information is **preformed**: all available data is established prior to use. Certainly printed documents require such a condition: the technology of printing establishes this constraint, encouraging the reader to understand the object as “complete” and the system as closed. Many digital documents, despite the flexibility of their form and structure, must be understood as having similarly closed systems: our ability to make decisions about what we want to see, how we see it, and when we see it, does not change the fact that the information available to a reader remains the same; its information boundaries are pre-established. This is not to say that the *meaning* of the document (either printed or digital) is closed or fixed, as multiple interpretations could stem from a recombination of the available information through changes in form and spatial organization. An example of this can be seen in Li Dynasty poetry in China, where extremely brief poems were constructed using words with multiple meanings, or hinge words. In such a system, there are relatively few sounds, but there is the possibility for many tonal and contextual variations on them. Variations in the aural representation of the selected hinge words result in a cascade of possible interpretations. The job of the singer is to tease out these hidden resonances by variations in pitch and stress and placement. When this is done well, the conflict and sympathy between different meanings create a dazzling moiré of shifting messages (Eno, 386).

This type of poetry provides an example of an object whose information boundaries are pre-established but whose identity, or concept of form, is highly variable. One of the more profound characteristics of the digital document *is* its physical malleability. A single textscape can be experi-

enced in an infinite variety of locations, in an infinite array of configurations. Here the materials of expression are highly malleable and, in most cases, the digital object will become whatever you want it to be. Because there is a fundamental separation between the digital document as object and the apparatus upon which this object eventually will be viewed, the form of the document exists *in potentu*—no singular form exists.

In addition to differing degrees of change in form and information the operational space of printed and digital documents differ broadly in conception (*figure 3*). Differences in the relative fixity of signs within the space, as well as subsequent changes in navigational strategies, suggest that the space of the page has little to do with the space of the screen. Codexspace, or the space of a printed document, has traditionally been tied to paper, a composing surface that is defined by its ability to take on a particular and repeatable size. As a fixed space, it functions as a textual counterpart, both surface and void, margin, letterspace and edge; as readers we can careen down the gutter, haul ourselves up the incline, sweep across the line and around to the next page.

figure 3



1

The relationship between visual syntax and the semantic implications of any text must be understood in terms of the reader's experience with the piece of writing. Changing its physical form, altering its rhythm, emphasizing visual and verbal linkages, recodifying systems of punctuation, alters the manner in which the text is read. This transformation of the reader's experience has consequences on the level of interpretation. Visual syntax has the potential to transform meaning as typographic gestures and spatial manipulations create effects with both visual and aural dimensions.

Situating visual signs within a hierarchy that is navigable spatially but fixed physically, codexspace provides rhythm and pacing for the reader.¹ Such a hierarchy utilizes spatial cues to aid in an understanding of where the document (as closed object) begins and ends, situating a reader in a particular place. The sense of closure or completeness can be extremely physical as even graphically manipulated signs are unable to escape the immutability of the final composition. As Walter Ong (133) notes, "Print situates words in space more relentlessly than writing ever did. Writing moves words from the sound world to a world of visual space, but print locks words into position in this space. Control of this space is everything."

2

While codexspace offers many visible spatial boundaries that facilitate navigation through the document, what indicators of boundaries² exist within a digital document? In what ways might these devices allow the reader to orient themselves in relation to an object that does not possess a single "structure" that can be transposed or transported to and from another medium and is notable for the appearance-disappearance of signifiers? (Kac, 191) Because of its tie to cyberspace, screenspace assumes an infinite blackspace as a real world equivalent to the universe: an unending, non-quantifiable field. Conceptually it can be understood as an open, potentially immersive volume—a manifestation of Borges' Library of Babel—where all possible words, all possible configurations (both visual and verbal) exist, in potential, below the surface of the screen. Because the spatial boundaries of a digital document are not defined by the edges of a physical surface, we, as readers, are offered no clues as to the nature of the dimension it occupies. Recognized as the "in-between" of here and there, the transformative space of the digital document presents a wander-ground, an architecture of joinery and kinetics situating sites of encounter within an evolving information structure. Embedded layers, rendered invisible through binary opposition,

await excavation. Information and its surface share identical materials of expression. To impose form simply requires calling code to the digital surface through the textual naming of a file. Here naming and renaming becomes a ritual of evocation, a disappearing act with reader as magician.

