LINKED VARIATIONS:
AUTHORING-SYSTEM SPECIFIC LINK CONSTRUCTION AND THE ANALYSIS OF HYPERTEXT LITERATURE

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Theodore J. Fordyce, B.A.

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LINKED VARIATIONS: AUTHORING-SYSTEM SPECIFIC LINK CONSTRUCTION AND THE ANALYSIS OF HYPERTEXT LITERATURE

Theodore J. Fordyce, B.A.

Thesis Advisor: Garrison LeMasters, M.A.

ABSTRACT

Any analysis of a work of hypertext narrative literature depends upon an often unacknowledged definition of the hypertext link that attribute to the link a set of characteristics and behaviors that are reflected in the analysis’ conclusions. This definition is very often applied across multiple hypertextual works created on a variety of authoring-systems, regardless of any differences that may exit among these systems. In this thesis, I argue that any definition of the link that does not take into account the specific ways in which a particular system constructs the link will fail to accurately describe the role played by the link within the work in question. To support this argument, I examine three separate authoring-systems, each revealing a distinct conception of the link and its possibilities as a narrative tool.

The structure of this thesis is organized around an increasingly specific focus of inquiry, progressing from digital media, to hypertext, to the link itself. The final chapter examines the three sample systems, applying the perspectives and ideas developed in the previous sections to each. In addition to demonstrating three very different definitions of the link, this last chapter also serves as an example of an analysis of the characteristics and behaviors resulting from a specific construction of the link and their implications for the writing and reading of hypertext narratives.
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Chapter 1: Introduction

Presuppositions provide the basic structural framework upon which discourses are built. They act as starting points from which ideas and theories can be developed that strengthen the descriptive power of the discourse. Like any framework, however, presuppositions also define the limitations of the system that they support. The relevancy of some questions is preferred over others. New information and perspectives that seem to fall outside of the limitations set by these systems are often either obviated or positioned as radical and/or deviant. Perhaps just as often, however, these new pieces of knowledge are reshaped to support the existing structure.

For example, only five centuries ago, any discussion of the Cosmos and man’s place therein worked under the presupposition that the Earth was the center around which everything else revolved. The geocentric presupposition structured the discourses of physics and astronomy for well over a millennia and, thanks to Ptolemy, these discourses appeared to be both descriptively robust and empirically verifiable. For 1,300 years, his tables and formulae provided the structure for a set of calculations that could accurately track any celestial body visible at that time. The aberrant behavior of any stellar object failing to conform to Ptolemaic predictions was remolded by the addition of add-on formulae and assimilated. Thus, while increasingly cumbersome, Ptolemy’s model grounded a discourse that allowed astronomers, astrologists, and theologians to debate and theorize over the nature of the Cosmos. The scope of this Cosmos, however, was severely limited by the presuppositions upon which the discourse was built. It was only with the gradual deprivileging of the Earth’s cosmological status that we have been able to develop a broader model of the Universe in which we live.
While the theological and political implications are obviously much less severe, the current state of hypertext theory is, in some ways, analogous to the Ptolemaic example. Presuppositions about the nature of hypertext and the link have structured a discourse that both facilitates and constrains our explorations of and conjectures about hypertext. Facilitation takes the form of a level of mutual coherency among both theorists and authors working on and within the medium. At the same time, however, the scope and depth of these works is constrained by a conceptualization of hypertext based upon one specific type of the link. Characteristics and behaviors attributed to this link type are therefore often presupposed in any hypertextual work.

In this thesis, I argue that there are a wide variety of link types, each determined by the structure of the authoring system in which it occurs, and that anyone attempting to create or analyze a hypertextual work must be aware of the characteristics and behaviors of the link type specific to the system in which they are working. For an author, the inability to recognize the distinction between link types means a failure to fully exploit the creative tool that they have chosen. Critical analyses of hypertext and hypertextual works that ignore this distinction are similar to the Ptolemaic calculations; they support an internally consistent and productive discourse while failing to acknowledge and benefit from a more comprehensive and in depth understanding of the subject that the discourse purports to describe. A deprivileging of this presupposed link type is an important step towards developing a broader and richer conception of the hypertext medium in which we work.

This thesis is also intended to provide digital scholars and literary critics with a critical framework that takes into account the affordances, restraints, and overall linking strategy of any particular hypertext authoring system. The link is the defining feature of a hypertext and an
integral part of any piece of text in which it occurs. The way in which an author engages with a particular linking design is therefore crucial to an overall perspective and evaluation of that text.

**HTML**

According to the current discourse, the hypertext universe revolves around what I call the HTML link construction. HTML, or HyperText Markup Language, is the programming code with which nearly all sites on the World Wide Web are built. Below is a line of HTML coding that includes a hypertext link.

```
<p> This <a href= "macaroni.html"> sentence </a> contains a hypertext link. </p>
```

The bolded portion of the line above is that section of the code that defines both the document to be accessed upon execution of the code and the point on the surface layer though which execution can be initiated. I will refer to this point as the link trigger. The surface layer is composed of the visual and auditory elements\(^1\), generated through the underlying layer(s) of code that are apparent to the audience, such as the text seen on the screen. In this case the text on the surface layer, or surface text, would most likely appear as:

This *sentence* contains a hypertext link.

The HTML code shown above designates “*sentence*” as a link trigger, commonly activated by the reader moving a cursor over the word and pushing a button, and the file named “macaroni.html” as the document accessed upon activation of the trigger. Thanks in large part to the ubiquity of the World Web Wide, in which HTML is the default programming language, this construction of the link lies at the center of most descriptions and debates concerning hypertext and hypertextual works. The presupposition of this link construction within the discourse of

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\(^1\) Other types, such as tactile elements, are possible as well, but the two listed here are the most common, especially in regards to on-screen hypertext.
hypertext influences the questions we ask as well as the answers we find, directing our beliefs concerning both the potentials and limitations of the medium.

While I call this type of link the HTML link construction, it is not the syntax of the HTML code itself that influences our conception of the link but rather the characteristics and behaviors exhibited by this kind of link. The HTML link construction identifies a type of linking that may exist in other codes and authoring systems as well. HTML is simply the most widespread system based upon this construction of the link. There are two important characteristics shared by any system using the HTML link. One of these is the node-to-node linking model. Within this model, triggering of a link in node A results in the appearance of node B. This does not mean that there can not be other links to other nodes on node A, or that node A is the only node containing links to node B, only that a node is linked directly to one or more other nodes. The other important characteristic of the HTML link is that the destination of a link is predetermined within the code of the link trigger itself. In other words, the designation of the destination nodes accessible from node A are a part of that node. Both of these characteristics have had a powerful influence upon standard expectations of the appearance and behavior of hypertext. It is important to understand, however, that these are characteristics of only one type of hypertext link and are in no way entailed within the nature of hypertext itself.

**Hypertext and the Hypertext Link**

In arguing against the projection of the characteristics of HTML linking structures across hypertext in general, I have left undefined the general characteristics of the hypertext link and, in broader terms, hypertext. No matter how broadly I wish to define the term, there must be at least one shared attribute between those objects to which I apply the term for it to have any meaning. Historically, theorists have tended to be more concerned with defining hypertext as a medium
rather than defining the hypertext link itself. Jay David Bolter, for instance, defines hypertext as, “a network of textual elements and connections” (Writing Space (1st ed) 23). A similar definition can be found in the instruction manual for the first edition of the popular authoring system StorySpace, which simply defines it as “interlinked electronic documents” (1). Instead of a definition, N. Katherine Hayles posits the necessary characteristics of hypertext, these being multiple reading paths, chunked texts, and a linking mechanism between chunks (Writing Machines 26). In each of these definitions, hypertext is defined by non-exclusive properties, meaning that these properties may also be found in other types of things. For instance, Landow’s definition could very easily be used to describe a telegraph network, but that does not mean that this network is a hypertext. In other words, a hypertext must possess these properties in order to satisfy the definition, but not everything possessing these properties is necessarily a hypertext.

Although these types of descriptions are useful in explaining hypertext in a general sort of way, a more basic definition is important if we are to minimize the influence of unacknowledged presuppositions. The properties listed in the above definitions themselves rely on a more basic, unspecified definition of hypertext. My own definition of hypertext is simply this: the term hypertext applies to any textual unit that includes a hypertext link. Note that this definition is bidirectional; any hypertext contains a hypertext link, and any textual unit containing a hypertext link is a hypertext. A property attributed to that unit can be designated as hypertextual if and only if that property can be shown to derive directly from the inclusion of the link within the unit. This definition is not unique to this thesis. The website for the W3 Consortium, the group that determines the standards for the continuing development of the World Wide Web, defines hypertext as “text which contains links to other texts” (“What is Hypertext?”). My definition of hypertext takes the hypertext link to be both essential and
exclusive to hypertext; any other properties the we may discuss in direct relation to hypertext are consequents of the link.

The above definition is obviously useless without a definition of the link itself. It is important to make as clear as possible what I am referring to when I use the term “link.” This definition must be broad enough to include the various past, present, and future constructions of the link while remaining narrow enough to allow a determination of what is not a hypertext link. I should begin by mentioning one use of the term link that, while used in relation to digital media, does not fall within my definition. In the networking of computing devices, a link is a connection between two entities on the same network. In the Open Systems Interconnections (OSI) network model, the data link layer sits between the network layer and physical layer, transmitting data between the two (Loshin 19). While a hypertext link that occurs within a networked document may utilize the data link layer, this layer is still separate from the hypertext link.

The difficulty in defining the hypertext link is that it is simultaneously object and function. I will explore both of these aspects of the link in detail in chapter four. My definition at this point, therefore, will be brief. The hypertext link is a textual element that serves as a reactive locus of textual change. By labeling the link as a textual element, I am asserting that the link is a part of the changing text. Even if the link is viewed as a function or as the conceptual space between linked objects, its existence within the text must be acknowledged. The term reactive within this definition indicates two important features of the link. First, it has, or perhaps is, action. This ability to act marks the key difference between hypertext and traditional text such as print. In the case of print, something is done to the text, such as being read. In the case of hypertext, in addition to being read, the text performs an action on itself or on other units of
texts. The link is reactive in that this action is always in response to something else, such as the reader activating a link trigger. The change that results becomes a part of the meaning-making force of the text.

**Clarification of Presuppositions and Focus**

Despite their ability to constrain and dictate the scope and development of a discourse, presuppositions are neither avoidable or undesirable. As I mentioned at the beginning of this chapter, presuppositions constitute the frameworks upon which discourses are built. What is important is that we make ourselves aware, as much as possible, of the key presuppositions upon which our arguments and perspectives rely, and that we remain critical of their tenability and consistency. The definition of the link given here will act as a presupposition upon which the rest of this thesis will be built. The definition itself relies on a number of presuppositions. Besides those already discussed, it assumes the link exists as, or at least corresponds to, a location. One other presupposition assumed throughout this thesis is that the hypertext is digital in nature, meaning that it is a product of systems usually associated with computing technologies. This assumption is not universally accepted. Some print based works have been lauded as instances of print based hypertext, or at least as print precursors of hypertext. The most often cited examples seem to be James Joyce’s two novels *Finnegan’s Wake* and *Ulysses* and Jorge Luis Borges’s short story “The Garden of Forking Paths.” These comparisons are almost always based on the earlier work’s uses of nonlinear or multilinear narrative forms, implicitly identifying hypertext with what is often called nonlinearity. Hypertext’s tendency to resist the linear form of traditional print is just one non-exclusive and non-necessary characteristic of hypertext, however. Other, non-digital forms may share this or other characteristics with hypertext, but that does not make them hypertexts.
A few other distinctions will be enforced for the sake of the present argument. These should be seen as focuses rather than presuppositions. In other words, I do not assume that the limited subject within the focus of this thesis represents the extent of hypertextual forms but are rather the result of my attempt to make this focus as specific as possible. The first of these distinctions lies between hypertext and electronic literature. I see hypertext as a type of electronic literature but will not consider other possible forms such as literature incorporating multimedia elements. This does not mean that a hypertext cannot include these elements, only that I am currently only interested in the hypertext in isolation.

Related to this will be a focus on hypertext as a tool with which to author literature. Here, I distinguish literature from more organizational or technical uses of the link. For instance, I am not interested in debates over how a contract or technical manual written in hypertext can maximize the organizational potentials of the link while avoiding disorientation. This focus is related to the presupposition that clarity and predictability are not necessarily the goals of the author of hypertext literature and that ambiguity and unpredictability are indeed important tools of the craft. It is important that this distinction be kept in mind, especially in chapter four, in which I define the function of the link as the recontextualization of the reader’s perspective of the text. While recontextualization may remain the, or at least a, function of the link in more technical hypertext documents, it is usually the goal of the author in these cases to minimize the impact of this function upon the reading experience as much as possible. The particular type of literature focused on within this thesis will be the narrative, as opposed to other forms such as poetry. I define narrative as the telling of a sequence of events (Holman 319). The reason for this particular narrow focus is that I personally find it to be the most interesting use of

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2 Creative hypertext might seem a better term than hypertext literature, but the word “creative” tends to carry its own load of presumptive baggage.
hypertext. The potential of the link to provide authors with new ways to create texture, depth, and meaning within their narratives is highly intriguing and, to a large degree, unexplored.

Finally, the word “text” will be used in the narrow sense of referring primarily to alphanumeric symbols that make up the written word. This is done not as a challenge to those broader definitions that include representational images, speech, or even actions, but is rather part of a larger goal of maintaining the greatest degree of specificity as possible. I have chosen this most traditional sense “text” because of its long-standing position of privilege as our most vital and versatile tool for the recording and conveying of complex structures of ideas.

None of the focuses noted above should be seen as comments on the importance that those forms falling outside of my focus should play within the overall study of hypertext. For instance, I believe that explorations of the most productive ways to structure networks of linked technical documents is crucial for an attempt to maximize the potentials for the use of hypertext within business and industry. However, the goals and structures are different in each of these forms; so are their use of the link. A study of the ways in which different linking structures work within these other forms is important but outside the scope of this thesis.

Media-Specific Analysis

This narrowing of focus reflects the larger organizational model of this thesis in general, in which I follow N. Katherine Hayles call for media-specific analysis (MSA). In Writing Machines, Hayles notes “Literary criticism and theory are shot through with unrecognized assumptions specific to print” (30). This is similar to my own argument that hypertext theory is unduly influenced by unrecognized assumptions specific to the HTML constructed link. A narrowing of focus foregrounds those assumptions, allowing us to analyze them so that we may retain, modify, or reject them in reference to the narrower focal point.
The general structure of this thesis can be compared to a four-stepped inverted pyramid. Beginning at the top, each step represents an increasingly specific media set. From top to bottom, these are digital media, hypertexts, the hypertext link, and specific constructions of the hypertext link. Through this strategy, I hope to determine what properties can validly be projected across all of the members of a set and which are actually attributable to only certain members within a set. This will in turn allow me to recognize the similarities and differences among set members.

My use of MSA is somewhat different from that which Hayles discusses in her book. She seems to be talking about specificity in the sense of looking at a specific media type among other media types, while here I am primarily using MSA to look at a specific media type within a larger media type of which it is a part. Whereas Hayles focuses on the distinctions between print and digital media, I argue that within the subsets of digital media there exist important distinctions that should influence the ways that we analyze and create instances of these subsets.

Description of Chapters

This present chapter serves as an introduction to my thesis and includes a brief explanation of both its relevance to the field of digital media and of the general theoretical and organizational framework from which I will be working. The second chapter is an examination of digital media theory in general. It will draw upon Lev Manovich’s *The Language of New Media*, Jay Bolter’s and Richard Grusin’s *Remediation*, and Espen Aarseth’s *Cyphertext: Perpsectives on Ergodic Literature*, all three works having been instrumental in forming our modern critical perception of digital media.

Chapter 3 narrows its scope of inquiry to hypertext itself. The history of hypertext theory will be traced from Vannevar Bush’s description of the memex to the present day. The rest of the chapter will explore the distinction between viewing the link as a function and viewing it as an
artifact. Landow’s *Hypertext 3.0* and *Hyper/Text/Theory*, as well as Jay Bolter’s *Writing Space* will serve as a basis for this chapter.

The fourth chapter increases the level of specificity even further by focusing on the hypertext link itself. Central to this chapter is my definition of the link function as the recontextualization of the reader’s perspective on the text. Works referenced in this section include Terry Harpold’s “The Contingencies of the Hypertext Link”, Ward Tietz’s “Linking and Care in Connection”, and Susana Tosca’s “The Lyrical Quality of Links.”

The final chapter of this thesis examines three separate hypertext authoring systems. Each of these systems provides the writer with a different link design scheme with which to create a narrative. By examining the differences between these systems, I intend to demonstrate the critically significant ways in which narratives written in these systems will necessarily differ from one another.
Chapter 2: Digital Media

This chapter provides an overview of the prevalent definitions and attributes most commonly identified with digital media. It begins with a look at the historical progression of theories about what we now call digital media. I move from here to an examination of Lev Manovich’s *The Language of New Media*, which has played a key role in formulating the discourse surrounding digital medias. This is followed by look at the concept of remediation, as expressed by Jay Bolter and Richard Grusin in their book *Remediation: Understanding New Media*. Finally, I consider the concept of digital media as it pertains to text in particular, relying once again on Bolter, as well as on Espen Aarseth’s discussion of cybertext and ergodic literature from his book *Cybertext: Perspectives on Ergodic Literature*.

My goal is to develop a broad base from which to begin a media specific analysis of hypertext literature. An understanding of prevalent digital media theories will allow me later to narrow the scope of analysis down to hypertext, and later the hypertext link itself, looking at the ways in which these theories do and do not apply to the more specific media.

**Terminology**

A few notes on terminology are necessary. Since being popularized by Manovich in 2001, “new media” has become the conventional term used to designate those media created or modified through the use of computer technologies. While it does serve as a way to assure media theorists that they are talking about the same general class of objects, the term itself is problematic. The name ‘new media’ tells us very little about the nature of the media that it refers to. In fact, the word ‘new’ attests to how little we know: indicating only that it is different (at least partially) from the types of media that have come before. The other obvious difficulty with the word “new” is that it is relative to the moment of its designation. Cuneiform lists were once
new media, just as video blogs will someday be old. As Janet Murray remarks in the introduction to *The New Media Reader*, the designation of the media in question as new is simply, “a sign of our current confusion” (3).

