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iCriticism: Rethinking the Roles and Uses of Computation and the Computer in Literary Studies

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ICRITICISM: RETHINKING THE ROLES AND USES OF COMPUTATION AND

THE COMPUTER IN LITERARY STUDIES

A Dissertation

Submitted to the School of Graduate Studies and Research

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Requirements for the Degree

Doctor of Philosophy

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Title: iCriticism: Rethinking the Roles and Uses of Computation and the Computer in
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The parameters, both theoretical and practical, that define the uses and roles of the digital technology within the field of literary studies should be continuously rethought in order to keep up with the rapid changes in technology and reach the best possible uses. In this context, the present study develops an approach –iCriticism- that redefines the roles and uses of the computer technology in the field of literary studies.

I start by arguing against a number of popular assumptions about the computer which limit its uses to a mere tool or aid. I move from there to discuss the different views about using computational methods in literary studies, aligning my position with the theories, exemplified by Johanna Drucker's Speculative Computing, that approach the computer as susceptible to different agendas and show the possibility of "humanizing" it. The theoretical foundations of iCriticism are laid out in chapters II and III which review theories about the material aspects of texts leading to a conclusion about emergent materiality and a hybrid model for the multidimensionality and heterogeneity of texts. I also discuss ways to overcome the impasse in the e-book design. The last foundation for iCriticism is my theory of partnership / cyborgism which presents a model for the human-computer interaction based on a division of labor and an exchange of roles. I conclude this thorough review

and analysis with a detailed list of iCritical principles and an illustrative table that contextualizes my approach in relation to previous efforts.

The dissertation is concluded with a part that theorizes and describes a prototype for a platform for reading and teaching novels that I call iNovel. The main objectives achieved by this prototype is the demonstration, in a concrete example, of the applicability of iCriticism and the possibility, through experimenting, of reaching new formats for literary texts that take the utmost advantage of the digital medium.

ACKNOWLEDGEMENTS

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INTRODUCTION

As the title shows, the dissertation makes a case for "iCriticism", an approach that builds on previous efforts towards a fuller integration of the computer technology in the field of English and literary studies in order to best serve the goals of the field. The term has certain resonances and connotations to be explained later, and the topic calls for a hybrid and interdisciplinary approach. Therefore, the theoretical spectrum in the research is wide, including post-structuralism, textual studies, media studies, computer science, Human Computer Interaction, Digital Humanities and digital literary studies.

Within this theoretical context, one general framework for the dissertation is the seemingly enduring disjunction between the literary enterprise and the computational method. We are still facing the classical dichotomy: Computation is quantitative, digital, rule-governed, mathematical, accumulative, data-driven, algorithmic--in short, scientific--while literary study is qualitative, analog, subjective, interpretative, intuitive, serendipitous, in short, humanistic. The disparity here which is between two separate domains is not a problem in itself. After all, human knowledge is compartmentalized into fields that, often, do not share common epistemological grounds. However, within the context of the use of computational methods in literary criticism and the range of this use, and with the increasing "fault lines" between the two fields or registers, we are forced to rework and refocus this dichotomy especially in terms of the finality of the counter-humanistic qualifications of computation and the computer and whether there are ways to "humanize" computation. This situation is an opportunity to look for new terms of engagement,

beyond the previous attempts, between the literary enterprise and a "scientific" tool that is becoming mainstream. My project in this dissertation is an attempt to make use of this opportunity.

An overview of the different trends within digital literary criticism can better contextualize my theoretical approach. There are at least four directions of research in digital literary studies and digital humanities in general. One is the trend to speak in terms of the impact of digital technology on the practices, forms, and tasks in the humanities, with special emphasis, in the context of literary studies, on new forms of textuality. One exemplar, George Landow's *Hypertext 3.0: Critical Theory and New Media in an Era of Globalization*, theorizes a convergence between critical theory and hypertextuality. Here, the way that Landow is able to use a general notion like hypertextuality as a generative paradigm shows that digitality is indeed inspiring in terms of new critical approaches. A second group of studies provides a theoretical model for understanding new media and digitality and the mechanism of their influence on old media and cultural forms, including such texts as Lev Manovich's *The Language of New Media* or David Bolter's *Remediation: Understanding New Media*. A significant contribution of the work of this group is the attempt to explain what makes new media new. This is what Manovich achieves in specifying five principles of new media which can well serve as useful guidelines for a theoretical outlook that would be new in correspondence to new media. Also, besides analyzing the avant-gardist impact of digitality in terms of form and genre, we had better also look at how new media "remediates" our epistemological tools and methods.

Some major theorists, understandably enough, dedicate their research to the new literary forms and genres that emerged out of the digital medium, which comprise what we now comfortably call e-literature, and with emphasis on the material specificity of e-literature and in implication. Espen Aarseth's *Cybertext: Perspectives on Ergodic Literature* comes to mind here, in addition to Katherine Hayles's *Electronic Literature: New Horizons for the Literary*.

A fourth trend is the one that takes as its objective the outlining of a new critical approach informed by the digital medium and one that, oftentimes, radically departs from established paradigms. This is what Marcel O'Gorman does in *E-Crit: Digital Media, Critical Theory, and the Humanities* and Jerome McGann in his *Radiant Textuality: Literature After the World Wide Web*. The latest example in this regard is Speculative Computing, the approach that Johanna Drucker theorizes in *SpecLab: Digital Aesthetics and Projects in Speculative Computing*. There are two interesting aspects in Drucker's approach; the first one is that it is design-driven; Drucker integrates a technical aspect in her theoretical accounts by drawing on the software projects at Speclab. Second, Drucker's approach foregrounds the subjective and the experiential in literary interpretation, which is reflected in the digital tools designed for that purpose. This foregrounding of the subjective, I believe, is tantamount to a form of infusing the humanistic into the computational which creates an interesting dialogue between the two registers.

In terms of objectives, my approach can be aligned with the third trend of research, parallel to E-Crit and Speculative Computing. There are lots of findings, directions, and applications in the previous studies that point to the same direction as

my approach, engaging computation in literary studies and humanities in new ways, beyond textual analysis (mere textual crunching of texts by the aid of computer technology). Each of the two scholars, however, focuses on a specific aspect, O'Gorman on visuality and Drucker's on subjectivity. The dissertation purports to show that new uses for the computer in literary studies are possible and still yet to be explored by introducing new points of focus. This can be done by engaging with the following issues: partnership and collaboration between the human and the computer; paying more attention to the emergent mechanism of the computer; the materiality of new media; computational thinking as a model; and the pedagogical potential of computational interfaces. Similar to Drucker's speculative computing, I will include a fundamental technical aspect. The purpose here is to ultimately translate theoretical findings into applicable results. Thus, the last chapter is dedicated to iNovel, a prototype of a platform for reading and teaching novels.

The dissertation consists of four chapters. Chapter one "The Intelligent Calculator: From Popular assumptions to Critical Analysis of the Computer" presents my argument against some popular assumptions about the computer. I show how the computer is different from other machines by way of programmability and the interactive mechanism of its operation which depends on cycles of feedback with the human user. I also explain the transformative consequences of the computer's mediation of cultural forms. The chapter concludes with a review of some critical theories pertaining to the use of the computer in literary studies and my argument against the reductive view of the computer as a mere aid or tool.

Chapter two "Enter the Digital: Emergent Materiality and the Digitization of Literary Texts" has three interrelated parts; the first one presents a theory about the emergent materiality of texts and proceeds to offer a hybrid model for describing and understanding the multidimensionality and heterogeneous nature of texts which is adapted from the work of different scholars. In the second part, I discuss some major problems in the e-book design and ways to overcome them, using the insight obtained in the previous chapter about the materiality and multidimensionality of texts. The last part of the chapter is about my theory of partnership / cyborgism which presents a model for the human-computer interaction based on a division of labor and an exchange of roles.

Chapter Three "The Rebels against the Republic and the Regime: iCriticism Must be Theorized" introduces the main principles of iCriticism. I precede this with a review of some main sources and influences of iCriticism: Speculative Computing, Media Specific Analysis, Hypericonomy, and the theory of funology. I conclude with a detailed list of iCritical principles and an illustrative table that contextualizes my approach in relation to previous efforts.

The last Chapter "iNovel: The Prototype" is dedicated to describing iNovel the prototype which is meant to be a showcase of iCriticism and its main principles. The main purpose is to make use of the capabilities of the digital medium rather than imitate or reproduce the print medium. As a platform for reading and teaching the novel, iNovel presents a different model for digitizing literary texts.

CHAPTER I

THE INTELLIGENT CALCULATOR: FROM POPULAR ASSUMPTIONS TO

CRITICAL ANALYSIS OF THE COMPUTER

I present iCriticism as an alternative approach that starts from a different set

of assumptions about computation and the computer that departs from some popular

ones, those that are limiting in terms of definitions of the computer and the

parameters of its uses, as will be explained below. Exposing these assumptions which

have cultural manifestations is a necessary step to prepare for the following

theoretical and technical parts. In this context, we can repeat with Johanna Drucker

that "the deepest error is to think "the task ahead is a technical one, not an intellectual

and cultural one" (*Speclab*, 198-99). The task in this chapter is to expose and refute

some of the limiting assumptions about the computer.

Popular Perceptions of the Computer

Let us start by looking at the perception of the computer as a machine in the

popular imagination and some of the implications. Perhaps the physiology of the

computer is so imposing and self-evident. The typical image of a pc or laptop, with a

screen, keyboard, and mouse leaves no room for imagination. Moreover, the ability of

the computer to embed old media makes it easy for it to pass as an advanced multi-

media machine, or a super-TV. This "façade" entangles the computer in machine

corporeality. The computer screen, a component that deserves special attention, is

bequeathed from earlier technology; the cinema and the TV are the closest relatives.

This link contributes to perpetuating the notion that the computer is another extension

of these mass media machines and which consequently hinders the ability to discover

subtle aspects that distinguish the computer. For example, the computer's screen is not merely a display tool designed for a passive viewer. Because the computer depends on continuous input from the user, its screen serves as a channel of output and input, and an interface between the user and the machine. Besides, the content that the screen "displays" or visualizes is much more diverse; we see all types of media, and there are also other types of content peculiar to the computer and its mechanism of work. When a programmer sits at the screen, he or she is actually "seeing into the mind" of the computer. The screen is also a platform of work for the user. We create and make things happen on the screen.

The computer is able to transform, or even evolve, into a spectrum of things when it is put to use, almost all the time in an interactive environment with humans. Here we have another distinct feature that makes the computer stand out, which is interactivity, or the role of the user. We agree that the computer, unlike other machines, performs a special set of functions that are easily aligned with human thinking processes, hence the qualification as an intelligent machine. It is also important to remember that the computer's intelligence manifests itself through the interaction with a human user, and with "nontrivial" effort on the user's part most of the time. This should sound simple and straightforward. However, this interactive is not easily acknowledged and we tend to think of the computer as working independently. The role of the computer's user goes beyond turning on and off the machine or providing input, and this role is further "amplified" by a larger set of input devices like keyboard and mouse. The interactivity of the user, and we are talking about the ordinary user here, is consistent and continuous. Besides, there is another

set of specialized or expert users, like programmers and designers, whose interaction is tantamount to a form of communication with the computer. The outreaching significance of this aspect called for a whole new field of research, which is Human-Computer Interaction, HCI.

The tendency in popular imagination to envision the computer as working independently is related to a desire in the relation between man and machine, emphasized by the industrial revolution, to seek automation at all costs. What this means is that the purpose of any machine is the total removal of human effort. This objective is usually centralized and used as a standard for the machine's performance. Applying this standard in assessing the performance of the computer is obviously mistaken, simply because the human-computer interactivity is an integral part of the machine's functioning, and the need for human effort is not simply a disadvantage in this particular case. The topic of interactivity will be extended in the following chapters.

The Leap From Calculation to Programmability

To better map out the current and potential roles of the computer, we nee also to look at the origins of computation as we know it now, both etymologically and historically. Of special significance here is the interplay between two basic notions that played a formative role in the evolution of computing: automatic calculation and programmability. The Merriam-Webster dictionary provides the following meanings for the entry "compute": "to determine especially by mathematical means", "to make calculation", and to "reckon". All of these meanings were also part of the original Latin word "computare" from which "compute" is derived. The absence of any

semantic distance between the word and its origin is in itself significant. It seems that computing is a static notion that defies the passage of time, or more accurately, it is a concept that belongs to the basic science, the protoscience, which is mathematics. Mathematical calculation is the core meaning of computing, and even the one sense that seems to depart a little, 'reckon'', refers to reckoning that comes as a result of calculation, again by mathematical means. The etymological line is unbroken, and the semantic boundaries are so rigid. On the cultural and epistemological level, this shows the hegemony of mathesis and its cultural authority with all the connotations of accuracy, systematicity, empiricism, and disambiguation.

A look at the early history of computing tells us that the computer evolved from automatic calculators. Automatic calculation is still central to modern digital computers. However, besides automatic calculation, there was another technology that led to the birth of computing as we know it now and, in fact, made all the difference. It is by virtue of this technology that the computer has its cultural authority in contemporary life. This was the technology of programmability. Interestingly enough, this magnificent technology did not rest upon or came about as a result of any material innovation beyond automatic calculation itself. It was simply a smart manipulation of the very method and process of automatic calculation which had then been enhanced by powerful "computers". Programmability is so simple yet so creative. The machine starts to "behave" in a desired way. Programmability is basically the process of making the computer able to receive instructions, basically by an orchestration of automatic calculations. In doing so, programmability "links automated processing to the symbolic realm" and adds "an extra level of articulation

in coding symbolic values onto binary entities that could be processed electronically" as Johanna Drucker says, and this "made the leap from automated calculation to computation possible." (*Speclab*, 23) Therefore, computation as we know it today is synonymous with programmability which was indeed a great leap not only towards enormous improvement of functionality, but also towards a transformation of automatic calculation itself and its uses.

Of course programmability in its basic sense was not new. Machines were programmed to operate in a certain way long before computers using mechanical methods most of the time and in a restricted way, Charles Babbage's analytical engine, for example. By contrast, computational programmability is integrated within the mechanism of automatic calculators, so its uses are never exhausted. Programmability upgraded computation to real communication with the machine. It has its own languages and language-like method, which is code. In fact, programming languages are correctly called so. Not only are they syntax-based sign systems but, more importantly, they serve as effective communication tools, and even augmented tools compared to natural languages, if we consider "the multiple addressees…which include intelligent machines as well as humans"(Hayles, *Mother* 15). This multiplicity of addresses is why code is code. It works in at least on two levels of interpretation linking human and machine epistemologies. The computer code translates between the human and the machine.

Programming and code are central to the present topic as they help illustrate some misconceptions about computing. With programmability, automatic calculation is transformed and moved to a different epistemological plane, that of instructions

and behavior. The process of calculation is not the end in itself but just a means. This bridges the gap between human intentionality and machine automation by translating human instructions into automated processes which end up in performing complex tasks. The great and complex leap entailed here implicates the machine and its user, the human, in a new dynamics of interaction, and marks a new phase for the machine. The machine would once and for all transcend its forefathers and be connected forever to humans in a complex network of functionality that soon invades all aspects of life. The cultural authority of code started here, by virtue of this leap. One basic misconception is the blindness to the epistemological nature of the transformation that programmability introduced to computing. This might be due to the fundamentality of automatic calculation that remains central to the whole process. In short, the biggest mistake is blurring the line between automatic calculation and programmability, insisting that the latter has not provided any major break with the earlier.

Computer Mediation

Through programmability and another feature we are going to talk about, emergence, the computer has achieved universality, perhaps not in the sense that is meant by Turing, but in the sense of computer's ability to embed other machines and media by emulation, which explains its ubiquity. Digitization is a process that reflects this ability of the computer. When the computer "mediates" the material processed on it, there is a metamorphosis underlying this process. This is why computer-mediation popped up naturally as an established concept in the discourse about computation. As a result of digitization and computer-mediation, we have a totally new category of

media, called new media. New media is a case in point that would help in demonstrating the formative and radical influence of the computer on cultural forms. This goes against the grains of popular assumptions that tend to envision the computer as a passive transmitter of media, which is another form of the failure to acknowledge the epistemological break brought about by programmability.

Let us illustrate this by referring to Lev Manovich's, now classic book, *The Language of New Media*, in which he specifies five principles of new media which are supposed to account for the newness of this media. Manovich mentions the following principles: numerical representation, which refers to the fact that "a new media object can be described formally (mathematically) and "is subject to algorithmic manipulation" (27), modularity, which means that new media objects are "represented as collections of discrete samples" (30), automation, variability, and transcoding. Manovich explains the last principle noting that "[T]he logic of a computer can be expected to significantly influence the traditional cultural logic of media, that is, we may expect that the computer layer will affect the cultural layer" (46). These principles overlap with the work of other theorists who also provide similar principles of computational media, not necessarily in the general sense used by Manovich. Some concentrated on new forms of textuality mediated by the computer. N. Katherine Hayles, for example, talks about four characteristics of digital or computer-mediated text. The first two characteristics she provides are layeredness and multimodality (combining text, image, and sound together). She adds that storage in computer-mediated text is separate from performance, unlike print books, for example, where the same artifact functions as both storage and performance

mediums. The last characteristic she mentions is that digital text manifests fractured temporality (*Electronic Literature* 164-65). It is not hard to see that both Hayles and Manovich are describing computer-mediation as such.

The computer is never a passive or "harmless" medium for transmission. The five principles and the four characteristics describe some direct consequences of computer-mediation, which indeed amount to a separate "logic" or layer, in Manovich's terms, that affects everything else. Taken together, these principles indicate the emergent working of the computer, and this is something that Manovich does not fail to notice: "Beginning with the basic, "material" principles of new media – numeric coding and modular organization – we moved to more "deep" and far-reaching ones – automation and variability (45). Thus, we can talk about two separate manifestations of computation, divided by an epistemological line. Emergence is the notion that can explain the relation between these two sets of principles / levels. The different levels are "genetically" related while at the same time they are distinct. The line dividing the two shows an epistemological leap as a one-to-one correspondence is obviously lacking. Again here, we say that dwelling on the basic level leads to the failure to recognize the epistemological leap. Transcoding is perhaps the principle that is supposed to summarize the overall imprint of the computer: "[I]n short, what can be called the computer's ontology, epistemology, and pragmatics – influence the cultural layer of new media, its organization, its emerging genres, its contents" (Manovic 46). What needs to be stressed, regardless of the controversy about the reaching of the influence designated here, is that computer-mediation has strong ontological and epistemological implications.

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But recognizing, and then acknowledging, this transforming influence of the computer is not without difficulty because of the way computer-mediation itself works. Perhaps a parallel question to the one about the newness of new media is why it is media, or what in this media that makes it retain the status of media. Computer-mediated media is media by another name, thus, we talk about digital film, digital photography, digital poetry…etc. this is because the computer and other mediums "intermediate" or "remediate" each other, as Katherine N. Hayles and Jay Bolter call this respectively. This indicates "complex transactions" between different forms of media (Hayles, *Mother* 7), and as Bolter says, it "involves both homage and rivalry, for the new medium imitates some features of the older medium, but also makes an implicit or explicit claim to improve on the older one" (23). We have seen how the computer "improves" on the material processed on it, but it is equally important to see how it "imitates" that same material, allowing it to retain its original medial categorization. The computer can simulate; it creates a simulacral "façade" and a surrogate physicality of/for the original media. I call it a façade because it reveals just the tip of the iceberg and hides all the inner workings. We tend to be blinded by this due to assumptions about materiality, representation, and originality.

In this way, the computer appears to act so smartly. It meets the requirements of the dominant culture in terms of mimesis and reproduction while hiding its transformations away from the skeptical eye of that culture. Or we can say it makes a trade-off. Without drifting into sci-fi scenarios, we may experience this sense that the machine is actually taking over. Those of us who insist that the computer is just a medium for transmission abiding by whatever rules we assign are in fact fooled.

The Emergent Mechanism of the Computer:

Let us reaffirm the fact that the computer works in an emergent way. The idea of emergence is that things can be understood as multi-level, complex systems where relatively simple patterns lead to emergent more complex ones. This also means that transformations take place when we move from one level to the other. Computation starts with "computation" but ends up with so many "emergent" patterns, some of which are not computational in any obvious sense. The computer works on different levels of complexity. On one level, we have machine language or code, and this is the "brute" pattern of "naked" digitality, or bits (ones and zeroes). All computational operations are physically carried out at this level. Many complex levels are based on this basic one and that might be said to actually emerge out of it - for example, the level on which programmers work with higher codes like C++ or Java, or the GUI level through which ordinary users interact with the computer. The computational level, in its mathematical rendering, serves as a basic level on which more complex, more advanced levels and functions "emerge".

Emergence and computation are so tightly related that they become synonymous terms in the work of emergence theorists. Some of these, as Hayles points, universalize the computational emergent paradigm:

> Recently, however, strong claims have been made for digital algorithms as the language of nature itself. If, as Stephen Wolfram, Edward Fredkin, and Harold Morowitz maintain, the universe is fundamentally computational, code is elevated to the lingua franca not only of computers but all physical nature. (*Mother*, 15)

They also understand the universe "as software running on the 'Universal Computer' we call reality" (Hayles *Mother*, 27). It is precautious to admit here though, following Thomas Kuhn in *The Structure of Scientific Revolutions*, that these theorists are applying a digital and emergent "paradigm" rather than simply discovering digitality and emergence in the world. But aside from the different questions about the theoretical soundness or the applicability of this paradigm, it shows how computation can be normative in terms of theoretical models. We will see this through other examples. The emergence in the computer also means that its uses are hardly exhaustive, and remain open for new, never previously imagined, manipulations.

