Designing Ivanhoe

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Abstract
Experimental interface designs for the Ivanhoe project were created at the intersection of theoretically-informed discussions about visual representation and the demands for a solution to practical problems of access and display. Implicit in this process is a critique of conventional information design, with its emphasis on direct manipulation and assumptions about clarity and communication. Standard approaches are grounded in engineering principles that stress functionality and the transparency of information. But theoretical discussions of visual representation offer critical insight into the limitations of this approach, showing that it depends upon naïve concepts of formal communication and a narrow, empirically-based notion of information. By drawing on fields that contribute to visual studies, from traditional iconography, semiotics, structuralism, and post-structuralism, and engaging their precepts with the problems of interface posed by cognitive studies, the specific potential of visual design for electronic environments begins to emerge. In this approach, interface is conceived of as dialogic and networked, generative and procedural, emergent, relational, iterative, dialectical, and transformative.

Creating designs for Ivanhoe’s interface has served to advance our critical thinking about the project. Key ideas have emerged from visual sketches, and implementations of critical and technical issues in our work have often derived from the way activities have been visualized. But grappling with this design has also reinforced my understanding of the ways interface exists at the intersection of two distinct practices -- engineering and information design. Each of these has its own priorities. Engineering emphasizes functional implementation while information design draws on the capacity of graphic expressions to communicate clearly to a user. In spite of these differences, however, both disciplines approach visuality with certain shared assumptions about communication and visual forms. And both operate far from the influence of critical thinking about visual representation, as if questions about representation had no role in what information designers do. Though it may seem a long reach to bridge the
gap between engineering-based approaches to human-computer interface and post-structuralist criticism, that is precisely what I am arguing should be attempted. Promoting serious dialogue between the traditions of critical thought and applied knowledge is crucial to Ivanhoe as a research project in its own right, as well as being one of its goals as a tool for research and pedagogy. So although I want to focus on a presentation of the graphic aspects of the Ivanhoe project, a reflection on the place of interface design within the larger concerns of visual studies seems useful as a frame of reference for what we’re attempting.

That frame reads as follows. Engineering approaches to interface, such as those perfected by Ben Shneiderman or Stuart Card, are grounded in certain assumptions that serve the communication task at hand, but go unquestioned at the level of ontology. Drawing on cognitive psychology, with its attention to the problem of designing environments that work with the operative limitations of human intelligence, rather than against them, and with increasing computational speed and capabilities, their approach is pragmatic. Such design is guided by principles of perception and cognition that can be tested and codified, such as the number of items that can be held in short-term memory, expectations about real-time interactivity, hand-eye co-ordination for interactivity, and so forth. Interface design can be skillfully implemented in this approach, so that a maximum of efficiency and clarity is achieved. No one would argue with the soundness of this as a basis for the design of everything from air safety traffic systems to operating room feedback mechanisms and ATM machines. After all, nothing is more frustrating than being asked to enter information into a space too small to display it. Try typing “Charlottesville” into the space allotted for “city” in most standard forms while you hope that the truncation doesn’t result in sending you or your tax returns to North Carolina instead of central Virginia. Or recall the difficulty of not being able to find the “enter” button in the gas station swipe card keypad because it happens to be labelled “ok” in this particular design. For most practical purposes, the engineering approach to design of human-computer interface is essential.

Engineering and cognition approaches place a lower premium on aesthetics than on what they consider functionality. The engineering solutions often stop with a design that works adequately, rather than seeking solutions that emphasize the rhetorical benefits of aesthetics in engaging a viewer. Sometimes such literal notions of functionality can prove so restrictive they undermine the results -- as is famously demonstrated in cross-cultural instances in which activities enabled by a machine inter-
face lack the social rituals that make them work. (Japanese ATM machines were almost ignored before the introduction of animated figures greeting the customer.) And information designers are well aware that there is no such thing as “mere information” -- organization, sequence of access, and relations among parts of an informational system all factor into communication in an interface. But overall, information design is driven by a preference for a functional, rather than seductive, aesthetic. Clarity is put above beauty, as if the two were mutually exclusive, or even separable. The work of Edward Tufte is a notable exception, hence the high regard for his elegant designs. But no matter where they are on the aesthetic spectrum -- whether we are referring to a consummate professional like Richard Saul Wurman, the distinctive Tufte, or the producer of click-art, pie-chart-and-bar-graph-in-grey-scale garden-variety presentation graphics -- information designers share a deeper core belief system with their engineering colleagues. They believe that the formal properties of graphic presentation can create a stable image of data. The quality of transparency -- ability to reveal the information -- is premised on a belief in apparen
cy -- the conviction that formal structures communicate directly through visual means.