The common attribute shared by all mediums usually placed within the category of new media is the computer, or, more precisely, the digital technologies which allow the computer to function. I therefore believe that digital media is a more accurate description of these types of media. It should be noted that Manovich explicitly rejects this designation. He points out that there are often three senses in which we use the term digital: the digitization of analog media, a common representational code, and numerical representation. He argues that this ambiguity is a good reason for not using the term to describe a class of media. In addition, he seems to think of digital primarily in the first sense, meaning digitization, and argues that the distinction between digital and analog is less clear than we may think. In contrast, I take the “digital”, in digital media to refer to binary code that underlies all computer based media. I also believe that any ambiguity in our use of the word “digital” is greatly preferable to that inherent in the word “new”. In addition, the term “digital” is also a reference to the computational processes that are at the heart of the generation of these media. Therefore, I will use the term digital media throughout most of this thesis. The exception to this rule occurs within this chapter’s examination on Manovich himself. In order to avoid confusion and any possible misrepresentation of his ideas, his terminology will be adopted within that section.

While the phrase “new media” will generally be avoided, I will adopt Manovich’s name for any particular instance of media, which he calls a media object. Manovich’s preference for the word “object” over others such as “product” or “artwork” is intended to connote both computer technology (such as in object oriented programming) and the avant-garde’s conception
of their works not as works of art, but rather as the results of human and industrial work. His examples of new media objects include digital stills, computer games, web sites, and the web as a whole. The term “object” ties in well with Manovich’s idea of modularity, in which new (digital) media objects can themselves be composed of multiple new media objects as well as becoming component objects within another new media object. I find this terminology be to a useful way of talking about specific works of digital media and will use it throughout.

The term “new media” became widely adopted in around 2001, thanks in large part to Manovich. One of the more notable indications of this occurs in the title of George Landow’s *Hypertext 3.0: New Media and Critical Theory in the Age of Globalization*. This book is a 2005 revision of his earlier works *Hypertext* (1991) and *Hypertext 2.0* (1997). Each of these editions have played an important role in shaping the way that hypertext is discussed and studied. The identification of hypertext with new media in the title of the most recent edition is therefore significant. Outside of the title itself, however, the term “new media” appears only once in all of the 398 pages of the 3.0 edition, when Landow observes that hypertext, “like other forms of New Media, tends to make those who otherwise consider themselves advocates of the new appear outdated” (334). The fact that the term did not occur in the first two editions can be attributed to the fact that both were published before Manovich popularized the term in 2001. The fact that the term is almost never used within the most recent edition, despite the fact that it is part of the title, suggests that the identification of hypertext with new media appears so obvious to Landow that it hardly merits mentioning, let alone a critique. As a consequence of this assumed obviousness, the extension of general digital media attributes to hypertext may seem obvious as well, possibly reducing our critical awareness of any problems that may occur from the application of some of these attributes to the more specific medium of hypertext. In order to analyze the specificities of
hypertext, however, it is necessary to reexamine the presupposition that hypertext is a subset of new media. This in turn requires an examination of new media itself in order to develop a set of definitions and characteristics commonly associated with it.

**Early Developments**

Many of our perceptions and concerns regarding digital media can be traced back to ideas first expressed by the scientists working on early computer systems in the middle part of the 20th century. These men were among the first to directly experience the digital medium and began trying to predict its possible epistemological and sociological impacts. One of the most prescient of these scientists has proven to be Vannevar Bush, director of the Office of Scientific Research and Development during World War II. A month prior to the war’s end, Bushed published a short article entitled “As We May Think” in the *Atlantic Monthly*. He describes a hypothetical information storage and retrieval device, which he names the memex, with which a user can physically link any set of inscribed information with any other set in the system, the associations formed being completely determined by the user, as opposed to being governed by any pre-established categories or relationships. Media and literary theorists alike have often noted the remarkable resemblance of the memex to modern hypertext. The article is just as remarkable, however, for its prophetic vision of digital technologies’ potential to alter the ways in which information is referenced and contextualized. Bush recognized that the sum of human knowledge had already reached a level at which the organization of existing information was just as crucial to the advancement of science as discovery, and that ways in which pieces of information are interrelated within this organization must depend on the context of the question pursued. This insistence on a variability of context and form would later be taken up as a major mark of digital media.
Bush’s interests lay primarily in the mechanical function of the device and the cognitive function of the operator. Scientists following in his footsteps, however, began to see these two as a single function, thinking not in terms of the separate actions of machine and operator, but of the interaction of the two. This approach stemmed, in large part, from the field of cybernetics, founded by Norbert Wiener during World War II. Wiener argued that machines function through their own judgment making processes, and that human judgment and machine judgment act together in a feedback loop (68). He believed that it was the responsibility of those building and operating the machines to input humanistic concerns within this loop, lest we become subservient to the judgment of the machine.

While Wiener was still concerned with human interaction with the machine in general, others began to see the potential of our collaboration with one specific type of machine, the computer. In 1960, J.C.R. Licklidder described the possible advantages to be gained from such a collaboration in his article entitled “Man-Computer Symbiosis.” He pointed out that the major difficulty in the communication between humans and computers is the difference in orientations when processing and applying information. Humans, he claimed, are goal oriented, while computers are process oriented. A synthesis of these two approaches would combine the flexibility and ingenuity of humans with the efficiency and consistency of the computer. Licklidder and Wiener both foreshadowed digital media theorists’ emphasis on interface and interaction.

The ultimate concern of both these scientists was the possibility of instilling a humanistic perspective upon technological systems. Approaching the problem from the field of media studies, Marshal McLuhan sought to bring attention to the changes in human perspective engendered by our interaction with these systems. Rather than anticipate a future in which our
goal orientation will supplement the process orientation of the machine, McLuhan argued that emerging technologies caused us to “strive not towards a point of view but to discover how not to have a point of view, the method not of closure and perspective but of the open “field” and the suspended judgment” (201). Bush’s memex can be seen as a foreshadowing of digital technologies’ promotion of a this way of thinking. Information within the memex is not fixed within certain classifications or relationships but is constantly redetermined by the specific context of the moment. The sum of available information truly becomes an “open field,” wherein delineations and connections are always temporary and contingent. Perspectives concerning the relevancy or viability of any particular piece of information become fluid and dependent on ephemeral relationships. McLuhan predicted an ascendancy of electronic media over print as our primary source of information and communication, resulting in a slow devaluation of the single focused, vision oriented point of view nurtured by print, in favor of a field of vision which places us within a field of multi-sensory stimuli. If this is the case, then this altering of perspective should prove even more profound for digital media, with its easy use of multimedia elements. Stressing the need to study the cognitive impact of the human/medium interaction over an analysis of the content of any specific message resulting from that interaction, McLuhan opened the door for theorists such as George Landow, Espen Aarseth, and Katherine Hayles who emphasize the material and functional characteristics of media types.

A sense of optimism regarding the relationship between humans and the emerging technologies of the 20th century can be seen in the perspectives of the four men discussed above. For Bush, Wiener, and Licklider, these technologies represented tools of knowledge and production that transcending the limitations of synapse and sinew. McLuhan saw the history of developing media technologies as a part of a kind of natural progression that is intimately bound
to the developments of human culture and perspective, both influencing and reacting to the other two. The development of electronic, then digital, technologies is seen as something to be aware of, but not necessarily feared. Other theorists over the past century have taken a more cautionary stance. Members of the Frankfurt School, for instance, pointed to the political nature of media technology and its potentiality as a tool or agent for subjugation and homogenization. Neil Postman believed that pervasive, multi-sensory mediums such as television are degrading our culture into “one vast arena for show business” (78). The debate over the potential evils and blessings of these technologies has yet to be resolved, having only intensified with the ascendency of digital media.

The discourse over digital media began to take on its current form in 1965 when Ted Nelson brought the idea Bush’s Memex together with advancing computer technology to give us a new paradigm for information as well as a new word, hypertext. The following chapter will discuss Nelson’s early conception of hypertext in more detail. Of interest here is his proposal for a digital media whose structure and function is controlled by users, rather than programmers. In Computer Lib/Dream Machines, Nelson urges the development of a design philosophy that emphasizes user choice and multilinearity. He also suggests that programmers find ways to take advantage of the increasing graphical capabilities of computer systems in order to promote the synthesis of image and text. These issues of choice, linearity, and multimedia remain major points within the larger discourse of digital media.

Computer Lib/Dream Machines was published in 1975, the same year that the Altair 8800 opened the way for the PC industry, and one year before the introduction of the first Apple home computer.
The Altair 8800

For the next 25 years, the topics introduced by these pre-PC era theorists would be returned to repeatedly by scholars and professionals from a wide variety of fields. Art, business, design, computer science, education, library science, journalism, literature, rhetoric, marketing, media studies, visual studies, and writing all laid their claim to the new computer based media, each working from their own paradigms and vocabularies. Digital media was a point of inquiry rather than a field of study. While this state of affairs reflected well the complexity inherent in digital media, the multitude of varying and sometimes opposing approaches to the subject often hindered dialogue and progress. The study of new media was in need of its own set of terms and principles which would allow participants from all fields to enter into a common and productive discourse.

Manovich and the Principles of New Media

These terms and principles were finally developed by Lev Manovich in 2001, with the publication of *The Language of New Media*. While attempting to establish a theory of the present state of new media (4), Manovich also helped to clarify its technological and cultural ancestors. Jay David Bolter, while taking exception to Manovich’s portrayal of some of the functions of new media, nevertheless admits that, “With his commanding knowledge of the media
technologies and media theory in the twentieth century, Manovich has given us the first convincing genealogy of new media” (“Remediation and the Language of New Media” 29).

One factor in the fragmentation of the study of new media lay in the fact that new media itself consists of a number of media types. In *New Media*, Manovich gave theorists a way to discuss these disparate types as a single, cohesive whole, sharing a common set of attributes and behaviors. Manovich lists these media types as web sites, virtual worlds, virtual reality, multimedia, computer games, interactive installations, computer animation, digital video, and Human-computer Interaction (HCI). These, in turn, are composed of “graphics, moving images, sounds, shapes, spaces, and texts that have become computable; that is, they comprise simply another set of computer data” (20). It is important to note the apparent exclusion of hypertext from Manovich’s construal of new media.

Perhaps the most important contribution made by *The Language of New Media* to this new field is the set of characteristics that he asserts define the form and function of all new media. These characteristics consist primarily of a set of five principles: numerical representation, modularity, automation, variability, and transcoding. With these principles, theorists are able to describe and compare new media objects in terms of the different ways in which they exhibit these principles. Manovich also identifies three operations, numerical code, the database, and the interface, that he feels are at the base of all digital technology, and thus all new media. For Manovich, an important aspect of new media is the way that the functions or ‘logics’ of these operations shape the ways in which we create, use, and perceive these media, and, increasingly, the way in which we view and approach the world around us.

**Numerical Representation**

The discussion of Manovich’s first principle, numerical representation, begins with the
statement that, “All new media objects, whether created from scratch on computers or converted from analog media sources, are composed of digital code; they are numerical representations” (27). Here we find both the primary prerequisite for new media as well an assertion that numerical representation entails digital code. In order for a media object to be designated as new media, it must be generated through digital code. This places new media firmly within the realm of the computer and its related technologies.

Manovich sees two major consequences resulting from the identification of new media with numerical representation. The first is that any new media object can be described mathematically. This means that, for any new media object, there are at least two levels of description, the level of calculation and the level of perceived forms. These forms are listed by Manovich as graphics, moving images, sounds, shapes, spaces, and texts. In the image of Mt. St. Helens that appears on my screen saver, the mountain is represented just as much by the numbers in the digital code as by the colors and shapes on my screen. The latter representation is the generation of the former.

The second consequence is that, as a product of numerical representation, any new media object is “subject to algorithmic manipulation” (27). For Manovich this equates to programmability. Once again, there are at least two levels of description, the level of the algorithmic manipulations and the level of change generated by those manipulations. It is important to note that when Manovich speaks of algorithm, he seems to not be concerned with simple additions or alterations in the code, but rather with changes in formulas that affect all parts of the code included in that formula. He points to the ability of applications such as Photoshop to change the contrast or dimensions of an image. In these cases, the code is changed throughout the media object.
The principle of numerical representation is important in that it emphasizes the dual nature of all new media objects, which are always instantiated in both code and the perceived form generated by the code. New media objects exist equally as collections of sounds and images and as strings of numbers. This added depth of representation is an essential component in new media, one that distinguishes it both materially and conceptually from older forms.

Modularity

Modularity is a result of both the first principle of numerical representation and the data base structure of new media. A new media object is a collection of elements, such as images, sounds, and behaviors. Manovich points out that these elements assemble into larger scale objects, which themselves are often assembled into even larger scale objects. For example, an audio file is just one element of a larger object such as a movie clip, which itself may itself exist in a larger object such as a web page. The audio file can be altered independently of the web page, or it can be removed altogether.

Any new media object is thus both a single unit and a composite of multiple units, often with varying degrees of granularity. These component units exist independently of the composite and may appear within other composites. The composite itself may act as a component in another composite. In this sense, both paradigmatic and syntagmatic relationships exist among media components within a new media object. For instance, a politician’s sound bite that is embedded in a news webpage exists not only in relation to the other components within that page, but also to the other instances of that sound bite on other pages.

Automation

Manovich sees automation as an affordance of both numerical representation and modularity. He posits two grades of automation, low level and high level. His examples of low
level automation include programs that generate and correct images and text, and the ability of web sites to assemble data on the fly. High level automation is tied closely to systems that rely heavily on AI found in computer games and virtual reality programs. In both of these cases, an automated process generates changes within the new media object, which means that both the numerical code and the perceived object are altered.

Automation means that new media reacts to stimuli, and that this reaction is not always predicted or intended. Manovich emphasizes this point when he states, “Human intentionality can be removed from the creative process, at least in part” (32). This idea relies heavily on Manovich’s second consequent of numerical representation, algorithmic manipulability. While the algorithms themselves are intentionally created by humans, the inputs into these formulas are often unpredictable and/or unintended. This is especially true in regards to higher order automation. In a computer game, for instance, a programmer can never predict the precise way in which a player will proceed through (and thus change) the game, just as the player does not completely control the reaction of the game.

Variation

In the case of both modularity and automation, a change is affected in the new media object. Change is, in fact, an important component within Machovich’s conception of new media in general. This is the basis of his principle of variation. According to this principle, “A new media object is not something fixed once and for all, but something that can exist in different, potentially infinite versions” (36). This variation can be as dramatic as the addition or removal of large major component objects or as subtle as that between viewing an object in web browsers like Internet Explorer or Safari. A new media object can also change over time, as when it is
subject to periodic updates. With the principle of variation, Manovich is able to describe a media object as both a class of objects and as an individual member within that class.

In discussing the possible ways in which variation manifests itself, Manovich pays particular attention to two cases that are of special interest to this thesis. The first of these he labels branching-type or menu-based interactivity. In these cases, the user is presented with choices and, depending on the choice made, the media object changes accordingly. Thus, different choices result in different variations of the same media object. Related to this is the case of hypermedia. In Manovich’s conception, hypermedia occurs when elements of a media object are connected through hyperlinks. He sees hypertext as a type of hypermedia. Hyperlinks are seen as possible paths for the user to choose. “We can think of all possible paths through a hypermedia document as being different versions of it” (38). Two different readings of an instance of hypertext literature will therefore create two variations of the same media object.

The variation principle raises some important questions concerning identity and essence. What property(s) relate variations to one another? At what point does a variation change so as to no longer be considered a variation, but rather becomes an unrelated object? Are variations such in reference to an original are only to other variations? Manovich’s discussion of these issues is rather vague. He asserts that two media objects are related through the principle of variation as long as there is “some kernel, some structure, some prototype” (40) that remains the same between them. As to the nature or requirements for these kernels, he references Jon Ipolito’s concept of “media variation.” Within this conception, media objects refer to certain key properties. The term property is used in this case to indicate something owned, as opposed to simply an attribute. A property can be a character, a narrative, a celebrity, and so on. Often there is an ‘original’ property, which variations refer back to. Manovich uses the example of the
original *Star Wars* trilogy. The property in that case is the original media object itself. Subsequent *Star Wars* movies were variations of the original trilogy because they referenced the original property.

While it seems to leave important questions unanswered, Manovich’s construal of the variation principle is significant in that it highlights the complex relationships that can exist among new media objects. There is obviously a sense in which the web site on my screen is a unique object. At the same time, there is just as obviously a sense in which it is the same object as the one I see when accessing the same site from a different browser, or in which images and texts have changed. The variation principle asserts this complexity to be part of the nature of new media.

Transcoding

Manovich believes transcoding, the fifth and final principle, to be “the most substantial consequence of the computerization of media” (45). This principle is, in many ways, simply an extension of numerical representation, in that it is based on the dual layers present in any new media object. As mentioned above, there exist simultaneously the layer of the numerical code and the layer of the perceived object generated by that code. Manovich now adds a third layer, the cultural, to new media in general. His examples of cultural level categories indicate that he is referring to the traditional ways in which we convey information using either encyclopedic or narrative structures. This layer is presented as distinct from what he calls the computer layer, which seems to be those sets of functions and processes that dictate the ways in which the code layer and the generated layer interact. Examples of components of this layer include data packet transmission, sorting, and data structure. According to Manovich, the organizational and semantic strategies prevalent in the computation layer will naturally filter into the cultural and
the ways that we view information and communication are steadily aligning with the structure
imposed by computing processes.

*Database Form*

Along with the layer of numerical code, Manovich sees the database as a key aspect of
new media that has the potential to alter the way in which we view information and the world.
Manovich attributes new media objects with the form of the database in the sense that they
“appear as collections of items on which the user can perform various operations – view,
navigate, search” (219). The database is, thus, a cultural as well as technological form,
representing a viewpoint in which data is storable and retrievable in discrete units. The
associations between different units are constructed by the user rather than being predetermined.
This same perspective can be seen in Bush’s conception of the memex, in which associations are
created by the operator. In Manovich’s view, “The database represents the world as a list of
items, and it refuses to order this list” (225). He contrasts this form with that of narrative, which
he claims, “creates a cause-and-effect trajectory of seemingly unordered items” (225), and sees
database and narrative as being in direct competition with one another for “an exclusive right to
make meaning out of the world” (225). Manovich clearly sees the database as the native form of
new media, stating that no matter what form they take, all new media are databases. He claims
that while the database form can support the narrative form, there is nothing about the former
that engenders or requires the latter, going so far as to note surprise that narrative still exists
within new media at all (228).