Computational Thinking:

Another concept relevant in this context is computational thinking (CT) which is a way to solve problems and understand things by drawing on the concepts fundamental to computer science, as Jeannette M. Wing explains in a seminal piece on the topic. She declares that CT "confronts the riddle of machine intelligence: What can humans do better than computers? And What can computers do better than humans? Most fundamentally it addresses the question: What is computable?". Wing points to a number of fundamental questions and issues in CT like thinking recursively and heuristically, and using "massive amounts of data to speed up computation and making trade-offs between time and space and between processing power and storage capacity"; CT requires thinking "at multiple levels of abstraction". Wing does not fail to point out that CT is "a way humans solve problems not trying to get humans to think like computers". The partnership between man and powerful computing devices entailed in CT enables us "to tackle problems we would not dare

take on before the age of computing and build systems with functionality limited only by our imaginations". She warns against the reductive view of CT as the employment of computational artifacts. CT emphasizes concepts or "ideas not artifacts" as she puts it. (33-34)

Similar to what was claimed about the emergent paradigm, we say that regardless of the controversy that might arise regarding the universal applicability of CT, computation is proving itself normative again. The idea behind CT points to an underlying dynamic unprecedented in science, other than the fundamental role of mathematics in relation to other sciences. Theoretical modeling in this form is closer to literary criticism where theories are meant to be extensive. Drawing from CT is a de facto process as all disciplines now have a branch called computational something, albeit with a technical concentration and without necessarily a theoretical adherence to the concept. Still, some basic concepts of CT are evidently at work. The question of "what is computable?" is indeed a central one. Practically, it seems that everything now is computable in the sense of digitizing or being mediated by the computer. But the question has an epistemological dimension that goes beyond this as we have seen in the previous discussion about new media.

Critical Paradigms:

Let us move into more specialization and look at some of the limiting assumptions about computation in the humanities discourse which are easy to pop up when computation or the computer is in communication with a supposedly alien register like the humanities. This is what Drucker and Nowviskie point to in the following remark:

Much of the intellectual charge of digital humanities has come from the confrontation between the seemingly ambiguous nature of imaginative artifacts and the requirements for formal dis-ambiguation essential for data structures and schema. ("Speculative Computing")

This confrontation, I believe, is the best thing that has happened to literary criticism, and perhaps to computing, as I am going to show. A central issue here is the seemingly-enduring disparity, disjunction, or incompatibility between the literary enterprise and the computational method. Computation is quantitative, digital, rule-governed, mathematical, accumulative, data-driven, algorithmic, in short, scientific, while literary study is qualitative, analogue, subjective, interpretative, intuitive, serendipitous, in short, humanistic. Within the practices and theories of literary criticism, there have been several attempts to circumvent this dichotomy by proposing a set of scientific or science-like paradigms – structuralism and formalism might be two good examples here. Besides the fact that these attempts go in the wrong direction (submitting criticism to sciences and thus empowering the scientific over the humanistic) at least from the point of view of iCrticism, the approach I am proposing in this dissertation, the de facto practices are still limiting the uses of the computer and thus perpetuating the anti-computational coding of English and literary studies on the institutional and theoretical levels. The rise of the digital and the consequent increasing "fault lines" between the computation and criticism are a good opportunity to change the rules of engagement and refocus on the practical dimensions of counter-humanistic qualifications of computation and vice versa. On alternative direction would be to look for ways to "humanize" computation. In other

ways, engaging the computer in the types of practices and activities that we term humanistic. The following chapters of this dissertation will focus on this.

We need to continue offering the humanistic insight which represents an enriching outside view for computing. This is why I stressed the importance of dialogue. However, the benefit here seems to be going in one direction. For literary criticism, the confrontation with computing and its agenda-setting requirements has been a chance to review some of the basic notions, practices, forms, and paradigms. However, the humanistic insight has rarely influenced the paradigmatic or technical choices usually taken within strict scientific and engineering frameworks-ebook design is a relevant topic here to be discussed in detail in the following chapter. One way to achieve this is to reinterpret these choices from a humanistic point of view, for example, the dominance of the visual paradigm represented in GUI, which basically means the translation of information into images, has underlying structures of philosophical and epistemological nature which are definitely outside the sight range of scientists and engineers. To spot these would not only lead to better understanding of these choices and their theoretical parameters, but would also be a chance to modify them for better technical results.

Stephen Ramsay's proposal in "Algorithmic Criticism" is a good example to illustrate some of the previous points about criticism and computation. In an attempt to rethink the conditions for re-integrating the algorithmic manipulation of literary texts into literary studies, Ramsay points to a number of key factors. The bottom line is that computing and its corresponding digital revolution have not "penetrated the core activity of literary studies which … remains mostly concerned with the

interpretive analysis of written cultural artifacts". The implicit assumption here is that any possible "penetration" by computation means a radical change of that core activity, which is inherently resistant to computation. The problem is that the available computational tools are still behind in terms of appropriating this core activity which is irreducibly subjective and is based on a different hermeneutical model or rubric, in which "the accumulation of verified, falsifiable facts" is the basis of interpretation. We lack the "tools that can adjudicate the hermeneutical parameters of human reading experiences — tools that can tell you whether an interpretation is permissible", and they still "stretch considerably beyond the most ambitious fantasies of artificial intelligence". The subtext of this description, which is an accurate and faithful one as long as the original assumptions it starts from are concerned, is the fundamental disjunction between the two parties, computing and criticism, and this creates a perfect stalemate.

Ramsay finds a way out of this stalemate in the context of algorithmic criticism. Although the transformation allowed by the algorithmic manipulation of literary texts cannot be intractably linked to the type of interpretive conclusions that we seek in literary studies, he affirms, it "can provide the alternative visions that give rise to such readings". We can still use textual analysis because any interpretation involves a radical transformation of texts; therefore, "the narrowing constraints of computational logic — the irreducible tendency of the computer toward enumeration, measurement, and verification — are fully compatible with the goals of criticism". It is hard not to agree with this conclusion, again taking into consideration the bottom line Ramsay delineates, which rendered his theoretical maneuvering heavy-handed.

However, a different conclusion is possible if that bottom line is rethought. Let us agree that the facts about criticism are hard to question and they are backed by established disciplinary and epistemological boundaries. As Ramsay points out, any radical change in criticism and its core activity would make it cease to be criticism. The scene is so different regarding the other party, computing and the computer. The disciplinary boundaries, if any, are less rigid, and the epistemological and theoretical parameters governing the field are still open to discussion.

Another case in point comes from the work of Johanna Drucker and her Speculative Computing, the approach that she theorizes in *SpecLab: Digital Aesthetics and Projects in Speculative Computing*. Speculative Computing, whose abbreviation SC reverses that of CS (computer science) -- not a totally insignificant thing, especially as speculation replaces science, is a pertinent example for many reasons; it is a fully-fledged theory and a self-conscious attempt at an alternative approach in digital humanities, one that presents a humanistic appropriation of computing, in addition to the fact that it links theory and practice (Speclab projects). The starting point of this approach is "a serious critique of the mechanistic, entity-driven approach to knowledge that is based on a distinction between subject and object." (21) The name given to this alternative theory is aesthesis, which is "a theory of partial, situated, and subjective knowledge" (xiii). Aesthesis is meant to contrast with and counter mathesis, which represents the mechanistic approach with all the implications of this.

Another starting premise of SC is a self-conscious awareness of the computation/humanities epistemological friction:

The humanistic impulse which "has been strong in its dialogue with "informatics" and "computing" but has largely conformed to the agenda-setting requirements set by computational environments. Our goal at Sepclab, by contrast, has been to push against the logical constraints imposed by digital media. (22)

These "agenda-setting" requirements are logical systematicity, formal logic and disambiguation, as Drucker points at different places, and are all patently counter-humanistic. The use of the generalist term "computational environments" is also significant and I will return to this later. SC also presents an alternative mechanism of work within these environments:

We used the computer to create aesthetic provocations – visual, verbal, textual results that were surprising and unpredictable. Most importantly, we inscribed subjectivity, the basis of any interpretive and expressive representation into digital environments by designing projects that showed inflection, the marked specificity of individual voice and expression, and point of view as a place within a system. (19)

We see how theory and practice are entwined. In fact, they are inseparable. The theoretical agenda of inscribing the humanistic is translated into design projects in Speclab. This means specific decisions on the techno-practical level. Let us take two examples of such decisions from one Speclab project, which is Temporal Modelling:

On a technical level, the challenge is to change the sequence of events through which the process of "dis-ambiguation" occurs. Interpretation

of subjective activity can be formalized concurrent with its production -- at least, that is the design principle we have used as the basis of Temporal Modelling. (Drucker and Nowviskie, "Speculative" "Speculative")

Changing the sequence of events means shifting the epistemological prioritization, or, as put by Bethany Nowviskie, Drucker's collaborator: "the subjective, intuitive interpretation is captured and then formalized into a structured data scheme, rather than the other way around". The importance of this example, besides specificity, is that we have an idea about how SC works; the rules of the game are changed within the computational environment. In doing so, SC realizes its premise in contrast to dominant practices in DH:

The digital humanities community has been concerned with the creation of digital tools in humanities context. The emphasis in speculative computing is instead the production of humanities tools in digital contexts. (25)

Projects in SC are not just technical experiments but have "ideological as well as epistemological" aims. Ideologically, the ultimate aim, as declared by Drucker is "to push back on the cultural authority by which computational methods instrumentalize their effects across many disciplines". The target, especially in relation to computing, is further clarified:

The villain, if such a simplistic character must be brought on stage, is not formal logic or computational protocols, but the way the terms of

such operations about administration and management of cultural and imaginative life based on the presumption of objectivity. (5)

This clarification is never redundant and very crucial. The problem is in the administration which "locks computing into engineering problem-solving logical sensibility". The relation between logical systematicity and computing is rethought and the assumed synonymity is broken; this really amounts to a revelation. Computing had been exclusively used for logical ends, but this was due to the lack of alternative approaches:

> We know, of course, that the logic of computing methods does not in any way preclude their being used for illogical ends -- or for the processing of information that is unsystematic, silly, trivial, or in any other way outside the bounds of logical function. (Drucker and Nowviskie, "Speculative")

SC and its corresponding Speclab projects have, thus, provided a positive answer to most of the questions that they set out to address:

> Can speculation engage these formalized models of human imagination at the level of computational processing? … What might those outcomes look like and suggest to the humanities scholar engaged with the use of digital tools? Does the computer have the capacity to generate a provocative aesthetic artifact? ("Speculative")

The computer definitely has a generative aesthetic capacity, not because this is an inherent capacity in it, but rather, because the computer's main capacity is in being

adaptable and susceptible to different uses. The question is to have a framework and a technical blueprint; this is what the theorists of SC have done.

SC is a lesson that we need to learn. One major mistake is the tendency to lag in the theoretical and ideological atmosphere that SC has rendered incongruous. Equally problematic is to insist that the villain is computing itself, independent of the approach in which it is appropriated, and to continue using an instrumentalist approach while maintaining that the computer is an irreducible instrument. Computing provides an environment; this is why I noted the use of this term. The word "environment" is a good choice as it indicates that computing provides surrounding conditions rather than impose any specific course of events.

There is a question that might easily go unasked. Why is it computing and computational environments that are in question here? The larger ideological framework for SC, which is aesthesis, is a critique of the instrumental logic in western culture and not exclusive to digital humanities or practices generally related to computing. It is either that computation, especially in humanities context, provides an extreme case of the working of the instrumental logic, or it serves as a perfect environment for countering that logic and "demonstrating" the alternative approach - it allows the entanglement of theory and practice, for example. If we disagree about the earlier we can easily agree on the later, and supportive examples from SC itself abound. Perhaps it is useful to conclude here with a reminder from Drucker herself:

> No task of information management is without its theoretical subtext, just as no act of instrumental application is without its ideological

aspects. We know that the "technical" tasks we perform are themselves

acts of interpretation ("Speculative").

So, we can in no way continue investing the computer with the vices of logical

systematicity, declaring it forever disjunct with humanities. The dominant trends in

computing cannot be separated from their theoretical and ideological subtexts.

Moreover, and more importantly, any change in the subtext will result in a radical

change in the nature of information management, which means among many other

things, that there is a great potential in terms of alternative approaches, in the manner

of SC.

Conclusion

If we start from a different view of computation, one that is free of the

limiting assumptions identified previously, a whole set of new conclusions will be

available. Computation's disjunction with literary studies is not a given. A different

view means reworking this disjunction, leading to new terms of engagement between

the two fields. A number of key issues will need to be revisited. Computation is not

only a set of tools or methods, not to mention an irreducible set. Similarly, the claim

that the only available role for computation in criticism is textual analysis acts like a

wall or a red line. All these assumptions lead to the tendency to frame the problem in

terms of technical limitations, and maintain the premise that the problem is that CS

and AI are still behind regarding human-like abilities. The claim to technical

limitations historicizes the disjunctive moment and implies that current uses are the

best available ones. Another outcome of this type of thinking is that the issue remains

within the science / humanities dichotomy, with computation as a scientific (and

scientifying) method, and digital literary studies easily becomes another attempt at scientifying the humanities.

But the question of how to reach new roles and uses for the computer , especially as pertinent to literary studies remains pending. The potential for answering this inquiry is, however, unlimited. This thesis will give some answers to this question. One cornerstone will be the marrying of theory and practice, much like speculative computing. In what follows I will introduce a number of themes/issues that spring from the preceding theorizing. Each of these will serve as the theoretical framework for a prototype (to be illustrated in chapter IV of this dissertation). The themes are the following: partnership and collaboration between the human and the computer (called tentatively cyborgism), the emergent mechanism of the computer, the materiality of new media, computational thinking as a model, and the pedagogical potential of computational interfaces.

CHAPTER II

ENTER THE DIGITAL: EMERGENT MATERIALITY AND THE DIGITIZATION

OF LITERARY TEXTS

In this part, I introduce the concepts which serve as the theoretical foundation of iCriticism, the approach I am proposing in this dissertation. Central to literary studies is the (re)definitions of textuality in relation to new media. Because texts are the object of study in the field, all the threads lead there. I will start unpacking this issue by proposing a model based on, on the one hand, the multi-dimensionality and heterogeneity of texts, and their symbiotic relation with human beings in the act of interpretation, on the other hand. The model is preceded by a thorough review of relevant theories. In the following part I move to discuss electronic textuality in the particular case of e-books. The argument developed here prepares the ground for the last part concerning the prototype, iNovel whose premise is the scholarly digitization of novels. In general, the part about e-books will be a middle ground in which theory and practice marry. The closing part of this chapter is dedicated to my concept of partnership/cyborgism which draws from SC and HCI. I want this last part to be an example of the kind of insight someone trained as a humanist can offer to computer science.

Emerging/Emergent Materiality

My argument about emergent materiality starts from the proposition that we need a theoretical model, which is both comprehensive (dealing with the major issues) and practical (can be easily translated into design choices), to understand the shift in material condition when literary texts are migrated to the digital. To achieve

this, an overview of the evolution of the concept of materiality and the different models developed or proposed by scholars is necessary. For this particular topic, the focus will fall on the work of Johanna Drucker, Jerome McGann and Matthew Kirschenbaum, besides reference to the work of textual critics, G. Thomas Tanselle and D. F. McKenzie.

In their engagement with the materiality of texts, textual and literary critics seem to have moved from opposite directions to ultimately meet in the middle. The first group's engagement with the physical aspects of texts led them to more attention to interpretational aspects by recognizing the inseparability between the two activities ((re)production and interpretation). Literary theories, each in its own way, moved from interpretational concerns to a serious consideration and inclusion of the physical and material factors, reaching more or less the same conclusions.

The concept of materiality especially as it applies to written texts was bound up with theories about language, signification, and literature, in other words, with philosophy and criticism, which were in turn intertwined with the actual production of literature and art (Drucker, *Visible* 9). The concept also developed along disciplinary, or practical, lines, as we will see with textual criticism. Therefore, the concept evolved with each critical and philosophical school. Johanna Drucker's *The Visible Word* contextualizes the study of experimental typography in modern art, providing a useful overview about writing and materiality (9-47). In broader terms, the attention paid to typography in modernist art and literature signaled a redefintion of materiality and its role in signification. Underpinning this was an urge to stress the autonomy of the work of art in terms of its "capacity to claim the status of *being*

rather than *representation*". To do so, the materiality of form was asserted as primary rather than subordinate condition (10).

The Saussurian model and the Semiotics based on it bear special significance in Drucker's analysis, and she shows how this model, though it re-inscribed writing into the study of language and established a role for it as compared to the phonological bias in the 19th century, included a paradoxical view of materiality's role in linguistic signification:

> Most important, it was in the fundamental deconstruction of the sign into two independent, but linked, elements that Saussure established the basis of examination of the manipulation of the signifier. Within this articulation of the structure of the linguistic sign, Saussure created a difficult-to-resolve paradox between a sign independent of all materiality and also dependent upon it. It is in this space created by this paradox that the exploration of the significance of the materiality of the visual representation of language will find its place. (26-7)

The paradox referred to here by Drucker is centered on the definition of the sign by Saussure as a basically psychic entity that depends on rules and differential distinctions for its existence. Within this definition, the signifier becomes non-corporeal:

> This is even more true of the linguistic signifier, it is not essentially phonic. It is noncorporeal and constituted not by its material substance, but by the differences which separate its acoustic image from any and all others. (Qtd in Drucker 23)

The sign is dematerialized but not beyond repair as Saussure left a certain gap in his argument. Within this gap, the Formalists and Prague linguists reconstructed the concept of materiality through two main developments: "much attention to the nature of poetic language" and "the emergence of a more refined model of the distinctions between linguistic expression and linguistic content" (28). This was a milestone and the beginning of a paradigm shift. Language, in its literary version, was discovered to hide intrinsic abilities beyond the referential, representational functions (poetry is always a special case because it best demonstrates this aspect). The effect we call literature is achieved by this mechanism of language (defamiliarization). Also, the relation between expression, or form, and content is not strictly hierarchical. Form is not merely a "vessel" for content. In fact, form can be content too.

The Marxist critique of formalism and semiotics which, by its emphasis on ideological and historical contexts, foregrounded some notions that were missing, like subjectivity and history, failed to address the metaphysical premises of the formalist/semiotic arguments (37). This would be the task of Derridian deconstruction which exposed the transcendental aspect of Saussurian linguistics (35). Because those theories are not sufficient for a model that fully recognizes and reinscribes materiality, Drucker goes on to suggest her own model that will be discussed later.

The experimental practices and the theoretical developments within literature, art, and criticism foregrounded the fact that the material aspects of texts cannot be separated from meaning production. A parallel development occurred in the field of textual studies towards an understanding of the intersection between the material reproduction of texts and the interpretation of these texts. We find this theme in the

works of major theorists in the field like G. Thomas Tanselle and D. F. McKenzie. In "The Nature of Texts", Tanselle talks about a "widespread failure to grasp the essential nature of the medium of literature [language]" which is "neither visual nor auditory, and is "not directly accessible through paper or sound waves" (16). Tanselle's argument relies heavily on the dichotomy between the work and the text. According to him, literary works are sequential arts (in addition to music, dance, and film) which "depend on sequence or duration" (22). These "can survive only as repetitions, which in turn require instructions for their reconstitution…which are not the same thing as the work itself" (22). From this Tanselle concludes that "literary texts are analogous to musical scores in providing the basis for the reconstitution of works" (23). Somewhat ironically, Tanselle uses this view of language to argue against the split between textual and literary activities: "We can never know exactly what such works consist of and must always be questioning the correctness-by one or another standard – of the texts whereby we approach them" (25). The inaccessibility, and therefore indeterminacy, of literary works, which is due to the nature of the medium of language, makes the textual activity itself a form of interpretation. Therefore, "the act of interpreting the work is inseparable from the act of questioning the text" (32).

Tanselle's view can be better understood from a technical and disciplinary perspective. He is talking as a textual critic whose main focus is the activity of recovering and producing editions of texts. His argument, therefore, is "limited" by this practical agenda and its system of priorities. Similarly, it can be said about Saussure, who was studying language form a scientific/scientifiying perspective, was

constrained by an emphasis on language's systematicity (Drucker, *Visible*, 21). And we can definitely see traces of the Saussurian double articulation of the sign in Tanselle's argument. The text is the signifier of the Work, which might be Tanselle's version of the signified, or the transcendental signified. Tanselle's ideas become more problematic when he claims that texts are only vessels:

> We sometimes confuse the statements or work with its physical embodiment, forgetting that manuscripts and printed books are utilitarian objects designed to perform a function…verbal works that make use of the visual aspects of written presentation are special cases, partaking – in unequal, and shifting, proportions – of two arts; but the vast majority of written verbal statements, the objects in which we find them serve – as do all vessels – the primary function of conveyance. (40)

We have here a classical case of condemning the visual or typographic aspects of texts and reducing them to special cases that bring texts closer to non-verbal arts like painting. Such a view takes us to pre-formalist concepts of language.

Despite the previously enumerated weaknesses, and his affirmation of the existence of an idealist Work to which the text is just a carrier, Tanselle emphasizes that the engagement with the text and its materiality involves an interpretation act. Besides, his definition of texts as "instructions for the reconstitution of works" includes a gesture towards the dynamicity of texts, as noted earlier. He also affirms the specificity of each physical reproduction of the text: no two copies are the same; any change in the instructions would change the work (45). D.F. McKenzie, on the

other hand, anchors meaning (the statement, the work) completely in the material text. McKenzie's redefinition of bibliography, in his *Bibliography and the Sociology of Texts*, departs from traditional views, like Walter Greg's, which excludes "symbolic" meaning from the concern of bibliographers as he sees a "relation between form, function, and symbolic meaning" that cannot be ignored (10). Thus, he starts from challenging the rift between transcendent meaning and its material form. To him, being involved in "interpretive" questions is an automatic outcome of being engaged in the recording of physical forms, which is bibliography's main job (61).