These beliefs ignore almost entirely those fields that pose substantive theoretical problems in visual studies. Iconographical studies, semiotics, post-structuralist theory and critical issues are remote topics as far as most information designers are concerned. Intent on designing effective means of communicating information in visual form, these professionals remain largely unconcerned with theoretical issues that touch on the identity of images themselves or the cognitive function of aesthetics. An empiricist belief underpins their practices. All proceed with the assumption that visual images have a self-evident character on which they rely. What you see is what is there, visually present, in lines, marks, colors, shapes that can be reliably disposed on a graphic surface or screen. However much the parameters on which they are generated or labeled might be criticized, the self-evident character of graphic entities is never itself brought into question. That images themselves might be dialectical, produced as artifacts of exchange and emergence, is a quite foreign idea in the fields of engineering and information design. (While information displays can be interactive, and results produced through variable input, they are not imagined as brought into being through dialectical relations -- an important distinction between the capacity to display variable results and the actual condition of coming into being through dynamic interaction.)
Even the idea that diagrams or graphics have a cultural history and resonance seems irrelevant (unless the issues have the kind of impact of the Japanese ATM machine) given their capacity to use appearance as a way to reveal information. Press an engineer or information designer on these issues and a quick dismissal brackets such issues as irrelevant. Presentation graphics, though produced with a keen awareness of formal, material properties, are still premised on an information delivery notion of representation rather than on a cognitive, performance-oriented model. As if “information” existed a priori, visual forms are arrived at through a series of design decisions that present the “best” -- that is, most transparent -- image of that information. Above all, the images exist outside of any human subjectivity. Such approaches are consistent with a structuralist semiotics, one in which a sign system is comprised of two related elements in a fixed binaristic relation at the micro-level (signifier/signified) as well as at a next higher order of organization (plane of discourse and plane of reference). Such binarisms, and the stable-seeming sign systems they employ, are the legacy of a structuralist tradition that is formal and descriptive, rather than dialectical and dynamic. Ivanhoe’s design is premised on the idea that an image is a structure that is created through an act of intervention in a potential field and that this image also calls forth a performance. An image is not a stable form revealing a fixed meaning (or possible meanings, in the case of interactive display). The implications of this distinction are profound.

Approaches to information design that are based on faith in the a priori existence of data are open to question even without resorting to the deconstruction of visuality. After all, critiques of statistical approaches are plentiful. With a little intellectual child’s play, we can conceive of inaccurate or misguided methods of producing quantitative results that pass for empirical data. Nor does it take much argument to demonstrate that the form in which information is presented visually has a great impact on how that information reads and what it is assumed to communicate. But the assumptions are that the rhetorical distortions introduced by an ill-conceived or overly expressive visual presentation can be “corrected” to make the image a clearer, more transparent instrument for revelation of the actual “truth” of the data. Though truth has had its day, the statistical character of data has asserted the validity of quantitative approaches all over again. Mathesis has had a strong resurgence of cultural primacy under the influence of digital technology. These are issues for another conversation, but hopefully I’ve made my point by now. Even if we consider informa-
tion design on its own terms, many critical issues could be raised about the relation between information and its presentation. These arguments would demonstrate, ultimately, that the presentation doesn’t embody information that exists elsewhere in another form. Presentation in graphical form creates a structure to engage the cognitive production of meaning. Some of the visualizations we imagine for Ivanhoe will serve familiar functions of compact display of quantitative information in legible form. But other features deliberately attempt to visualize activities or processes in an arbitrary-seeming display format in order to be suggestive or provocative. These theoretical issues arise within discussions from outside of information graphics and engineering, drawing on those traditions that critique the idea of “presence”, calling attention to the apparently self-evident character of visual images.