BOUNDARIES	CODEXSPACE boundaries are tied to object	SCREENSPACE boundaries are tied to apparatus for viewing
	page size	screen size
	book size [in inches]	document size [in k or MB]
	print quality	pixel resolution
	ink	light
	paper	screen
	cost of color	no cost of color
	printed typography	bitmapped typography
	binding	programming / coding
	static structure	malleable structure
	information: closed system	information: open or closed system
	navigation: spatial	navigation: temporal
	information is static; reader + environment may change	information, reader + environment may change
	permanent	flexible

2 spatial practices

Paul Saffo has written that,

“It is not content but context that will matter most a decade or so from now. The scarce resource will not be stuff, but point of view. . . The future belongs to neither the conduit nor content players, but those who control the filtering, searching and sense-making tools we will rely on to navigate. . . (*Wired*, March 1994, “It’s the Context, Stupid.”)

Navigation or reading involves constructing a coherent relation between text and context, between object and the spatial practice necessary to engage that object. The root Latin word, *texere*, means “to weave” and the context provides an array of peripheral elements that, woven together with the text, make a document.³ Moreover, navigation is an attempt to engage space in a visceral, meaningful way.⁴ The concept of the cybnaut, (cyber coming from the Greek *kyber*, meaning to steer, while “naut” means ship), provides a model for thinking about possible roles, or spatial practices. Defined on the one hand by the relationship between the identity (form) and constraint (structure) at play in either the printed or digital document, and on the other by the motives of the reader (what they are reading and why), the assumed navigational role plays a significant part in determining a reader’s experience (*figure 4*).

figure 4



3

What is the nature of the role that form manipulation as an indicator of context plays in the interpretation of a text? Taking a cue from e. e. cummings, we can say that visual distortions may be visual in nature but non-visual in function; they may function to regulate the speed of the reader’s comprehension of words and sentences; or they may be used to create, reinforce or violate rhythmic ideas. (Marks, 117). In each case there is a desire to direct the reader’s experience.

4

John Sparrow, in his study of inscriptions, found that the quality of the impact that a piece of writing makes upon our minds may, in part, be determined by the layout and particularly by the lineation of the text in which it is embodied on

the page. From this we can conclude that the meaning of a text does not depend solely on the concreteness of words or on their referential quality. Meaning is directed by the relationship between form and navigation as experienced by the reader.

Earlier reference was made to the following diagram. Initially it was presented to describe a framework of parallel continuums within which a printed or digital document must be considered. Here it is represented in the context of several proposed navigational strategies for reading. Five such roles are introduced for consideration, each representative of a hybridization of possible relationships. It should be understood that positioning of these roles within the framework are general, rather than specific, and are intended as points of departure for further research and discussion beyond the scope of this article.



drifter

Any inquiry into spatial practices and means of navigation must take into account the issue of control, of chance or choice, of **random** or choreographed encounter. The above mentioned roles rely on a pattern of movement originating from within the desires of the navigator. But what of a spatial practice reliant upon the **desires of the system**? In answer to this we propose the role of **drifter**, a reader at the mercy of the ebbs and flows of the textscape, who imposes no will in the formulation of the textual encounter. Paul Auster has written beautifully of this concept: “On the surface this motion seems random. But such randomness does not, in itself, preclude a meaning. Or if meaning is not quite the word for it, then say the drift, or a consistent sense of what is happening, even as it changes, **moment by moment**” (Auster, 104). Instead of reading *for a meaning*, the reader gains meaning by opening themselves up to the *experience* of the text.