In “Narrating Bits: Encounters Between Humans and Intelligent Machines,” N. Katherine
Hayles questions this strict identification of new media with the database. She argues that the
database represents only a portion of what she calls “possibility space.” In a joking reference to
Donald Rumsfeld, she categorizes information into three classes, known knowns, known unknowns, and unknown unknowns. A new media example of a known unknown is the generation of an object or response which, while not prescribed, remains an intended possibility due to the programming behind the media object. An unknown unknown, on the other hand, could be an object or response resulting from the interaction of some form of AI with the original programming, and is unforeseeable even by the human programmers. Possibility space includes all three of these categories, while databases occupy only the first. The database is thus a subset of possibility space. A focus on the relationship between narrative and the database, Hayles argues, restricts the discussion of narrative to only a portion of new media and should rather be recast in terms of the relationship between narrative and possibility space. While this relationship remains complex, it nevertheless allows us to avoid Manovich’s unattractive and seemingly unintuitive relegation of narrative to the status of an outdated, unnecessary strategy for meaning making within new media.

*Cinema and Text*

Manovich believes that the rise of new media has also resulted in a de-emphasis of text as a conveyor of messages. He does acknowledges that text composes, in one sense, the meta-language of new media and thereby holds a privileged position within the field. This meta-language is the programming code with which the computer generates the sights and sounds experienced by the user. It is the text generated onto the screen that Manovich sees as losing its semiotic and semantic primacy within new media. More importantly, he contends that text is no longer the primary generator of what Neil Postman calls, “The predisposition of a cultural mindset” (51).
According to Manovich, the mind-set, or form, of text oriented print culture has been superseded by that of cinema, which he believes is more in accordance with the principles and functions of new media. “Cinematic ways of seeing the world, of structuring time, of narrating a story, of linking one experience to the next, has become the basic means by which computer users access and interact with all cultural data” (78). The formulation of cinema as the ‘natural’ form of new media informs Manovich’s entire theory. His principle of automation, for instance, relies upon a conception of new media as a time based medium, while the second and fourth principles seem to be clearly imagic in character, describing the ways that new media images relate to other images within and without the frame. New media is thus portrayed as compositions of images, and possibly sounds, that move and change over time.

Other, non-cinematic, approaches are certain to produce other conceptions of new media. Those theorists whose interests originate from the field of literature, for instance, have offered perspectives that complicate or even oppose those of Manovich’s. Hayles and Marie-Laure Ryan have both tended to approach digital media from the perspective of narrative. Janet Murray sees digital media as a new way of storytelling. In Hamlet on the Holodeck, Murray describes new media not in terms of the cinema related concepts of temporality and composition, but rather from the narrative based criteria of immersion, agency, and transformation.

Remediation

The different perspectives used by Manovich and Murray are pointed to by Bolter when he notes, “Although both of these books set out to describe the possibilities of digital technology as an expressive medium, they have few intertexts in common. It is not surprising that as a literary critic Murray would draw on literary models, where Manovich draws on the visual arts” (“Remediation and the Language of New Media” 28). Bolter believes both Manovich and
Murray to be mistaken in that they both portray digital media as simply a successor to these earlier media, inheriting their logics and perspectives, while pushing back the limitations imposed by earlier media. In *Remediation: Understanding New Media*, Bolter and Richard Grusin argue that digital media, like all media, is a product of its own spatial, technological, and economic properties, that enforce their own logics and perspectives. This is not to say that media do not influence each other. Whenever a new type of media is introduced, users initially transfer those techniques and conventions that have been developed with existing medias unto it. These strategies and conventions are always refashioned, however, by the properties of the new media. Bolter and Grusin call this process remediation.

Remediation is not just a feature of the early stages in the development of a new medium. It is a process that goes on constantly and in all directions. Older media remediated newer media, as can be seen by the multiple “windows” often seen in current news casts, a conventions that originated on computers. In fact, Bolter and Grusin define a medium as “that which remediates” (98). They note, however, that this definition is not necessarily essential to the nature of all media, but rather a contingent fact that reflects the current state of media. On the other hand, remediation is seen to be a necessary property of digital media, stating that remediation itself is, “a defining characteristic of the new digital media” (45).

Bolter and Grusin see the goal of most digital media as “to get past the limits of representation and to achieve the real” (53). They point to two, seemingly opposing, strategies of remediation that are used to achieve this, hypermedia and immediacy. Hypermedia seeks to achieve the real through its insistence on the acknowledgement of the reality of the media object itself. A web page containing multiple windows, using a variety of forms such as audio, image, and/or text, is not conveyed as simply a collection of representations of other things and media,
but rather presents itself as its own object with its own logic and form. Hypermedia strives to present the medium itself as part of the real.

Immediacy is described as a disappearing act. The goal of immediacy is to eliminate or minimize awareness of a medium as a representation by eliminating or minimizing awareness of the medium itself. One example given by Bolter and Grusin is Virtual Reality, in which the apparatus seeks to convince the participant of its own non-existence through an immersion of experience of the real. Another example of immediacy is the use of digital graphics in movies. The goal here is most often to eliminate any perceptible distinction between what was digitally generated or enhanced, and what was actually filmed in the traditional sense. The viewer in this case is meant to believe that experience of the real is remediated only by the medium of film, rather than the medium of film as remediated by the medium of digital imaging. “The digital medium wants to erase itself, so that the viewer stands in the same relationship to the content as she would if she were confronting the original medium” (45).

In the cases of both hypermedia and immediacy, digital media simultaneously depend upon and attempt to deny remediation, in what Bolter and Grusin call the double logic of remediation. The only way that they can assert themselves to be ‘real’ experiences rather than representations of other medium is through convincing representations of those medium. These representations, however, will always be subject to the mediating function of the present media. For Bolter and Grusin, this double logic is a hallmark of digital media.

**Digital Media and Text**

This double logic can be seen at work in digital media’s remediation of text. For example, the hypermedia aspect of word processing applications, such as Microsoft’s Word or Corel’s Word Perfect, is expressed in the mass of buttons and menus appearing across the top the
visual space attempting to make it very clear that this is a much better writing tool than a simple piece of notebook paper. On the other hand, the writer’s work appears in an object that takes the appearance of a exactly the thing that we are supposed to consider to be inferior. The application attempts to establish a level of immediacy by recreating the familiar visual experience associated with writing in print. This desire for immediacy has even filtered into our vocabulary, such as in the term web page. Bolter would call both of these acts remediations of the writing space of a standard print medium. Writing space, as described by Bolter, is more than just a matter of spatial dimensions, however;

Each writing space is a material and visual field who’s properties are determined by a writing technology and the uses to which that technology is put by a culture of readers and writers. A writing space is generated by the interaction of material properties and cultural choices and practices. Moreover, each space depends for its meaning on previous spaces or on contemporary spaces against which it competes. Each fosters a particular understanding both of the act of writing and of the product, the written text, and this understanding expresses itself in writing styles, genres, and literary theories. (*Writing Space* 12)

While the writing space of a digital medium often remediates that of other media, our interaction with text occupying that writing space is determined by the material and cultural properties of the digital medium. These material properties include the technological aspects of the medium. Thus, the abilities and limitations inherent in that technology are a part of that writing space. Bolter sees digital text as mostly a remediation of print text, with the digital writing space differentiated from that of print primarily by the flexibility and interactivity that he attributes to digital media.
Espen Aarseth examines the relationship between text and medium in *Cybertext: Perspectives on Ergodic Literature*. Aarseth sees these as two components of a three-part machine. The third component is the operator or reader. Each of these components acts upon, and is acted on by, the other two. In fact, there exists no clear distinction between each of these components. “Each part can be defined only in terms of the other two” (*Cybertexts* 21). This machine did not originate with digital text. It went largely unnoticed, though, before the advent of digital media. This is because the machine component was usually static. In the case of the book, for instance, the role of the medium was a constant, and therefore left, for the most part, out of the equation of the writing and reading process. In the case of digital text, however, the function of the medium is dynamic and often unpredictable, highlighting its role in the overall process. Aarseth calls machines with this dynamic component cybertexts, recalling Licklidder’s prediction of a symbiotic relationship between man and computer.

This dynamic character of digital media can be seen in Manovich’s principles of variation and automation, as well as his description of algorithmic manipulation. Given Aaresth’s formulation of the machine, this dynamism will also be taken up by both the text and the reader of a cybertext. For the reader, this the often involves some type of action that will effect the other two components. Aarseth refers to this as ergodic. Ergodic literature is the product of a cybertextual machine in which a “non-trivial effort is required to allow the reader to traverse the text” (*Cybertexts* 1). Non-trivial effort can be contrasted with that such as turning a page, a nearly automatic action that requires nearly no cognitive contribution from the reader. Clicking the mouse on the link trigger is an example of a non-trivial effort, involving the reader in a

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3 It should be noted that Aarseth uses the word “text” in much broader than what I have defined within this thesis. The component of the machine that I call the text, he refers to as the verbal sign, whereas his “text” is the machine entire.
decision making process that includes both of the other two components within the cybertextual machine.

In both Aarseth’s and Bolter’s models, the text generating process cannot be separated from the text itself. In the case of most non-digital texts, this process is largely theoretical in nature, a way of describing the relationship between reader, text, and medium. For digital texts, however, generation is also a characteristic of the medium itself. A digital text is constantly being generated, or more precisely, regenerated, barring deletion or an interruption of electricity. Furthermore, digital text is generated by more than just the flow of electrical current. It is also generated by the layers of code beneath the surface text. This code is not prior to the text, but is rather a constituent of that text. Therefore, not only is digital text in a constant state of being generated, it is constantly generating itself. This represents a fundamental difference between digital and print text. Digital text is always both a visible object and the process generating that object. It is always simultaneously function and artifact.

This is not the only duality within digital text. As with all types of digital media, duality is a defining characteristic. While Manovich’s treatment may have been based on a cinema biased perspective, his first principle of numerical representation remains at the core of all digital media. As just mentioned, digital text is simultaneously surface text and code text. This code text itself can be brought to the surface, as when we look at the HTML code of a web page, but even this text is based on underlying text. In fact, duality is not really the correct term in the case; multiplicity better describes the state of digital text. Numerous layers of code exist between the

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4 The text is not the only factor in its generation. Electrical current and the logical circuitry of the system also play important roles. (I am not sure where to place machine code in this model, though most first inclination is to place it as a mediator between the higher level codes, which I include in the text, and the more mechanical aspects of the computer). However, this fact does not change the dual nature of digital text.

5 I am restricting the term digital text to those texts that appear as a component of a digital medium, as opposed to those created by a digital medium but then transferred to non-digital, such as a print copy of a digitally designed image.
surface text and the base code expressed in the rhythm of electrical pulses. To complicate matters even further, each of these code layers exist simultaneously as text as and numerical operations. The surface text that we read entails all of these elements, while still bearing the systems of signification that have developed around the reading of text over the past 5,000 years.

As defining characteristics of digital texts, duality and multiplicity of nature will be found in all of its subsets, including hypertext. This complicates the discussion of hypertext and the hypertext link, because it means that there are always multiple ways in which the two can be described. Each description can be seen as a different perspective, each with their own points of focus. A thorough understanding of the medium requires looking at it through more than one perspective. This fact informs much of the structure of the next two chapters. In each, I approach the subject as both a function and an object. Each perspective results in its own set of insights into the nature of hypertext. This strategy recognizes hypertext as a form of digital media while providing a means of discovering those aspects which distinguish it from other forms of digital media.
Chapter 3: Hypertext

In chapter 2, I described the term digital media as applying to any media object that is created with, stored on and experienced through digital technologies. Digital text describes any unit of text that fits this description. Hypertext is a particular type of digital text, and thus a type of digital media. The characteristic that distinguishes it from other types of digital media are evident in the name itself. Our ‘hyper’ derives from the Greek “huper.” which roughly translates to over and beyond. The way in which hypertext is “more than” text is hinted at not so much by the language of the ancient Greeks as by the science fiction of the mid 20th century. The term hyperspace was originally used by physicists and mathematicians to denote space in more than three dimensions. As early as the 1947, Isaac Asimov began using the idea of hyperspace as a means of “jumping” between two points in space instantaneously (Odenwald). The hyper in hyperspace took on a connotation of movement and action, in addition to the more traditional meaning of being somehow “over and beyond”. Similarly, hypertext is more than ordinary text because of the possibility of action that resides in the text itself. As mentioned in chapter 2, this action is not simply something that happens to the text; the text itself is a co-catalyst of that action. Hypertext is above and beyond ordinary text because it is more than text, it is both text and action.

In chapter four, I will look at the focal point of this action, the hypertext link. In this chapter, however, my concern is with text in which this link occurs. I begin with a brief history of the idea of hypertext, primarily focusing on those three people whose ideas constitute the main benchmarks in its development, Vannevar Bush, Theodor Nelson, and Tim Berners-Lee. Following this, I examine what it means for a text to both text and action, or in more general terms, artifact and function. An attempt is made to work through some of the confusion caused
by this dual nature and identify some of the more important aspects related to each perspective, 

Finally, I will examine the notion of linearity and its relationship to the hypertext narrative.

**History**

Consider a future device for individual use, which is a sort of mechanized private 
file and library. It needs a name, and, to coin one at random, “memex” will do. A 
memex is a device in which an individual stores all his books, records, and 
communications, and which is mechanized so that it may be consulted with 
exceeding speed and flexibility. It is an enlarged intimate supplement to his 
memory. (Bush 45)

With this passage from his 1945 article “As We May Think”, Vannevar Bush famously 
proposed the device hailed as the conceptual forerunner to what we today call hypertext. The 
uses that Bush anticipated for this device are clear from his description; it was intended as a 
means of storing and retrieving information, a mechanical and external imitation of internal and 
biologically based memory. There seems little at this point to draw the interest of narrative 
writers besides its use as a vast and efficient depository of works. It is the way in which this 
information would be retrieved “with exceeding speed and flexibility” that begins to prophesize 
the potentials of hypertext for literature. Bush saw the contemporary systems of information 
indexing as cumbersome and artificial, wholly inadequate for dealing with vast amounts of data 
being generated at ever increasing rates by modern research. The memex’s solution to this 
problem was its use of associative indexing, “a provision whereby any item may be caused at 
will to select immediately and automatically another” (10). Through this provision, the user of 
the memex would create a connection between two separate documents. This connection would 
be based upon user perceived associations between the documents, these associations reflecting
the context in which the information is being considered. It is also permanent; remaining available to future users who wish to follow the path created from one document to the next.

Association was the defining feature of the memex, conceived by Bush as a replication of the way the mind works. “With one item in its grasp, it snaps instantly to the next that is suggested by the association of thoughts” (9). By relating the memex to the functions of the mind, Bush proposes a device whose use goes beyond that of simple storage and retrieval to the representation of myriad other consequences of the brain’s ability to draw links between disparate concepts, not the least being the connection of narrative fragments.

While Bush’s article made clear the needs for and potentials of the memex, it offered little advice as to how to build such a machine. Bush assumed that technology would soon advance to the point where the function of associative indexing could be accomplished through the moving parts and automation of the machine. He was partially correct; memex like systems began to be developed some twenty years after the publication of “As We May Think”. However, it was through the circuitry and electronic impulses of the digital computer, rather than the gears and levers of the mechanical machine that his prophecy was finally fulfilled. Ted Nelson was one of the first to attempt to use the computer to actualize the possibilities of the memex. Nelson invented his own word to describe such a system. Recognizing the radical changes that it would bring to the function and conception of text; he named this new system hypertext, introducing the term to the world through a series of articles and lectures in 1965. Along with Andries van Dam, he developed the Hypertext Editing System (HES) at Brown University in 1967 and the File Retrieval and Editing System (FRESS) in 1968.

Nelson originally defined hypertext as, “A body of written or pictorial material interconnected in such a complex way that it could not conveniently be presented or represented
on paper” (“File Structure” 137). The interconnections or relations between textual elements are thus an essential quality of hypertext from its inception. A different, yet compatible definition is offered in his book *Computer Lib/Dream Machines*, where he describes hypertext as, “Non-sequential writing-text that braches and allows choices to the reader” (17). It is clear from this second definition that hypertext is seen as a form of writing. Taken together, these definitions reveal that hypertext was devised as a mode of writing that prioritizes the relations between textual elements to a degree that would be difficult or impossible to achieve in print.\(^6\)

The following decades saw the development of various hypertextual systems attempting to advance upon HES and FRESS. Examples of these early systems include, Notecards (’83), Intermedia (’85), StorySpace (’87), Aquanet (’91), as well as Nelson’s own long developing Xanadu. In most cases, these applications targeted very specific fields and industries. Hypertext enjoyed very little recognition outside of the programming and advanced user communities, such as participants of early protocols such as Usenet and FTPs, throughout the 1980s. The rise of hypertext to a dominant media form began in 1989 with a proposal written by Tim Berners-Lee to his colleagues at CERN (the European Organization for Nuclear Research) in which he suggests the development of a distributed hypertext system as a solution to, “the problems of loss of information about complex evolving systems” (“CERN” 1). In a follow-up proposal released the next year, Berners-Lee introduced the concept of the World Wide Web. This distributive information system would incorporate internal servers as well as utilize the existing Internet infrastructure. More importantly, the Web was to be built upon the principles of hypertext, which Berners-Lee describes as “a way to link and access information of various kinds as a web of

\(^6\) Nelson’s definition of hypertext is clearly different from my own given in the introduction of this thesis: the term hypertext applies to any textual unit that includes a hypertext link. While it may seem more sensible to use the definition given by the person who coined the term, I believe I have good reason for retaining my own within this thesis. I believe that those properties described by Nelson in his definition are secondary and derive from the presence of the link.
nodes in which the user can browse at will” (“HyperText” 1). Around this time, Berners-Lee also
developed the basis for HTML, the coding language upon which this system was to be built.
Berners-Lee noted that this system still required the development of what he called a browser,
“A program which provides access to the hypertext world” (“HyperText” 2). In 1993, a GUI
browser named Mosaic was made available to the general public, and the World Wide Web’s
rise to ubiquity had begun.