The presumption of visual presence, or of graphical form as self-evident, is very similar to the attitude towards textuality that construes a literary work to be equivalent to its words -- or, even more, its “meaning”. (Literal readings of materiality that emphasize formal characteristics and reading through a work for its “meaning” as if the literal surface were transparent are equally plagued by an undialectical, information-delivery model of graphical presentation.) Ivanhoe’s interface design attempts to use visual and graphical means to bring critical awareness into the game in a central way, while also, incidentally, raising issues about visuality that are the theoretical complement of those that inform its conceptualization from a textual studies perspective. The graphic vocabulary of Ivanhoe calls attention to emergent, generative, iterative, procedural, and transformative activities. These are overt properties of digital media, even though not always fully exploited in interface, but more importantly, once these dynamic characteristics are really understood, they can be demonstrated to be part of any artifact, no matter what the medium. Electronic interface design, therefore, is premised on the idea that a visual form does something, rather than that it is something. As I’ve written and discussed elsewhere, with regard to books in particular, this insight is relevant to traditional paper-based and print artifacts as well as electronic ones. But when it comes to Ivanhoe, this principle is foremost. We borrow from systems theory and cognitive science, rather than engineering and formal graphics. But we also draw on the theoretical context of visual studies in formulating the theoretical aesthetics on which the design of Ivanhoe is based.

Such theoretical conversations are informed by information-processing theories of vision that have displaced older, mechanistic models
of perception. Here, again, cognitive science and psychology combine to create an iterative conception. Instead of imagining vision as an eye receiving stimulation and sending a signal to the brain in a one-way communication channel, cognitive approaches describe an optical system. A feedback loop connects a learning eye and a continually revised cognitive model. In this system, neither image nor idea exists a priori, and sensation is an effect of cognitive capability. This shift in models of vision has implications for the way images are understood. The work of biologists Humberto Maturana and Francisco Varela, pioneers in the cognitive approach to human knowledge, demonstrates that we constitute the objects we perceive through our capabilities, and they, in turn, act on and transform our understanding. Vision is an emergent activity. An image is an entity constituted through a perceptual act. In other words, this information processing model of vision, as Alan MacEachren, among others, terms it, has undermined previously held ideas about the autonomy of images, sensations — and of individuals as discrete entities simply reacting to or perceiving pre-existing elements as a set of stimuli-response mechanisms. Instead, we have to understand all of these as constituent components of a dynamic system in which interaction among elements produces effects. Such an approach doesn’t disregard the intrinsic properties of, for instance, texts, graphics, and images. But it emphasizes that these formal and material properties define a set of contingencies, conditions from which an intervening perception can be produced. An image is constituted by this act as well as giving rise to it as a performance of its structured codes and possibilities. The idea that an eye “learns” through exposure to various kinds of stimuli lends support to arguments for aesthetic agency and the formative power of expressive means.