Besides, and as the title of the book shows, McKenzie does not see any possible separation between the technical and the social dimensions of text production and transmission:

> But it [Bibliography] also directs us to consider the human motives and interactions which texts involve at every stage of their productions, transmission, and consumption. It alerts us to the roles of institutions and their own complex structures, is affecting the forms of social discourse, past and present. (15)

To illustrate his view, McKenzie gives a very interesting example from the opening quotation of "The Intentional Fallacy" by Wimsatt and Beardsley. He explains how "tiny" typographical details can lead to misreadings and comes up with the following intriguing conclusion:

> …in some cases significantly informative readings may be recovered from typographic signs as well as verbal ones, that these are relevant to editorial decisions about the manner in which one might reproduce a

text, and that a reading of such bibliographical signs may seriously shape our judgment of an author's work. My argument therefore runs full circle from a defense of authorial meaning, on the grounds that it is in some measure recoverable, to a recognition that, for better or worse, readers inevitably make their own meanings. In other words, each reading is peculiar to its occasion, each can be at least partially recovered from the physical forms of the text, and the differences in readings constitute an informative history. (18-19)

There are many significant points here: Meaning, both as an interpretation or an interpretation of an interpretation, in other words, whether produced or recovered, resides in the "typographic" aspects of the text, long thought to be insignificant or marginal in relation to "verbal" ones. The visual aspect of the sign, which is part of its material form, is not transparent. Those serve as both indicators and parameters of meaning. Therefore, they "can falsify certain readings" and "demonstrate new ones" (22). Editing (marking the text) is always interpretational. McKenzie takes this argument further to suggest that the history of the physical text "must be a history of misreadings" (25). Another important point in this conclusion regards the subjectivity of reading. Every reader cerates his/her own reading, but this is not independent form the physical forms of the text. Readers' responses are produced and recovered from the materiality of the text.

An ultimate conclusion for McKenzie is blurring the boundaries between textual and literary criticism:

With that last example, it could be argued that we reach the border between bibliography and textual criticism on the one hand and literary criticism and literary history on the other. My own view is that no such border exists. In the pursuit of historical meanings, we move from the most minute feature of the material form of the book to questions of authorial, literary, and social context. These all bear in turn on the ways in which texts are then re-read, reedited, re-designed, re-printed, and re-published. (23)

In other words, any theory of text or the interpretation of text must include a theory of history and a theory of materiality. In an indirect response to Tanselle's theory, McKenzie offers the following proposition:

Whatever its metamorphoses, the different physical forms of any text, and the intentions they serve, are relative to a specific time, place, and person. This creates a problem only if we want meaning to be absolute and immutable. In fact, change and adaptation are a condition of survival, just as the creative application of texts is a condition of their being read at all. (60-1)

However, both McKenzie and Tanselle seem to agree on the indeterminacy and changeability of texts - though Tanselle believes that there is an original statement whose recovery constitutes a noble enterprise and a form of historical enquiry. But whether we believe or aim at an ideal Work, we are left with the fact that the main activity is the production of works or approximations of works through the production of texts and their documents.

The previous review shows evolution of the concept of materiality or, more accurately, the relative importance of materiality in meaning production. This theme's development came along different agendas. The emphasis in linguistics and semiotics on systematicity was necessary for achieving a scientific nature. This was at the expense of acknowledging materiality. With Modernism, attention to form and the need to stress autonomy led to more attention to material aspects. The function of a work of art, and thus its meaning, is not exclusively representation, transcendent meaning. Meaning is also a function of the text itself, hence the formalist claim of the self-sufficiency of language, which explains why poetry was always a special case. With Marxism came the shift to ideological functions of literature, but also to history and the constructed nature of meaning, form, and genre. Scholars like Walter Ong showed the vast impact writing has on cultural forms and that it is far from being just a simple technology of recording speech. In the conclusion, the ultimate conclusion seems to be disclaiming any heuristic distinction between symbolic and non-symbolic meanings, including social meaning. This has run from Saussure to digital humanities.

The principles established above about material basis of symbolic meaning and the interpretational nature of textual production are necessary. However, it is also imperative for a comprehensive model, such as the one aimed at here, to understand the internal mechanisms by which a text produces meaning and the rules that govern the reciprocal influence between texts and their interpreters. Here comes the significance of the work of Jerome McGann whose theories about textuality combine the perspectives of textual criticism, literary criticism, and digital humanities.

Therefore, his approach to the issue of materiality is informed by expertise in all these fields. I would like to focus on three themes from his work: text as an autopoietic system, rethinking textuality and the algorithmic nature of text, and his theory about text dimensions/dementians.

McGann defines texts as "autopoietic mechanisms operating as self-generating feedback systems that cannot be separated from those who manipulate them" (*Condition*, 15). Here he draws from Maturana and Verala's work. In "Marking Texts of Multiple Dimensions", he elaborates on this concept:

> All components of the system arise (so to speak) simultaneously and they perform integrated functions. The system's life is a morphogenetic passage characterized by various dynamic mutations and transformations of the local system components. The purpose or goal of these processes is autopoietic – self-maintenance through self-transformation – and their basic element is not a system component but the relation (co-dependence) that holds the mutating components in changing states of dynamic stability.

An interesting and new idea in this definition is that the text and its manipulator comprise one system. In this way, McGann helps us see interpretation as an "interactive" process that involves reciprocity between the textual mechanisms and manipulators / interpreters. Thus, meaning is part of the textual mechanism or system, or, in other words, meaning is one with the text. Moreover, the human intervention or manipulation, in the form of reading, critiquing, or interpreting, is not alien to the text

but takes place in loops of codes, instructions and their execution. McGann elaborates on this theme in "Rethinking Textuality":

> Text generates text; it is a code of signals elaborating itself within decisive frames of reference. A text is a display and a record of itself, a fulfillment of its own instructions. Every subsequent re-presentation in whatever form – editorial or interpretive – ramifies the output of the instructional inheritance. Texts are like fractal derivation. (*Radiant*, 151)

Being simultaneously a record and a display is an illuminating way to look at texts, both traditional and digital. In the case of the latter, though, it seems that record and display have different "mechanisms" as we will see later.

McGann's autopoietic theory reveals the dynamic nature of traditional or print texts. One recurrent theme in his work is rethinking (print) textuality in relation to digital technology, or what McGann calls "a thoroughgoing re-theorizing of our ideas about books and traditional textualities in general"(149). He calls for this in order to discover the dynamic nature of texts, all texts. There is a useful summary of McGann's ideas in this regard in "Rethinking Textuality", which starts with a list of conclusions about texted documents that came as a result of an experiment with Johanna Drucker (*Radiant Textuality* 138-9). One of the main claims there is that "the rationale of textualized document is an ordered ambivalence", and that "any heuristic distinction", perhaps in the manner of Tanselle's theory, "between bibliographic and semantic elements obscures the field of textual meaning by identifying the signifying field ("its rationale") with the semantic field" (138). Like McKenzie and Tanselle,

McGann states that "marking is interpretational" (138), an idea that he pointed out in earlier works like *The Textual Condition* when he claims that "[t]he idea that editors 'establish' the texts that critics then go on to 'interpret" is an illusion" (27).

With the help of McGann's ideas, we have no difficulty in understanding that all texts are algorithmic. As his autopoietic theory shows, texts are far from static. A common misapprehension in digital studies is thing that traditional texts are static while only digital or digitized texts are dynamic. This is why the widespread theories focused on differentiating docutexts from cybertexts, with the latter being dynamic and non-linear are mistaken, and McGann cites Murray and Arseth in this context (148-9). McGann stresses the fact that digital technology has enabled us to discover the "algorithmic" nature of print textuality: "Documents are not containers of meanings or data but sets of rules (algorithms) for generating themselves, for discovering, organizing, and utilizing meanings and data" (138). Engaging Tanselle, we say that the text and the work are the same thing. The text includes instructions for its own reconstitution, rather than something outside it, the Work in Tanselle's understanding. McGann summarizes this argument in three major points:

> First, we want to recover a clear sense of the rhetorical character of traditional text. Rhetoric exposes what texts are doing in saying what they say. It is fundamentally "algorithmic." Secondly, we want to remember that textual rhetoric operates at the material level of the text — that is to say, to build digital tools that can exploit the resources of traditional texts. Finally, we have to preserve a clear sense of the relation of those two features of traditional text and the inherently

differential, undetermined character of textual works. Texts are not self-identical, but their ambiguous character – this is especially clear in poetical texts – functions in very precise and determinate ways. (*Radiant*, 149)

The third theme is about the textual dimensions / dementians. In "Marking Texts of Multiple Dimensions", McGann talks about the following dimensions in any text: 1) linguistic, 2) graphical/auditional, 3) documentary, 4) semiotic, 5) rhetorical, and 6) social (*Marking*). To be in line and consistent with McGann's work as a whole, we should not impose any heuristic distinction among these but see them as operating within a dynamic field. Also, we should remember that this model is applicable to both traditional and digital textualities and even other forms of language like oral expression, the second dimension, for example, includes oral forms of language. McGann suggests that other dimensions might be proposed or imagined and this is indeed tempting. I am thinking about the factors related to the logistic of reading (navigation, for example, or what we might call allied textual functions).

McGann's theories about texts show their heterogeneity and dynamicity but we are still unclear about what happens when the material conditions shift, especially with the migration of texts to the digital. Do they lose their material basis and become immaterial as the phenomenological experience of readers and some capabilities like transmissibility and reproducibility indicate? I propose viewing the shift in material conditions as a rearrangement of the textual landscape and its different elements or dimensions. I will come to this later, but first we need to understand the computer's mechanism in general and in processing textual objects in particular. Matthew

Kirschenbaum offers a full-fledged theory about the materiality of new media in *Mechanisms: New Media and the Forensic Imagination.* He talks about approaching the materiality of digital media from the specific vantage points of computer forensics and textual criticism from which there has been "very little consideration" (16). And before we look for evidence and counterexamples, like McGann's approach, Kirshenbaum goes on to illustrate another peculiarity in his approach, explaining the keyword in the title, "mechanisms": "Here I propose a close reading, a reading both close to and of a piece with the machine -- a machine reading whose object is not text but a mechanism or device" (88). This focus on the mechanism or device becomes clearer with the theory he proposes about materiality, and the binary classification into forensic and formal materialities which "are perhaps better brought to rest on the twin textual and technological bases of inscription (storage) and transmission (or multiplication)" (15).

The two categories are useful on many planes; first, forensic materiality, which exists on the physical level of inscription and represents the "potential for individualization inherent in matter," demonstrates that digital media is not only material in the general sense of having a material basis, but also in the specific sense of each object being unique and forensically tractable. But such an aspect of digital media is hard to notice simply because we have another level of materiality:

> A digital environment is an abstract projection supported and sustained
> by its capacity to propagate the illusion (or call it a working model) of
> immaterial behavior: identification without ambiguity, transmission
> without loss, repetition without originality. (11)

This capacity is another name for formal materiality, as defined by Kirschenbaum:

> Formal materiality thus follows as the name I give to the imposition of multiple relational computational states on a data set or digital object. Phenomenologically, the relationship between these states tends to manifest itself in terms of layers or other relative measures, though in fact each state is arbitrary and self-consistent/self-contained. (12)

Later and in one of the most important ideas in his study, Kirshenbaum illustrates how these computational states are imposed, i.e. by which "mechanism":

> These two properties of digital computation -- its allographic identity conditions and the implementation of mathematically reliable error detection and correction -- are what ultimately accounts for the immaterial nature of digital expression. My point is not that this immateriality is chimerical or nonexistent, but rather that it exists as the end product of long traditions and trajectories of engineering that were deliberately undertaken to achieve and implement it. The computer's formal environment is therefore a built environment, manufactured and machined, and it has as its most basic property the recursive ability to mimic or recapitulate the behaviors of other formal environments. (137)

Kirschenbaum cites Danny Hillis, who defines the "allographic identity" as "the implementation technology must produce perfect outputs from imperfect inputs" (qtd. in Kirschenbaum 133). To Kirschenbaum, this is "the most effective and important formulation of the nature of the digital" (133). I think that Kirschenbaum's

notion of "formal materiality" more comprehensively and specifically demonstrates the nature of the digital and computation in general. The "recursive ability to mimic or recapitulate" almost any formal environment gives the computer comprehensibility, but it also creates an assumption of immateriality.

Kirschenbaum also introduces a number of notions which, taken holistically, can further explain why code-based objects tend to behave immaterially, especially at the phenomenological level of the user's experience. The first notion is "system opacity", the fact that new media is removed from the human eye (40). At a later point, Kirschenbaum describes digital inscription as "a form of displacement" which "remove[s] digital objects from the channels of direct human intervention" (86).

In light of this observation, let us compare traditional books and their digital counterparts. Print books serve multiple functions. They are the "carrier' of the text and the platform of reading. On the sensory level, the experience of reading primarily involves sight and touch, direct intervention. With e-texts or e-books, the interaction is not completely direct and there is a loss of one sensory type of data, that of touching. The carrier and the platform are independent from the text. The text and its carrier do not seem to exist in one perceptual space. The electronic platform becomes a container of the text, rather than one with it, like traditional books. We tend to think of the text as immaterial because our notion of materiality is related to what is physically accessible, or that which has a complete sensory basis.

The second notion introduced by Kirschenbaum is "screen essentialism", which was coined by Nick Montfort to refer to "the prevailing bias in new media studies towards display technologies that would have been unknown to most

computer users before the mid-1970s" (31). However, display technologies have underlying paradigms and are not in themselves the target of the bias. Historically, the introduction of a display unit marked a revolutionary shift in computing because it made programming a computer "interactive". The screen replaced a fragmented set of input and output devices, and the programmer could then deal with one main unit of input/output. Another radical change that followed was the shift from verbal, text-based interfaces to visual or image-based ones. In HCI terms, direct manipulation replaced command lines. This meant that instead of "telling" the computer what to do, the user now did the thing with or on the computer, that is, he / she directly manipulated it. Alan Dix summarizes the significance of one of the first graphical interfaces, Sutherland's Sketchpad:

> Computers could be used for more than just data processing. They could extend the user's ability to abstract away from some levels of detail, visualizing and manipulating different representations of the same information. Those abstractions did not have to be limited to representations in terms of bit sequences deep within the recesses of computer memory. Rather, the abstractions could be made truly visual. To enhance human interaction, the information within the computer was made more amenable to human consumption. The computer was made to speak a more human language, instead of the human being forced to speak a more computerized tongue. (67)

The shift to visuality not only transformed computing but the relationship between the computer and the human. All this paved the way to usability as a result of the

elimination of the need to memorize complex command lines or syntax. Eventually, a clientele of "ordinary users" entered the scene. From then on, computing became mainstream, ubiquitous, and mass produced. Montfort's view, therefore, is partial as it ignores the larger context of the rise of display technologies which amounts to an epistemological shift in knowledge production.

Similarly, Kirschenbaum's note that "the graphical user interface is often uncritically accepted as the ground zero of user's experience" (34) also requires some elaboration and contextualization. The so-called WIMP interfaces (window, icons, menus, pointers) and GUI in general are based on the visual representation of tasks and represent a major paradigm shift that was mainly based on visuality and interactivity (direct manipulation and direct results) (Dix 171). These interfaces are built on the premise of an environment that two dimensionally simulates the real work environment, basically by activating a number of visual metaphors, the desktop, for example. Not only this, the specific mechanisms of interaction and user input are also simulated (the buttons, icons, folders). Alongside this, a hierarchy between these objects and their "real" counterparts is maintained, hence the binary soft / hard copy. A printing out which would give these objects an authentic and tangible form is always imminent. The GUI represents a type of reality that transforms information into images.

The previous paradigms lead to what Kirschenbaum calls "medial ideology", his third term, or the "uncritical absorptions of the medium's self- or seemingly self-evident representations" that results in "many of the plain truths about the fundamental nature of electronic writing apparently unknown at a simple factual

level, or else overlooked or their significance obscured. (45). On the ordinary user's level, such a medial view contributes to hiding the shift in material conditions since, as I pointed out earlier, we play by the computer's rules. We confuse the capabilities of computational methods, on a simple factual level, with deeper mechanisms and realities. A digital object that can be copied, edited, or deleted effortlessly looks immaterial because we take this behavior to be self-evident. On a fundamental level, of course, these objects have a material basis. On the specialist view of, say, literary critics, the medial ideology takes different forms. For example the docutext/cybertext dichotomy that assigns dynamicity only to digital texts originates form an uncritical absorption of new media representations.

Besides Kirschenbaum's notions, I add the notion of "visiocentrism" which I think is the paradigmatic basis of formal materiality (with its roots in formalism and geometry). I mean by this the centrality of the visual in computational representations (formal modeling/materiality). This takes place both paradigmatically, by centralizing form, and perceptually, by centralizing sight. Things are represented by a reproduction of their visual imprint -- scanning is prototypical here. Thus, a page on the screen is a rectangular white page, demarcated by virtue of visual differentiation.

As a concluding remark, I propose considering the outcome of migrating texts to the digital in terms of a rearrangement of the textual landscape. The formal modeling of the computer creates a break between the text and its platform and carrier. Therefore, the text seems to be independent of its forensic, physical basis, which remains, even if only seemingly, hidden, opaque, and undetectable. Another way to see this rearrangement is as a break between storage and multiplication. In

Hayles's words, we say that storage is now separate from performance (*My Mother* 164), and borrowing from Drucker, we say that the text and its configured format are no longer "inextricably intertwined" as is the case in print media (147). We can also say, with the help of Kireschenbaum's model, that these different elements/functions no longer exist in the same perceptual space. The physical/forensic is moved to another perceptual level of interaction, away from the human "naked" senses.

How can the understanding of materiality that has been gained from all these theories and models help in the practical agenda of this dissertation? It is useful first to remember that we are working within a humanistic endeavor and way of knowing which, as Kirschenbaum reminds us, "assigns value to time, history, and social or material circumstance--even trauma and wear" (23). Thus, discovering the materiality of digital media simply cannot be a "scientific" discovery. There is also need to understand the issue of materiality from the user's point of view, the phenomenological level. The different theories, especially Kirschenbaum's, help us see that digital texts have their artifactual existence (forensic materiality) and that they can be individualized. However, the significance of this fact on the phenomenological level, of the reader's experience, is limited, due to the rearrangement and the mechanism of formal modeling. True to its name, forensic materiality remains only forensically significant, and ordinary users will remain interacting with formal models, continually dissolving them.

Within the framework of these remarks, I am going to propose a hybrid model for understanding materiality and its relation to textuality. This model tries to combine the most relevant aspects in the theories previously discussed and their

underlying models. Drcuker's model, which responds to the paradox in Saussurian linguistics and its semiotic model as well as to the following critiques of this model, like the Marxian and Derridian, is a good starting point. Here she introduces this model:

> Such a model includes two major intertwined strands: that of a relational, insubstantial, and nontranscendent difference and that of a phenomenological, apprehendable, immanent substance. Each of these must be examined in turn, as well as the relation they have to each other in interpretation. The basic conflict here -- of granting to an object both immanence and nontranscendnece -- disappears if the concept of materiality is understood as a process of interpretation rather than a positing of the characteristics of an object. The object, as such, exists only in relation to the activity of interpretation and is therefore granted its characteristic forms only as part of that activity, not assumed a priori or asserted as a truth. (*Visible*, 42)

The model is obviously challenging, especially in terms of "tak[ing] into account the physical, substantial aspects of production as well as the abstract and system-defined elements" (43). But, as Drucker suggests, we can view materiality as an interpretational outcome, not an inherent, self-evident characteristic of objects. I see this as a working definition of emergence. This can tie with a later notion developed by Drucker, probabilistic materiality, meant to indicate "a shift from a concept of entity (textual, graphical, or other representational element) to that of a constitutive condition (a field of codependent relations within which an apparent entity or

elements emerges)". (150-1). In short, materiality is the outcome of a process, of the interaction of different elements.

Drucker's model has affinity with the concept of materiality developed by Katherine N. Hayles Here Hayles introduces her concept:

> I want to clarify what I mean by materiality. The physical attributes constituting any artifact are potentially infinite;[...] From this infinite array a technotext will select a few to foreground and work into its thematic concerns. Materiality thus emerges from interactions between physical properties and a work's artistic strategies. For this reason, materiality cannot be specified in advance, as if it preexisted the specificity of the work. An emergent property, materiality depends on how the work mobilizes its resources as a physical artifact as well as on the user's interactions with the work and the interpretive strategies she develops—strategies that include physical manipulations as well as conceptual frameworks. In the broadest sense, materiality emerges from the dynamic interplay between the richness of a physically robust world and human intelligence as it crafts this physicality to create meaning. (33)

Hayles stresses the fact that materiality is not an inherent, thus preexistent, quality but comes as a result of a form of human intervention, like interpretation. However, as Kirschenbaum notes, Hayles's model seems to exclude "formal materiality" or "the computationally specific phenomenon of formal materiality, the simulation or modeling of materiality via programmed software processes" (9). The space between

"physical properties" and artistic and "interpretative strategies" is wide enough to include formal materiality. However, what was lacking in Hayles's model is the intermediary, media itself and its technologies, most importantly the computer.

McGann's multi-dimensional model can also help in extending the notion of emergent materiality. McGann notes that his conclusion about the algorithmic nature of traditional texts should not be dismaying:

> What has this to do with the possibility of using digital technology to improve the study of traditional texts? The discussion may perhaps appear simply to have spun to a dismal conclusion about that possibility. But my argument is that we (necessarily) reach dismaying conclusions in these matters when we discount or miss the algorithmic nature of traditional text. (*Radiant*, 151)

However, there is one aspect that might be dismaying. By showing this algorithmic mechanism of traditional texts and the multiple layers of coding or dimensions, we might have reason to believe that, after all, the shift to the digital is not as complex as it is made to look like. The nature of texts is not radically transformed. Also, the fact that there are multiple dimensions/layers/codes at work in any text should mean that the shift in material conditions when texts are digitized is not that overwhelming or comprehensive as it influences some and not all layers. But again, such a realization can also be liberating.