surfer

A third proposal for the role of the cybernaut is that of **surfer**: a role, like that of nomad, which relies heavily on the powers of selection and intuitive, free-associating movement. Yet unlike the nomad, the surfer does not see herself as “the primary motor” for her movements. Instead her “actions emerge from the dynamics of the water.” Sanford Kwinter, in writing about dynamic systems, notes that “Waves create temporary and formal intensities, **fluid streams**, in which the surfer employs intuition (to be one with the wave) and innovation (to explore unknown realms). The landscape (waves) has to be transformed to make the situation convulse, oscillate and break” (Chaplin, 411). Seeking the most workable lines—the “gaps” or “cuts”—trajectories that are never twice the same, the surfer works to harness the energy of the system. Euphoria is found in the ride itself, in the exhilaration of the kinetic encounter, completion and arrival tolerated only as **platforms for imminent departure**.

nomad

Following Deleuze and Guattari, we can discuss the role of cybernaut as **nomad**, alluding to a **fluidity of movement** in navigation that is a spatial practice requiring “a walking pace to ensure the full emotive power of the experience.” (Chaplin, 409) While the implications “of being a pedestrian” on the information superhighway may be cause for alarm, as a model for the negotiation of a space often characterized by serendipitous encounter it is highly appropriate. In search of a constructive and motivating force, the nomad embraces the multitudinous opportunities afforded, desiring the quiddity of the **happened-upon connection**. We walk and we wander, choosing our steps carefully, slowly engaging the scope of the document. Further, as a spatial practice nomadic navigation references the Situationists’ idea of the *derivé* where to pursue the *derivé* was “. . . to give yourself up to the promises of the city, allowing signs to divert, to ‘detourn,’ your steps, and then to divert those signs yourself, forcing them to give up routes that never existed before. . . .” (Marcus, 170). In the *derivé* “each situation would be an ‘ambient milieu’ for a ‘game of events’; each would change its setting, and allow itself to be changed by it” (Marcus, 164).

thief

The role of **thief** invites the cybernaut into the spatial practice already occupied by hackers and junkies: theft, addiction and violation of the system. Participating in a choreography of appropriation and adrenaline in which a system is infiltrated and dismantled, the thief **steals and recombines**, achieving a degree of **intertextuality** dating back to manuscript culture. “Manuscript culture had taken intertextuality for granted. Still tied to the commonplace tradition of the old oral world, it deliberately created texts out of other texts, borrowing, adapting, sharing the common, originally oral, formulas and themes. . . .” (Ong, 133). In addition, the formulation of cybernaut-as-thief implements the Situationist idea of detournment (the theft of aesthetic artifacts from their contexts and their diversion into context’s of one’s own devise) giving the textscape up to free-play and recombination. With the thief, stealth and invisibility grant undenied access to the power of **overlapping spatial discourse**.

chameleon

Each of the above four models are dependent upon closed systems of information where information is preformed and the concept of organization primarily algorithmic. In such cases the document experience is **reader driven**. While variation in a digital document can occur in both form and navigation (changes in sequence, ordering of information) variation in a printed document is possible only in the context of navigation, with each equally dependent upon the motives of the reader. The role of **chameleon**, with its emphasis on **adaptability** in both form and behavior, offers a very different model for navigation predicated on the ability to shape and adjust its own action within the context of a **self-evolving system**. Instead of remaining outside of the system—asserting control based on a known structure—the chameleon is an **integrated** component, monitoring (and adjusting) its own behavior in relation to the alterations in its surroundings. Such a model situates change as the catalyst for navigation and the experience of the text becomes a journey of possibility.

3 anti-space

William Mitchell has noted that space in a digital document is “. . . fundamentally anti-spatial. It is ambient nowhere in particular but everywhere at once” (Mitchell, 30). A reader’s inability to situate this anti-space in a particular place has a marked effect on the conception and experience of boundaries and limits of the document. Consequently, the choreography of reading (*figure 5*) changes from a movement *across* space to a movement *through* time where space is used for both distinction and distance between nodes of information. This distinction must be understood in terms of the time taken to travel from one node to another. Because the distinguishing characteristic of the digital document is its linking navigation structure, time as the measure of distance travelled replaces any notions of space as a bounding entity.