The idea of autonomy undermined by this cognitive turn comes directly out of modernist art and aesthetic theory. Though this is an argument too elaborate to be touched on except in brief here, we can even say that the distinctive characteristic of modernism is its insistence on autonomy. And autonomy is defined, first and foremost, as the insistence that images are presences, rather than representations. (“You present a baby,” Picasso famously stated, making an analogy between paintings and other progeny, “you don’t represent it.”) Built on this belief are ideas of autonomous art as a form of cultural expression, but the founding premise is that images are self-evident and apparent, though qualified by the recognition that many signs are only legible with specialized knowledge of their codes, and that visual forms can be grasped directly by the eye.
in their full and replete self-sufficiency. This conviction is integral to the still-persistent tenets of structuralist semiotics, in which the apparency of the signifier is never up for question, no matter how complicatedly it may be put into play within a signifying chain. Formalist approaches to visual images are based on these assumptions, and Ferdinand de Saussure’s lectures of 1911-12, transcribed through his students’ notebooks as the founding texts of structural linguistics, incorporate the same formalist precepts that are articulated by his fine arts contemporaries.\textsuperscript{7} We can see evidence of the idea of visual autonomy in every critical articulation of modern art. Emile Zola, writing of Edouard Manet’s painting in the mid-19th century, stressed the “thereness” of visual art as “nothing but simple facts” -- with an emphatic insistence on the formal presence of images.\textsuperscript{8} This idea of aesthetic autonomy can be traced to the critical writings that mark mid-19th century formulations of visual modernism, but it reaches a crucial turning point in the early 20th century. In the decades of the 1910s and 20s, theories of representation -- visual, linguistic, and semiotic -- align under the banner of the full-fledged modern formalism. Since this is also the historical epoch within which graphic design as we know it came into being, it is hardly surprising that a field like information design continues that sensibility into the present. The terminology of visual communication, the so-called “language of design”, is itself a direct legacy of the work of artists like Wassily Kandinsky and Paul Klee, whose attempts to fix the rules of abstract composition, color, and form had such an influence on early 20th-century art and design.\textsuperscript{9}

Other intellectual traditions lend credibility to notions of formalist autonomy. The formalist turn is a part of the larger “rationalization of sight” described by print historian William Ivins.\textsuperscript{10} The virtue of printed images, their capacity for “exactly repeatable” replication, contributed to the stable representation of knowledge and its dissemination in standardized form. Ivins argued that standardized, conventional, stable representation in graphical or pictorial formats gives visuality a unique role modern epistemology. Like the work of imaginative artists of the early 20th century, Ivins’s work is based on Cartesian principles of rationality. Principles of post-Cartesian graphics -- non-Euclidian geometry, non-linear analysis of event-formations -- have yet to serve the daily business of information graphics, or to be a staple of display design. For current purposes, the simple critique of formal autonomy should be understood in relation to the way assumptions about presence that are the legacy of modernism persist in current electronic information design. When put to specific uses
in display of empirically-gathered data, an image is considered a stable entity whose materiality is conflated with its presence. An image “is” by virtue of its formal properties. The tendency is to collapse the materiality of images with their formal value. But just as a text is a field of possibilities that engages a reader, so an image -- and graphical forms of text are included in this term -- should be seen as a work to be performed through interaction and response. This approach to vision cycles us back to the information-processing model described above and contains the suggestion that the very field of visual presentation should shift in response to active engagement of a viewer. Ivanhoe’s interface isn’t merely designed to “represent” individual subjectivity, but to provide the space in which it can be enacted, performed.

The applied aesthetic challenges of Ivanhoe are just as daunting as the theoretical ones. First, we face the challenge of making visible critical concerns that are almost intractably abstract. What is the way to present a “discourse field” conceived of as the social and production history and associative field of which any particular text is simply one snap-shot instantiation of a sequence or chain of production events? Is it possible to make evident the “non-self-identicality” of a text through graphical means? Can the dynamics of play be given a configured form as a visualization that becomes a primary site of activity rather than simply a display? The technical challenges are non-trivial in such an agenda. So are the design tasks. What are the conceptual primitives of a schema for such a design? What set of objects, relations, and behaviors define the structural foundation of this system, free of specific content, but able to provide a framework for the activity of critical studies? Though we have yet to fully answer that question, our progress to date charts increasingly concrete ideas about how to proceed. We have moved from named and identified areas of a screen sub-divided by windows to a fluid, activity-based, n-dimensional space of activity zones. In other words, we’ve shifted from a rigid, formal structure in which elements are defined a priori to a dynamic field configured relationally or contingently.