Over the next two decades, the World Wide Web experienced a rapid growth in
popularity and coverage. From marketing, to e-commerce, to file sharing, to blogging, to social
networking and beyond, the Web has become an important site of commerce, communication,
and interpersonal connections. This surge in popularity naturally led to an increase in the
public’s familiarity with hypertext For many computer users, their first, and often only,
encounter with hypertext has been through the Web. This often leads to an identification of the
Web with hypertext. This identification may seem initially valid, as the Web itself was
conceived as a hypertextual system. The Web can be identified with hypertext, however, only in
the sense that it is an instantiation of hypertext. Hypertext itself is not the Web. This point has
been argued vigorously by Ted Nelson himself who sees the Web as a misuse and
misunderstanding of hypertext. One of his strongest criticisms stems from the belief that the
structure is still rooted in the print based modes of organization that he had intended hypertext to
overcome, calling the Web, “The minimal concession to hypertext that a sequence-and-hierarchy
chauvinist could possibly make” (Paradigm), while calling the browser, “An extremely silly
concept—a window for looking sequentially at a large parallel structure. It does not show this
structure in a useful way” (Paradigm). Despite the protests of Nelson and other’s, however, most
of what has been theorized and argued about hypertext in the years following the introduction of Mosaic has been in reference to hypertext as constructed in HTML.

Besides the differences in opinion as to how hypertext should be implemented, it is also important to note a key difference in the definitions given by Nelson and Berners-Lee. The first two words of each scientist’s description are particularly revealing. For Nelson, hypertext is “a body”, while for Berners-Lee, it is “a way.” In the former case, it is an object, made up of connected components, while in the latter it is the means by which those connections are made. These two ways of describing hypertext point not to contradicting definitions, but rather to the complex nature of the subject defined. Hypertext is; while at the same time, hypertext happens. Although the hypertext object cannot truly be separated from the hypertextual function, it is still often necessary to talk about one aspect or another in on unambiguous way. To do this, it is important to acknowledge the distinction between the two and recognize the characteristics of each.

**Hypertext as Artifact**

Hypertext is a thing or artifact in the same way that digital text is. The word “hypertext,” however, like the word “text,” refers to a type rather than to a specific object and does not completely clarify what we are referring to when we talk about a hypertext. In order to talk about hypertext as an artifact, we must have a succinct way of referring to a specific hypertextual object. This is complicated by the fact that there are really two classifications that usually go undifferentiated within the term “a hypertext.” While the scope of these classifications may often times be coextensive, they are not necessarily so, therefore an examination of each is called for.
The Hypertext Segment

The first classification is that of the hypertext segment. This is simply a textual unit that includes a hypertext link. The scope of this unit is dependent upon the focus of discussion. Thus, a segment can be a single sentence, a CD, or the entire World Wide Web. Under this classification, the point of inquiry lies upon the link itself, both in its relationship to the other textual components of the segment and as a point of interaction for the reader. This allows us to talk about the page beginning with the line “I try to recall winter. "As if it were yesterday>” from Michael Joyce’s *Afternoon* as a hypertext, and, for example, theorize as to the effect that a question of yes or no has on our understanding on the rest of the text therein, without regard to where the links may lead.

My notion of a hypertext segment is different from the traditional conception of the hypertext node. A node is a non-modular unit of text that is linked to other nodes. Jeff Conklin defines the information contained within a node as such that, “(a) you always want to view it together; (b) you never want to take it apart; and (c) you rarely even want to reference parts of it outside of the context of the rest” (Conklin 28). Moreover, the internal coherency within the node is determined by the intention of the author. The internal consistency of the text within a segment is determined by the context of the reader’s analysis and may contain any number of component segments. In fact, given my definition, even non-hypertextual or even non-digital components may be included as a part of a hypertext segment. For instance, Mary Shelly’s *Frankenstein* could be examined as a part of a segment that also includes Shelly Jackson’s
Patchwork Girl. There is no requirement that the components within a segment be connected by a link, only that at least one link be present.

The Hypertext Network

The term “a hypertext” may also refer to a network of linked textual units. The scope of the hypertext network is once again dependent upon the context in which the text is being examined. Two linked pages within a hypertext novel constitute a hypertext network just as much as the entire novel does. When a hypertext is studied as a network of segments, the focus shifts to the relationship between segments and the effects upon the reader of going from one segment to another. It is within this classification that we can discuss things like the organization of a site or the impact of the unexpected destination upon the reading process.

The only requirement upon the size of a hypertext network is that it must contain at least one hypertext segment and at least one other textual unit. It is not even necessary for other units within the network to themselves be hypertext segments. Consider a hypertext network in which a start page contains links to three other pages, but none of these pages themselves contains links. In this case, while these three pages are part of a hypertext (in the sense of a hypertext network) they are not themselves hypertexts (in the sense of hypertext segments). Their value to the hypertext theorist lies solely in their relationship to the other segments to which they are linked (through the start page) rather than in the internal relationships within them.

It should be obvious that any object that can be classified as a hypertext in terms of a network can also be classified as a hypertext in terms of a segment. It should be just as apparent that many hypertext segments are themselves hypertext networks. The question therefore arises as to what use there is in this distinction. The purpose here is not to provide a way to differentiate

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7 It remains questionable, however, whether there would be any critical advantage to the construction of such a segment, unless it could be argued that the links within the hypertext novel somehow impact the interpretation of a later reading of the older work.
between types of hypertextual artifacts, but rather to disambiguate two related but very separate focal points by which we analyze these artifacts and to foreground the point that a complete analysis of any piece of hypertext literary must utilize both of them.

**Hypertext as Function**

The hypertext network is a product of the hypertext function. This function connects disparate textual segments into a network. In a sense, the hypertext function creates a single artifact out of many. The hypertext network is more than just the sum of its segments, however, and the hypertext function does more than simply combine preexisting texts. It also constructs the connections between segments. These connections constitute an essential component within the network, influencing the reader’s interpretations and interactions with the narrative.

The hypertext function can itself be seen as working in two different modes, the authoring mode and the reading mode. Each mode corresponds to a different way in which we identify a specific hypertext network. The authoring mode works through the underlying hypertext code dictating the destination of a link. When generated in this mode, all segments within a network are referenced by the hypertext code contained within at least one other segment within that network. The authoring mode can also be seen as a mode of potentiality, as it identifies all of the segments that could possibly be linked to from within a hypertext. This mode allows us to talk about an entire hypertext novel as a single artifact, regardless of the fact that each reading will likely access a completely different set of segments in different configurations. Thus, the hypertext function is not necessarily a result of the activation of the link but can result simply from the link’s presence. The author mode also makes it possible to consider a specific hypertext as something that endures over time.⁸

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⁸ This is of course assuming that no changes are made to the code itself. It is also somewhat unclear whether it can be said that all author networks are unchanging in themselves. It is possible for the code within a hypertext to
The network generated by the reading mode of the hypertext function is determined by what the reader actually reads. This mode allows us to discuss two different readings of \textit{Patchwork Girl} as encounters with two separate hypertexts. Unlike the network generated in the author mode (or for brevity’s sake, the author network) the reader network is wholly dependent upon the activation of the link. It does not come into existence until the first link is activated. Just as importantly, this network changes with each additional activation. The reading mode can also be seen as one of actuality, as it identifies all those segments that are actually accessed by the reader.

While the distinction between these two modes is an important one, it is just as important to remember that they are both modes of the same function. This duality makes it possible for us to say that two people reading the same author function generated hypertext are at the same time reading two different reading function generated hypertexts. A hypertext must be considered to simultaneously be a single and a multitude of artifacts. This fact constitutes a major difference between an analysis of the reading experience of a hypertext and that of a print novel, as two separate readings of a hypertext are comparable neither to two readings of a single print novel, nor to the readings of two separate print novels.

**The Reading Path and Linearity**

Within the network created by the reader function lies the reading path. The difference between the reader path and the reader network is one of sequence. A reader network can be described simply by identifying the total of segments and inter-segment relationships encountered by the reader; a description of the reader path must also take into account the order generated a random, non-repeating result, meaning that the code itself generates a different segment every time. I believe this what Aarseth refers to as an indeterminate text. My first thought is that the existence of the variable itself remains the same, and the author network itself does not change.
in which those objects are encountered. The word “path” implies not only the landscape crossed by the reading, but also the route taken through that landscape.

The reader path is not unique to hypertext, but rather a feature of the reading experience in general. Bolter points this fact out, stating that, “To read is to follow one path among those suggested by the layout of the text” (Writing Space 100). This fact is often overlooked in the study of printed text, simply because the number of paths suggested by the layout of the book is rarely anything other than one. The unbroken sequence of pages, each filled with print flowing in the same direction and each bearing a number to reinforce its place in line, leaves little doubt as to what path the reader is expected to take. This form tends to restrict the author’s options as well. Recognizing that any reader will be funneled along the same path, the most obvious strategy is to construct a narrative that conforms to that path. In this way, the Aristotelian plot form of one beginning and one ending, bridged by a series of middles, remains the dominant narrative form.

Because most print narratives will dictate the same single reading path to all readers, it is appropriate to talk about the reading path of such a narrative. The linear nature of this path is usually easy to discern, running in an obvious progression from start to finish. In hypertext literature, however, a reader may be confronted by a number of options as to how to proceed, each option seemingly equally reasonable in relationship to the form and content of the text up to that point. In a hypertext network, it makes sense to talk about multiple possible paths running through the text. This fact calls into question our traditional ideas about the linear nature of narrative and is seen by many theorists as a defining feature of hypertext literature. Landow includes non or multi-linearity as a hallmark of hypertext (Hypertext 3.0 220). Similarly, Hayles lists “multiple reading paths” as a defining characteristic of a hypertext document (Writing
Machines 26). Stuart Moulthrop sees the reading path as something separate from hypertext itself, with hypertext simply facilitating the reading process, stating, “At minimum, hypertext automates and simplifies the reader's task in moving through a complex, non-linear document” (“In the Zone”).

Landow seems to equate linearity directly with the Aristotelian plot structure, consisting of a definite and non-interchangeable begin, middle, and end (Hypertext 218). He contends that hypertext brings to the foreground the need to reexamine those paradigms of literary criticism that take for granted linearity as the ‘correct’ narrative form, and relegates linearity in hypertext to the experience of the reader, rather than the work as a whole: “Linearity, however, now becomes a quality of the individual reader’s experience within a single lexia and his or her experience following a path” (Hypertext 221). Instead of a single preferred reading path common to all of a text’s readers, hypertexts have multiple possible paths from which to choose. Thus, in Landow’s view, hypertext narratives are multilinear rather than linear.

The idea of the multilinear text is essential to a discussion of hypertext. I do not agree, however, with Landow’s positioning of the multilinear as something outside of or even opposite to the linear. To say that a narrative is linear in nature is to acknowledge the existence of at least one path through that narrative, but this path does not necessarily preclude the possibility of others. The linear can include both the multilinear and the unilinear; unilinear texts being those through which only one obvious path can be traced. Those texts adhering to Aristotle’s formulation of a proper plot are thus unilinear, while a hypertext novel such as Patchwork Girl is multilinear, but both qualify as linear texts. This association may be similar to what Aarseth meant when stating, “The linear text can be seen as a special case of the nonlinear in which the convention is to read word by word from beginning to end” (“Nonlinearity” 52), except here,
multilinearity is one subset of the linear, with the unilinear, which I believe is close to what Aarseth referred to as the linear, being another. An important advantage of this definition is that it restricts the term nonlinear to refer to those texts through which no obvious reading paths run. Assuming for the moment that hypertext makes possible both multilinear and nonlinear texts in a way that traditional print does not, the term non-unilinear seems to be the most precise way to make a general distinction between the reading paths of print and hypertext.

Another important point in Landow’s quote pertains to the association of unilinearity (what he calls linearity) with the reading path of a single reader. Even when a reader has multiple paths available to choose from, they can only take one path at a time. This single path consists of a sequence of symbols and interpretations, each step in the sequence occupying a moment in time. Bolter points out this phenomenon, stating, “The temporal dimension of a text is created by the reader’s moment-to-moment encounter with these [spatial] structures” (Writing Space 99). This moment-to-moment encounter is necessarily unilinear. At any given point, there can be only one such moment immediate before and one immediately following the present. The reading path is therefore always unilinear.

Multilinearity, therefore, is about possibility. To say that a text is multilinear is to note that there are other viable, possible paths that the reader might, or might have, chosen other than the actual path chosen. Multilinearity in this sense can be applied to both the network created by the author function and that created by the reader function. A focus on the later would indicate an inquiry into how different possible sequences of the same segments alter the interpretation of the narrative. Usually when a text is labeled multilinear, however, the term is meant to refer to the entire piece. In this case, the concern is not just with different possible sequences, but with the significance of a there being entirely different possible reader networks.
Of course, one of the interesting differences between a print and a hypertext narrative is the incentive for repeat readings of the latter. It is true that people often read print narratives multiple times but these readings are usually spaced out over a period of time. More importantly, any difference in the reading experience is due to the contexts in which the reader finds themselves at the time of a reading. The multiple possible reading paths promised by many hypertexts, however, encourage the reader to begin one path as soon as the last is finished. In this sense, the reader does experience multiple reading paths of the same hypertext network. This is close to what Aarseth had in mind when he defined nonlinear text (what I would call multilinear) as, “An object of text that is not simply one fixed sequence of letters, words, and sentences but one in which the words or sequences of words may differ from reading to reading” (“Nonlinearity” 51).

It seems that there are really two, related, contexts in which we can talk about the multilinearity of a hypertext, that of multiple readers and that of multiples readings by the same reader. Both cases include the possibility of multiple reading paths. The former context also presents the possibility of multiple reader-function generated networks. In the case of a single reader, however, the reader network is expanded rather than multiplied. The possibility of multiple reading paths through a single, expanding reader network, complicates the relationships between the narrative, the reading path, and both the reader-function and author-function generated hypertext network. As with most aspects of hypertext, we can view the reading experience in light of this complication from multiple ways. First, we can say that the reader has encountered multiple narratives within the same author-network hypertext, thus equating a narrative with a single reading path. We can also say that the reader has encountered two different variations of the same narrative. This description recalls Manovich’s inclusion of
variability as one of the five principles of new media and, like that principle, raises the question of what type of relationship exists between variables. Is there an original, or intended, narrative from which all other possible reading paths diverge, or are all of the possible variations simply the set of possible sequences of segments within a hypertext network? Finally, we can say that the reader has gained two different perspectives on the same narrative. By positing a single narrative on which multiple insights can be gained, this description identifies the narrative with the author network. It is also the one that I find most interesting, as it suggests an analysis by the reader of the relationship between multiple paths in addition to that between segments along a single path.

Like multilinearity, nonlinearity is never a property of the reading path, but rather of the network traversed by that path. The two are also similar in that, in both cases, there will be a multitude of possible read paths besides those actually chosen. The difference between these two lies in the predetermined relationships between segments. Within a multilinear hypertext, each segment is linked to a limited number of other segments. The indication is that there exists some author-intended connection between the present segment and the available choices. An obvious example of a nonlinear hypertext lies in spatial hypertexts in which the reader is presented with a screen full of unconnected, unorganized boxes. Choosing a box accesses the corresponding node, but to access another, the reader must return to the screen of boxes. Here the nonlinear can be seen as similar to the unilinear in that neither provide the reader with guideposts with which to navigate their path. The unilinear text has no need of signposts, there is usually only one path to take. The nonlinear text, on the other hand, maximizes the number of possible reading paths to all segments available within the author network.
In multilinear and nonlinear texts alike, the actual reading path(s) taken by the reader constitute only a portion of the total set of paths possible within those texts. In most cases, the difference between actual and non-actual possible paths is determined by the reader’s choices. These choices construct both the reader path and the reader network, and, conversely, determine what segments of the author network are excluded from the reader’s experience. The reader, however, is usually not aware of the course of the path that they are taking. The path is the sum result of the reader’s choices. Each individual choice is only in regards to the next step taken along that path. This step is the hypertext link. In the following chapter, I examine the link from a number of different perspectives, looking at how the nature of the link informs the individual choices as well as its impact on the reading process as a whole. This overview of the link in general will then be used in chapter 5 as a starting point from which to explore the ways that different constructions of the link determine different characteristics and behaviors that influence the ways in which we write and read hypertext narratives.
Chapter 4: The Link

No matter how it is conceived of or designed, there is no hypertext without the hypertext link; “So, too, is the link the primary quality, device, mechanism, formal feature of hypertext” (Raley 16). All talk of linearity, choice, authorial control, and so on is ultimately about the consequences of introducing the link within a document. Talking about the effects of a thing, however, is not the same as talking about the thing itself. The link often goes unnoticed in the quest to understand hypertext. If Landow is correct, however, in asserting that hypertext is defined by the link (Hypertext 3.0 152), then any hypertext theory that fails to address the nature of the link is necessarily incomplete. This chapter will therefore concentrate on the characteristics of the link itself.

A major difficulty, indeed the root difficulty, of talking about the hypertext link lies in the multiplicity of modes or senses in which the link may be described, and subsequently, the ambiguity that invariably arises in any description of the link in which mode(s) goes unspecified. The relevancy of any such description is contingent upon the mode(s) under which the link is considered. For example, Susana Tosca’s call for relevant links in “A Pragmatics of Links” assumes a conceptual mode in which the link includes the on-screen “trigger,” as opposed to one in which the link exists between linked elements or even one in which the link is the actual process that is triggered. Tosca’s article also assumes the link as a linguistic entity rather than a computational procedure. It should be noted that this abundance of senses, or even the ambiguity that they generate, is neither completely avoidable nor even undesirable. The complexity of form and usage inherent in the link lends itself, most likely requires, a certain level of thickness to any
The acknowledgment and recognition of this ambiguity, rather than its resolution, is necessary for a complete and cohesive description of the hypertext link.

The word link can be used as both a noun and a verb. For example, in the following description of hypertext system, the word “link” appears as both within the same sentence. “All the lexia (the cards) are initially linked, and certain links are effectively removed at every stage of reading” (Millard 59). There is certainly nothing incorrect about either usage of the word in this sentence. A link links, just as a rise rises and a border borders. Both usages, in fact, use the root word in the same sense. The verb “link” is simply a description of what the object designated by the noun “link” does. In this sense, the link is an object that does something. Links exist on the page, to be either displayed or hidden, chosen or passed by, used or traversed. This mode supports a navigational metaphor of hypertext, in which the link acts as a passage from one textual location to another. It also promotes the notion of reader choice and reader control. The link is a tool used by the reader to construct the narrative. While the sense of link as object does not confine the theorist into accepting either of these portrayals of hypertext, it certainly has been a major factor in bringing both to the forefront of the hypertext discourse.