In addition, the indeterminate space of a digital document cannot be conceived as a facilitator of rhythm and pacing in the same way that codexspace can. Where codexspace depends upon spatial organization for hierarchy,⁵ screenspace looks to time as the ultimate determinate of value. While codexspace is characterized by its role in controlling movement *through* and *across* the page, the mobile signifying system of the digital document “extend[s] its expressive power to encompass time, since the words are not fixed upon a surface but rather float in space” (Kac, 190). Whitespace turns blackhole and, as a material of expression, contributes little to the definition of the topography of the document. Instead, this role is assumed by an architecture of hyperlinks that may exist in the same visual space but in different moments in time.

5

See Johanna Drucker’s excellent discussion of visual and literary materiality in *The Visible Word: Experimental Typography and Modern Art, 1909–1923*. Drucker cites Stephen Mallarmé’s experimental poem *A Throw of the Dice* as a precedent for new ways of thinking about space as a system of signification. Mallarmé manipulated both spatial and typographic form, paying close attention to visual features, spatial distribution, and its capacity to organize the text into a hierarchized figural order.

Eduardo Kac, in his research with holopoetry, refers to this embedded architecture as quadri-dimensional, integrating dynamically the three dimensions of space with the added dimension of time. No longer dependent upon available square footage this new anti-spatial architecture leads to changes in our perception of the organizing factors of the document, challenging the metaphor of a document's physical topography—a metaphor that has been encouraged by a reliance upon the accepted, but crude, convention of window-based software where opaque panels of information are layered on top of each other like a deck of cards. Rooted in a print-based assumption that the visual presentation of information occurs in the form of a stable syntax, such a metaphor ignores the dynamic and volatile quality of digital information. Data in digital documents doesn't rest quietly on the surface. Instead signifiers "transform themselves, move in three-dimensional space, change in color and meaning, coalesce and disappear" (Kac, 190). Kac refers to these visual signs as *fluid* or as a ". . . sign that changes its overall visual configuration in time, therefore escaping the constancy of meaning a printed sign would have. Fluid signs are time-reversible, which means that the transformations can flow from pole to pole as the beholder wishes, and they can also become smaller compositional units in much larger texts, in which each fluid sign will be connected to other fluid signs through a discontinuous syntax" (Kac, 194).

But what about the object that has the potential to continuously change not only its representation in form but the very information being represented? Such an object relies on a series of generators of new, unpreplanned material and poses a model not possible in a printed document. This **generative** model of information (*figure 6*) has an identity that is adaptable to the conditions of the system so that there is an inextricable connection between form and information where form is an absolute condition of the system. Several examples of such a model currently exist: screen savers such as

6

Jean Tantra designed a screensaver called *Stained Glass* that evolves by “digesting” and reconfiguring bits of itself.

7

Bliss is a computer program invented by Greg Jalbert which enables a user to construct generators of visual patterns which unfold over time on the computer screen. The program offers control over types of mark, treatments of images, positioning on screen and color evolution (Eno, 308).

Jean Tantra’s *Stained Glass*⁶ and Greg Jalbert’s *Bliss*;⁷ games such as *Sim Earth* and *Sim City*; as well as the graphic work of William Latham and Karl Sims, both of which have invented programs for creating complex and beautiful three-dimensional “organisms” (Eno, 308). Unlike an object whose identity rests in the manipulation of preformed, and therefore complete, information, documents whose information is self-evolving and responsive to the conditions of the data environment lack an interest in the precise nature of the object. These objects have the ability to grow limitlessly, while at the same time enable the reader to limit the range of this growth. Limitations are imposed by the reader based on their desired goals. We can visualize this as a “scale of orientations” where, on the left hand is placed a label “tending to subdue variety,” and on the right, “tending to encourage variety” (Ashby, 1964). While the extreme polarities of this scale provide interesting edges locating hybrid points along the scale is probably more fruitful. Instead of trying to specify the limitations in full detail, readers specify them only somewhat.