The earliest versions of the interface design, drawn in the summer of 2000, used conventions of software design based on windows, icons, and pull-down menus. We dealt with the limited screen real estate by collapsing many of the activities of Ivanhoe into spaces that had to be clicked open. The sense of “there-ness” in this design was overwhelming. To begin with, the interface was organized around a “source text” (terminology we’ve subsequently discarded in favor of a “called text” and “declared
that dominated the screen. This text, and the workspace below it, were strongly reified by the framing devices that fixed their relationship into a hierarchy while also making it almost impossible to display any other documents from the discourse field. While this initial design worked well as a sketch of activities we wanted to structure into Ivanhoe, as a design it was flawed. The software interface wasn’t web-friendly, for one thing. And the windows structure was at odds with the basic premise that entities will define each other through contingent relations. By creating fixed and determined spaces, labeled for each activity and type of text or move in advance, this interface embodied all the ideas we actually want to counter. It provided a useful point of departure, however, for all those reasons.

Figure 1. Hand-drawn interface design for Ivanhoe, Summer 2001, showing all aspects of game play allocated space on the
screen. The primary document display is at the top of the screen, just below the menu bar, the work space is the larger area below, with indications of text, image, sound, time-based media modes in the frame bar. Other areas indicate the game play log (on the left), sliding windows for accessing rules and player files (on the right), with the game play diagram, living theater (moo-type space for players to interact in “character”), and a café space (in which players back-chat about the game) stretch across the bottom. At the upper left, Ivan himself struggles constantly to mount the slippery and difficult path to enlightenment.

We formalized that initial design as a story-boarded exercise so that we could see how it would work in a step-by-step user-scenarios. This interface included visualization spaces for various aspects of the game that lend themselves to iterative and procedural presentation such as the game play diagram and a space for showing linked elements of the discourse field. (Figures 2, 3) From the beginning we knew that visualizations had to play a key role -- not only in providing the graphical form of texts, but as a means of analyzing the dynamics of an emergent work and social field of activity.
Figure 2 and Figure 3. Formalized versions from Summer 2001 of the hand-drawn interface showing pull-down menus. Though useful for concretizing our image of the game, this approach felt too rigid and reified in its structure to accommodate the theoretical principles of our design.

As we struggled with alternatives to the windows-based interface, we considered the possibility of archive, library, or codex-based metaphors. In one version, we took this idea to a literal extreme, conjuring an interface design that “looked like” a library space. (Figure 4). Abstracting function and activity from literal representation of spaces took some time. The tendency is to imagine that a simulated space, because it can be visualized on a screen, will function the same way as a real space. The specific properties of a digital environment, however, its irremediably flat surface and limited real estate, are so fundamental to its display capabilities, that very different design conventions were needed. So we overturned this rather literal metaphor by trying to imagine ways to create a deep-space, non-illusionistic topography organized by coordinate axes. (Figure 5). The question of parameterization, and of what semantic values to attach to these axes, came up immediately. We may well concede that a book is a three-dimensional object that we encounter along a fourth, temporal axis. But we don’t navigate a text spatially, at least, not in the kind of three-dimensionality that is used for fly-through views. Though we jettisoned the idea of creating artificial conventions for spatialized display, we have preserved the use of dimensional illusion in our most recent designs.
Figure 4. Diagram of game play in the formalized version from
Figure 5. The idea of simulating a library or study space met with horrified response in the research group, and this image was greeted with critical derision, useful as a stage of testing our common understanding of the design approach. Though we agree to wanting to replicate the functionalities and activities enabled in such a space, we all found the simulated environment too kitsch and literal.
A persistent feature of Ivanhoe designs has been the presence of visualizations of data that are generated by player activity. We’ve been interested in the process of abstraction that allows displays to be created from such seeming intangibles as the choices of an individual player, or the character of their engagement with a particular text or selection of elements. The idea is to produce images of an “emergent work” as it might be generated through the inter-subjective exchanges among participants and artifacts. The arbitrariness of assigning values for display is evident. But we are not trying to model any a priori evidence, but rather, to give rise to a model as an emergent manifestation of activity, to see what it might be if figured in a visual form. The idea of the visual presentation as an aesthetic provocation, as a primary interpretive act, is at work here -- as is a certain amount of willingness to suspend any pretense of allegiance to empirical models of statistical information gathering.