My use of the term “thick description” is somewhat different from that of both Gilbert Ryle, who introduced the term and of Clifford Geertz, who popularized its use outside of analytic philosophy. In examples offered by both men, “thickness” seems to apply simply to a complex context of cause and effect relations and social idiosyncrasies that must be taken into account for a full description of the object or event in question. They contrast this to a “thin description” which ignores context and simply acts as a statement of the most obvious “facts”. My own sense of the term can be contrasted with what I call a flat description, in which all particulars of a description can be formulated in one consistent string of conjunctions, disjunctions, and consequents. I believe the examples given by both Ryles and Geertz constitute flat descriptions. A thick description, then, incorporates particles that seemingly exclude the possibility of each other but apply simultaneously, each requiring a different perspective on the thing being described.

“Because text links are revealed by pressing a special key … Storyspace encourages a two-handed reading posture” (Bernstein “Storyspace 1” 174).

“Textual units of various sizes are presented to the reader in an order that is determined, at least in part by electronic links that the reader chooses to follow” (Remediation 272).

“Instead of thinking of the link as a connector between nodes, consider it a space one has to cross and fill to get to the next node” (Parker 2.)
The Link as Function

In the as-object sense of the hypertext link, the link is something that performs the function of linking. However there is also a sense in which the link is that function. In this sense, the object, be it the code, the trigger, the object linked, or the metaphysical connection and space between, is not the link itself but simply the thing(s) needed for the function of the link to occur. This is similar to the difference between the part of a car that we call the ignition, and the act of igniting the air-gas mixture that the ignition enables. The hypertext link does not exist in a static state. As is the case with ignition, something must happen for the link to occur. The link-as-function sense implies that the link does not exist except when functioning. In other words, the link only exists at the moment of linking. The link becomes a hybrid of speech and writing, in that it is still document-confined like the written inscription, but like the spoken sound, is always temporary, appearing and disappearing at the same moment.

Function Generators

Thinking of the link as a function prompts an inquiry into the nature of that function. This inquiry can be (artificially) divided into three parts, what initiates the function, what is produced or altered by the function, and finally what does the function do. A partial answer to the first question is obviously those things that are referred to when the word “link” is used in the sense of an object. To this set can be added all of the various layers of code, as well as the computer upon which the document is being read, the network (assuming it is read online) on which it is accessed, all the way down to the electrical current that powers the equipment and pulses through the CPU. The relationship of the reader with the rest of this set is also reconfigured. When the link is conceived of as an object, the reader is isolated from the

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13 The set also includes the myriad components upon which these systems are built.
components of the link unless it is argued that the reader is a component of the link, which seems highly unintuitive. It is much less problematic, however, to posit the reader as a member of those sets of objects that initiate the link. The reader is a collaborator working in concert with the other elements on and beneath the screen to bring about the link.14

The idea of the reader as collaborator in the creation of hypertext is taken up by Rita Raley when she argues for a performative conception of hypertext. This performance is complex both in terms of the performers (the reader and the rest of the hypertextual system) and in scope; “The performance collapses processing and product, ends and means, input and output, within a system of ‘making’ that is both complex and emergent” (6). Aarseth uses the idea of performance as well, with the three parts of the cybertextual machine performing together to generate the text. For Raley, it is the performative nature of hypertext that distinguishes it from print. Hypertext cannot be known in a static state but only as it is performed. To see hypertext, and more precisely, the hypertext link, as performative is to see it as something that happens, as an event, rather than an object.

The designation of the hypertext link, whether seen as cybertextual machine or complex performance, as a producer of signs is questioned by Marie-Laure Ryan, who points out that in most cases the text accessed via the link is pre-generated (“Immersion” 120). Ryan categorizes the collaborative aspect of the link as what she calls weak literal interaction. The interaction is literal because it results in a physical change in the text, and weak because this change does not create new signs, but rather produces signs created by the author(s). She notes that this categorization depends on a conception of the text as the entire set of hyperlinked documents, or “the sum of possible readings, rather than viewing every possible textual configuration possible

14 While my focus here is on the interaction of the reader, it is important to note that the author(s) is also an important member of this set.
as a separate text” (“Immersion” 127), in other words, looking at the entire author-function generated network instead of individual reader networks.

**Function Consequences**

The collaboration of reader and text is not unique to hypertext. The interpretive and contextualizing role of the reader has always been a necessary component in deriving meaning from texts. It is the ergodic and generative nature of the link that distinguishes hypertext literature from traditional forms of print. The relevant question is to what degree do these additional elements affect the meaning making process of the reader.

Ideally, there are three cognitive components in the reader’s role in the generation of the link. The reader must first decide to interact with the rest of the link generating process at a certain point, most commonly to activate a specific link trigger. This step is complex in itself, as it requires the reader to analyze not only the text on the screen, but also the sum of related texts already read, as well as the relationship of the link marker to these other two. The second component is the reader’s prediction of the target text. The final component occurs when the target text is accessed and the reader reevaluates their analysis and predictions in light of the newly generated text.

The significance of the link trigger to the reader, considered both independently from and in relation to the rest of the text, is a major factor in its selection. A reader of the sentence (assume underlined words are link triggers) “Sam arrived at the commune two weeks before Nancy knew he had converted,” may choose the link trigger “converted” because he is intrigued

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15 The first and second components can probably not logically be separated, as the reader’s prediction of the result is likely entailed in the choice. However, while they are entangled, they are not identical, and I separate them here to emphasize the importance of both in the overall process.

16 It is, of course, always possible that the reader will choose a trigger purely by random and/or without reading the text. In the latter case, I believe that the meaning making process instigated by the link can still occur. The latter case calls into question whether we can even call someone who does not bother to read the text a reader.
by the concept of conversion. At the same time, another reader would choose the trigger “Nancy” because they have found her to be an interesting character from previous sections of the text. In “Linking and Care in Connection”, Ward Tietz discusses this in terms of care. The reader must feel some level of care regarding the text in order to want to choose a link. Care can be elicited or enhanced by the nature of the link trigger. Care can also be damaged when the reader too often feels misled or frustrated by the result of the link.

Susan Tosca describes this decision making process by calling upon the linguistic notion of relevance. She uses Dan Sperber and Deidre Wilson’s formulation of the relevance theory from their book *Relevance: Communication and Cognition*, which, not surprisingly, involves a cognitive and a communicative component:

1. (Cognitive) Human cognition tends to be geared to the maximization of relevance.
2. (Communicative) Every act of ostensive communication communicates a presumption of its own optimal relevance. (*Relevance* 125)

Consider the following example. My wife asks me if I plan to mow the lawn today and I reply simply, “It’s raining.” Because she will presume that my reply must be somehow relevant to her question, she will most likely interpret my reply as communicating that no, I will not be mowing the lawn because it is raining. This reply is actually more informative than a simple “no”, as it also communicates why I will not be mowing the lawn. Tosca relates this theory to hypertext by considering the node and link to be a “speaker’s utterance” and reformulating the principle as “Every link communicates a presumption of its own relevance” (80).

Under this view, a hypertext link, by its very existence, establishes an expectation of relevance to the hypertext in which it is contained. Tosca defines communication as relevant
when it “helps the recipient understand a part of the world better” (“Pragmatics” 78). In the case of a narrative, the world referred to is that of the narrative rather than the actual world of the reader. According to the theory of relevance, the link elicits an assumption of its own ability to further the reader’s understanding of the hypertext as a whole. The nature of this understanding, or what aspect of the hypertext it is relevant to, is interpreted based on the link trigger. Tosca envisions this interpretive process as a sort of inner dialogue or axiom. Take for, example, the following section from Deena Larsen’s hypertext “Ferris Wheels”:

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We have escaped the noise of the KBPI radio booth on Colfax, set up on the Courthouse steps where I got my divorce about two years ago. A booth advertising buffalo gyros and green pepper salsa covers the step where I stood and cried for four and a half hours. We wander around the raucous, overpriced food booths that are trampling the pines and marvel that the intricate flower gardens between the courthouse and the capitol are still intact.
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My interpretation of the link trigger “still intact” might run something like this:

1. Intact means that something retains its whole, that it remains as it has been.
2. ‘Still’ indicates the possibility of change. To say a thing is still ‘x’ suggests though it was at one time ‘x’ it is conceivable that it would have ceased or will cease to be so.
3. A previous sentence tells me that that narrator was recently divorced. Her marriage is no longer intact.
4. It is difficult to know which things will remain intact and which will change.
Beside its role as a determining factor in my choice of link triggers, this process also promotes a reinterpretation of the text. The process of prediction itself is an act of interpretation in which the reader determines new possibilities that suggest new relationships among pre-established textual elements. In fact, the very introduction of the link trigger informs the reader’s interpretation of the overall text. Not only does the trigger communicate a presumption of relevance, it also emphasizes that relevance over the surrounding text, increasing its perceived significance and meaning making force.

While useful, the above example oversimplifies the process in that the reader in this case comes up with only one conclusion. It is far more likely that multiple possible outcomes will be foreseen. Tosca envisions the ability to predict multiple outcomes to a link as exerting a centrifugal force upon the reader’s conception of the text as a whole, in which the set of possibilities is expanded outward. (81). The target page, on the other hand, exerts a centripetal force in which that set is re-concentrated around an interpretation of the text based on what is actually written. The reader foresees multiple outcomes based on their interpretation of the relevance of the link trigger as well as the surrounding and preceding text. A single outcome is realized at the link target, which may or may not bear any resemblance to one or more of the reader’s previous predictions. It is likely that a reevaluation of the text will take place once again. Unless, the reader succeeds in fully predicting the outcome of the link target, a reexamination of the relevancy of the link trigger will be in order. The trigger will retain its presumption of relevance. The reader will go through a process similar to that described above, incorporating the new text found at the link target. It is always possible for the target text to appear completely non sequitur from previous text. However, as Scott McCloud argues in his discussion of comics, the reader is likely to always determine some connection between the two texts, no matter how
unrelated they may appear (73). The result is once again a reinterpretation by the reader of the text as a whole.

*The Function Itself*

The constant series of link provoked reinterpretation results in a continuous cycle of recontextualization, in which previous contexts are supplanted by new. This recontextualization of the reader’s perspective of the narrative is the function of the link. Reader context can be seen as the set of assumptions that determine the perspective through which information is interpreted. The link prompts a reevaluation of assumptions and, subsequently, the interpretations they support. The reader is called upon to predict the result of the selection of a certain trigger; this prediction is based upon assumptions that have developed up to that point in the text. An important component within this set of assumptions is the subset of those generated by the appearance of the trigger itself. Once the target is achieved, these assumptions will most likely need to be altered to some degree in order to maintain a presumption of the link’s relevancy. This change in assumptions represents a recontextualization for and by the reader and a new perspective from which the text will be interpreted. This new perspective applies not only to an interpretation of the text going forward, but of text read previous to the trigger as well.

The assumptions affected most directly by the link are those concerning the actuality of possibilities within a narrative. In other words, the reader assumes, to varying degrees of confidence, that certain possible states are actual\(^\text{17}\), and it is these assumptions that are most impacted by recontextualization by the link, as opposed, for example, to assumptions about the speed of the computer on which the narrative is being read. The recontextualization following a link causes the reader to dismiss some of the previously assumed possible states as non-actual

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\(^{17}\) Actuality pertains here not what we might call the “real” world, but rather to the narrative revealed in the accessed text.
and to form new assumptions. Many of these, however, will be neither validated nor invalidated by the target, though the degree of certainty with which they are considered actual may be altered.\textsuperscript{18} To complicate the matter, even a dismissed assumption is dismissed only as an assumed actual state of affairs, the possibility of these assumed states is not negated. They remain as narrative might-have-beens, still lurking around within the context generated by the link.

If recontextualization is the function of the link, then the reader is an integral component of that function, as it is the reader’s constant reevaluation of assumptions that determines that process. This also means that the link always remains unfinished until this recontextualization occurs, in other words, until after the target has been achieved and interpreted. Even at this point, however, the link is not closed. Unless the reader stops reading all together at this point, they will eventually choose another link trigger thus creating another link and a new context from which to reinterpret all previous links. The link is always simultaneously acting upon both the past and future of the reader’s interaction with the narrative. Terry Harpold goes as far as to contend that this is what unifies a hypertext narrative into a whole: “What keeps it (a hypertext) from collapsing into a Byzantine collection of embedded narratives … is that the frame that appears to enclose the destination-thread within the departure-thread opens both ways: while you’re crossing, the fabric can be textured in both directions” (130). The function of the link is never wholly confined between or within the objects that it joins sequentially.

The uncontainability of the link is taken up by Adrian Miles when he writes, “Links always have a remainder, a residue of contextualizing force that extends against and into the moment before their promise, and at the point of their inaction into an open future that can only

\textsuperscript{18} An assumption with a low degree of certainty is a guess. A large number of these ‘guesses’ can be generated by the link trigger’s centrifugal force. It is not even necessary for the set of guesses (assumptions) that comprise a context to be logically consistent in order for them to determine the reader’s perspective.
ever be a bet against an unknowable outcome” (62). This residue is what Miles calls the excess of the link. This excess points, in part, to the proliferation of non-actualized or unvalidated assumptions. There will always be more assumptions, more meaning, than the actual text can contain. Excess also refers to the constant reinterpretation of a link prompted by subsequent links’ recontextualization of what has gone before. There is always more meaning within a link than can be pulled from the link itself, as its meaning is always subject to its relationship to the other links in the text.

The ability to recontextualize the reader’s interpretation of the text is not unique to hypertext, having always been a feature of narrative, whether delivered orally, in print, or otherwise. An event may cause the reader to see a character and her actions differently than before. Similarly, an action that took place earlier in the narrative may take on new significance based on information gained later on. Within older narrative forms, this function is dispersed across the entire narrative. In a hypertext, however, it is focused and amplified at particular points within the narrative. The link trigger is a provocation, forcing upon the reader’s awareness their own role in the construction of context. A great deal of the difference between writing print narrative and hypertext lies in the use of this provocation. In “Pushing Back: Living and Writing in Broken Space”, Moulthrop answers those critical of hypertext’s tendency to call attention its own operation by contending that, rather than being a flaw of certain hypertext writers, this “pole-in-the-face” phenomenon is a defining feature of hypertext that he calls the break. The centrality of the break to Moulthrop’s conception of hypertext is attested to by his definition of hypertext as, “A structure of breakdown in semantic space” (657). In fact, he applies this definition to all cybertextual works that are inherently subject to system failure and unpredicted results. In hypertexts, however, the break is not just a system in which the break might happen
but occurs repeatedly at every link. The link target is almost never entirely predictable. This encounter with the unexpected forms a cognitive break between the reader and the act of reading. The reader is jolted outside of their immersion within that particular point in the narrative, forcing recognition of the narrative and the medium on which it is presented. The most violent example of this break is the broken link, in which the reader is thrown completely outside of the narrative and left to reflect upon the systems that brought them to that point. Even when the target is close to the reader’s expectation, however, a break still occurs in which the reader must reassess previous assumptions, in other words, recontextualize their interpretation. The effect of the break will likely extend to the trigger as well, as the very anticipation of the unexpected forces the reader to consider their reading experience beyond a particular point in the narrative. Moulthrop’s notion of the break calls attention not just to the recontextualizing function of the link, but also its ability to heighten the reader’s awareness of this function as the product of the interaction between themselves, the medium, and the texts.

The Link as Object

The functional sense of the link is extremely useful for providing a clear and productive means of analyzing the processes that take place when a link trigger is activated as well as the centrality of the reader’s role within that process. There is no denying, however, that the word “link” is more often used in the sense of an object and that this usually seems the most natural mode in conversation. We talk about a link as something that is clicked, followed, seen, and written. There are, in fact, a number of senses or sub-senses in which the link is taken as an object. While the link as object was briefly and broadly discussed at the beginning of this section, it is now time to explore deeper into the various senses in which that object is described.
The prevalence of the navigation metaphor in hypertext discussion is obvious from a quick reflection upon the way in which we talk about the World Wide Web. We go to web sites and we follow links. The most popular application with which we visit the Web is named Explorer, which was preceded by a program called Navigator. While hypertext theorists have pointed out the possibilities of other metaphors, the great majority of works about hypertext rely on this metaphor as well. This is not surprising given that the reading of print text is often described in terms that suggest the reader is moving from one space to another. The idea of the reading path is one obvious example. With hypertext’s introduction of choice into the reading path, it is easy to see why the metaphor of navigation so heavily influences our conception of the link.

*Bus Metaphor*

The navigational metaphor lends itself to other metaphorical ways with which to conceptualize the link. These, in turn, reflect and engender different prioritizations of link aspects. Two metaphors, in particular, can be associated with the different senses in which the link is portrayed as a means of getting from one place to another. One of these senses utilizes the bus metaphor, in which the reader gets on at one stop, and, after a very, very fast ride, exits at another. In this sense, the link is something that transports the reader. Interaction is analogous to choosing and getting onto a bus, the journey itself being the passive experience of the passenger. At the arrival point the reader reorients and moves on.

The emphasis within this sense tends to be on the points of departure (POD) and arrival (POA) with an especially intense focus upon the former. The POD is equivalent to the link trigger from the previous discussion of the link as function. For many theorists, the most important feature of the POD is the flag or marker that indicates the POA. The
reader’s determination as to what that POA might be is dependent upon both the text on and form of the marker. The text are those symbols and images that indicate, to some degree, the location (or more precisely, the nature) of the POA. The forms are those conventions that distinguish the marker from the rest of the text on the screen, marking it as a POD. For example, in the following sentence from Mark Amerika’s *Hypertext Consciousness*: “They told me that The Liberal Armies are my friends,” the text of the marker is the phrase “the liberal armies,” while the form is that text as an underlined element on the page, a convention which any Web user will recognize as marking a POD. The form alerts the reader to the fact that they can go somewhere else from that point; the text gives clues as to where that somewhere may be.