figure 6

performed

(performed chunks of material through which the user navigates)

CONTENT all available information is established prior to its use

NAVIGATION user has control over which material is seen and in what order

CONSTRAINT (structure) algorithmic: "a comprehensive set of instructions for reaching a known goal"

IDENTITY a precise concept of form (or identity, or goal, or direction) already exists, and it is taken for granted that this concept is static or singular

Navigation leads change

generative

(a series of generators of new, unpreplanned material over which the user can exert various degrees of control)

CONTENT variable and self-evolving

NAVIGATION contains built-in mechanisms for monitoring (and adjusting) its own behavior in relation to the alterations in its surroundings

CONSTRAINT (structure) heuristic: "a set of instructions for searching out an unknown goal by exploration, which continuously or repeatably evaluates progress according to some known criterion"

IDENTITY a responsive network of subsystems capable of autonomous behavior, that regards the irregularities of the environment as a set of opportunities around which it will shape and adjust its own identity

Change leads navigation

tending to encourage variety
↑
tending to subdue variety
↓

The most relevant aspect of this alternative organizational strategy lies not in a generative system's ability to create unique output, but in the apparent change in the overall perception of structure by the user and his/her subsequent change in navigational strategy. Previously we suggested that although print (as well as many digital) documents allow for variety in representation they do not allow for variety in information. Most CD ROMS and web sites fit this category in which a reader's interactivity is limited to a simple rearrangement of cataloged information. A reader approaches such an object with an understanding that they will be moving through an environment assumed to be closed (again, not in terms of meaning but in terms of available information) with a precise concept of form already in place. Cybernetics describes such a organizational structure as **algorithmic** (figure 7) or as a "rigidly ranked, skill-oriented structure moving through an environment assumed to be passive (static) toward a resolution already defined and specified" (Beer, 69). Such a structure operates predictably for one set of tasks but is not adaptive and does not easily assimilate change. Moreover, a precise concept of form exists prior to use and it is taken for granted that this concept is static or singular.

figure 7
continuum of
organizational structures

algorithmic

(complete object)

a rigidly ranked, skill-oriented structure moving sequentially through an environment assumed to be passive (static) toward a resolution already defined and specified

offers an impression of a hierarchy of value

operates accurately and predictably for one class of tasks but is not adaptive

not self-stabilizing and does not easily assimilate change or novel environmental conditions

requires a particular type of instruction in order to operate

precise concept of form already exists

it is taken for granted that this concept is static or singular

heuristic

(incomplete object)

hinges on the fact that changing environments require adaptive organisms

requires a built-in monitoring mechanism for adjusting behavior (navigation) in relation to the alterations in its surroundings

the real coordinates of the surroundings are either too complex to specify or are changing so

unpredictably that no particular strategy (or specific plan for a particular future) is useful

an organism operating within this structure must have a responsive network of subsystems capable of autonomous behavior, and it must regard the irregularities of the environment as a set of opportunities around which it will shape and adjust its own identity

In opposition to this concept of organization is one that typifies certain organic systems and is based on an assumption of change rather than stasis; of probability rather than certainty. Unlike algorithmic structure such a concept does not typically offer instructions toward highly specific results, and hence does not specify wholly repeatable configurations of information. We can consider this system of organization to rely on a kind of improvisational or empirical composition that “. . . aims to set in motion a system of organization that will generate unique (that is, not necessarily repeatable) outputs, but that, at that same time, seeks to limit the range of these outputs. This is a tendency toward a ‘class of goals’ rather than a particular goal,” (Eno, 335) and should in no way be understood as “goalless” or indeterminate behavior.