We can see a dialogue between Kirschenbaum's binary classification and McGann's dimensions theory, while not failing to acknowledge their difference in focus: mechanism versus textuality, and the fact that McGann's model can apply to

both traditional and digital texts. The first observation is that we can easily align the documentary dimension with forensic materiality. It is interesting to see how formal materiality fits into any dimension, perhaps more into the linguistic and the graphical/auditional. Other dimensions, like the semantic, rhetorical, and social might well stay outside the binary categories, and thus, to a certain degree, away from the direct influence of computational processes.

Kenneth Thibodaux's classification of digital objects can too be engaged along these lines:

> Every digital object is a physical object, a logical object, and a conceptual object, and its properties at each of those levels can be significantly different. A physical object is simply an inscription of signs on some physical medium. A logical object is an object that is recognized and processed by software. The conceptual object is the object as it is recognized and understood by a person, or in some cases recognized and processed by a computer application capable of executing business transactions. (6)

The physical object is another conceptualization of the forensic/documentary level. The logical and conceptual categories could encompass the rest of McGann's dimensions. The concept of logical objects is close to formal and computational modeling.

I would like to end this part by proposing a hybrid model that is based on the following premises: first, that texts are multi-dimensional and heterogeneous and the relation among their various dimensions, codes of significance, or levels is not

heuristic; second, marking is interpretation and interpretation is marking, and third, everything comes as a result of the interaction, or the epistemological space created, between human beings and the world in the latter's attempt to create and assign meaning. Therefore, my model has two basic levels: the physical (substantial, forensic, documentary) and the human (interpretational, phenomenological, artistic, conceptual, insubstantial). On the middle ground and true to its name, lies media (and technology) as an intermediary and an indispensable element. Here is a table that illustrates this model:

Table 1
Model for the Multidimensionality of Texts

	THE WORLD	MEDIA/TECH	HUMANS	
Thibodaux	Physical object	Logical Object	Conceptual Object	
McGann	Documentary	Graphical	Linguistic, Rhetorical	Semantic, Social
Kirschenbaum	Forensic Materiality	Formal Materiality		
Drucker	Physical/Substantial	Material	Interpretational/Insubstantial	

It can be noted that some dimensions, categories, lie in-between different levels and that formal materiality encompasses a large space that includes media and humans and thus a spectrum of dimensions. This is a good illustration of the computer's powerful position due to its ability at formal modeling which gives it comprehensibility. This model will be a major guideline in the following parts of this dissertation.

The Impasse of E-Book Design

In the early 1990s, after stressing the fact that the computer needs different conventions from those for print, Jay Bolter made this announcement:

> The electronic book must instead have a shape appropriate to the computer's capacity to structure and present text. Writers are in the

process of discovering that shape, and the process may take decades, as it did with Gutenberg's invention. The task is nothing less than remaking the book. (3)

The book and almost all cultural and social forms have been being remade, and this remaking is indeed a process of discovering. We might disagree on the evaluation of a certain e-book interface but we can easily agree that it is not the ultimate e-book. What this also indicates is frustration with current results especially as compared to the early hype. This might be due to technical limitations. Our task, though, is to point out the underlying models and paradigms that ultimately guide the technical choices. To bypass the current impasse and discover a new form for the e-book, an alternative approach is required.

The conclusion of the previous section about emergent materiality is one starting point. A general guideline, therefore, is the acknowledgement of the multidimensionality and heterogeneity of textual forms, especially the book. The traditional book has a conceptual, virtual or phenomenal existence (Drucker 169). Similarly, it creates, alongside its physical space, a "conceptual space in the minds of writers and readers" (Bolter 85). The page, for example, should be seen as "a complex series of marked and unmarked spaces" (McGann *Radiant*, 176). We cannot deal with the book as a monolithic, one-dimensional form.

The paradigms that have handicapped e-book possibilities need to be revised. A major one is striving after perfect emulation of the traditional book. This leads to the fact that "electronic presentation often mimics the kitschiest elements of book iconography, while potentially useful features of electronic functionality are

excluded", and e-books simply are designed "to simulate in flat-screen space certain obvious physical characteristics of traditional books" (Drucker, *Speclab* 166-7). In addition, the belief that underlies perfect emulation which states that simulation is simple and complete reproduction is fraught with misapprehensions about computation and materiality, especially in its formal dimension/modeling which forms the basis for simulation.

Understanding the evolution of books in the context of writing technologies is also a necessary step before reaching a better model for designing e-books free from misconceptions**.** The e-book belongs to a cluster of e-hyphenated genres which, as their names show, maintain the connection with old forms, and this has brought theses old forms into new light. Now we understand the book as a technology, and a historically situated form. As Landow says, the advent of hypertextuality has enabled us "to see the book as unnatural, as a near miraculous technological innovation rather as something intrinsically and inevitably human" (25). This view, that can be termed historical, historicist, or, following Foucault, archaeological, has paid off, and it builds on previous attempts at understanding language technologies, especially writing -- for example, Walter Ong's study of orality and literacy discussed earlier. Writing, and then print, as Ong shows, has shaped the evolution of art and literary genres, and contributed to the rise of modern science, in addition to their role in forming the reading activity itself and bringing about "a clientele of reading public" (135, 158). With this realization, it is easier to see why the book is a "near miraculous innovation." However, as Ong's argument demonstrates, the book's comprehensive

and massive impact is inseparable from the technological and material specificity of writing and print.

As Landow's previously quoted comment shows, the computer technology has exposed the technological nature of books, which resonates well with McGann's theory about the algorithmic nature of texts. The computer is another addition to a cluster of technologies, each of which has its own possibilities and limitations. The shift from one to the next technology can be a form of intermediation, using Bolter's term. Sometimes we tend to overstate the impact of the latest technology. Thus, Hobbes reminds us that "print is only a phase in the history of textual transmission, and that we may be at risk of over-stating its importance" (Quoted in McKenzie 62). The same can be said about the computer especially in terms of seeing it as radicalizing the nature of texts, an assumption we should be cautious about.

These language technologies are supposed to "technologize the word" in Ong's terms, or to mark and encode natural language, in McGann's terms:

> Print and manuscript technology represent efforts to mark natural language so that it can be preserved and transmitted. It is a technology that constrains the shapeshiftings of language, which is itself a special-purpose system for coding human communication. Exactly the same can be said of electronic encoding systems. In each case constraints are installed in order to facilitate operations that would otherwise be difficult or impossible. ("Marking Texts")

Writing, and therefore, its different types of impacts on the word, thought, and consciousness, evolved with each technological modification. This is why Ong makes

a differentiation between the overall impact of writing and that of print: writing "moves speech from the oral-aural to a new sensory world, that of vision" (85), while "print both reinforces and transforms the effects of writing on thought and expression" (Ong 117). Furthermore:

> Print situates words in space more relentlessly than writing ever did. Writing moves words from the sound world to a world of visual space, but print locks words into position in this space. Control of position is everything in print. (121)

Though each of the language technologies has its own uniqueness, the computer still poses a challenge and it is safe to consider it a special case. The following generalized classification that fits the computer easily with other "techniques of writing" should be reconsidered: " This new medium [the computer] is the fourth great technique of writing that will take its place besides the ancient papyrus roll, the medieval codex, and the printed book" (Bolter 6). There is no problem is classifying the computer as a writing technology, but we need to affirm that the computer is at least a unique technology, and in this sense, it does not perfectly fit in this teleological rendition of writing techniques. While the roll, the codex, and the print book are all inscription technologies, invented for the sole purpose of technologizing the word, the computer is just marginally a writing technology. Because the computer's uses, unlike print, are diverse and are not centered on writing, its effects are not simply a matter of "reinforcing" in the way print has reinforced writing. This is another reason to discard perfect emulation. Being used for writing -- and reading -- is a byproduct of the computer's complex

mechanism of operation and susceptibility to different uses, exemplified by formal modeling, and as illustrated in the first chapter of this dissertation. Kirschenbaum expresses a similar idea here:

> My argument, then, is this: computers are unique in the history of writing technologies in that they present a premeditated material environment built and engineered to propagate an illusion of immateriality; the digital nature of computational representation is precisely what enables the illusion – or else call it a working model – of immaterial behavior. (*Mechanism*, 135)

The uniqueness of the computer as a writing technology is that it is a "built" writing environment, based on formal modeling. The computer is a writing technology by way of modeling the print environment. This complicates things by rearranging the relations among the different dimensions of the text, as explained in the previous part.

Like all cultural forms, books serve, and reflect, dominant traditions of knowledge production and circulation. Drucker refers to the scholastic tradition as the context for the invention of many features that have become traditional and iconic. She states that these "formal features have their origin in specific reading practices", and they are also "functional, not merely formal" (171). This brings us to the conclusion that perpetuating forms means preserving, albeit indirectly, certain practices and condition of knowledge production. The implication here is that the book and its features are multi-dimensional and we cannot be preoccupied with one or few dimensions at the expense of others. A comprehensive, and hybrid, model is needed.

To further illustrate some of the previous points and show some complications when migrating from one medium to the other, let us take the page as an example. The page is a space, both physical and conceptual, where words are locked and controlled. Its rectangular shape is basically the outcome of engineering considerations related to efficiency, economy, and usability, in addition to features related to alphabetic writing like linearity. The page is also a unit of measurement and a tool for navigation; it marks a specific, measurable point in the whole artifact (through its number). It also, individually and collectively, serves as a lever for navigating within the artifact through flipping. The rectangular shape besides the material and physical qualities of paper allow all these functions. The attempt at simulating the page digitally is based on a misconception that form is ideal and can abstracted from its material condition, thus a paper can be modeled on screen. The resulted rectangular space that represents a page, whether created through photocopying, scanning, or simulating like pages in Word or other word processors, simply CAN NOT function as it does in print: "The replication of such features in electronic space, however, is based on the false premise that they function as well in simulacral form as in their familiar physical instantiation" (Drucker 173). Of course this is different from claiming that the same functions cannot still be achieved in the digital medium–again with a certain acknowledgeable loss. We need, following Drucker, to differentiate between functionalities and forms with the latter being reproducible. This is why scrolling for example, which achieves the functionality of navigating, has been the more plausible choice for online texts whether the page space is simulated or not.

The previous insights and conclusions should be translated into guidelines and then technical choices, which collectively comprise the alternative approach. Johanna Drucker's suggested approach can be a good starting point:

> 1) start by analyzing how a book works rather than describing what we think it is, 2) describe the program that arises from a book's formal structures, 3) discard the idea of iconic metaphors of book structure in favor of understanding the way these forms serve as constrained parameters for performance. (170)

The first two steps can be achieved via the theoretical model for materiality I proposed previously. A description of the book's functionality and formal structure can be difficult if taken in a generic sense that includes all books. This is reason to consider being specific.

Specificity is another guideline that can be added. Acknowledging all the complications when migrating to the digital should lead us to be specific. In other words, because designing an e-book that perfectly emulates the traditional book, that is, which has the ability to perform all of the latter's complex functions and uses, is not possible, we had better be more specific. This goes in line with Catherine Marshall's sound conclusion at the end of her study about electronic books:

> The lesson to take away from these examples is not to throw up our hands in frustration and limit development to building the perfect paper emulator; there would be little point in that … instead of developing the perfect paper emulator, we can develop capabilities based on our understanding of specific disciplinary practices, specific

types of reading, and specific genre of material. We can tame the

vagaries of our imaginations by checking in with our readers. (148)

The target will be specific and independent "capabilities." This would also encourage

targeting those capabilities specific to the digital medium, in this case, beyond the

book capabilities. This requires a re-aligning of each of these capabilities with textual

dimensions to see how the shift influences them.

This alternative approach can also be an opportunity to rethink the social role

of the book and its genres. Marshall makes a similar point while citing Dominick in

the context of discussing the genre of textbooks:

The important lesson to take away here is that there is little point in

carrying an unsuccessful genre forward from print to digital. Rather,

this transition might provide exactly the right opportunity to rethink

the form and its social role. As he winds up his dissertation, Dominick

predicts that in two generations, textbooks as we know them will

disappear completely. (137)

Of course the disappearance of textbooks that Dominick talks about refers to the

gradual replacement by new rising genres. It goes without saying that we cannot talk

about new genres independent from a new set of pedagogical paradigms.

Partnership / Cyborgism

In addition to the concepts I have so far developed about textuality and e-book

design, some notions within computer science need revision. This is necessary since

practically the fields of DH and digital literary studies exist on an interdisciplinary

plane, besides the fact that the kind of insight that humanists can offer is illuminating.

For this purpose, in this part I will be proposing a different paradigm for the human computer interaction that stems from rethinking the relations between humans and the computer as one of partnership, or the term I am suggesting, cyborgism. The partnership paradigm is an alternative approach both to the idea of the computer as an aid and the computer as a prospective super-machine with human-level "intelligence". Both ideas are limiting and entail the expectation of maximum reduction of human effort. On the other hand, we regret the fact that the computer is still behind in advanced functions and indulge in science fiction scenarios about artificial intelligence.

As noted in the first chapter, the computer human interaction is a special kind of interaction because the user's role is substantive or nontrivial and also consistent. Unlike other machines, the computer operates collaboratively with its human user. Interfacing in personal computing can be understood as a two-way channel that translates between human perception and machine operations. Thus, an alternative way is to think of the computer human relation as a complementary one, hence the significance of the term "cyborgism" which denotes hybridity and complementariness. It is useful to note that this view is not totally new as it might be found in use, albeit as an understood principle. However, the potential for partnership and cyborgism is yet to be discovered.

The dominant interaction paradigms in HCI, which extend the theory of ergonomics, start from the dichotomy of the human versus the system. Besides the expectation of total automation on the part of the machine, a compartmentalization of skills and tasks and a hierarchy ensue from such a paradigm: The human is

responsible for high level actions like formulating goals, interpretation, and then evaluation, while the computer, the system, is left with "lower" actions like the execution and then presentation of tasks.

As Dix et al show, the main interaction paradigm in HCI is Donald Norman's framework in which interaction is defined as "the communication between the user and the system" (125). The typical scenario in this model goes as follows:

- user establishes the goal

- formulates intention

- specifies actions at interface

- executes action

- perceives system state

- interprets system state

- evaluates system state with respect to goal (126)

The dichotomy and the hierarchy are evident in this model. The user establishes, formulates, specifies, and later on interprets and evaluates. Let us remember that this model was originally proposed to apply all machines or systems, and then it was adopted in HCI, a fact that indicates the assumption that the computer's mechanism of work is not significantly different from that of other machines.

Norman's model also includes an explanation of the emergence of problems during the interaction. There are two situations for this:

1. The user's formulation of actions may be different to those actions allowed by the system--"gulf of execution"

2. The user's expectation of the changed system state may be different to

the actual presentation of this state- "gulf of evaluation" (126)

As Dix notes, Norman's model "concentrates on user's view of the interface only"

(127), and this is another consequence of the underlying dichotomy and hierarchy.

Abowd and Beale's is the major adaptation of Norman's model in HCI. It is

shown in this figure:
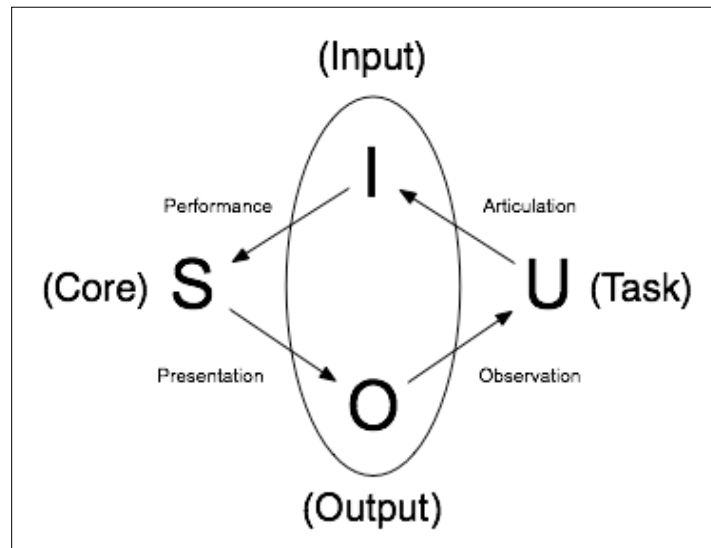
Fig. 1. Abowd and Beale's Adaptation of Norman's Model

The same kind of compartmentalization which is evident in Norman's exists here

with two distinct realms: the system / core and the User / task. The latter articulate

and observes while the former performs and presents. The alternative approach I am

proposing requires a different paradigm with less rigidity in the division of roles

between user and machine, leading to the exchange and oftentimes reversal of roles.

Let us see what happens if we reverse this model, substituting S for U:
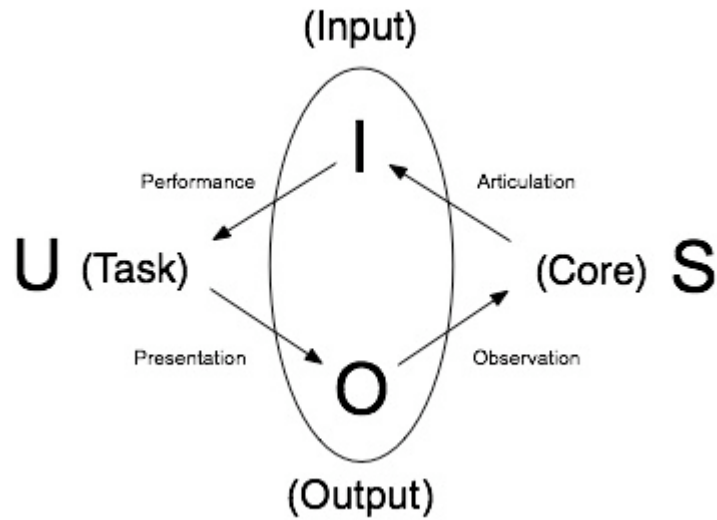
Fig. 2. Reversal of Abowd and Beale's Model

Simply, there is a reversal of roles with the user becoming the performer of the task and the system the observer. Such a model is hard to imagine because of the assumption that the machine is unable to do the tasks usually done by the user. This very assumption is a direct outcome of the strict division between user and system which demarcates two separate sets of skills that cannot be exchanged, which is not the case if we consider the advanced functions that the computer performs that can be easily aligned with the ones expected from the user. But if the rigidity of this dichotomy is replaced by flexibility and the understanding that each party can play different roles at different points depending on the task in question, the claim that the computer is unable to perform certain tasks disappears.

To illustrate the previous points, I propose the following adaptation of the Abowd and Beale framework:
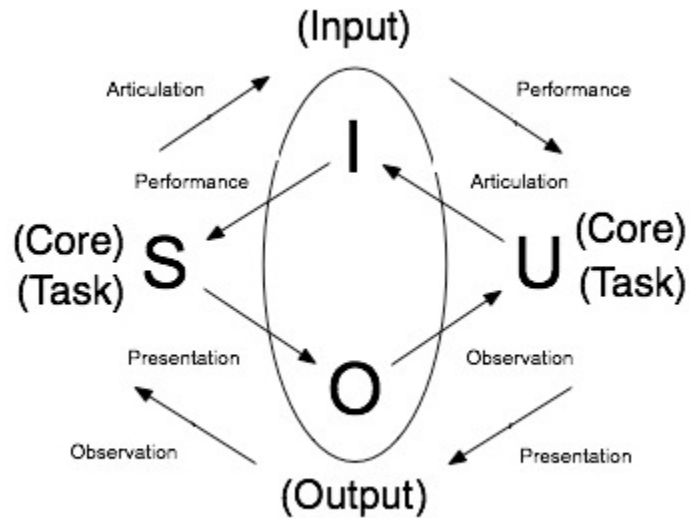
Fig. 3. Adaptation of Abowd and Beale's Model

Both parties exchange roles depending on the task at hand. This would mean a division of labor between man and machine: "who" can do which better. The computer is not supposed to work independently but in a self-consciously interactive environment that allows both parties (human and computer) to share and exchange information and insight. Successes and failures would thus be judged from the same collaborative perspective. Ultimately, both could enhance and augment each other's abilities, which results in more efficiency.

This can also be a way to circumvent the computer's inability to perform certain tasks, especially those which computers are unlikely to be able to do in the near future. Thinking of the computer as a partner means sharing the skills with the human user towards the execution of tasks on equal grounds that lead to better performance. Therefore, the computer can "resort" to human abilities whenever needed; consequently, the gap in abilities will be bridged. A similar concept is

"human computation," developed by Luis Von Ahn. This is how he introduces the basic idea:

> We focus on harnessing human time and energy for addressing problems that computers cannot yet tackle on their own. Although computers have advanced significantly in many respects over the last 50 years, they still do not possess the basic conceptual intelligence or perceptual capabilities that most humans take for granted. By leveraging human skills and abilities in a novel way, we hope to solve large-scale computational problems that computers cannot yet solve and begin to teach computers many of these human talents. …In this paradigm, we treat human brains as processors in a distributed system, each performing a small part of a massive computation. (11)

What Von Ahn does in "human computation" is that he recognizes the difference in abilities between humans and computers and integrates the former's into the computer's operation. Von Ahn goes on to illustrate specific ways to accomplish this scheme, like the famous CAPTCHA which is a way to make sure the generator of the response is a human not a machine. We are all familiar with this tiny test whenever we are asked to type in letters and numbers form a distorted image. There are other applications to which human computation is put in use but the main idea is to make use of the manpower abundantly available online to "help" the computer perform tasks it is not yet able to do.