A realization of the marker’s dual aspects supports an understanding of the marker as both word and image. In the above example, the phrase “The Liberal Armies” has meaning based to a large degree on our understanding of the arbitrary symbols that are the letters as well as the rules governing their configuration. We read them as words. On the other hand, our awareness of the presence of a POD is based on our understanding of visual composition of the marker. We see the letters and the underline as a single image marking the POD.

The marker influences the reader’s prediction of the POA. This influence is not necessarily the only role it plays, however. The marker can work as advertisement as well as pointer. As Mark Bernstein points out, the marker has the capacity to not only help the reader predict where they might go, but also convince them that they want to go there. He sees these roles being intertwined: “The first regards external consequences while the second regards the reader’s disposition” (*Legible* 216). Bernstein seems to place the latter role primarily upon the form. Once again echoing Moulthrop’s concept of breakdown, the look of the link marker is used to “interrupt, to arrest the eye, to invite the
reader to reflect” (216). In this case, however, the reader’s eyes may be drawn to a marker not only away from the rest of the text, but in preference to other markers on the page as well, thus allowing the author to nudge the readers in a direction they might not choose simply based on prediction of the POA.

Bernstein sees the advertisement role of the marker as working to counter the possible negative influence of the marker’s clarity, clarity meaning the level of certainty with which a reader can expect a prediction to be correct. This negative impact occurs when the reader believes they know where the link will lead and doesn’t want to go there, while the author may intend that destination to be crucial to the overall hypertext. Clarity is assumed to be the preferred status of the marker. This assumption is common to articles examining the link marker, as most are concerned with the use of hypertext to create technical and informational documents. The utilizations of the marker will obviously be different in these types of documents from those in which the link’s role of recontextualization is prioritized. This difference is recognized by Deena Larsen and Richard Higgason in their short paper “An Anatomy of Anchors” in which they distinguish efferent (informational and advertisement) hypertexts from aesthetic (literary). The differences between these two are demonstrated through their separate modes of execution in six properties that Larsen and Higgason propose as means of analyzing the marker. These properties are decoration (means of notability), format (form), location (where they are on the page), function (denotive vs. connotative), density (how many exist on page and how they are clustered,), and uniformity (constancy of form).

Overall, markers within aesthetic works tend to be more varied, more connotative, and less structured than their efferent counterparts. Efferent hypertexts generally seek to promote a consistency of interpretations amongst multiple readers, attempting to assert control over recontextualization by restricting the pool of equally plausible assumptions that the reader might take from the marker.
Literary hypertexts, on the other hand, expect a much greater degree of involvement from the reader in the creation of new contexts, admitting and provoking predictions and interpretations that are much more dependent on the reader’s own initial perspective. Larsen and Higgason’s marker properties provide a way to begin talking about the different ways in which the author can use the marker to initialize this involvement.

While the bus stop metaphor is useful here, it does not account for the degree to which the POD and link marker have been emphasized over the POA in hypertext theory. The rider of a bus is often much more focused on their destination than the point at which they get on the bus. Little has been said, however, about the structure of the POA itself. Landow acknowledges the importance of the POA, stating that, “Designers of hypertext and hypermedia materials confront two related problems the first of which is how to indicate the destinations of links and the second, how to welcome the user on arrival at that destination” (“Encoded Links” 331). Like Bernstein, however, he is here concerned with informational hypertexts and how to assure the reader that they have arrived where they expected to. Assurance is not necessarily the intention within a more literary hypertext. The POA does not simply progress from the POD to be interpreted in terms of the logic of progression, but rather interacts with the POD to create new contexts and meanings.

One possible reason for the lack of work available on the POA is that the POA itself is difficult to pin down. While the marker usually exists at a precise point on a page, there is often no corresponding point at the POA. The POA can be described, with equal validity, as a page, a new section, or the entire rest of the hypertext, including the original POD if the reader is led back to the page on which it resides. The POA does not even require a new page, as in the case when the result of following a link is the appearance of new elements on the page of the marker. Further complicating any theory of the POA is the chicken-in-the-egg level of complexity in the
context making process. The POA is interpreted based on predictions based on the marker, but these predictions are reevaluated based on the interpretation of the POA. Despite these complexities, the importance of the POA to the process of recontextualization calls for more work to be done on this topic.

*Bridge Metaphor*

While the bus stop metaphor lends emphasis on the connected points, the bridge metaphor tends to focus on the connection itself. In this sense, the link is something that the reader crosses to get from one node to another. The reader takes an active role in the journey itself, a role that is more physical in nature than in the bus stop metaphor. Relevancy is at least as much a matter of the relation between the connected narrative points as between the link sign and POA.

The bridge metaphor also lends itself well to a conception of the link as something that is constructed by the author. The reader’s interaction rests in the traversing rather than in creation. The nature of that construction determines the reader’s experience, and thus, the perspective gained from crossing the link. A number of theorists have posited different strategies of categorizing links. In each of these, it is the manner in which the author constructs the link that determines how it is categorized. Not surprisingly, early theorists tended to categorize the link in relationship to its use in technical documents. For example, Steven Derose’s suggested link typology, shown below, focuses on organization and retrieval (251).
Landow’s link types are concerned primarily with navigation. He acknowledges three basic types of links: unidirectional node to node, bidirectional node to node, and string (word or phrase) to node (*Hypertext 3.0* 14). Later theorists began to express the need for a way to classify links based on literary effect rather than navigational or organizational function. As Jeff Parker states, “[Hypertext] is a device of navigation by its very nature, but it must be seen as a literary unit if the artistic practice of electronic writing is to advance” (2). Parker offers his own categorization strategy, separating what he terms functional links from the emotive. The emotive link is further divided into four subcategories, lateral, complicating, temporal, and portal.

Bernstein’s suggested categories include navigational as well as literary and cinematic themes. These are the cycle (reader returns to a previously visited node), counterpoint (two alternate voices that weave together a theme), mirrorworld (parallel narrative), tangle (variety of links with few navigational cues), montage (multiple writing spaces visible simultaneously), split/join (narrative track
divided and rejoined) missing link (presence of non-existent link suggested by text), and the feint
(indicates an opportunity that is not meant to be followed immediately) (“Patterns” 22-25).

The bridge is the connection between nodes. Links denote a disconnect as well as a connection,
however. This bridge sense also fosters awareness of the space being bridged. This space can be seen
as the conceptual inverse of the bridge. There is always a conceptual space between nodes. Harpold
comments on this when he notes, “The link serves not only to join the threads it associates, but also to
circumscribe a place where the threads are divided from one another. The link is where the narrative
takes a turn around a place that is inaccessible because you can only encircle it” (127). The link in this
sense denotes a narrative absence or gap, or to be more precise, a gap of narrative as written by the
author. This process of encirclement that Harpold described can be seen as a filling of this gap by the
reader, a focal point at which the collaboration of author, reader, and text is most apparent and
productive.

This conceptual gap is analogous to the visible space between comic frames. This space is
sometimes referred to as the gutter. Scott McCloud discusses this space in detail in *Understanding
Comics*. Here he argues that comic strip readers must interact with the gutter whenever they read from
one frame to the next by filling in the absent information. This process is called closure. McCloud
points out that closure is something that we do continuously throughout the day. When I look out the
window and see the head and shoulders of a man passing by, I am not fooled by this partial
information into believing that the man has no torso or legs. My mind fills in the missing information.
In this case, the missing information is primarily visual; I know that the legs and torso exist even
though I cannot see them. While there is obviously a visual component in reading a comic strip, there
is a narrative component as well. In this case, the reader is required to fill in the missing narrative.
The gutter can be seen as a place where the reader achieves closure by producing narrative to fill in the absence.

Closure of a gutter requires varying degrees of effort from the reader. The degree of effort involved depends on the nature of the gutter that exists between the bordering frames. Scott McCloud gives six types of gutters, moment-to-moment, action-to-action, subject-to-subject, aspect-to-aspect, scene-to-scene, and non sequitur (70-72). Different types of closure are required for different gutters. For instance, the closure involved in moment-to-moment and action-to-action is primarily temporal, the reader needing to fill in the missing space of time between frames. Subject-to-subject and scene-to-scene require something more from the reader, prompting them to fill in the relationship between characters, objects, places, and so on. Closure of the first two types listed will probably involve less cognitive effort than the others. Non-sequitur gutters will likely require the greatest degree of closure, as there will be no intentional clues, obvious or otherwise, to help guide the reader. McCloud believes that even in these cases, it is the nature of the gutter to provoke and facilitate closure. “There is a kind of alchemy at work in the space between panels which can help us find meaning or resonance in even the most jarring of combinations” (73). The gutter represents a void that the reader is compelled to fill, collaborating with the surrounding text to create new narrative elements.

The void crossed by the hypertext link can be much more expansive than that between comic frames. When the reader of a comic strip is confronted with a gutter, they can at least see the other side from the previous frame. In most cases, the reader will barely even notice the gutter as they step across it, especially when the closure required is of the moment-to-moment or action-to-action variety. It is only when a significant level of effort is required that the comic reader is likely to realize that there even is a space between frames. In hypertext, on the other hand, the reader cannot even be sure that there is another side until they make the leap. The reader stands at the narrative edge only guessing
what they will find across the way. This not-knowing highlights the presence of a narrative void, and subsequently, the need for that void to be filled.

The hypertext reader’s inability to know a priori what exists across the link/gutter also means that closure cannot take place until the reader reaches the far side. At this point, the reader fills the void behind them with narrative built upon their own perspective of the relationship between the present node and what has come before. Upon activation, the link is transformed from a potential into an actual narrative component of the larger text. This new component is distinct from those that border it, however. This distinction rests upon the fact that the narrative created within the gutter is not hardwired by the inscription of the author, but remains mutable, its form changing with every subsequent closure.

Both the bus and the bridge metaphors are useful means by which to describe multilinear hypertexts. Both, however, imply movement along some route. This makes them unsatisfactory in regards to nonlinear hypertexts. A better metaphor in these cases may be the transporter, ala Star Trek. When Kirk steps on the transporter platform, there exists no prefigured routes to limit or guide his destination. Scotty does not give him a list of options to chose from. From Kirk’s perspective, there is no movement from point A to point B, there is only sequence; he was at A, now he is at B. This changes the conceptual nature of the reading path from spatial to temporal. The path in this case traces only the sequential order in which segments are encountered. This metaphor is not exclusive to nonlinear text, being useful in any hypertext analysis which tries to avoid the navigation metaphor. In the transporter metaphor, recontextualization can be seen as being similar to a malfunction, wherein some property of the destination interferes with the reassembly of molecules, resulting in an altered crewmember.
Importance of Multiple Perspectives

All of the metaphors mentioned here arise from thinking of the link as an object. However, the link is not just an object metaphorically. As pointed out earlier in this chapter, the link also exists as artifact that can be created, manipulated, or erased. Like all digital media objects, it exists at a variety of levels. The underlying hypertext code, as well as the deeper system codes, is a just as much a part of the link as any other aspect that I have discussed. The link, therefore, is subject to numerical representation in the same way as all digital media. Any examination of the link that fails to take this fact into account will be necessary incomplete.

Likewise, any account that does not include both the object and function perspectives can only result in a distorted perception of the link. When used in conjunction with one another, the insights gained from these perspectives are cumulative, rather than compartmental. The link is an object; it has physical properties that we can see and sometimes even hear and feel. These properties influence both the writing and reading of hypertext. At the same time, there is something “over and beyond” the physical nature of the text. What we see on the screen, or even the code and apparatus behind that, is not the entire link. The link is an action, an action relying on those material objects for generation, but also responsible for the generation of other material objects, as well as the conceptual objects formed in-between.

The third and fourth chapter of this thesis have presented a variety of perspectives and metaphors from which to examine hypertext and the hypertext link. In the final chapter, I will apply these perspectives to three different hypertext authoring systems, each representing a different way of constructing the link. Each of these systems lend themselves to a different way in which we should view and approach the link and the way that link is used within a narrative.
Chapter 5: Authoring Systems

Over the course of this thesis, I have described the hypertext link with a level of specificity that increased from one chapter to the next. In chapter 2, I examined hypertext’s relationship with digital media in general, to discover what, if any, of the characteristics attributed to that media can be applied to our subject. Following this, I looked at hypertext as a unit of text, focusing on the various ways in which the term “hypertext” can be applied. Finally, in chapter 4, I narrowed my scope of inquiry to the hypertext link itself, looking at the different, though not mutually exclusive, ways in which the link can be portrayed, and how these different portrayals dictate the characteristics that we perceive within the link. Each chapter has thus analyzed an increasingly specific media set.

Through all of these chapters, I used the term “the link” to describe the characteristics of links in general. In this chapter, however, I hope to demonstrate that any analysis of a work of hypertext literature should be informed by a definition of link that is specific to the authoring system on which it was created. The link within a specific system should be viewed as a type unto itself, related, in some degree, to the links of others systems, but at the same time completely distinct from them.

I support this argument by describing three separate hypertext authoring systems: StorySpinner, Hypersections, and Literatronic. I will examine each one, looking at the different constructions of the link inherent in each, as well as the ways in which these constructions either require or influence the author to construct the narrative in a certain way. Some of these system-specific link characteristics are hard coded into the structure of the narratives, while in other cases, they are defaults that can be overcome through the use of conditional rules. Even in these latter cases, however, the system itself favors a system-centric conception of the link.
Selection Criteria

The choice of systems used here was based upon a desire to demonstrate a wide variation in link constructions that all bear significant differences from what I will call the standard hypertexts. These standard hypertexts basically conform to the HTML model. Another system I include within this standard category is Eastgate’s StorySpace. This choice has nothing to do with my view of the importance of that system, which can boast of being the platform on which most of today’s best known hypertext novels were written. However, because it is well known, a description of its use of the link would likely be less revealing than of those I have chosen. StorySpace is also much more like HTML than any of these three. All of the link constructions examined here can be seen as alternatives to those of both these better known systems.

Of the systems discussed here, Literatronic is the most developed. A number of lengthy novels have been written in the system and are available on the Web. Juan Gutierrez, the developer of Literatronic, makes the system available to authors who are serious about writing extensive hypertext narratives. StorySpinner was developed as an experiment in the use of hypertext storytelling. Two short stories were written as part of the system’s demonstration, but nothing else has been done with it in the last few years. Hypersections is more a description of a system strategy than an actual system, though its developers have created an interface for demonstration and reportedly plan to continue to working on the system. My goal here is not to describe different available authoring systems but rather to present examples of different ways in which the link is being conceived and constructed. Each of these systems can be seen as representing a type of link. These types may or may not be unique to each of these systems, but each serve as an example of the ways in which links can be discussed in relation to other systems and as entities specific to the systems in which they function.
StorySpinner

StorySpinner was built at the University of Southampton by Clare Hooper and Mark Weal. They saw this system as “a test bed for experimenting with the authoring of narrative flow in automatically generated stories” (“Sculptural Reader “ 288). As such, it was never developed beyond the demonstration phase, the only stories ever written with it being a retelling of “The Three Little Pigs”, and a very short story about a malodorous knight. It is valuable, however, for its innovative construction of the hypertext link.

StorySpinner is based upon a system of associations. Cards are associated with interpretations, which are associated with story nodes. Readers select a sequence of cards. This sequence determines the course and content of the narrative. When the reader chooses a card, the StorySpinner system determines the most appropriate node to insert into the narrative at that point. This determination is based partially upon the number of interpretations with which a card and a story node share an association. Consider the following example:

The reader chooses the Bear card.

The Bear card is associated with interpretations 1, 3, 7, 14, and 19.
Story Node A is associated with interpretations 2, 4, 7, and 11, and 19.
Story Node B is associated with interpretations 3, 6, 8, 15, and 19.
Story Node C is associated with interpretations 3, 4, 7, 10, and 14.

In this case, StorySpinner, barring any possible constraints, will insert node C into the narrative at this point, as it shares more interpretation associations in common with the Bear card than do the other two nodes.

Constraints are rules imposed by the author that take the form of either restrictions or classifications. Restrictions are a function of either sequence (for instance, node B can not be inserted before node C) or logic (node A cannot be inserted if node B has been inserted and vice versa). A story node is classified by both its place (which section(s) of the narrative it belongs in
and whether the node marks the end of a section)\(^{19}\) and function. A story node’s function is either
descriptive or required. Descriptive nodes are favored in earlier sections of the narrative while
required nodes take preference in later sections. This preference acts as a tiebreaker between
nodes that share an equal number of associated interpretations with a chosen card. Returning to
the above example let us assume that the following conditions and restrictions are in place.

The reader is currently in the first section (act) of the story.
Neither A, B, or C nodes have yet been inserted.

<table>
<thead>
<tr>
<th>Node</th>
<th>Restrictions</th>
<th>Place</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>none</td>
<td>Act 1</td>
<td>Necessary</td>
</tr>
<tr>
<td>B</td>
<td>none</td>
<td>Acts 1 or 2</td>
<td>Descriptive</td>
</tr>
<tr>
<td>C</td>
<td>Can not be inserted before node B.</td>
<td>Act 1</td>
<td>Descriptive</td>
</tr>
</tbody>
</table>

In this case, node C cannot be inserted at this point in the story because node B has not yet
appeared. Both nodes A and B share two interpretations in common with the Bear card and
neither has any other restrictions. Under these conditions, Node B would be inserted into the
story because at this point (act 1) its categorization as a descriptive node preferences it over node
A, which is a required node.

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\(^{19}\) In the story examples used to demonstrate the system, narratives are divided into three acts. The writer
determines the act(s) in which a node may be inserted.
Above is a screen shot from the main page of the StorySpinner narrative “James Tale”.

Two rows of tarot cards are on top. Squares with text but no cards represent cards that have already been chosen. Below this appear the nodes, to the right of which are the chosen cards that accessed these nodes. The text in the top node was accessed by choosing the “Transformation” card and reads as follows:

Essie was an old woman, bent with age. Darks spots marked her hands and arms, and her clothing was black, brown, grey, and tatty; the people of Frin were divided on whether her actions were for good or bad, but either way – she had always been a part of Frin, and it seemed that she always would.

As a figure of mystery and the unknown, Essie was of course the topic of many an intrigued conversation – as long as those involved had glanced over their shoulders, to be sure she wasn’t nearby. There were no certain reports of her being cruel or harsh, but no one was entirely sure of what deeds – good or bad – she was actually responsible for. Many a myth surrounded the woman, and distilling the truth was a difficult, if not impossible task.