The kind of instruction necessary to engage a generative information hierarchy is known as **heuristic** (*figure 7*): “a set of instructions for searching out an unknown goal by exploration, which continuously or repeatedly evaluates progress according to some known criterion” (Beer, 77). Objects whose structure of navigation is heuristically-based require a representational strategy that is similarly adaptive—a natural condition of a digital document. Furthermore, a reader operating within this structure must have a responsive, rather than preplanned, navigational strategy and will be unable to determine a precise concept of form prior to engagement. The result is that the object tends to lead navigation—as conditions of one change, so do the conditions of the other. Another way to think about this is in terms of a constantly changing point of view—a navigational strategy sympathetic to changes in context.

4 conclusion

As designers of both printed and digital documents we must work within the field of potential changes in both syntax and meaning. Having variable control over how the object will be seen, or read, means there is a similar loss of control over what the object will eventually become, especially if we argue that there is an inherent relationship between the form of an object and its meaning. So how does this adaptability contribute to our understanding of the relationship between representational strategies and operational needs, especially in the context of the digital object? We end up designing for potential configurations rather than for any singular object or site of encounter. Muriel Cooper has written that "Design skills have been honed over centuries for the organization of information in the static territory of the printed page. Now designers must contend with information arriving continuously from sources beyond their immediate or ultimate control" (Abrams, 53). As concepts about the role of context in the development of intelligent hierarchies continue to evolve so will ideas about form and content. Navigational and organizational models such as those touched upon here can, perhaps, provide new approaches and ways of managing material that embraces the realm of disappearances.

References

- Abrams, Janet. 1994. "Muriel Cooper and the Visible Language Workshop." *I.D. Magazine*, September/October, 53.
- Ashby, W. Ross. 1964. *An Introduction to Cybernetics*. London: University Paperbacks, reprint.
- Auster, Paul. 1988. "Facing the Music." *Disappearances. Selected Poems*. Woodstock, New York: Overlook Press, 104.
- Beer, Stafford. 1972. *Brain of the Firm: The Managerial Cybernetics of Organization*. London: Allen Lane, 69.
- Diehl, Edith. 1980. *Bookbinding: Its Background and Technique*. New York: Dover, 1-3.
- Chaplin, Sarah. 1995. "Desire Lines and Mercurial Tendencies. Resisting and Embracing the Possibilities for Digital Architecture. *Leonardo*, 28:5.
- Eno, Brian. 1996. *A Year with Swollen Appendices: Brian Eno's Diary*. London: Faber and Faber Ltd.
- Kac, Eduardo. 1995. "Holopoetry." *Visible Language*, 30:2, 184 - 213.
- Marcus, Greil. 1989. *Lipstick Traces: A Secret History of the Twentieth Century*. Cambridge, Massachusetts: Harvard University Press, 170, 164.
- Marks, Barry A. 1964. *E.E. Cummings*. New York: Twayne Publishers, 117.
- Mitchell, William. 1994. "The Electronic Agora." *Any*, October/November, 30.
- Ong, Walter. 1982. *Orality and Literacy: The Technologizing of the Word*. London: Routledge, 133.
- Saffo, Paul. 1994. "It's the Context, Stupid." *Wired*, March.
- York, R.A. 1989. "Mallarmé and Apollinaire: The Unpunctuated text." *Visible Language*, 23:1, 45-62.

Katie Salen is an assistant professor of design at the University of Texas at Austin. In addition to her work as the editor and designer of the design journal *Zed*, her articles have appeared in *Eye Magazine*, *Visible Language*, *Bookworks*, *Spirals* and *the AIGA Journal* among others. Ms. Salen's research focuses on using a design practice to investigate broad ideas about the dynamic relationship between cultural identities and their expression through visual language.

Sharyn O'Mara is an assistant professor and program head of the design program in the Department of Design and Illustration at Kansas City Art Institute. She previously taught at the Rhode Island School of Design where she was design director of the RISD website. In addition to practising design at *b l u e*, her design firm, she is a writer and bookartist.