Although the process is called human computation, the human contribution is not independent from that of the machine. In fact, it would be meaningless without

the presence of the machine. There is an execution cycle that starts and ends with the machine. The human "interference" comes to fill in the gap in the machine's ability. Let us take the example of an instance of CAPTCHA, represented in the following diagram that I have prepared for this purpose (also based on the Abowd & Beale framework):
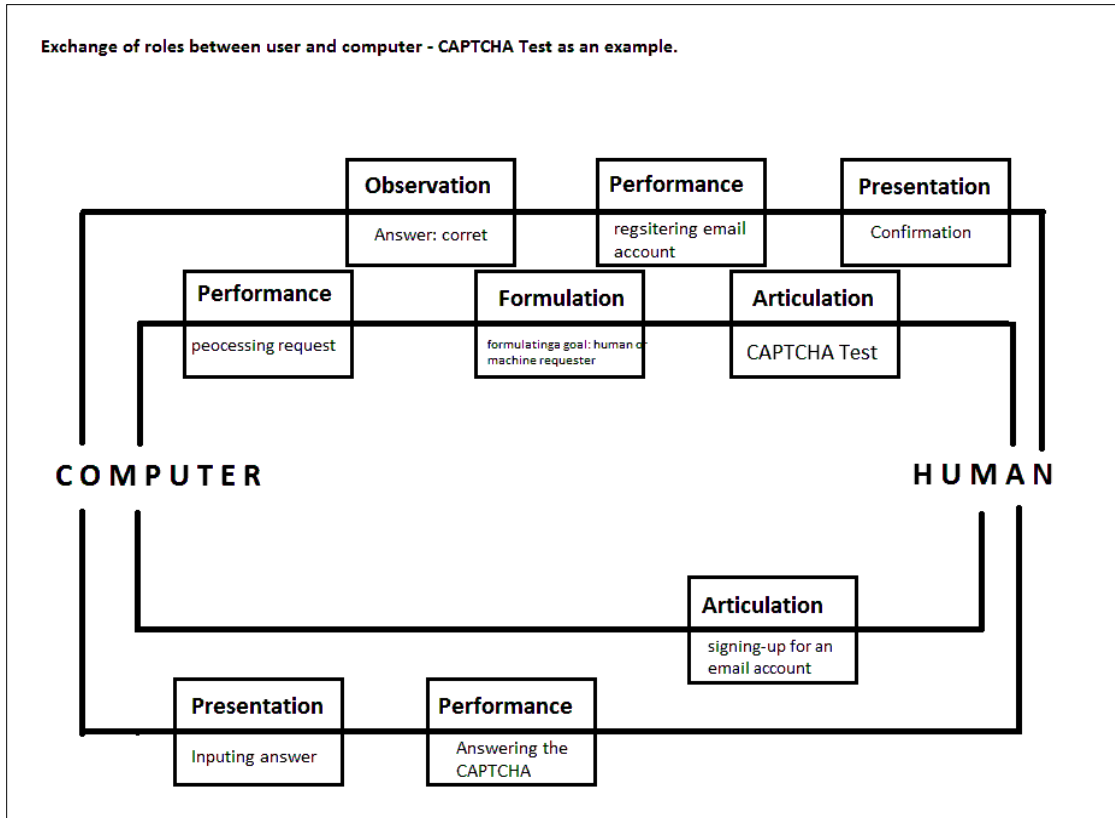
Fig. 4. Exchange of Roles in CAPTCHA

Both ends of the process, the human and the computer exchange roles: the human starts as usual by articulating an objective which he/she observes and evaluates after the computer performs it. This traditional cycle is broken when the computer begins a new cycle by articulating a new sub-objective and sends it to the user to perform. The user is expected to perform and then present the task, answering the CAPTCHA in this case. This shift in roles allows the computer to resort to human skill to help in

executing the task, or meta-task, deciding whether the requester is human or machine. After obtaining the needed info, the computer returns to the usual cycle, performing and then presenting the results.

Machine translation provides a tangible example for the application of the principle of partnership. If we look at the current software for machine translation, we will notice the limiting influence of the automation-at-all-costs requirement that I talked about earlier. The machine is "left alone" to do the tasks, and the human's role is to provide the input, usually by a simple procedure like copy-paste. An alternative and definitely more efficient model would be a collaborative one which would include tools that enable the program to ask for feedback from the user on challenging issues, usually those that cause faulty translations, and this should be throughout the translation process.

Scoring test software is another example for showing how partnership is already in use as an understood principle. I recently had an experience of working with a test scoring program. The interface includes a scanned image of the answer and scoring criteria. Besides saving the scores, the software provided statistical data, like the distribution of grades for each scorer and agreement rates among scorers (10% of papers were doubly scored). Scoring is thus part computerized, part human due to the fact that both parties are efficient in different, but complementary skills. Human scorers are needed to read the answers which vary in their legibility and comprehensibility and decide on a specific score. Such a skill is unthinkable by a computer (except with a very limited level of accuracy). Partnership in this example is understood. The computer and the human are partners in the execution of the task,

scoring tests. The computer provides accuracy, speed, and reliable statistical data (which can be built upon towards interpretative and managerial decisions regarding the evaluation of scorers and prospective results), while its human partners perform the interpretative and evaluative tasks.

The view of human brains as processors in a massive distributed system voiced earlier by Von Ahn touches upon the same issue of partnership, though on a larger-scale and for specific tasks. The same concept can be applied on a smaller scale with one user, one computer but with a wide spectrum of uses. However, I am reluctant to use the now classical analogy between brains and processors, which in fact is reciprocal: brains are compared to processors and processors to brains, because it can be misleading. This analogy, as Paul Thagard shows in *Mind: An Introduction to Cognitive Science*, is the dominant one in cognitive science. The hypothesis that stems from this analogy is what he calls "CRUM", which stands for *Computational-Representation Understanding of Mind* (10). Thagard summarizes this central hypothesis in the following way:

> Thinking can best be understood in terms of representational structures in the mind and computational procedures that operate on those structures…CRUM assumes that the mind has mental representations analogous to data structures, and computational procedures similar to algorithms. Schematically:

Program   Mind

Data structures + algorithms = running   Mental   representation   +

programs   computational procedures =

thinking

(10-11)

There are two major components that link mind and computers: representation and computation. In the case of the computer, things/events/entities/problems are represented by data structures, which are mirrored by the mental representations of the mind. Those are processed by computational procedures or algorithms, in other words, a set of instructions. Formal logic underlies this model, and anyone familiar with AI would understand the massive influence of this model and its underlying assumptions. Prolog language, which is based on the concept of knowledge representation, exemplifies this trend.

The biggest challenge for CRUM and its branching trends has been how to reduce the complexity of the human experience to formalized structures:

> CRUM seems to restrict thinking to computational processing occurring in the mind, ignoring the fact that most of what people do involves continuous and rich interaction between their bodies and the world-at-large. (Thagard 191)

As a result, several alternative approaches have been proposed. One example is Narrative Intelligence (NI), which integrates narrative and storytelling into the design of agents. NI is an interesting example because it is built on the premise of adapting and borrowing modes of knowledge production from the humanities, design and the arts (Mateas and Sengers 4). NI has the following streams of influence: Art, Psychology, Cultural Studies, Literary Studies, and Drama (10-13). It is evident that

NI is an approach that has sought inspiration from outside the CRUM hypothesis by integrating experiential or non-cognitive aspects into the design of "intelligent" agents, and these aspects can "fruitfully inform technological conceptions" (Mateas and Sengers 14).

The basic concept of emergent materiality as discussed in the previous chapter can itself be the basis for an alternative approach to CRUM because it starts from the recognition of the interactive context between humans and the world from which everything emerges. Besides that, emergent materiality acknowledges the importance of material or non-cognitive factors in cognitive functions like interpretation, which, as a result, cannot be exclusive to mental processes. The same idea is expressed in some philosophical and critical approaches that view knowledge as embodied rather than disembodied, for example Katherine N Hayles in *My Mother Was a Computer* and Mark B Hansen in *New Philosophy for the New Media*. Similarly, partnership/cyborgism starts from a rejection of CRUM and its underlying analogy which foregrounds independence and parallelism between humans and computers, and thus, limits interactive possibilities. The mind does not exclusively work in a representational/computational manner. Similarly, the emulation/copying of the brain/mind and their mechanism are not the best path for the computer as it brackets off significant factors.

Thus, we have two ways to view the computer/human, mind/program relation: as hierarchical division and separation of tasks or as collaboration. The significance of the choice goes would have formative implications on interface and software design whose objective should not be the removal of human effort but the

best way to integrate and channel human abilities. Von Ahn's "human computation" and its model can thus be extended if we start to think of human contribution as a central, welcomed, and consistent element. In short, the machine should be allowed to resort to the human ability whenever there is a challenge.

Besides cyborgism, which entails an autopoietic relation between computers and their users in which the two become one massive system of processing and evaluating information, I also propose the term "incremental intelligence" to describe the same approach. Like narrative intelligence which includes stories in the design of intelligent behavior, partnership is based on an incremental view of machine intelligence as a progressive process not a final stage. The computer should be allowed to build its intelligence accumulatively through its interaction with human beings. This notion has affinity with the main concept in machine learning which states that machines can learn; in other words, they can acquire skills. We can extend machine learning with the partnership/cyborgism paradigm in order to make the human user a main source of learning for the machine rather than just a "mentor." I will try to show this principle in practice through the iNovel prototype.

CHAPTER III

THE REBELS AGAINST THE REPUBLIC AND THE REGIME: ICRITICISM

MUST BE THEORIZED

I propose iCriticism as a new and alternative approach in English studies. The term echoes the trend by Apple devices (iPad, iBook, iPhone..etc) and this is meant to be part of the term's significance and connotation but, basically, I want the term be an alternative to the, now overused, "e" prefix. One aspect of this is that the letter "i" does not stand for a single word but a network of notions represented in a triangle of words "interactive / interactivity," "intelligent / intelligence," and "innovative / innovation". These are meant to apply as one complementary unit; for example, interactivity that is both intelligent and innovative is shown in the partnership paradigm I introduced earlier. Within this framework, iCriticism aims at intelligent, interactive and, above all, innovative uses of the computer.

To reach this goal, I will use the notions and ideas introduced so far about materiality and partnership as foundations for iCriticism and move on, in this part, to define iCriticism and summarize its main principles and concepts. By way of introduction, I will discuss some of the main sources, inspirations and influences of iCriticism. The first one is parallel or similar projects in the field, namely, Johanna Drucker's Speculative Computing, Katherine N. Hayles's Media Specific Analysis, and Marcel O'Gorman's "Hypericonomy." I follow this with a general review of some digital tools for literary and textual analysis. I will also introduce the theory of funology from which I am adopting some paradigms besides discussing some aspects

of text encoding, which forms the basis of marking texts digitally. This will pave the way for iNovel, the prototype I will be describing in the last chapter.

Parallel Approaches

iCriticism builds on previous efforts by critics and theorists in the field. As an approach that claims to provide new insight for the uses of the computer within the field, iCritical theory will be drawing considerably from the theories and approaches that included a great extent of innovation. One of these is "Hypericonomy".

In *E-Crit: Digital Media, Critical Theory and the Humanities*, Marcel O'Gorman proposes Hypericonomy as a new approach informed by the dialogue between new media and literary theory. Hypericonomy comes in response to what O'Gorman sees as a discrepancy between new media and scholarly practices. The paradigm shift in Hypericonomy is towards a "pictorial turn":

> The goal is…to establish the painting as a node onto a web of epistemes, or information circuits, if you will. In this way, the painting interrogates culture, rather than vice versa…pictures are not pictures, but discursive inlets and outlets. (19)

O'Gorman allies his approach with "post-hermeneutic" theory following Gregory Ulmer and Fredrick Kittler. In this sense, the pictorial turn centralizes the other of scholarly discourse:

> Pictorial modes of representation are the other of scholarly discourse…By focusing on pictures in a new mode of scholarly discourse, I am not necessarily recommending a radical revolution but,

in some ways, a restoration of a holistic humanities-spurred formal

experimentation in the sister arts. (36)

In his argument for hypericonomy, O'Gorman does many things: first, he

reveals the discrepancy between "scholarly procedures and contemporary modes of

storage, recall, and representation" (9), and embarks on narrowing the consequent

gap; second, he proposes some uses of new media beyond digitization and visual

representation (12) (which are self-limiting); third, he points to dominant paradigms

and suggests alternative ones: "the sequential exposition and logical argument," for

example (42), and fourth, he calls for new genres/forms: for example, the hypericon,

which is "a generative, multi-directional passageway" (22) and associational

networks instead of the linear sequential essay (42).

Much like Landow's project in *Hypertext*, O'Gorman's sees new media as a

translation of poststructuralist thought. In general this is the theoretical framework of

DH which, "extends the theoretical questions that came into focus in deconstruction,

postmodern theory, critical and cultural studies, and the theoretical inquiries of recent

decades" (Drucker, *Speclab* 6). However, the important contribution by O'Gorman,

besides the four points delineated above, is that he describes a full-fledged approach

with a set of pedagogical tools. He does so by blending pictorially-based forms and

new media capabilities to counter the dominant practices, represented in Kittler's

notion of "The Republic of Scholars":

> This republic of Scholars extends at least as far back as Peter Ramus,
>
> the father of scholarly method, and its presence can be traced in many
>
> places ever since: in the simultaneous emergence of print technology

and scholarly method; in Enlightenment rationality; the information of a literary 'canon'; and finally, in the spread of Kantian critique, which is still being practiced in the various mutations of hermeneutics, textual scholarship that is prevalent in the humanities today. This Republic of Scholars, with its faith in transparent language, scientific proof, and the text-based, linear, sequential essay, provides the methodology and discourse for all who wish to maintain affiliation within the academic apparatus. (24)

Such a historical understanding of dominant practices is preliminary to proposing alternative ones. O'Gorman points to a symbiotic relation between print technology and scholarly methods and forms. The genre that the hypericon is meant to rival can be characterized as text-based, hermeneutic, linear, sequential, and rational. By contrast, the hypericon is picture-based, associational, and non-sequential. In short, O'Gorman rebels against the Republic by using its marginalized population and enlisting new media.

O'Gorman's hypericonomy calls to mind Johanna Drucker's Speculative Computing. O'Gorman himself points to "a new mode of academic discourse [that] lies between Drucker's 'serious' theoretical work and her artist's books" (37). The linking thread here is the engagement with visual and graphical aspects of language. As illustrated in the first chapter, Drucker proposes aesthesis and graphesis as "a serious critique of the mechanistic, entity-driven approach to knowledge that is based on a distinction between subject and object" (21) and "a theory of partial, situated,

and subjective knowledge" (xiii). O'Gorman's approach, like Drucker's, helps demonstrate the computer's adaptability and susceptibility to different agendas.

Drucker also contrasts SC to digital humanities in which the central concept is "the requirement to disambiguate knowledge representation so that it operates within the codes of computational processing (5) via the "statistical processing, structured data, metadata, and information structures" (9). The encounter between the Republic and the Regime of computation has defined DH:

> Humanists are skilled at complexity and ambiguity. Computers, as is well known, are not. The distinction amounts to a clash of value systems, in which fundamental epistemological and ideological differences arise. Digital projects are usually defined in highly pragmatic terms: creating a searchable corpus, making primary materials for historical work available, or linking such materials to an interactive map and timeline capable of displaying data selectively. Theoretical issues that arise here, therefore, intimately bound to practical tasks, and all the lessons of deconstruction and poststructuralism--the extensive critiques of reason and grand narratives, the recognition that presumptions of objectivity are merely cultural assertions of a particular, historical formation – threaten to disappear under the normalizing pressures of digital protocols. (7)

This note can help us to see how Hypericonomy is O'Gorman's attempt at resisting these normalizing pressures. Another implication is that DH might include a revival of pre-structuralist paradigms, like formalism for example, and we will see this when

we discuss digital tools. Drucker details the contrast between SC and DH in the following table (*Speclab* 25):

Table 2
Attributes of Digital Humanities Versus Speculative Computing

Digital Humanities	Speculative Computing
Information technology/formal logic	Pataphysics/the science of exceptions
Quantitative methods (problem solving approaches) (practical solutions)	Quantum interventions (imagining what you do not know) (imaginary/imaginative solutions)
Self-identical objects/entities (subject/object dichotomy)	Autopoiesis/constitutive or configured identity (codependent emergence)
Induction/deduction	Abduction
Discrete representations (static artifacts)	Heteroglossic processes (intersubjective exchange/discourse fields)
Analysis/observation (mechanistic)	Subjective deformance/Intervention (probabilistic)`

This table helps us see that the paradigm shift brought by SC is systematic and comprehensive.

Media Specific Analysis (MSA) proposed by Katherine N Hayles in *Writing Machines* is another approach that provides important insight on the uses of the computer for studying literature. There are two main notions that Hayles introduces: Material metaphor "a term that foregrounds the traffic between words and physical artifacts" (22); and Technotext, "a term that connects the technology that produces texts to the texts' verbal constructions" (25). MSA is built on the premise of paying more attention to the materiality of the medium and its specificity, insisting that "exts must always be embodied to exist in the world. The materiality of those embodiments interacts dynamically with linguistic, rhetorical, and literary practices to create the effects we call literature" (31). So, literature is an emergent effect, and this is a bold and insightful claim. Later I will show the position iCriticism takes in relation to all these theories. It is one of extending, building on, and adopting.

Besides this review of some critical approaches and theories, a look at some applications in the form of digital tools is useful before theorizing iCriticism.

Review of Select Digital Tools[1]

A famous Arab proverb says that "it is foolish to try what has been already tried". To avoid this, a review of some of the available digital tools is necessary. As these tools are diverse, here is my classification of them:

    A. Stylometric tools in the manner of computational linguistics.

    B. Virtual realities and Games.

    C. Multimedia, intermedia or meshing of media.

    D. Hypertextuality.

A brief review of a select number of them, those that represent the major trends would be useful in in terms of spotting the lessons that can be learned and the underlying paradigms that control the design of these tools.

    A. Virtual Reality and Games

In *Teaching Literature in Virtual Worlds*, Allen Webb, the principal investigator at WMU Literary Worlds, defines a literary virtual world as "a computer simulated environment interpreting a literary source text or texts" (1). The book, which is a seminal study of virtual reality and literary studies, includes the following typology of virtual worlds: 1) Role-play stage, 2) Alternative reality, 3) Second world, 4) Textual riff, 5) Intertextual map, 6) Virtual tour, and 7) Virtual Museum (11-12). What is common among this diverse set is that each one is an "interpretation" of the original texts in addition to being a pedagogical tool (it is

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[1] Part of this section is adapted from a previous research I did as the final project in an E-Crit course at IUP (2009). The original research is available on this website: <http://waysunimaginable.comuv.com>

meant to help student learn something about the text). They are better thought of as adaptations of the texts, much like film versions: "In some sense, like an artwork or movie, Literary Worlds combine the way text can show us what an author wants us to see, yet with the ability to choose a path around in the space" (162). Pedagogically, the use of virtual worlds in teaching novels starts from a number of principles like "learning by doing approach," and the emphasis on "the activity of the learner and the development of motivation, independence, and autonomy" (Webb 3). The use of virtual reality to teach novels is also based on two elements: the parallelism between novels (texts) and computer games (159), and the fact that readers identify with the characters (161).

B. Textual Analysis and Stylometric Tools:[i]

These tools are mainly built to "crunch" texts in the manner of computational linguistics, either by creating tables of co-occurrences, distribution lists, or morphological, lexical, prosodic, and narratological criteria. This applies to widespread tools like *HyperPo*, *WordHoard*, and most tools in *TAPoR*. The empirical focus of these tools might point to an implicit tendency towards reviving "traditional" theories, like Formalism, Structuralism, and New Criticism. Theoretically speaking, textual analysis is based on the premise that statistical data retrieved more easily by a computer can be used towards some interpretative conclusions:

> Lexical and vocabulary studies can also be used to investigate themes, imagery, and the like. Care needs to be taken with these studies since the computer can only find specific instances of words or phrases, unless the text has been encoded with interpretative material which can

be a lengthy process or reflect one scholar's viewpoint which must

then be explained. (Hockey 72)

However, such an assumption about the limited capacities of the computer in relation to the objectives of literary criticism is not as simple as it might sound. Underlying is a deeper question about "the difference between what we think can be measured and what is outside that conception entirely" (Drucker 10). Previously, I discussed Stephen Ramsay's conclusion which states that the transformation allowed by the algorithmic manipulation of literary texts, though intractable, can still provide the alternative visions that give rise to interpretative readings. He concludes that we can still use textual analysis because any interpretation involves a radical transformation of texts; therefore, "the narrowing constraints of computational logic — the irreducible tendency of the computer toward enumeration, measurement, and verification — are fully compatible with the goals of criticism".

As I will show below, iCriticism aims at going beyond this framework which makes the computer and literary criticism just coincidently compatible and brackets off the possibility of humanizing the computer in the manner of Hypericonomy and SC in particular.