The kingdom of Callah was a peaceful place. It was full of silent forests, broad rivers and rolling farmland. It was not large, its people either lived in tiny villages or the central town of Frin.

Hooper calls StorySpinner a “sculptural” model of hypertext (“Sculptural” 288). This model is explained more fully by Bernstein when describing his own Card Shark system, a hypertext
writing tool that both Hooper and Bernstein note as precursors to StorySpinner. Bernstein’s explanation of the term is below,

Conventional hypertexts take a set of unconnected nodes … and link them together. Card Shark begins with a set of nodes, all of which are connected to each other, and builds structure by removing unwanted connections. We call Card Shark *sculptural* because we create structure by removing unwanted connections, much as a sculptor may create objects by removing unwanted material. (“Card Shark” 42)

In a sculptural system, then, the reader network is what remains, rather than what is built during the act of reading. The reader is initially confronted by the author network, and, link by link, chips away to carve out their own creation. The narrative created through this process can be said to have already existed within the author network, just as the form of a duck already existed within a block of wood before it is carved. A major difference, however, is that the reader rarely has a preconceived notion as to what type of network, and therefore what narrative, they are sculpting.

In chapter 3 of this thesis, I proposed that the hypertext function works in both an authorial and a reader mode, each with its own corresponding type of network. The reader network is made up of those segments of the authorial network that have actually been read. Outside of this set exists those unread segments within the hypertext network. Sculptural hypertext highlights another distinction within the reader network, that between those segments that simply have not been read, and those that have been eliminated from the pool of segments that can be accessed. This subset of “unwanted” segments, however, remains an important component in determining the relationships between the segments. Contradiction is itself a
relationship. While the elimination of accessible nodes may not be apparent to the reader, both author and critic should understand the reasons why the inclusion of one segment within the reader network excludes another.

The sculptural model followed by StorySpinner is just one of its distinguishing features. Another is its use of cards to develop the narrative. This is not a new idea; the Card Shark system mentioned above is one example of early card based systems. Hypercard, released in 1987 for Macs, was one of the first applications available to the general public providing hypertext functionality. [http://macgui.com/usenet/?group=14&id=4827](http://macgui.com/usenet/?group=14&id=4827). With Hypercard, however, the card structure was a metaphor that referred primarily to its organizational paradigm, in which linked modes were “stacked.” In both StorySpinner and Card Shark, the card metaphor seems to have more to do with the element of randomness built into the system. For StorySpinner, this randomness takes the form of tarot cards. The reader chooses the cards, without much knowledge as to the node that it will access. This random element is of course an important component in hypertext in general. The unexpected outcome is, after all, a common factor within the recontextualizing force of the link. However, in the other authoring systems examined in this thesis, the reader is usually aided in their predictions by the link marker. The enigmatic nature of the tarot card greatly reduces the reader’s confidence in the decipherability of these markers. Tarot cards are meant to be mysterious, this is a part of their charm and what keeps mediums in business. A reader of any story using these cards is immediately alerted to the difficulty in predicting the results of any choice. The relevancy of the link marker (the card) to the narrative seems minimal.

This seeming lack of relevancy is not simply a reflection of the ambiguity inherent in tarot cards, however. The cards themselves do not relate directly to the nodes at all; in fact, the
link trigger does not even reside within a node. The most immediate connection that both cards and nodes have is to the interpretations assigned by the author. These interpretations act as an intermediary between the two. The interpretations themselves are fairly vague. For instance, Hooper lists three interpretations of the “The Fool” card as joy, optimism, and new beginnings. (“Narrative Pace” 232). Thus the card, which is itself ambiguous by design, chosen by the reader, is relevant to the resulting node only because they both share a relationship with a broad concept that the reader can only guess at. The reader in this case has little confidence in their ability to predict how the story will progress. There is therefore little inclination to reflect upon the differences between the prediction and the actuality. It seems that, at least in the example stories, the greatest opportunity for reinterpretation lies in guessing at the concept shared by both card and node. This guess, however, does not result in an evolving context through which the narrative is constantly being reinterpreted, but only in a series of single, unrelated, predictions.

It is important to note here the difference between the StorySpinner engine and the way in which it has been implemented so far. The choice of tarot cards is in no way suggested by the system, but is rather a homage to Italo Calvino’s novel *The Castle of Crossed Destinies.* (“Narrative Pace” 232) Each card could just as easily clearly signify a character, or place, or some other story element that the reader may wish to explore. Likewise, the interpretations used by the designers are only one type of connection that could be made between card and mode. “Plot devices” is one obvious alternative. For instance, suppose a reader chooses the “Paris” card. This card is associated with a number of different plot devices, each event being associated with a number of different nodes. Suppose also that the reader had previously chosen a “Willard” card. The resulting node would be the one sharing the highest number of plot devices with the “Paris” card that satisfies all the rules connected with the “Willard” card. A large amount of the
ambiguity existing in the current examples is thus alleviated, increasing the relevancy of the cards to the reader’s interpretation, as well as the recontextualizing force of the link.

No matter how clear-cut we make the components, however, the fact remains that the link trigger chosen by the reader will always relate to the resulting node only through shared associations. This feature is the most interesting aspect of the StorySpinner system. The gutter spanned by the metaphorical bridge is, in this case, more than just conceptual space. There exists a midway point, serving as both a part of the function of the link and as a part of the physical link, since it exists in the code itself. The reading path passes through the shared association, but this point is not viewable from the path. While this point can be read within underlying code, it can only be guessed at from the surface text. It remains an unread component of the narrative. What the relevance between marker and node loses in tensile strength, it gains in depth. The reader is invited to interpret the text not only on the perceived relationship between trigger and node, but through their speculation as to the shared association as well.

The reading path in a StorySpinner hypertext is further complicated by the fact that it takes the reader outside of the narrative itself. The link markers are read and interpreted by the reader but external to the narrative being read. Moulthrop’s idea of the hypertext break is taken to an extreme. There exists very little opportunity for the reader to immerse themselves in the reading. This is especially true in the sample stories in which no node contains more than a few short sentences. The reader is constantly forced out of the narrative in order to make those choices that will determine the course of the narrative. Consequently, they are unable to ignore the structure of the hypertext upon which the narrative is built.

Some components of this structure will be more evident to the reader than others. The restrictions placed by the author will be obvious from neither the reading path nor from the
“outside’ position of the cards. These restrictions are set in place to control narrative flow, maintaining the desired sequence and logic from node to node. These restrictions lie outside not only the reading path, but of the hypertext network itself. They are not hyperlinked to any segment within the network. Outside of the code itself, their existence is evident only through their influence. Each StorySpinner narrative, however, contains its own set of restrictions that are a unique and integral component within the overall hypertext. They are still a part of the hypertext, thus requiring, when discussing hypertexts written in systems such as StorySpinner that include rules or restrictions, a third definition of “a hypertext”, one broader than both the hypertext segment and the hypertext network.

The major challenge facing any author using the StorySpinner system will be the maintenance of relevancy. By routing the link through associations, the reader is able to explore avenues other than those pertaining to the traditional who, why, or when. At the same time, however, the risk of obscuring the relationships between nodes is high. In a traditional hypertext, there exists a two-point relationship between the node bearing the link marker and that accessed by the link. In a StorySpinner hypertext, this grows to a four-point relationship of origin node to card to association(s) to accessed node. The care with which the author builds each of these will go a long way in determining the relevancy of the link.

The two other factors determining the relevancy within StorySpinner hypertexts will be the nature of the cards and the author’s use of restrictions. In both the “Three Little Pigs” and “Jame’s Tale” demonstrations, neither is used very effectively towards this end. To be fair, however, relevancy was not the author’s goals. StorySpinner was conceived as an engine to create “automatically generated stories” (“Explorations” 1). As such, it was seen more as a tool for readers looking to explore narrative and hypertext rather than for writers attempting to use
hypertext to create meaningful narrative. While this is evident in the stories that the authors use to demonstrate the system, the system itself is potentially a powerful, if challenging, tool for authoring quality hypertext fictions. More importantly is its demonstration of an alternate conception and function of the hypertext link.

**Hypersections**

Introduced in 2008 by Jean-Hugues Rety, Jean Clement, Nicolas Szilas, and Serge Bouchardon, Hypersections can best be described as a strategy for the structuring of a hypertext network that emphasizes the author’s control over the reading path through that network. This structure is hierarchical in nature, with nodes being grouped together in sections, which are themselves parts of higher order sections.\(^20\) This method of grouping the nodes of a hypertext provides valuable insight into the way that hypertext structure impacts the link itself.

The developers of Hypersections were motivated by a desire to provide hypertext authors with a method of influencing the reading path that was less burdensome than those systems that require the author to imbue nodes with a series of preconditions, assertions, and constraints. The strategy they adopted is similar to the one behind that of cascading style sheets seen in web design. A set of rules can be applied to an entire section, or hypersection, of nodes, with other rules applying to subsets within these sections or even to individual nodes. These rules control the paths available within these sections as well as transitions between sections.

\(^20\) While an authoring application has been built, I will focus on the influence that the Hypersection strategy itself exerts on the link. The primary reason for this is that very little information about this system, named Recontre, is available. In addition, Hypersections itself represents a recontextualization of the link different enough to warrant examination independent of other factors.
The smallest textual unit within this structure is the fragment. Fragments are similar to nodes in that they cannot be altered or divided by the interaction of the reader. Fragments are grouped into hypersections, which may themselves be components of larger hypersections. Both the fragments and component hypersections within a larger hypersection are called subsections. A hypersection may consist only of fragments, only of smaller hypersections, or of both smaller hypersections and otherwise independent fragments. This approach recalls Manovich’s principle.
of modularity. This points to an emphasis on the structure of the database over that of the
narrative. Rety and his associates, however, seem to reject this distinction, seeing the
Hypersections strategy as a way to maintain the intended narrative structure despite the possibly
randomizing interaction of the reader.

A hypersection is composed not only of its subsections, but of a behavior and termination
property as well. A termination property determines the conditions under which that
hypersection is removed from the set of accessible sections. An example of a termination
property is one that is activated once three of a hypersection's five subsections have been
accessed. Termination properties are applied to fragments as well. For instance, the author can
stipulate that a certain fragment is terminated once it has been displayed twice. Behaviors
determine the set of fragments accessible at any given point. Rety calls this the set of successor
fragments.  

There are both deterministic and non-deterministic behaviors. Deterministic behaviors
specify the order in which a series of subsections can be accessed. When a deterministic
hypersection is accessed, the reader is presented with the first non-terminated subsection within
that hypersection. This subsection is followed by the second (if there is one) and so on. This
type of structuring is seen as conducive towards the development of causal relationships between
narrative elements. Non-deterministic behavior places no constraints upon the order in which
subsections are accessed. Upon reaching a non-deterministic hypersection, the reader is able to
access any non-terminated subsection within that hypersection. It is important to note that even
when deterministic behavior is employed, the reader is not necessarily deprived of choices. A
subsection within a deterministic hypersection may itself be a non-deterministic hypersection,

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21 It is unclear from the text rather this set is composed of only those fragments immediately accessible or the entire
set of fragments that the reader may still encounter along their path.
meaning that the reader may encounter the component subsections of a non-deterministic subsection in any order, but, upon termination of that subsection, will move directly to the next subsection in the sequence.

The developers of Hypersections found that deterministic behaviors inevitably led to an undesired reduction in the amount of choices available to the reader. To counter this, they introduced deterministic behaviors with fuzzy transitions. These allow the author to set thresholds pertaining to the portion of a subsection read, that, when satisfied, allow the reader to move on to the next subsection in the sequence. For instance, the author can specify that once a reader has read 70 percent of subsection A, they can then access both the A and B subsection. The author can also establish a threshold determining the maximum amount of one subsection that can be read before another is terminated. A threshold can be set, for example, that requires that the reader satisfy the termination conditions of subset A before reading more than 20% of subset B, meaning that once this threshold for B is reached the reader only has choices from A until that subsection is terminated. In addition to wanting to maintain a certain level of reader choice, the developers also wanted to place a limit on the amount of choices available as well in order to prevent “cognitive overload” (“Hypersections” 395). This limit is achieved by including a parameter in each segment that specifies the maximum number of subsections accessible from another segment. It is not explained how the system determines which segments to include within the set parameter, but I will assume that sequence is the deciding factor.\footnote{Even within a non-deterministic section, the subsections are still arranged sequentially (in the graphic interface suggested by the author, this is represented in a left to right order), however, in this case the sequence does not determine the order in which the reader may access them, except, I’m assuming, as is determined by the maximum choice parameter.}

Hypersections structural strategy appears to conform to a conception of hypertext that is exactly what Ted Nelson warned against in regards to the World Wide Web. The hierarchy
inherent in Hypersections is evident in the examples for a graphical authoring tool suggested by its developers. The entire hypertext network is conceived of as a top level hypersection, subordinate to which is a set of second level subsections which in turn have their own subsections and so. The hypersection itself can be seen as a category whose subsections share one or more attributes defined by the author. A subsection may itself by a category of related sections, just as the parent category may itself be grouped with other sections within an even higher order category.

Because nodes are organized within categories, writers are prompted to structure their narratives as a collection of related groups. The relationship between members within these groups takes on a communal nature. Instead of sharing a unique, one-to-one connection, the relationship between two nodes within a hypersection is shared by all the other nodes therein; they are related because they belong to the same category. It is possible that this standardization of relationships reduces the significance of any individual link, especially those that do not cross into other hypersections. This, in turn, would seem to reduce the significance of individual nodes in favor of sections of which they are a part. While deterministic behavior rules allow the writer to refocus on individual relationships, the overall organizational strategy encourages a less granular approach.

A hypersection is not only a community of fragments of nodes but, in many cases, a community of communities. Hypersections that are subsections of a higher order hypersection relate to one another just as do fragments within the same lower order hypersection. Subsequently, nodes that reside in two different subsections of the same higher order hypersection also share a communal relationship, one that is similar to, but more distant (at least within the author’s categorization scheme) from, those nodes within their own subsections. This
sense of distance is a result of the hierarchal nature of Hypersections. In Hypersections, there is also a logical, absolute distance between nodes based upon how many sections within the hierarchy separate one node and another. This difference may be seen as a loose description of the level of categorical distinction envisioned by the author between the two nodes.

The importance in this is that it changes the nature of the space being linked. The link now crosses a logical boundary, one that is permeable but well defined. This boundary crossing will possibly impact the reader context in a way that is different, either in degree or kind, than would happen between two nodes within the same category. The difference is partially due to the fact that what are being linked here are not simply two separate nodes, but also two separate hypersections or categories. The question that arises is whether or not the reader, whose perspective from within the reading path may not have any visibility to these boundaries, would ever be effected by these crossings. If the reader has no knowledge of the organizational strategy built into the Hypersections hypertext that they are reading, then the answer is probably no. However, this may once again highlight the value of what Moulthrop was getting at when advocating the hypertextual break; the reader’s awareness of the mechanics of the system on which they are reading can add complexity to their understanding of that reading. It is interesting to note here that in the reader graphical interface suggested by the developers, this screen is split in two, with the text of the currently accessed node on the left and a tree chart for the entire hypertext on the right. In this case, the reader would always be aware of a crossing between hypersections once the link is activated.

While the organizational strategy behind Hypersections serves to emphasize the boundaries between nodes within different hypersection sections, and, in the case of the graphic interface just mentioned, to make these borders visible, the goal behind this strategy is to smooth
the reading path’s transition from one hypersection to another. In any hypertext, a host of characteristics can be attributed to each node, and most of these characteristics are shared by multiple nodes. For any node, however, there are most likely a number of others with which very little is shared, resulting in a minimal amount of narrative continuity between the two. By being able to identify characteristics and to group nodes according to those characteristics, the author identifies those relationships with high levels of continuity. With the inclusion of behaviors and termination properties, the author is given a considerable amount of control in being able guide the reading path away from transitions of low continuity and repetition.

A major concern for any author within Hypersections will be the identification and organization of categories. The system encourages the author to think of their narratives as multiple groupings of narrative points, rather than as a series of points. The groupings created by the author will give a clue as to what the author sees as significant to the story as a whole. Also revealing will be the way in which the author balances deterministic and non-deterministic hypersections; the former being those points which they see as essential and over which they wish to have the most control.

Hypersections presents the author, critic, and reader with a model of the link tightly bound with its hierarchical structure, for it is this structure that is crossed/connected by the link. Awareness of this structure and the ways in which it can be negotiated by the link will be essential to authors, critics, and readers encountering the Hypersections system.
Literatronic

Literatronic was developed at Florida State University by Juan Gutierrez (presently at the University of Miami) between 2002 and 2005. Currently available works created with this system include Extreme Conditions, a Spanish language novel by Gutierrez, A Show of Hands by Mark Marino, and a hypertextualization of Don Quixote. The stated goal of the system is to provide the author with a means of insuring narrative continuity along the reading path.

Gutierrez sees a lack of continuity as one of the primary reasons why a reader might abandon a hypertext narrative prematurely, and believes that most currently available authoring systems fail to provide a convenient and effective way of addressing the problem. He also suggests that the lack of continuity and linearity, often accepted as a feature of hypertext, is more likely a consequence of the limitations of early authoring systems rather than an inherent trait of hypertext in general. Below is a screen shot from A Show of Hands.

During a phone interview with Dr. Gutierrez (May 18, 2010), he was careful to stress the difference between the Literatronic engine and the different deployments of that engine. The Literatronic discussed here conforms to that described in the majority of published articles on the system.

23 During a phone interview with Dr. Gutierrez (May 18, 2010), he was careful to stress the difference between the Literatronic engine and the different deployments of that engine. The Literatronic discussed here conforms to that described in the majority of published articles on the system.
Narrative continuity is maintained by controlling the “narrative distance” between linked nodes. Gutierrez see this distance as a quantification of shared kinship, affinity, or connection (“Literatronica” 5). It can also be seen as a measure of relevancy intended by the author between linked nodes. Distance is dependent upon the hypertextual cost, described as “a positive real number proportional to how disruptive the transition from page \( v_i \) to \( v_j \) is” (“Hamiltonian Cycles” 4). The author assigns a number to what they estimate this cost may be, with a higher number indicating a greater cost. This number is, of course, extremely subjective, being a product of the author’s intentions.