Figure 6. Our first attempt to take advantage of the illusion of spatial depth on the screen in a non-windows-type design raised immediate questions about the way to parameterize the axes. We struggled to think through the connection between logical
structures of text that had an intuitive sequential form that could also be linked to these dimensional illusions.

Attention to the specific capabilities of screen display includes exploring the ways resizable elements, stacking and layering, and careful use of alpha values for degrees of transparency and opacity might maximize electronic environments. Bethany Nowviskie’s visual experiments have explored some of the existing electronic capabilities for features of dynamic interface design: scalable windows, pull-tabs, and means of using illusion of transparency for screen display. Her visualizations of emergent avatars display the figured form of on-the-fly characterizations of play, in a prototype demonstration of the aesthetic provocations mentioned above. (Figure 7) Many of these elements have found their way into the “frames-based” hand-drawn sketch from which our current designs are derived. (Figure 8)
Figure 7. This frames-based sketch from 2002 broke away from either an illusion-based simulation or a flat windows environment. The activities of the first hand-drawn story-board were indicated here in sketchy, diagrammatic form, with the addition of the avatars that stretch across the bottom of the screen – artifacts of game play data displayed as a graphic “character” profile of player roles.

Figure 8. This Spring 2003 design for the interface was based on zones of activity, rather than defined areas of screen real estate. The image of an emergent work, the idea of a discourse portal and text call, and other “active” areas of play are all features of this design, showing a shift from entities and objects to actions as the basis of the game space.
Other electronic versions have included a modified version of Grey Matter, created by Nowviskie for playing “Turn of the Screw” in spring 2002, and a web-based windows version designed by Nathan Piazza. Nowviskie’s design, though quite simple in the features it offered (no dynamic, on-the-fly diagrammatic features or elaborate navigation), provided a legible way to separate the several areas of game play. The source text, moves, player journals, evaluations, and challenge spaces that constituted the game each had a color code and individually logged sequence of moves.

Piazza’s version of interface design used standard web-space conventions (sidebars, navigation bar, etc.). And in that version we confronted, more than in any previous visualization, the reifying effects of an on-screen presentation of a text. The flat, surface, the seamless unity of the windows environment, reinforced a sense of “there-ness” that spoke volumes for the need to modify our electronic space dramatically, and to rethink the relation between theoretical precepts in textuality and those derived from visual studies.

The most recent iteration of Ivanhoe’s interface has been derived from a reflection on these previous versions. The design follows a few basic principles. First, that screen display is governed by two fundamental properties: the flat surface and the illusion of depth. All display in Ivanhoe will acknowledge that flat surface—with artifacts displayed in the convention of the picture plane, perpendicular to the viewer’s point of view. Within the screen, even within a document, a potentially unlimited number of deep-spaces can open along other coordinate or perspectival axes. For instance, if a series of associated terms (e.g. the heteroglossic field of a word) is to be shown, it can open from any place in the text as a deep space receding from or towards the viewer for purposes of display. The layering and palimpsestic character of textual interpretation and bibliographical study will be accommodated by alpha values. No text will simply appear, but every text will have to be “called” through a “discourse portal” and then “declared” as an edition or version in which to work. As interpretive play begins, the text will be “claimed” and marked, its “codes” revealed, and its structuring principles made graphically evident through the patterns of play. Size and scale will be used to facilitate the stacking of documents, support materials, palimpsestic versions, moves, workspaces, journals, logs and any other materials. And no fixed windows or frames will unify the space. All the elements in play at any time, both within and individual player’s space and in the game as a whole, will be represented in some visualization, as well as the configured relations among these.
These premises counteract the idea of display as the manifestation of already present or known “information” in visual form or outside of a field of activity. We hope to take advantage of the efficiencies of visual modes of gestalt for complex, large-scale sets of information. Visualization will be used to produce intellectual and imaginative thought, as a primary mode of theoretical query, not simply a means to provide access to a fixed set of structured relations. The design calls for a fluid, dynamic, and highly iterative and emergent interface, one that allows for transformation of the information within the field of play at the level of material. Visualization is a site for intervention as well as display. The interface includes basic zones of activity, rather than rigidly defined areas, a priori subdivisions, of its limited screen real estate. No activity has a pre-defined area or space. Though the basic elements of “text call”, “discourse portal” and areas of “play” and “commentary” are designated as zones within the overall screen. As the process unfolds, a work emerges from the elements brought into play and the relations configured among them and the participants. The dynamic web of relations can be viewed from any number of subjective positions -- no view exists outside the game-play, just as no work pre-exists its performance in the electronic space.