The following part reviews some tools for textual analysis.

a. TextArc:

TextArc is an interesting tool more, I would say, due to the possibilities and potential it draws our attention to than to what it achieves at its present state. The vision behind the tool is related to the leveraging of a powerful, underused resource:

human visual processing. The following paragraph illustrates how this visualization works:

> TextArc represents the entire text as two concentric spirals on the screen: each line is drawn in a tiny (one pixel tall) font around the outside, starting at the top; then each word is drawn in a more readable size. Important typographic features, like the mouse-tail shape of a poem at about two o'clock, can be seen because the tiny lines retain their formatting. Frequently used words stand out from the background more intensely. (T*extarc*)

Thus, visual and geometric competences are used in the observation of statistical data and the establishment and recognition of relations (the different places a word or a phrase occur). This visualizing has many advantages over traditional way of representing results (spreadsheet grids, for example). Besides short-circuiting long processes of statistical analysis, new relations can be revealed or "seen" by virtue of the comprehensive "view" that this type of visualization facilitates.

b. Tapor:

As declared on the website TAPOR is "a gateway to the tools used in sophisticated text analysis and retrieval." Let us take one of the many tools available which is Circus. Circus "is a visualization tool that displays a word cloud relating to the frequency of words appearing in one or more documents". One can click on any word appearing in the cloud to obtain detailed information about its relativity. The following image shows the results for the text of this chapter retrieved on 07/20/2012:
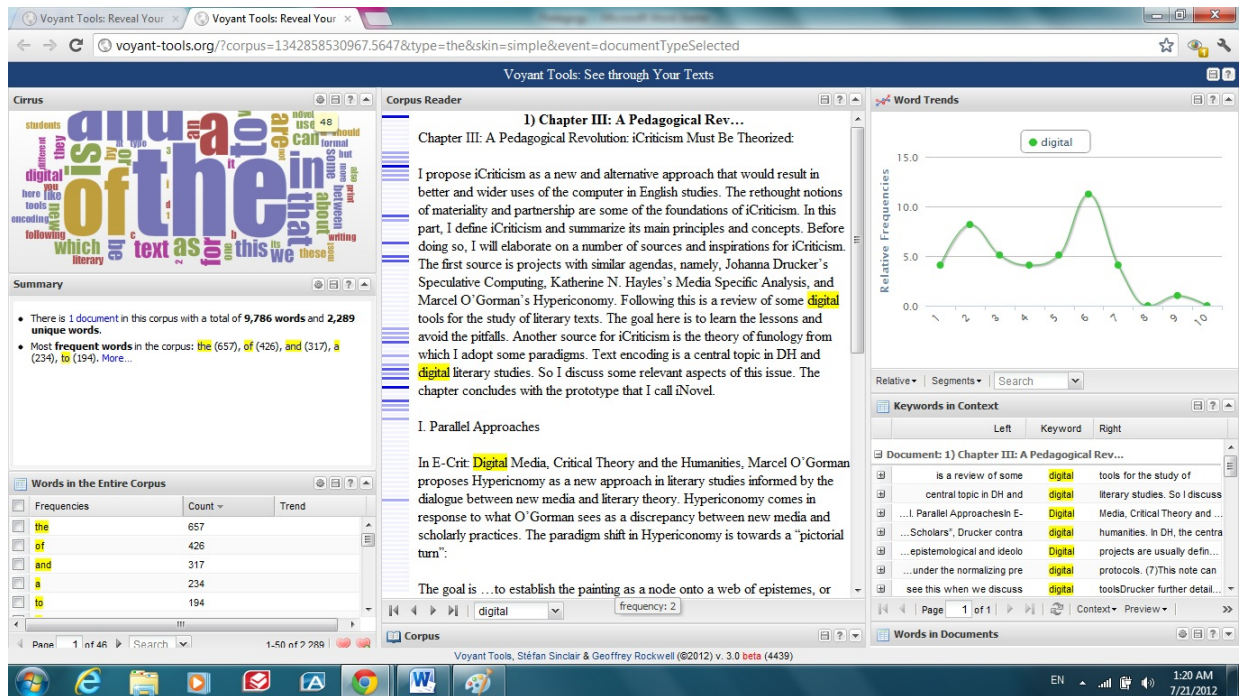
Fig. 5. Circus Interface

As can be seen, statistical data are represented in different visual ways. The type of interpretative conclusions that can be based on these are left to the user. There are other visualizing tool in TaPoR like The Visual Collocator and Big See. The Visual Collocator displays collocates of words using a graph layout. Words which share similar collocates will be drawn together in the graph, producing new insight into the text. Again here we have a leveraging of visual processing and an alternate representation of statistical data.

Big See takes the vision of Visual Collocator further by adding the 3D dimension to the visualization. The Big See is an experiment in high performance text visualization. We are looking at how a text or corpus of texts could be represented if processing and the resolution of the display were not an issue. Most text visualizations, like word clouds and distribution graphs, are designed for the personal

computer screen. In the Big See we anticipate wall displays with 3d views and the processing to manipulate large amounts of data like all the content words of a novel.

c. Timelines:

Inherently, timelines are temporal and linear; they are used as a visual aids to help conceptualize the linear development of a group of events. This is why they are common with biographies and historical themes. Digital timelines by virtue of the new capacities of the medium are more hypertextual, dynamic, and interactive. Readers now browse rather than read these timelines. Nevertheless, what we have here remains a sophistication and refinement of a traditional tool.

Abslaom Absalom Interactive Chronology is an interesting example here. We have a digital flash based timeline intended for teachers and students and

> The goal is to take as much advantage as we can of the capacities of electronic technology to help first-time readers orient themselves inside the stories William Faulkner is telling in Absalom, Absalom! while preserving some aspect of the experience of reading it. At the same time, we hope it may give aficionados and scholars new ways to conceptualize and appreciate the intricate brilliance of the novel's design. (*Absalom Absalom)*

I think that the timeline achieves much of these goals by virtue of an innovative use. Targeting first-time readers is as important as envisioning this tool as an aid to conceptualize intricate narrative techniques. This tool is characterized by the animation and visualizing of key events and key characters in the novel.

The previous review yields a number of observations. One is that stylo-metric tools are dominant. This might be explained by technical limitations but most importantly it originates in the instrumental approach to the computer and the belief that computation and literary interpretation are incompatible. The latter therefore resists systematizing and automatizing. However, the way the results of those tools are processed makes a difference. The use of non-textual representations like visualization helps process statistical outcomes in better and faster ways. Besides being efficient, visualization makes the interpretation and analysis of texts "user-friendly" by making them more appealing and less demanding.

Another important observation is that the objectives and tasks envisioned behind the design of these tools should be considered and rethought: for example, shifting the focus to context rather than text (tools that provide contextual or background information of all kinds). This would also be a shift to post-formalist theories like Marxism, Feminism, or Historicism.

Some of the tools show significant features of the digital technology, especially generativity and extensibility; any formula can be easily turned into a generative model, and this has many advantages in terms of accessibility and utility but also regarding the democratizing and de-compartmentalizing of education and knowledge with more incorporation of student and casual users as active agents not just recipients.

Another general observation is related to the assumptions that are migrated from print to digital media. Part of the limitedness of digital tools is print-based assumptions which determine our theoretical framework. I discovered that a great part

of the limitations is digital tools is due to my expectations and preconceptions about what counts as interpretation. Most of the tools are driven by the dominant hermeneutic urge, to explore hidden themes, for example. We should always be aware of these assumptions and their "unconscious" impact.

Technically, the lessons that can be learned from the previous overview are important. Visualization enables the shift from one sense to another through a translation of one type of data (numbers) into a new type of representation. Here, we did not change the nature of the results themselves but their representation, using the computer's abilities. This can serve as a model for using the stylo-metric results in innovative ways.

The mere fact of using new tools entails revising or modifying paradigms, whether deliberately or as a by-product. The pedagogical aspects of some of these tools are worth noting. The use of the computer – virtual worlds for example – allows the application of learning by doing which helps introduce motivation.

Funology

Another source I am drawing from is the theory of funology as introduced in *Funology: From Usability to Enjoyment* which is edited by Mark A Blythe et al. The unifying theme in the collection is the emphasis on enjoyment and fun along usability, which had dominated the theory of HCI. The main concept is that usability cannot be separate from aesthetics (Overbeeke et al 9). I think we can easily notice a trend to separate what is useful from what is beautiful in software and website design. Here again we witness the dominance of engineering paradigms. The reintroduction of enjoyment, fun, and aesthetics, exemplified in the theory of funology, means a

reengagement with the humanities. In fact, the book includes many articles by scholars with a strong interest in the humanities, like Phoebe Sengers.

I mentioned Sengers's theory of narrative intelligence previously. In one of her articles in the book, she calls for a more integrative approach to experience that rejects the bifurcation of experience into work vs. fun (19). Such a rejection leads to the realization that "we cannot fully represent experience within the software, and instead try to set up more nuanced relationships between (internal, formal, clean) code and (external, messy, complicated) experiences" (26). I find this statement compelling and it contains a recipe for overcoming the compatibility problem between computational methods (the formal and clean) and humanistic fields like literature (the messy and complicated). The partnership paradigm I presented in the previous chapter is an attempt to create a nuanced relation between the computer and the human by acknowledging their complementariness as two distinct sets of abilities and experiences.

The prototype, iNovel, will be a chance to put some of these principles into practice, especially as reading novels is a multifaceted and rich experience.

Text Encoding

Text encoding is a central issue for any consideration of computational methods and the humanities. In her pioneering work, *Electronic Texts in the Humanities*, Susan Hockey defines the term "electronic text" within humanities context as "an electronic representation of any textual material which is an object of study for literary, linguistic, or related purposes" (1). The core of this process is providing information that will "assist a computer program to perform functions on

that text" (Hockey 24). Text encoding, therefore, has two interrelated procedures: representation and preparation (providing information). The information that can be provided, and therefore the functions based on this, is limited by the fact that "computer programs only perform mechanical processes and are unable to apply any intelligence unless that intelligence is defined unambiguously and in small steps within the program" (Hockey 4).

John Lavagino in "Completeness and Adequacy in Text Encoding" differentiates between two approaches in text encoding: idealist and localist. The first one "stipulates that an electronic text should reproduce exactly the written copytext. Completeness has similarities to "the editorial criterion of definitiveness" (63) and in this sense, it resonates with the legacy of textual critics like G. Thomas Tanselle (65). We witness the same dilemma in Tanselle's theory: the text is just a carrier of the Work which is inaccessible. However, the only way to experience a work is through a text which can only be an approximation of that work. By contrast, the second approach, localism, is concerned with "incidentals" and "with details" (66). Of course these theories mirror the main trends in textual criticism as discussed in chapter II.

Regardless of the approach, text encoding is performed via a mark-up languages, usually XML-based, like HTML for example, which define a set of rules for encoding documents. The main method is these languages is tagging. A tag is a construct that begins with < and ends with a >. Inside this construct different elements can be defined and assigned some "attributes". The different Tags exist in nested networks. Here is a simple HTML code for a simple page:

<!DOCTYPE html>

```
<html>

<body>

<p>The first paragraph.</p>

<p>The second paragraph.</p>

<p>The third paragraph.</p>

</body>

</html>
```

Mark-up languages are readable for both machines and humans, and this makes them exemplify the central clash/disjunction between computation and humanities, or, in other words, "the tension between mathesis and aesthesis" (Drucker, *Speclab* 15). To unpack this tension/clash, which is central to this dissertation as I declared in the first chapter, I will briefly review the following topics: the material shift, marking as interpretation, the unique capabilities of new media, interpretative tagging, and code as writing.

Tagging entails the following requirement: the text must be decomposed into discrete elements that are disambiguated and standardized, like title, author, lines, paragraphs, headings…etc. in other words, they are formally modeled and such modeling, using the emergent materiality model, includes a break between the different dimensions, for example, the documentary and the graphical/auditional. Consequently, certain features disappear, especially those that are extra-linguistic (extra-alphanumeric) like typography and layout. In his introduction of TEI, "Textual Criticism and the Text Encoding Initiative," C. M. Sperberg-McQueen states that "the

TEI currently provides no formal language for the description" of graphical aspects. He explains this by the following reasons:

> First, different portions of the community have very different requirements in this area…A second reason for the sparse treatment of typography and layout in the TEI Guidelines is political: the marketplace of text processing software is currently dominated by WYSIWYG word processing systems which are singularly ill suited to the needs of scholars transcribing original source materials, precisely because they focus exclusively on the appearance of the printed page… A third reason typography receives no formal treatment in the Guidelines is the most serious, at the moment. It is not at all obvious how best to describe the layout of a page in an electronic transcription of that page.

I have previously discussed the dominance of the GUI paradigm and its visiocentric model, which WYSIWYG (what you see is what you get) is one of its consequences. We should remember too that this is one of the requirements of the formal modeling of the computer. The third reason seems the most interesting and promising. The difficulty of describing layout features using the formal modeling of the computer stems from the inability to acknowledge the shift in material conditions.

As concluded earlier, marking any text is interpretational. In terms of text encoding, this would mean that all choices made in formal modeling reflect interpretational decisions. In "The Electronic Text and The death of the Critical edition", Charles L Ross suggests this solution:

My argument is simply that, in place of the critical edition's technology of presence, which aims to "restore" or "reconstruct" am author's final intentions, we need a technology of difference, by which the reader can create multiple texts…to rewrite a whole text. (226)

So, instead of the self-imposing limitations of the restoration, reconstruction, or faithful reproduction approach, we can talk in terms of rewriting or (re)interpreting the text at hand. This is a working solution.

We should also consider the unique capabilities of digital media in the context of text encoding. Some theorists talked in terms of the qualities/principles/characteristics that make new media different or unique. In *Digital Poetics*, Loss Pequeño Glazier lists the following qualities of electronic texts: being searchable, transmissible, nearly without a physical size, manifesting symptoms of being anti-text, and being manipulated (84-5). I previously quoted Manovich's principles of new media, which are numerical representation, modularity, automation, variability, and transcoding (27-33). Similarly, N. Katherine Hayles talks about four characteristics of digital text or computer-mediated text: layeredness, multimodality (combining text, image, and sound together), the fact that storage in computer-mediated text is separate from performance, and fractured temporality.

It is useful to group these characteristics. Some of them describe the text itself, namely the following: without a physical size, numerical representation, modularity, variability, automation, and layeredness. Others are related to the interaction between the user/reader and the text/object: being searchable, transmissible, and manipulated. A third group describes the relation between the

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digital text/object and its context: transcoding and being anti-text. Some of these qualities should be critiqued. For example, qualities like searchability and transmissibility apply to both digital and traditional texts but with different degree. It is useful to remember McGann's statement about the algorithmic nature of print texts, in addition to his theory about the multiple layers/codes/dimensions of texts.

One promising direction for text encoding is to work on interpretational tagging, embedding interpretational information that makes content-based search possible. This is a controversial issue apparently:

> Opinions vary about approaches towards the deeper analysis of literary text. Most scholars tend to favour the 'fishing expedition' approach where repeated searches in a text can help to draw attention to new features and new interpretation… An alternative approach is to embed interpretative information directly in the text with more detailed markup. This makes it easier to carry out searches directly on the markup… (Hockey 75)

The major obstacle for interpretative tagging is that such information cannot be subjected to the type of disambiguation and standardization needed for mark-up languages. My suggested solution is that we can dismiss the idea of standard and general tags and instead think of specific tags for individual texts. My thought is that because we cannot come up with a general tag, that defines and demarcates a personification or a social critique, it does not mean we cannot use the mark-up constructs towards tagging these features for individual texts. If we take a work like Dickens's *Great Expectation*, we can perhaps exhaustively enumerate all aspects or

elements of literary significance and mark them, but it is not as easy to come up with standard tags that will be applicable to other texts. This is the price that must be paid if we want to break the rigidity of formal logic and its requirements. Individualization and specificity, therefore, replace standardization.

Another thing to remember is that in digital texts we have an additional level or dimension, which is code, and code is writing:

> Despite the level of technology upon which it depends, it is important to emphasize that, principally, the Web is writing. It is represented as a series of pages that are written. In addition, each page is also writing because it is written in HTML. (Pequeño 78)

As I explained in the first chapter this level affects all other levels. In fact, many of the qualities of new media like transmissibility and transcoding. are due to code and its logic, or worldview, in Katherine Hayles's words (*My Mother was a Computer*).

In light of the previous discussion, we can recognize a number of problems/challenges for text encoding. Of course these are not peculiar to text encoding but are more of manifestations of the bigger challenges in the field. The first one is that the tools driven by computational linguistics are still the ones that dominate textual encoding and the digital processing of texts. Though the results yielded by these tools are efficient, these remain marginal to the core activities of literary critics. There is also the failure to understand the shift from print to digital as on in material conditions rather than from material to immaterial. Last but not least more effort is needed to come up with innovative uses that can redefine the parameters of computational methods, tagging in particular.

Overcoming the previous problems requires more work in the following directions:

1. A complete theory for text encoding that is based on the algorithmic, dynamic nature of traditional texts and their different codes besides acknowledging the material basis of digital media.

2. Rethinking code as writing and acknowledging it as an additional layer in digital texts.

3. Thinking innovatively: for example, designing interpretational and graphical tags.

4. Finding ways to realize the fact that interpretation of texts is a process of rewriting them. This means providing more option for students/readers to create their own text.

5. Realizing that encoding should take into consideration all codes or dimensions and not only the auditional and linguistic as is the case.

6. Using specificity and incremental approach in tagging as explained above which breaks the requirement of standard tags.

The large body of literature within DH and digital literary studies contains many efforts in these directions. The point here is to follow up and build on the work so far achieved especially in terms of concrete results. This is one objective in this dissertation.

Principles of iCriticism

Having introduced some basic themes, we can move to define iCriticism. Broadly speaking, iCriticism is a response to the fact that reading now takes place in

an ecosystem of devices including both print and digital, and a substantial part of our interaction with texts in the field of English and literary studies happens on screen. iCriticism starts from the belief that the computer is a unique invention (I am deliberately avoiding the word, machine) which is susceptible to a wide variety of uses which ultimately determine its description (an aid, a tool, or a partner). Within literary studies, the computer can be used in a humanistic way to best serve the purposes of the field. Simultaneously, we should take the integration of the computer and the transformation of reading as a chance to rethink the goals and paradigms of the field. iCriticism's contribution will be through the following principles, which are classified into theoretical, practical, and pedagogical:

A. Theoretical:

   a. The computer's adaptability to different uses based on the theoretical agenda.

   b. Rejection of formal logic and CRUM (*Computational-Representational Understanding of Mind*) paradigm as the only option.

   c. Texts are multi-dimensional and heterogeneous and the relation among their various dimensions, codes of significance, or levels is not heuristic. They are algorithmic.

   d. Marking texts is interpretational.

   e. Material conditions, including textuality, are created in the space between physical and non-physical (human) factors.

   f. Co-dependent, Emergent Materiality.

g. The need to be self-conscious of the symbiotic relation between print technology and literary genres, and the new special relation between the digital technology and literature. A new relation between digital technology and scholarly practices.

h. Digitizing texts is a process of translation / rewriting that can result in pedagogical tools.

i. The computer allows the translation between different perceptual levels that can be used to move from quantitative to qualitative levels.

B. Practical:

j. Interactivity / Partnership as a viable paradigm for the user/computer relation.

k. The design of humanities tool within digital contexts and not the other way round.

l. More work is needed in the practical application and experimental design to turn the theories into results.

m. The computer technology can introduce fun and increase the engagement of students through attention to experiential aspects.

C. Pedagogical:

n. The description of new academic genres to replace the linear argumentative essay.

o. The goals of literary criticism are continuously. Not a translation of post-structuralist thought.

p. There is a need for new academic genres that would integrate technology and improve students' performance.

q. The activity and centrality of the learner.

r. One pedagogical implication is the multiple roles that the student can play: user-player-learner-reader-writer.

The following table illustrates some of these principles and contextualizes iCriticism by placing it in relation to literary theory, Digital Humanities, the CRUM paradigm (which represents computational methods) and some of the innovative approaches discussed earlier:

Table 3
Principles of iCriticism Versus Other Approaches

Traditional Lit. Criticism	CRUM	Digital Humanities	SC, Hypericonomy, MSA, Innovative Tools	ICriticism
Rationality/Kantian critique/scientific proof	Formal logic	Information technology/formal logic	Pataphysics/the science of exceptions/ Pictorial turn "The other"	Designing collaborative environments
Hermeneutic/Literary canon	Computational procedures	Self-identical objects/entities (subject/object dichotomy)	Quantum interventions ((imaginary/imaginative solutions)/post-hermeneutic/the icon	Digital objects exist on a continuum between humans and computers
Scholarly method – print technology/text-based	Quantitative methods	Quantitative methods (problem solving approaches) (practical solutions)	Autopoiesis/constitutive or configured identity (codependent emergence) materiality of the medium/interrogation between verbal and technological elements	Incremental Intelligence / translation from quantitative to qualitative methods
Linear/Sequential exposition	Standardization	Induction/deduction	Abduction/associational/multi-directional	Specificity and Individuality
	Data structures	Discrete representations (static artifacts)	Heteroglossic processes (intersubjective exchange/discourse fields)	Translation between perceptual levels
	Computer as a tool	Analysis/observation (mechanistic)/Computer as an aid	Subjective deformance/Intervention (probabilistic)`	Partnership: Computer as a partner with which users exchange knowledge
		Representing experiencing		Triggering experiences rather than representing them
Disembodied texts		Immaterial (digital) texts/Hypertexts	Embodied texts/ material code/ Technotexts	Emergent dynamic texts/ usable aesthetic artifacts

Genres/Applications	Sequential essay	Running programs	Text Encoding/ XML/Standardized tagging	Humanistic tools in digital context/ the Hypericon	Specific tagging/ propose an alternative to the essay (fun, interactive, motivation…etc.)
Pedagogical Implications	Teacher-centered			Student-centered/learning by doing/non-sequential exposition/technology-savvy students	Funology/motivation/ reading as an experience/ multiple roles: student-learner-user-player

Some concluding remarks on the principles and the table: iCriticism tries to build on previous theoretical efforts, mainly by turning them into practical results. The inclusion of CRUM in the table is meant to show that the dominant views about the computer which are limiting originate from a certain approach within computer science and AI rather than merely computation as a method. It is also worth noting that SC, MSA, Hypericonomy, and by extension iCriticism, are post-structuralist in their theoretical agendas.