Two other factors effecting distance are the hypertextual attraction of the destination node and the number of nodes previously accessed. The former is calculated using the cost of all links to that node. If this number is low, meaning that the node bears a high degree of relevance to multiple pages, then the system adjusts to decrease the chance of the node appearing too early in the reading path.\(^{24}\) The inclusion of the number of nodes read within the equation is based upon the assumption that relevancy to all nodes increases the more the narrative is revealed to the reader. In other words, the more that the reader context is informed by the actual text, the greater the relevancy of the remaining text to that context. Therefore, the distance assigned to a link may decrease the farther down the reading path that it is encountered.

The calculation of narrative distance dictates what links are available to the reader. For any node accessed, the system will determine the three nearest nodes. Link markers for these nodes are displayed, at the bottom of the page, with the nearest on top. The link marker itself is composed of the first 15 or so words appearing on the linked node. In Marino’s A Show of Hands, the sign also includes the names of the characters present in that nodes narrative. Once a

\(^{24}\) I believe the idea behind this is that, if the node is highly relevant as a destination from a number of other nodes, then continuity is better served if all, or most of those nodes are read first.
node has been accessed, it is removed from the list of available links. The goal is to lead the
reader along a Hamiltonian path, in which each node is encountered once and only once
(“Hamiltonian Cycles” 1). Gutierrez argues that all nodes should be essential to the narrative as a
whole. “Every word should be carefully crafted and deserves a place within the text. If a
sentence is not needed, it should be eliminated. Likewise, if a sentence is missing, a vital part of
the text is missing” (“Hamiltonian Cycles” 4). According to this view, the reader network and
author network should be identical when the reading path is completed. Only the sequence of
nodes along the path should vary from reading to reading, and even this variance needs to be
restricted to a level that maintains narrative continuity.

Literatronic is designed to minimize the breadth of the gutter between nodes as much as
possible. With the reduction of narrative distance also comes a reduction of the open narrative
space in which the reader is required to collaborate in the construction of narrative. There is, by
design, little room or need for the reader to reflect backwards upon arrival at the destination, or
at least any more so than would be required in a print narrative. The chance of surprise is also
greatly reduced, being discouraged by the overall strategy of the system. Moulthrop’s
hypertextual break has no place within the Literatronic system. The broken link, whether broken
functionally or conceptually, is seen as the antithesis of continuity.

The link is seen primarily as a vehicle of choice, with its cognitive force existing almost
completely on the originating rather than the destination node. The reader’s interaction with the
narrative exists in their choice of options. The reader is still required to predict the destination of
the link, but a great deal of the guess work is taken out of the prediction process. Once again, the
importance of the space between links is minimized. This can be seen as both increasing and
reducing the reader’s level of control over the course of the reading path. On one hand, by being
able to make more informed choices, the reader is in a better position to choose where they want the link to lead them. At the same time, however, these choices will always be influenced to a large degree by the author’s intention of what that course should be.

The reader’s ability to accurately predict the destination node in Literatronic is based largely on the inclusion of the text from that node within the link marker. The significant factor in the form of the marker is its position in relation to the other two available markers. The system’s determination of the destination node’s relevancy is revealed in the order of the markers. The reader has two criteria by which to choose. First, the system’s estimation of which choice will best maintain maximum narrative continuity, and second, based on the marker text, which choice will most satisfy their own point of interest. By limiting these choices to the three “nearest” nodes the system attempts to minimize the loss of cohesion that might result when the reader’s interest is something other than continuity.

Gutierrez sees Literatronic as a “digital author” (“Hamiltonian Cycles” 2) that takes an active role in constructing the plot of the narrative. Here he relies upon the distinction between plot and fabula, identifying fabula with what I would call the entire authorial hypertext network, and plot with the reading path. While the human author is the sole creator of the fabula, they are joined by the system (and, I would argue, the reader) in determining the plot. Literatronic is described as a dynamic system, meaning that it changes on the fly according to the reader’s interaction. In calculating what link choices to provide, the system always takes into account which pages have already been read, and what percentage of the overall text has been read as well. This means that link markers do not belong to a particular page, but are assigned based upon an ever recalculating formula. It also places Literatronic well within Manovich’s principle of numerical representation, as the system is constantly being reconfigured by its own algorithm.
The collaboration between human author and digital author is further developed by the author’s ability to alter costs (and therefore distances) based on reader behavior. As I noted earlier, the author’s assessment of a link’s continuity is highly subjective. Literatronic stories reside on a server that gathers metrics of readers’ choices through the narrative. The author has access to these metrics and can adjust costs according to how their hypertext is actually being read. Costs can be adjusted to either accommodate reader trends or to try to place greater stress upon a link that the author perceives to be essential but that readers tend to ignore. This sets up an interesting cycle of collaboration between author, system, and reader, in which a reader’s choices influence the author’s assignment of costs, which in turn influences the system’s calculation of distances, thereby influencing reading choices.

By attempting to limit the reader’s choice to only those with the most relevance, Literatronic points out the dilemma faced by most hypertext systems. This is the problem of maintaining a level of continuity that fosters a reader’s faith that the reading is somehow worthwhile, while allowing a high level of involvement in the determining of relevancy, and thus, a constant recontextualization. Literatronic rejects the second half of this dilemma as a misconception of the reader’s role in narrative and of hypertext. If a reader abandons a text out of frustration, it really does not matter how provocative the next link was. The goal of Literatronic is to keep the reader’s interest in moving forward, rather than forcing them to figure out where they are. In Gutierrez’s view, hypertext was not designed with narrative in mind, and it is futile to try to mold hypertext characteristics such as fragmentation and non-linearity into literary forms.

Literatronic questions the presuppositions behind other hypertextual systems such as HTML. It attempts to eliminate those underlying characteristics often taken for granted. It
instead promotes adaptability as the most important feature of hypertext. The system adapts itself to a reader’s behavior in order to maintain narrative continuity. The author adapts as well, adjusting costs to reflect reader trends. Despite this difference in focus, the link remains as a source of recontextualization. In this case, however, recontextualization is not simply the result of the reader’s (re)evaluation of their place within the reading path, but rather a process that alters the entire system, initiated by the reader’s choice of links and resulting in a change in the context in which the rest of the narrative will be encountered.

Final Analysis of Systems

StorySpinner, Hypersections, and Literatronic each demonstrate a distinct approach to the construction of the hypertext link. To conclude this chapter and this thesis, I will examine the different ways in which each positions the link’s roles within a narrative, as well as the ways in which they are similar. In this way, I hope to further demonstrate the specificities inherent in each linking system.

One of the key differences in the way these systems construct the link lies in what is being linked. In HTML, as well as in other well known authoring systems such as StorySpace, the link is between two, otherwise separate, nodes. This type of linking is so prevalent that it may be presumed to be the only or correct way. Each of the systems explored here, however, challenges this presumption. This, in turns, challenges the way we define and analyze the link itself.

Links within a Hypersections hypertext exist not so much between individual nodes as they do among groupings of nodes. All of the nodes within a particular hypersection can be seen as sharing a single, common link. This link is the instantiation of the characteristic(s) by which that section is defined. The author of a Hypersections hypertext does not, by default, designate
links between specific nodes. Links are automatically constructed connecting the members of a section to one another. The author then implements behaviors and terminations in order to manage how these links are presented to the reader. However, while these are, in one sense, all one link, the reading path will most likely encounter it as multiple links connecting different nodes. In examining the effects of links within Hypersections, it will be important to understand this relationship in which links are both one and many.

StorySpinner suggests the most radical departure from the standard node-to-node linkage strategy. Here, the POD resides not on a node, but is rather a card that exists outside of the narrative flow. To further complicate matters, the card does not bear a direct link to the destination node, but rather is associated with it through a shared interpretation. So, what exactly is being linked here? From one point of view, both card and destination node are linked directly to an interpretation. In fact, it is possible that both are linked to multiple interpretations, some of which bear no relevance to the result. From the point of view of the reading path, however, a card is linked directly to another node. The reader is left to determine the relevance between card and destination node with little or no awareness of the connecting interpretation. There is also a sort of phantom link established between the node preceding the choice of cards and the destination mode, because the process by which the system determines a POD is influenced by what cards have already been chosen.

Literatronic is the most conservative of the three systems in terms of what is being linked. Nevertheless, an important difference exists in the way that the system’s philosophy conceives the units linked. Nodes within Literatronic are not seen as fragmented and disparate textual pieces, related to one another only by a context, but rather as members of a highly structured set of closely related elements.
Differences in the nature of the linked objects impact the nature of the link itself. As these examples show, the characteristics of these objects can vary from system to system. This variance may in turn impact the way in which the author constructs the hypertext network, as well as the context developed along the reading path.

Related to the question of what types of objects are being linked is that of the nature of the relationship between these objects. In HTML and similar systems, the answer seems to be left almost entirely up to the author’s intention and the reader’s recontextualization. In each of the systems examined here, however, this nature is defined within the system itself. It exists within the very way in which the author creates the work. The reader is still free to interpret this nature according their own context, but this interpretation cannot help but be informed, to some degree, by the underlying structure of the system.

Literatronic defines this relationship as a distance. This distance reflects the perceived level of narrative continuity between nodes. The link marker is always an indicator of one thing, the level of continuity maintained or disrupted by its activation. This is interesting because it introduces the idea of a degree of linking. A node may be “more linked” to Node A than it is to Node B. All Literatronic works currently available are very explicit about the way the system works, the reader should thus be very aware that the top link offered leads to the “closest” step in the narrative. The reader is given a choice, but this choice comes with an implicit warning that the third link listed is more likely to take the reading path off the intended trail.

In trying to construct the link in such a way as to maximize narrative continuity, Literatronic seeks to minimize the hypertextual gutter as much as possible, while at the same time highlighting the existence of that gutter. When the reader is aware that the availability of a link and the positioning of its marker are dependent upon the level of continuity existing between
its destination and their present location, then they are also made aware that the degree of
cognitive effort required to maintain relevancy will be greater with one choice than with another.
Thus, while attempting to avoid the hypertexual break described by Moulthrop, Literatronic
nevertheless instigates a break; by refocusing the reader on the continuity of the narrative, it, at
the same time, reminds them that narrative exists within a system in which discontinuity is
always lurking just beyond the third choice.

Nodes and larger sections within Hypersections are related to one another by a shared
trait or set of traits. Two nodes are linked because they share something in common. The
assignment of these traits is, of course, subjective and dependent upon the intentions of the
author. This subjectivity does not lessen their significance within the hypertext network,
however. The link between sections is evidence of a shared characteristic, and thus highlights
that characteristic over others. This highlighting can help to clarify the relevance between the
sections, a relevance existing between all the subsections within a section and becoming clearer
as more of the nodes are read.

Relationships within Hypersections can also be described in genealogic terms. Two nodes
within the same section can be seen as siblings, sharing the same parent section in which they
reside. Two nodes residing within the same section of a section, or third order section, would be
said to share a common grandparent, making them cousins to one another. Looked at in these
terms, Hypersections is similar to Literatronic, in that links have various “distances”. In this case,
distance is a matter of how closely related two nodes are within a family of sections. Whereas in
Literatronic this distance is indicative of the level of narrative continuity existing between nodes,
in Hypersections it is a measure of the traits shared between them.
Not surprisingly, StorySpinner offers the most complicated model of a linking relationship. It is difficult to even pinpoint where precisely the relationship is. This difficulty is probably because in one link activation there is not one but at least two types of relationships taking place. These are the relationship between card and interpretation and that between node and interpretation. In both cases, the nature of the relationship is that of possible association. A card or node could be associated with the interpretation to which it is related. For instance, a card bearing the image of a tower could be associated with the interpretations strength, security, vision, and so on. It is important to note that while both card and node relate to the same interpretations, the nature of the relationships will be different. The card relates to the interpretation as an image and the node will relate as text. The semiotic differences between these two modalities are likely to result in a difference in the way in which they relate to the ideas expressed by the interpretations.

The card and destination node are also related to one another through the intermediate step of the interpretation. This relationship is complicated by the way in which the system chooses which node to access. It will be very likely that a card shares multiple interpretations with the destination mode. It is just as likely that the card shares multiple interpretations with other nodes not chosen by the system. StorySpinner chooses that node that shares the highest number of interpretations and satisfies the restrictions imposed. A card may be related through interpretation to every node available, even though only one node is accessed. Because of this fact, the specific quality of the relationship is not as important as the quantity of relationships. Instead of being subject to distance, as in Literatronic and Hypersections, relationships in StorySpinner are determined by quantity.
In many hypertext systems, the link marker is associated with a specific origin page. It is placed on a page by the author for the reader to find on the origin node. In HTML hypertexts, this marker can be a part of the narrative text or appear in menu along the edges of the page. In StorySpace, for instance, the link can also reside in the text, or it can be revealed in a drop down menu. In both cases, the marker is coded onto the page. Each of the three systems examined here reject this strategy to some degree. This changes the nature of the relationship between marker, link, and destination, and thus affects the relationship between reader and narrative.

As has been stated before, the StorySpinner link marker is separate from the nodes of the reading path. The reader can choose any card not previously picked, regardless of the node currently accessed. This does not, however, mean that every non-accessed node is always available. StorySpinner demonstrates, more than any other of these systems, the distinction between the link and the link marker. Not only does the link not reside on any node, it passes through narrative objects (the interpretations) that exist within the hypertext but which the reader will never see.25

The text and form of the marker is very difference from that of both Literatronic and Hypersections. The text, at least in the case of the sample stories, is an image and the form, obviously, is that of a card. As stated earlier, both text and form serve to highlight the challenge the system presents in trying to determine relevance across the link.

While Hypersections link markers do reside on the nodes, they are not placed there by the author, or at least not directly. The system assigns link markers to a page based on shared community within a section and rules established by the author. It is unclear exactly how these markers are meant to appear on the node, but it seems safe to assume that they would be separate

25 At least not from within the story path. This raises an interesting question as to whether reading of the code behind a hypertext still constitutes a reading of the narrative.
from the narrative text. Because the author does not assign the markers directly, they would not be able to choose where in the narrative text to place it. This structure ensures that the reader will almost always be presented with choices after the entire node has been read.

The Literatronic author does assign links to specific origin nodes, but the system chooses which links to make available to the reader. Because of this, the author does not assign specific markers. What markers appear on the page can depend at least as much upon the previous behavior of the reader as on the links assigned by the author.

The text of the link marker is the text of the destination node. This marker can be seen as being the opposite extreme from the StorySpinner marker, which seems to seek to obscure its destination. The Literatronic marker is not only clear, it is transparent, acting as a window onto the destination node. The appearance of the marker, in this case, is not as important as its relationship to the other available markers. In this sense, the form of the mark, like its location, is not predetermined, but rather subject to the ever-changing calculations of the system.

One other trait shared by all of these systems is their heavy dependence on rules. Rule sets are not unique to these programs. Storyspace’s guard fields are just one example. In systems like Storyspace, however, these rules are an optional tool, provided to allow the reader to exert a greater amount of control of the reading path, but not a necessary part of the writing process.26 In StorySpinner and Hypersections, creation of conditions and restrictions are an integral and necessary part of the writing process. In Hypersections, for instance, behaviors and termination rules are considered a component of a hypersection in the same way that subsections are. Both of these systems require us to take into account those rules that determine link destination as a part of the hypertext the same way that the text, nodes, and links are. While not a part of the actual

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26 In a 2002 study of 28 of the most widely read StorySpace hypertexts, only seven were shown to use guard fields in over 20% of their links, and 13 did not use guard fields at all (Storyspace 1 176).
reading path, they exert control over the course of that path. An analysis of the hypertexts authored using these systems should include the author’s use of these rules. Literatronic depends on mathematical rules, or formulae, to determine possible reading paths. While these may or may not be set by the author, the author is still responsible for manipulating the formulae to achieve their intentions.

**Conclusion**

The traits discussed above reveal the similarities and the differences in roles that each of these systems assign to the hypertext link. Taken together, the differences add up to separate views as to the level of recontextualization that should take place upon activation of the link. These three can be seen as lying on a spectrum. On one end is Literatronic. The goal in this system is to minimize the level of recontextualization required of the reader as much as possible. The link in this case is almost entirely a vehicle for interaction, intended to give the reader a certain level of choice while maintaining a high level of narrative continuity.

Hypersections sits in the middle. Within this system, contexts are tied closely to categories. Logical continuity takes precedence over narrative continuity. The inclusion of behaviors and terminations are intended to help maintain narrative relevance within the story path. The concern here, however, seems to be with the entire path, or at least long stretches of path, rather than in the relevance lying between any particular two nodes. For example, a rule may determine that a certain amount of the nodes in one category be read before those in another are available. Recontextualization between linked nodes is still left, to a large degree, up to the reader.

StorySpinner seeks to exploit the recontextualizing force of the link to the greatest degree. The reader is encouraged to determine relevancy between card and node and from node
to node. As in Hypersections, the rules are intended to give the overall path some sense of continuity, or at least cohesion. The StorySpinner link is a tool not for connecting one node to another so much at it is for connecting ideas.

This difference between these systems reveal one of their most important similarities. Each demonstrates the eclectic nature of the link. Each shows us that the link is not a single entity with a static set of characteristics. In all three systems, what we call the hypertext link is instantiated in widely different ways. From the appearance of its markers, to its function within the narrative, to the way in which it is coded, the link appears as a distinct type, the nature of the link is specific to the authoring system built around it. Links from the systems encountered here, as well as from any other hypertextual authoring system, should not be seen as simply various, interchangeable tokens of the same type. Each system presents a link that is distinct, with its own set of characteristics and functions; each providing the author with a different set of challenges and affordances. To understand the writing and reading process involved in the creation of a hypertext narrative with any of these systems requires a definition and understanding of the link specific to that system.

The most important similarity, however, shared by these and many other hypertext authoring systems, is the implicit belief in the potential of hypertext as a tool with which to create narrative. In all of these systems, the hypertext link is seen not simply as a convenient or efficient way to organize and access knowledge. These systems show that hypertext has grown beyond the dream of the memex, and is more than the global community of the World Wide Web. Most of all, they show us that the power of text itself has not been diminished by the advent of digital media, but has embraced the new technologies to provide authors with powerful new tools in the creation of evocative and insightful narrative.
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