At this stage of design and theorization, Ivanhoe’s interface draws on a host of concepts from the history and theory of information in emergent spaces. These will be briefly noted, though here, as elsewhere in this piece, I am touching on matters deserving of more extensive discussion. This list is meant to provide a set of references for the project’s conceptual underpinnings within a larger context.

**Dialogic and networked:** Ivanhoe is created at the intersection of individual subjectivities in dialogue with each other through a work and its interpretive field. The interface should permit the mapping of these interrelations, and emphasize the social nature of the production of imaginative work, and the collaborative character of interpretive acts. The critical foundation for this approach draws on conceptions of the web as a social space, one of shared exchange and virtual communication. Envisioned in H.G. Wells’ prescient vision of the world mind, this notion was the impetus for J.C. Licklider’s work in the 1960s on human-computer symbiosis as the basis of virtual communities. Reinforcing the idea of interface as a portal to social interaction, Ivanhoe is designed to discourage solipsistic play and to encourage the recognition that creative and scholarly work takes place in a social space.
**Generative and Procedural**: Max Bense’s discussion of generative aesthetics in the early 1960s established the idea that visual forms, even those he defined as artistic, have an algorithmic foundation. Extended through the study of complex systems, the idea of rule-based, procedural production of imaginative works or interpretations is grounded in computational methods. Bense’s vision was limited by his mechanistic conception of form, but certain features of his premise remain useful. Generating visualizations, or moves, from prescribed procedures is one aspect of this approach, but reversing that process and generating rules and procedures from visualizations is the other. The latter implements the potential of an image as a primary, first-order expression of knowledge whose algorithmic foundation can be revealed. In addition, the notion of generative aesthetics applies to every graphical visualization of text or other artifacts within the space of play, since this involves “calling forth” a document and then rendering it through an algorithmic transformation of the data.

**Emergent**: Visualization through on-the-fly processing of information that is itself constantly changing manifests degrees of complexity not contained within or accounted for in the first generation of instructions or manifestations. Emergent behaviors, such as those generated by swarm systems, or even by simpler AI engines that use probabilistic methods to produce statistically varied results, will be used to create player avatars and other game-play diagrams and representations. These are meant to return to the game as aesthetic provocations. The shape of game play, or of interpretation will produce the “emergent work” that is the ongoing outcome of interpretive actions among players. This will necessarily be an emergent form, continually evolving.

**Relational**: Ted Nelson’s earliest notions of the web as a space of associative meaning extended Vannevar Bush’s concepts of Memex from the mid 1940s. Ways of thinking about knowledge as an interlinked field have been a part of the mythology of networked knowledge systems since their invention, and earlier, paper-based diagrammatic organizations of knowledge and argument can be traced to Ramus and his method in the late middle ages. Reconfigured conceptions of this approach are part of Renaissance formalizations of knowledge, (classification systems, textual and paratextual apparatuses, and well as graphical modes of information representation), but the electronic environment has awakened awareness of the living character of associative thought processes. The notion of a text as a single, incidental, instance of a larger discourse field -- as a snapshot in the sequence of production events -- is one central theme of Ivan-
hoe. The bibliographical or genealogical relation of artifacts to each other can be presented according to production and reception histories within recursive, non-hierarchical, and contradictory models.