The table is also meant to help us see the symbiotic relation between print on the one hand, and literature and literary criticism on the other. Item "g" in the principles needs elaboration in this context. The symbiotic relation between writing technologies and disciplinary practices and paradigms should entail that changes in the first must inevitably be translated into corresponding ones in the latter, much like the case with the introduction of literacy and print. This seems like a natural transition, so why should we bother to theorize new forms that correspond with the digital technology? The answer lies in the unique nature of the computer as a writing technology and its formal modeling. A more important thing to remember is that writing and print, as Ong shows, did not only revolutionize the production and

transmission of documents but also how people authored texts. Writing became a solipsistic and solo activity much like reading. This means that such pervasive and comprehensive transformations would persist even with the introduction of new technologies.

CHAPTER IV:

INOVEL, THE PROTOTYPE:

Introduction

The goal of the prototype is to apply some of the principles of iCriticism and serve both as a demonstration and a test of them. The choice of the novel genre is due to the fact that it represents a dominant print book genre, and it is a genre that "rose" with the advent of printing. I will start this section with a historical overview, then analyze the results of a questionnaire I did on the use of e-books among English majors. I will also discuss a number of themes related to reading as an activity and the book form in general.

In *The Rise of the Novel*, a classic on the genesis of the novel as a genre, Ian Watt points to a number of "favorable conditions" (9) that coincided to cause the novel genre to rise. What Watt mainly does is show the interconnectedness and interdependence between formal conventions and the wider social, cultural, and material context:

> [B]oth the philosophical and the literary innovations must be seen as parallel manifestations of larger change – that vast transformation of Western civilization since the Renaissance which has replaced the unified world picture of the Middle Ages with another very different one–one which presents us, essentially, with a developing but unplanned aggregate of particular individuals having particular experiences at particular times and at particular places. (31)

Some of the factors he enumerated that contributed to the rise of the novel are "rejection of universals and the emphasis on particulars" (15), "increase in feminine leisure" (44), and "the decline of literary patronage and the rise of booksellers as the new middlemen" (52-3).

Most of these were translated into formal conventions like the use of "actual and specific time and place," "descriptive and denotative" language (29) and a "copious particularity of description and explanation." In elaboration, Watt explains that:

> What is often felt as the formlessness of the novel, as compared, say, with tragedy or the ode, probably follows from this: the poverty of the novel's formal conventions would seem to be the price it must pay for its realism." The new literary balance of power …tended to favor ease of entertainment at the expense of obedience to traditional critical standards. (49)

We can easily see the affinity with Walter Ong's work on orality and literacy, despite the difference in their focus. Both link formal conventions to the wider context (historical, social, philosophical and technological). It is useful to try to combine ideas from both of them. Here is a table that does so:

Table 4
Contextual Factors in the Rise of the Novel

Historical/Epistemological Context/ Cultural parameters	Technological Possibilities/Constraints	Formal Features
Realism - Rejection of universals/ study of particulars / the rise of booksellers	Print codex/reading as a activity/ writing as a solipsistic activity/ repeated visual statement	Lengthy narrative
Actual and specific time and place	Closure	Linear climactic plot
Descriptive and denotative sue of language	Control of space	Temporal sequence of events
Authentic account of the actual experiences of the individual		Round characters

The main lesson that we can learn is that genre is created at the intersection of history

and technology. Through his argument, Ong differentiates between orally- based

thought and chirographically and typographically based thought (36-48). The novel

belongs to the second type, while a genre like the epic shows the dynamics of orality.

Here is another table I prepared based on these ideas:

Table 5
The Epic Versus the Novel

Orally based thought	The Epic	Typographically based thought	The Novel
Additive		Subordinate	
Aggregative	Episodic	Analytic	
Redundant	Repetitive	Accumulative/progressive	Linear plot
Conservative			
Close to the human lifeworld	Performed in front of an audience		Read in isolation
Agnostically toned		Dogmatic	Ideological/political
Emphatic and participatory		Distanced	
Homeostatic			
Situational		Abstract	

Both tables help us see the network of relations in which a genre is born. The lesson to be learned is that migrating a genre from one technology to another entails a break in this network. The digitization of a novel from the 19th century includes a break with several elements from the original network in which the work was produced. Migration of texts, which remains a necessity, is better thought of as a process of translation with a certain amount of loss and gain. The best strategy is to acknowledge the shift in its different levels (historical, philosophical, and technological) and do that systematically and self-consciously.

Basic Facts about Reading

In this part I will be drawing from Catherine Marshall's up-to-date study about the e-book, *Reading and Writing the Electronic Books*. As she makes clear, an e-book "can refer to hardware, software, content prepared to be read on the screen, or a combination of the three" (33). This validates the previous comment about reading as taking place in an ecosystem of devices. Because reading is becoming more diverse and multifarious, the definitions of the e-book is not stable. It can simply be a pdf, a Kindle file, or software for browsing documents.

When we think of novels, we tend to think of immersive reading as prototypical for this kind of reading. But reading is a diverse activity with multiple forms and objectives. Marshall provides the following table that illustrates the different types of readings (20):

Table 6

Types of Reading

TYPE	CHARACTERIZATION
Reading	Canonical careful reading. The reader traverses the text linearly. The aim is comprehension.
Skimming	Faster than canonical reading. Traversal is still linear, but comprehension is sacrificed for speed. The aim is to get the gist if the text.
Scanning	Faster than skimming. Traversal becomes non-linear; the reader looks ahead and back in the story. The aim is often triage or to decide on further action.
Glancing	Pages are turned very quickly; the reader spends almost as much time turning pages as looking at them. The aim is to detect important page element (e.g. beginnings and endings of article, photos or figures, headings) until something holds sufficient interest to transition to another type of reading.
Seeking	Reader scans quickly for a particular page element (e.g. proper nouns) with an aim orthogonal to full comprehension.
Rereading	Rereading is meta-type that is included in the table s a reminder that any type of reading may be occur multiple times.

As the results of the questionnaire, discussed below, shows, students or readers associate certain types of readings with either print or electronic texts.

Another classification of reading is that of Heyer, summarized by Vandendorpe in his discussion of reading on screen: "Heyer proposes three different modes of reading or gathering information, based on metaphors borrowed from the ways our ancestors gathered food: grazing, browsing, and hunting" ("Reading on Screen"). If we could talk about an emerging type or types of reading among these it would definitely be browsing and hunting. In this sense, a website is most comparable to a magazine. Vandendorpe adds that:

> …the hunting mode is also becoming fairly common due to the availability of answers to any given question a user might happen to think of. In the future, if this trend continues, the novel as a literary

genre could well become an endangered species, despite its long

history.

The claim about the novel as an endangered genre should not concern us here. The significant claim remains that the hunting and browsing modes which are generally shorter and pragmatic are becoming the norm, mainly due to the new technology for reading.

Besides its different types, reading as an activity requires a number of functionalities usually embedded in the reading platform/device. These are annotation, navigation: with two sub-categories: a. moving, b. orienting, clipping, and bookmarking (Marshall 51-67). Instead of viewing them as rigid forms, these functionalities are best thought of as "corollary to specific text genres and activities" (Marshall 51).

The Questionnaire

The questionnaire entitled "Uses of e-books in the Study of Novels Inside and Outside the Classroom by Undergrad Students" was administered from April to June 2012. The participants, 25 students and 5 professors, are from Indiana University of Pennsylvania and Robert Morris University. The participants completed the questionnaire online. The purpose of the questionnaire was to get feedback from students and professors about the use of e-books and the different capabilities of digital texts as used in novel courses. The students' questionnaire was in two parts, and the whole questionnaire consists of 16 questions, while the one for the professors consisted of 10 questions. The questionnaire plus the detailed analysis of the results are provided in Appendix A to this dissertation.

A number of conclusions and general guidelines can be deduced from analyzing the results of the questionnaire. Print books are still preferred for comprehension and careful reading for reasons related to convenience and experiential factors, while, e-books are still mainly used for searching and shorter types of reading. It is also worth noting that e-books are still widely seen/evaluated in contrast to their print counterparts. In this context, it is relevant to cite Marshall when she notes that "as the materiality of eBook becomes more comparable to that of the print book–the objections to reading on the screen begin to disappear" (33). However, this is not the direction I would go for. Instead, we should be looking for a form of e-book that would take full advantage of the unique capacities of new media and its material conditioning. Experimentation is required to do so as will be shown in the following part about the interface of iNovel.

It can be noticed that students widely use online sources and general searches to obtain background information. There is a wide use of plot summaries, either as support for reading the text or a substitute to it. The type of extra-textual info that students look for is background / contextual info, thematic analysis, and plot summaries.

Laptops are the most preferable platform for reading e-books mainly for availability and convenience, while e-readers are appreciated but are less available with students than laptops. Providing functionalities that are efficient and user-friendly is important for increasing the use of e-books. Different platforms of reading are preferred in different settings. It is also evident that annotation is an important functionality.

The questionnaire also shows that content-based search might be a good example of beyond-the-book capability to include in e-books. Therefore, it is imperative to focus on beyond-the-book capabilities which seem to draw students' attention and admiration.

These conclusions in addition to the previous ones comprise a large list that will guide the following part in the which the prototype, iNovel, will be described.

The Interface of iNovel

The design of iNovel is guided by all the principles so far specified. It is worth noting here that the interface of iNovel described below is preliminary and more research is needed to complete the final product. However, its present state can serve the purposes of this stage of the research. The prototype is meant to show the applicability of iCriticism. Specifically, the main objective is to reach a form for digitizing novels and a platform for reading them that seeks to explore the possibilities of the digital medium without being limited by the urge to emulate the print codex. To this end, I will use Johanna Drucker's suggestion: approaching the book as a program that creates a performative space for the activity of reading and viewing forms as "constrained parameters of performance" (Drucker, *Speclab* 170) rather than as an iconic molds. The different forms of the codex book (layout, pagination, table of content) besides its material character (that emerges as a result of the interaction of the readers with the physicality of the book) are meant to facilitate a specific form or, the phrase I prefer, "ritual of reading." The reader ends up performing this ritual by following the parameters of the form. The end product can be described as a program. Starting with the codex book, the program behind it can be

described as follows: creating a performative space by "carrying", storing, and organizing the text and by making the reading activity practical through easy navigation and orientation. In addition, the book as a logical object serves the purpose of simultaneously presenting an argument in logical sequence and making it debatable.

The following step is to look for functionalities behind the familiar forms in order to envision alternative ways to achieve them. The following table lists the different forms and their corresponding functionalities in the codex novel:

Table 7
Forms and Functionalities of the Codex Novel

Form	Functionality	Dimension concerned/ type of object/ parties concerned	Alternative way to achieve it	The code involved (translated into pseudo-html)
Table of content	Mapping of content, guidance into text, Non-linear navigation	Rhetorical, graphical, semiotic, logical	Links and nodes, 3d map of content	<work> <chpater1 href= "work:chapter1"> <section..> <segment1> </segment1> <section1> </chapter1 <chapter 2> <section> …. </work>
Page numbers	Orientating	Graphical, logical	Slider	<PageNo alt="You are here" "You have read so far">
The page (turning)	Moving, navigating	Physical	Scrolling, automatic flow of content	<TurnPage> X=x+1 </TurnPage>
The page (material unit)	organizing, content carrier	Physical, graphical, linguistic	A block of the screen, a narrative or thematic unit	<work> <chapter> <page> <paragraph> </paragraph> </page>

				</chapter> </work>
Paragraphs	Content carrier, organizing message	Graphical, linguistic	A horizontal line, a block of text united thematically or narratively	
White spaces	Organizing space, defining units	Physical, Graphical		
Cover	Orienting, introducing	Graphical, Logical	loading page	
Title page	Introducing, defining		Webpage Title	<title> <author> <genre, content>
Chapters	Organizing content/message	Graphical, logical	Thematic or narrative divisions	
Titles	Introducing, defining	Logical, linguistic		
Font (type, size)		Graphical		
Lines	Organizing content	Graphical, linguistic		
Level of language		Linguistic, Social		
The book as a physical object	Individuality, character, unity	Physical	The interface	
The book as a work	Individuality, unity	Logical		
Words, sentences, the collective linguistic text	Carrying content, communicating messages	Linguistic		
Plot		Logical, semiotic		
Characters		Logical		
Setting		Logical		
Narrator				
POV				
Themes				

The table includes a variety of forms, ranging from those related to layout, materiality, and genre. I left the classifying and grouping of these elements to the third column which specifies the textual code each of them is related to. The table is neither meant to be exhaustive nor strictly technical as some items or their designated functionality might be controversial. The purpose is to explain in concrete examples the idea of the book as a program and of forms as parameters of performance. The table also helps expose the problematic nature of emulating or simulating print forms if we disregard the functionalities behind them.

As shown in the table, I propose some alternative ways to perform the same functionalities digitally and describe the program behind some of them in pseudo-code. By this, I try to illustrate the program or the group of coded events, "parameters of performance," behind each form. The information in the table is necessary but reaching new forms always requires a great deal of experimentation, similar to the experimentation that definitely took place before the print codex took its final form. This urge towards experimentation is embraced in the prototype.

Another starting point for the prototype is a different conception of the reading activity, one that is more akin to the digital medium. The print codex served, and also created, a certain ritual of reading. The computer, similarly, has its own ritual of reading on screen, closer to the browsing and hunting modes as previously noted. The interface of iNovel is meant to serve this mode of reading, browsing and hunting, by creating a performative space that encourages it. The

reader is supposed to be browsing and navigating short segments of text one at a time rather than engaging in long silent reading.

This is a general view of the interface of iNovel:
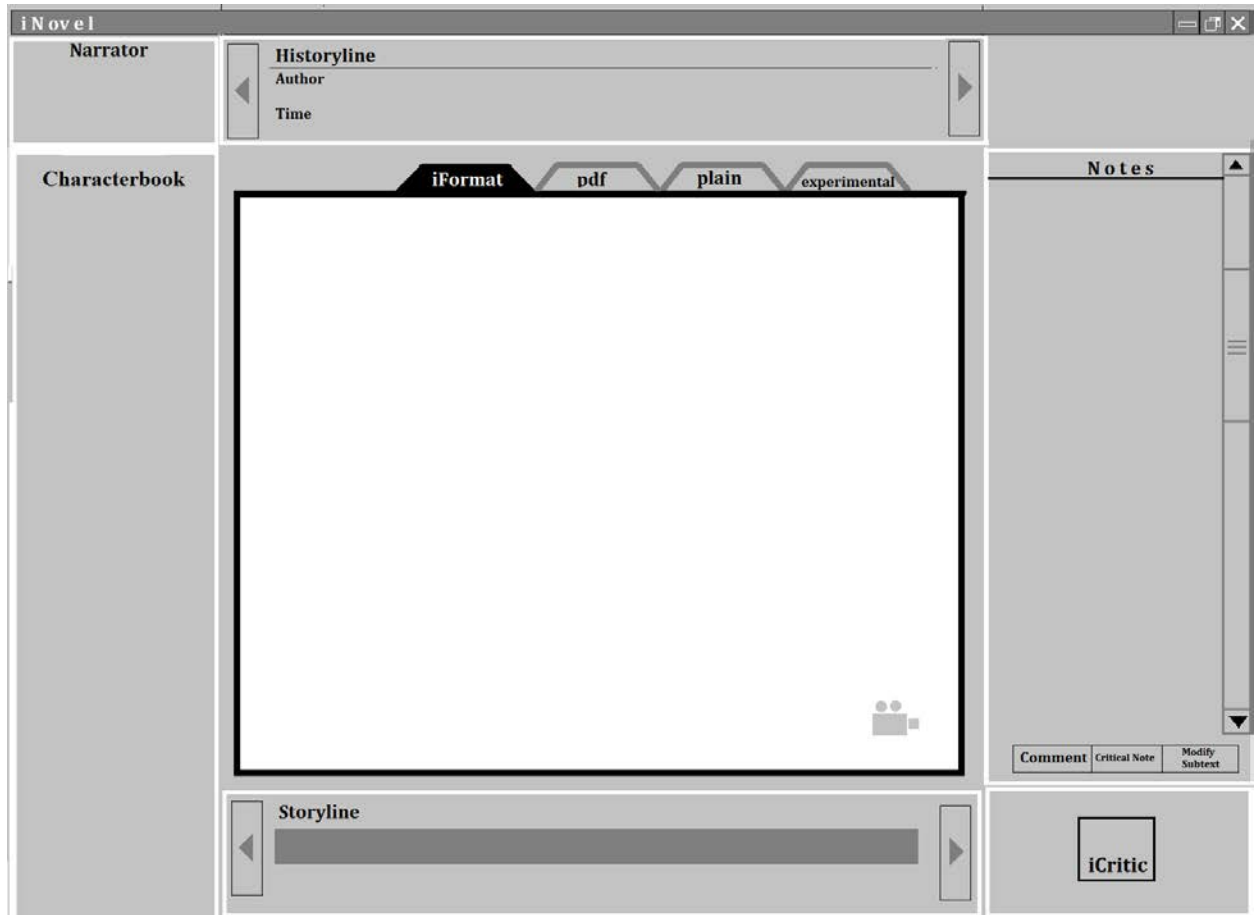
Fig. 6. iNovel General Interface

The interface has different sections each serving a purpose. The central space is reserved for the text which can be viewed in four formats: iFormat, pdf, plain, and experimental. The video clip icon on the bottom right corner becomes active when there is a video clip available about the section being read, usually a clip from a movie adaptation. On the left, there is a section entitled "characterbook" which will list the characters and on the right a space is reserved for students' notes and annotations which will be shared among them. There are two timelines:

Historyline and Storyline located above and below the text. The icon at the
bottom right corner opens the iCritic tools window. To illustrate with a real
example, here is the interface with Charles Dickens's *Hard Times* as the active
text:
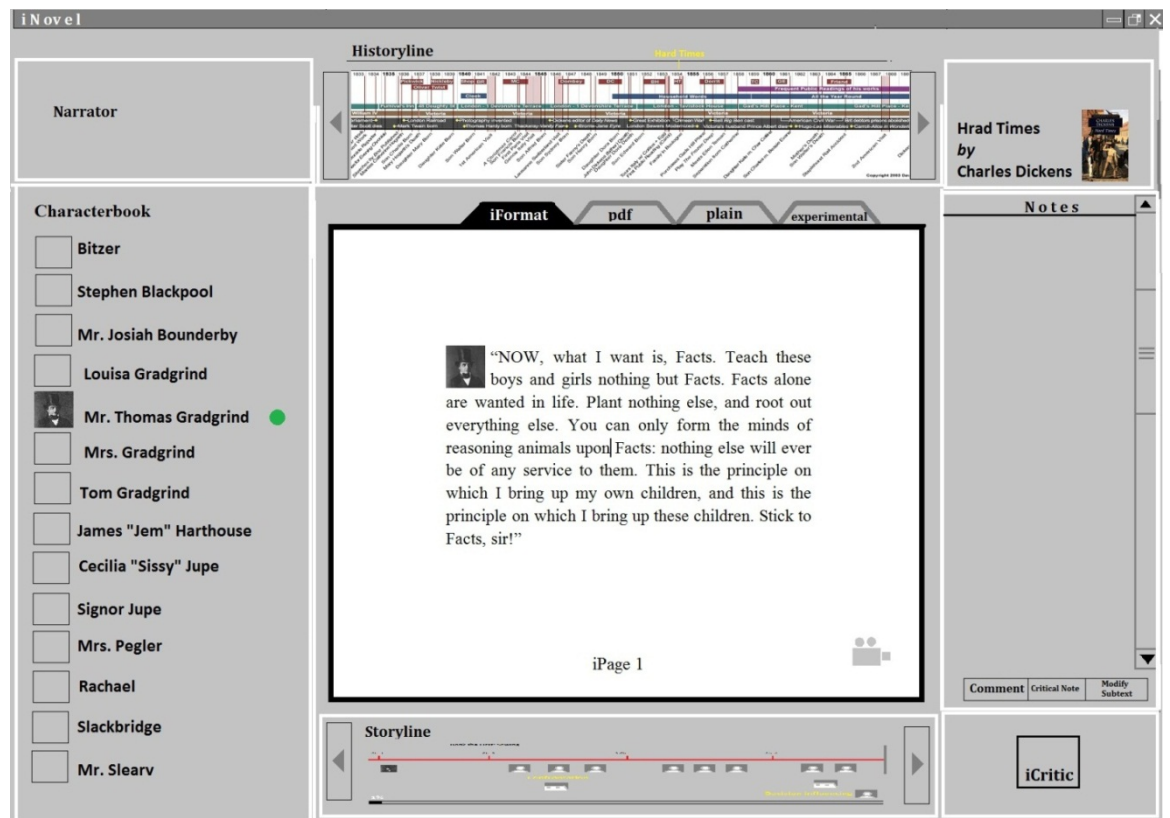
Fig. 7. iNovel Interface with HT as the Active Text

(Historyline adapted from David A Purdue)