**Iterative manipulation**: The interface permits versioning, so that the palimpsest of meaning production can be perceived as a thick field of interpretive activity and meaning production. Game play states, their continual transformation and relation to each other, to the original start-state of the game, and the basic work and rework of a series of recursive interactions are all available for presentation and analysis. The lessons of responsive interface and direct manipulation (or its illusion) in work by Ben Shneiderman others established conventions for a reversible, navigable, legible, design. Going beyond menu-driven options, or combinations of pre-set data, Ivanhoe’s interface is designed to allow manipulation in the material (coded data) of the elements of the game. Thus the visualizations are iterative, versioned, but also, can be manipulated at the information level, not only that of display. Display and visualizations are a point of direct access to the structured data of the emergent work or the game play.

**Dialectical**: The interface demonstrates the non-self-identical character of images and texts, of visual artifacts. No work exists a priori in Ivanhoe. Any artifact or text has to be called and then declared, that is, given a presentation form. This reinforces the realization that any visual form is a constitutive intervention in a field of potential, rather than the display of an inert or fixed artifact. This principle, of calling and declaring, echoes the process of intervention crucial to quantum mechanics, where the act of intervening determines an outcome from a probability distribution. Ivanhoe’s interface calls artifacts, game play, player profiles, activities, and action, and behaviors into being so they can be configured as visual entities. On another level of display, the continually shifting configuration of elements in play constitute the “work”. Emphasis is on contingency and relational production of configured form rather than on any formal or a priori structures. Through algorithms that respond to a participant’s activity, the computer becomes an active player, engaged in a dialogic exchange of activity and display.

**Transformative**: The transformation of information at the level of material instantiation in code and visual presentation, is perhaps the key overarching concept of the interface design as a whole. Interpretation is a performative transformation of the material condition of an artifact. This is always the case, and the electronic environment extends, rather
than innovates, in this tradition. But the dramatic possibilities for making evident the effects of interpretation as acts of what McGann has referred to as “deformance” are drawn from a legacy of such approaches. Some of these have their roots in esoteric practices, such as gematria and kabala, some in the ludic sensibility that governs combinatoric visual and verbal artifacts (volvelles, moveable books, mobile and kinetic works of art), and some in the critical traditions of potential literature (OuLiPo). Ivanhoe’s interface intends to make this graphically evident.

In summary, then, Ivanhoe is designed to countermand the idea that materiality is “what is” by offering instead a set of conditions for the creation of what can be. It is an interface that generates possibilities from a potential field. The interface is responsive and emergent, involved in perceiving the participant as part of the information of the system, while insisting on the way an emergent work is constituted at the intersection of all the participants’ aggregate activity within a social sphere of production with its historical and cultural dimensions.

Ivanhoe’s generative aesthetics open the screen as field of play, of ludic invention. Iterative visualization provokes an emergent, rather than self-evident, representation. Ivanhoe recovers an alternative tradition of inventive and generative approaches to visual epistemology and representation that is at odds with rational modernism and traditions of visual epistemology that derive from fine art and scientific visualization. That same modern sensibility informed critical approaches to literature as what McGann terms a “spectator sport”. Both textual and visual fields were governed by the assumption that materiality was a stable fact, unproblematic, a priori, and self-evident. By contrast, Ivanhoe assumes a complex system in which a work is produced by the dynamic interplay of an individual interpretation and a set of possibilities structured and encoded in an emergent field. Ivanhoe’s interface is designed to make these principles a part of the experience of play, as well as to open the horizon of research into wider application of post-Cartesian approaches to graphesis.

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Endnotes


6 MacEachren, op. cit.

7 Ferdinand de Saussure, Course in General Linguistics, edited by Charles Bally and Albert Sechehaye (NY: The Philosophical Library, 1959) from their notes during his lectures.


9 For writings by Kandinsky and Klee, see Herschel B. Chipp, Theories of modern art: a source book by artists and critics (with contributions by Peter Selz and Joshua C. Taylor), (Berkeley: University of California Press, 1968) also see my Theorizing Modernism (NY: Columbia University Press, 1994) for an extensive discussion of these issues.


11 See <http://www.speculativecomputing.org/ivanhoe/index.htm> see especially the sections linked under headings “design process” and “working notes” for images and experiments.

12 Herbert George Wells, “The Brain Organization of the Modern World,” World