The experimental tab inside the central section allows students to choose from
among a number of experimental formats. One of these might be having the text
flash as one word at a time or as a group of lines separated horizontally as shown
below:
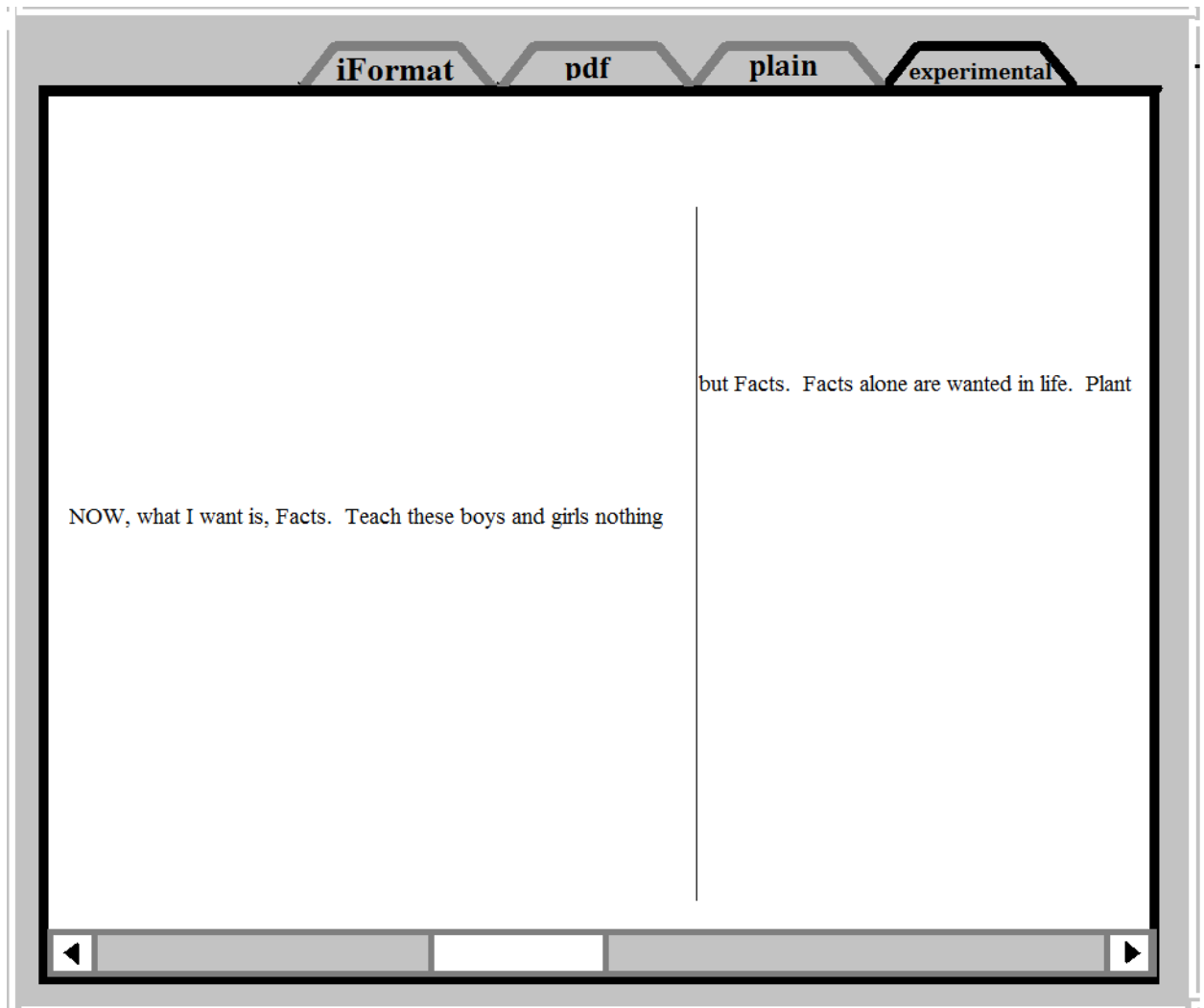
Fig. 8. The Experimental Tab

Other formats can be added / thought of. The experimentation will help student be conscious of graphical aspects of texts and the fact that units like lines, paragraphs and pages are not ideal or transcendental. Such unusual presentation of the text will also help demonstrate the rearrangement process among the different dimensions or layers of the text, for example, the corresponding shift in the documentary and auditional levels. A button with the command "reveal code" could be added to iFormat and/or the plain text or the pdf version. The idea here is to reveal the deeper layers, much like the command that reveals the code in

HTML pages. The code can refer to all the active but invisible codes like those related to genre, graphics, layout…etc.

The "characterbook" lists characters in the manner of Facebook and each of them has his/her own profile. Those who are involved in the section being read will have the small green dot as a sign of their activity. Here is the starting profile of Thomas Gradgrind:

characterbook

Thomas Gradgrind

Retired Merchant
Member of Parliament
Lives in Coketown, England

ABOUT   Friends   Photos

Thomas Gradgrind

In this life, we want nothing but Facts, sir; nothing but Facts!

About You

"A man of realities. A man of facts and calculations. A man who proceeds upon the principle that two and two are four, and nothing over, and who is not to be talked into allowing for anything over....With a rule and a pair of scales, and the multiplication table always in his pocket, sir, ready to weigh and measure any parcel of human nature, and tell you exactly what it comes to. It is a mere question of figures, a case of simple arithmetic."

Fig. 9. Sample Character Profile

As the example shows, the character profiles start with minimal information and remain editable so that students can add information as they progress in the novel.

Presenting characters in this way will make reading and interacting with characters more enjoyable.

Below is an example of the iFormat of the first and part of the second chapters of *Hard Times*.

iPage 1:

"NOW, what I want is, Facts. Teach these boys and girls nothing but Facts. Facts alone are wanted in life. Plant nothing else, and root out everything else. You can only form the minds of reasoning animals upon Facts: nothing else will ever be of any service to them. This is the principle on which I bring up my own children, and this is the principle on which I bring up these children. Stick to Facts, sir!"

iPage 2:

The scene was a plain, bare, monotonous vault of a schoolroom, and the speaker's square forefinger emphasized his observations by underscoring every sentence with a line on the schoolmaster's sleeve.

From "The Illustrated Hard Times" by Nick Ellis

iPage 3:

The emphasis was helped by the speaker's square wall of a forehead, which had his eyebrows for its base, while his eyes found commodious cellarage in two dark caves, overshadowed by the wall.

The emphasis was helped by the speaker's mouth, which was wide, thin, and hard set. The emphasis was helped by the speaker's voice, which was inflexible, dry, and dictatorial.

The emphasis was helped by the speaker's hair, which bristled on the skirts of his bald head, a plantation of firs to keep the wind from its shining surface, all covered with knobs, like the crust of a plum pie, as if the head had scarcely warehouse-room for the hard facts stored inside. The speaker's obstinate carriage, square coat, square legs, square shoulders, — nay, his very neckcloth, trained to take him by the throat with an unaccommodating grasp, like a stubborn fact, as it was, — all helped the emphasis.

iPage 4:

"In this life, we want nothing but Facts, sir; nothing but Facts!"

iPage 5:

The speaker, and the schoolmaster, and the third grown person present, all backed a little, and swept with their eyes the inclined plane of little vessels then and there arranged in order, ready to have imperial gallons of facts poured into them until they were full to the brim.

iPage 6:

THOMAS GRADGRIND, sir. A man of realities. A man of facts and calculations. A man who proceeds upon the principle that two and two are four, and nothing over, and who is not to be talked into allowing for anything over. Thomas Gradgrind, sir — peremptorily Thomas — Thomas Gradgrind. With a rule and a pair of scales, and the multiplication table always in his pocket, sir, ready to weigh and measure any parcel of human nature, and tell you exactly what it comes to. It is a mere question of figures, a case of simple arithmetic. You might hope to get some other nonsensical belief into the head of George Gradgrind, or Augustus Gradgrind, or John Gradgrind, or Joseph Gradgrind (all supposititious, non-existent persons), but into the head of Thomas Gradgrind - no, sir!

In such terms Mr Gradgrind always mentally introduced himself, whether to his private circle of acquaintance, or to the public in general. In such terms, no doubt, substituting the words 'boys and girls,' for 'sir,' Thomas Gradgrind now presented Thomas Gradgrind to the little pitchers before him, who were to be filled so full of facts.

Indeed, as he eagerly sparkled at them from the cellarage before mentioned, he seemed a kind of cannon loaded to the muzzle with facts, and prepared to blow them clean out of the regions of childhood at one discharge. He seemed a galvanizing apparatus, too, charged with a grim mechanical substitute for the tender young imaginations that were to be stormed away.

iPage 7
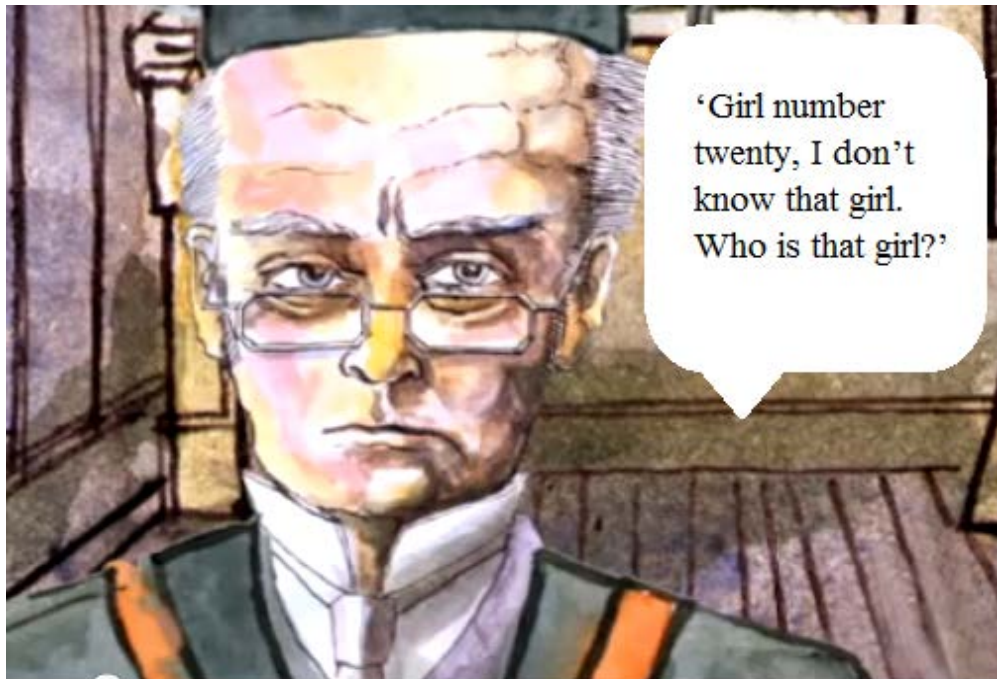
Fig. 10. An Example of an iPage

The pagination with "iPage" is based on a disproportionate division of the text into narrative and/or thematic sections, which are usually short, ranging from one or few lines to a paragraph or two. The presentation of the text in each iPage varies depending on the nature of the text whether it is narration, description of a place or

dialogue. This is meant to go beyond the imitation of print besides making reading the novel closer to browsing because readers are engaged with a short segment of the text at a time and the variety of the presentation breaks the flow of the text. In addition, styles can vary in presenting segments of the text inside each iPage. For example, on iPage3, the line "The emphasis was helped" is repeated three times and this can be done by keeping the line on screen while shifting the text that follows it. This might serve as a good example of how the different dimensions of a text (documentary, linguistic, auditional) work together towards a certain effect. In this context, let us remember Hayles's not that "the materiality interacts dynamically with linguistic, rhetorical, and literary practices to create the effects we call literature" (31). It is also safe to assume that the effect created by the iFormatting in the previous example is definitely a modified one than the original due to the material shift.

The iFormat tries to include multimedia in a creative way by making them tools in the narration presentation of the text and sometimes in real time. On iPage2 for example, the image of the classroom should be revealed gradually with the flow of the text which includes the narrator's description of the scene. Another example is the dialogue between Gradgrind and Sissy which is presented in a comics-like manner as illustrated on iPage7.

Both of the timelines provide orientation and background knowledge. They allow the presentation of information visually which helps easy absorption. The Historyline is designed to help students contextualize the work historically and in relation to other works by the author. The Historyline in the above image is adapted but it can be done in limitless ways. The general form is that it contains two sections:

one about the author and another about the time, the work in focus should be highlighted as the example shows. The Plotline, on the other hand, has different objectives. Here is a sample segment of it:
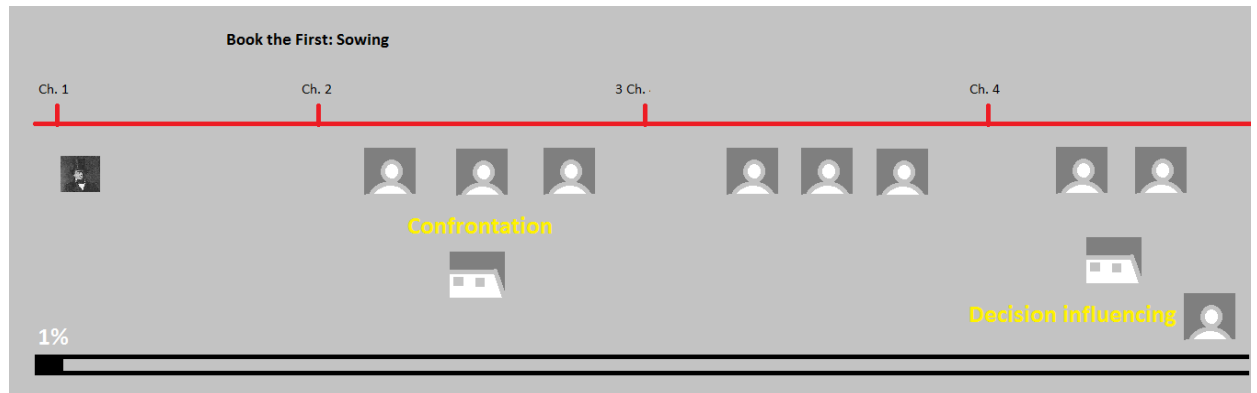
Fig. 11. Plotline Section

The plotline does different things: first, it serves as a table of content by containing links to the different chapters and subchapters and by being navigatable, second, it serves as an orientation tool by showing how far the readers has gone in the text; third, it helps readers keep track of the events in the story and see the interrelation among them by including shortcuts to events, characters, and places; and fourth, it contributes in making the reading activity exciting by introducing suspense. As shown in the example, the events and details on the timeline unfold gradually and there are hints to major events or twists coming up in the narrative in the form of words or icons (a decision influencing a character in the example).

When students click on the iCritic icon, they open the following window:

'NOW, what I want is, Facts. Teach these boys and girls nothing but Facts. Facts alone are wanted in life. Plant nothing else, and root out everything else. You can only form the minds of reasoning animals upon Facts: nothing else will ever be of any service to them. This is the principle on which I bring up my own children, and this is the principle on which I bring up these
children. Stick to Facts, sir!'

The scene was a plain, bare, monotonous vault of a school-room, and the speaker's square forefinger emphasized his observations by underscoring every sentence with a line on the schoolmaster' sleeve. The emphasis was helped by the speaker's square wall of a forehead, which had his eyebrows for its base, while his eyes found commodious cellarage in two dark caves, overshadowed by the wall. The emphasis was helped by the speaker's mouth, which was wide, thin, and hard set. The emphasis was helped by the speaker's voice, which was inflexible, dry, and dictatorial. The emphasis was helped by the speaker's hair, which bristled on the skirts of his bald head, a plantation of firs to keep the wind from its shining surface, all covered with knobs, like the crust of a plum pie, as if the head had scarcely warehouse-room for the hard facts stored inside. The speaker's obstinate carriage, square coat, square legs, square shoulders, - nay, his very neckcloth, trained to take

Fig. 12. iCritic Tools

There are four icons; the first one allows students to see the subtext, that is, the underlying themes behind a certain segment of the text. Here is an example: (The analysis is adapted from *Spark Notes*)

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Dickens was concerned with the miserable lives of the poor and working classes in the England of his day, and Hard Times is one of several of his novels that addresses these social problems directly. Hard Times is not Dickens's most subtle novel, and most of its moral themes are explicitly articulated through extremely sharp, exaggerated characterization, and through the narrator's frequent interjection of his own opinions and sentiments. For instance, in the opening section of the book, a simple contrast emerges between Mr. Gradgrind's philosophy of fact and Sissy Jupe's frequent indulgence in romantic, imaginative fancy. While Gradgrind's philosophy includes the idea that people should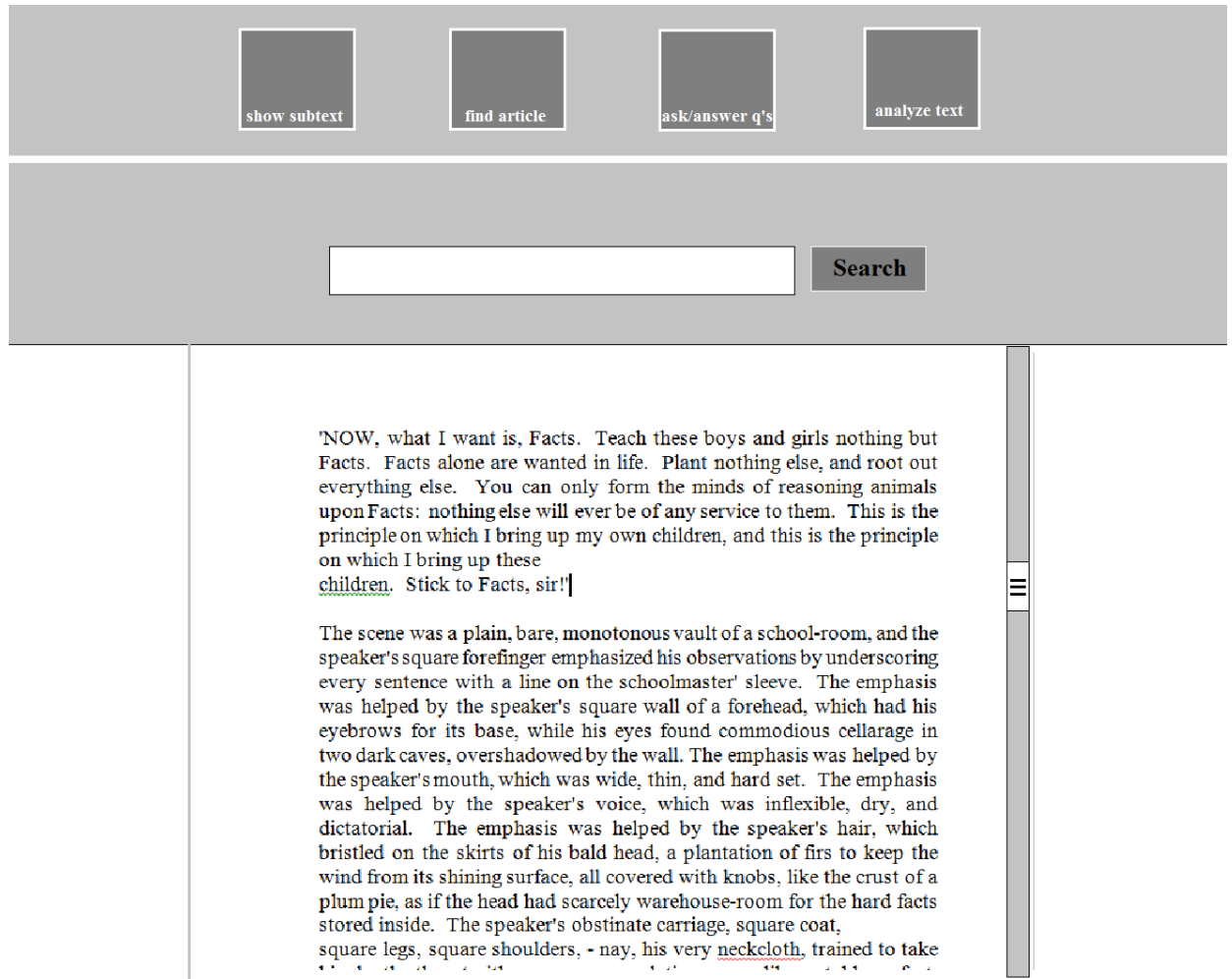 only act according to their own best interests, which they can calculate through rational principles, the actions of the simple, loving Sissy are inspired by her feelings, usually of compassion toward others. The philosophy of fact is continually shown to be at the heart of the problems of the poor—the smokestacks, factory machines, and clouds of black smog are all associated with fact—while fancy is held up as the route to charity and love between fellow men. Philosophically, this contrast is a drastic and obvious oversimplification. Clearly, a commitment to factual accuracy does not lead directly to selfishness, and a commitment to imagination does not signify a commitment to social equality. But for the purposes of Hard Times, these contrasting ideas serve as a kind of shorthand for the states of mind that enable certain kinds of action. Cold rationalism divorced from sentiment and feeling can lead to insensitivity about human suffering, and imagination can

(background text) The scene was a plain, bare, monotonous vault of a school-room, and the speaker's square forefinger emphasized his observations by underscoring every sentence with a line on the schoolmaster's sleeve. The emphasis was helped by the speaker's square wall of a forehead, which had his eyebrows for its base, while his eyes found commodious cellarage in two dark caves, overshadowed by the wall. The emphasis was helped by the speaker's mouth, which was wide, thin, and hard set. The emphasis was helped by the speaker's voice, which was inflexible, dry, and dictatorial. The emphasis was helped by the speaker's hair, which bristled on the skirts of his bald head, a plantation of firs to keep the wind from its shining surface, all covered with knobs, like the crust of a plum pie, as if the head had scarcely warehouse-room for the hard facts stored inside. The speaker's obstinate carriage, square coat, square legs, square shoulders, - nay, his very neckcloth, trained to take him by the throat with an unaccommodating grasp, like a stubborn fact, as it was, - all helped the emphasis. "In this life, we want nothing but Facts, sir; nothing but Facts!" The speaker, and the schoolmaster, and the third grown person present, all backed a little, and swept with their eyes the inclined plane of little vessels then and there arranged in order, ready to have imperial gallons of facts poured into them until they were full to the brim.

Fig. 13. Subtext Function

Presenting the analysis in such a manner is a visualization of the idea of subtexts.

The second icon "find articles" should allow students to find articles about the novel in general or a specific part of it. They should be able to copy and paste or post a link to this article in the Notes section on the interface. The "ask/answer q's" icon opens a space where students post a question or browse Q's and A's and can choose to answer some of the posted questions. In short, this is meant to be an interactive space for discussion.

The "analyze text" icon should allow student to pick a section and provide their interpretation of it. This part should work in the following way: the program

stores the different analyses of the students and the section of the text they address. Whenever there is a new attempt at analysis, the program, with a pop up window, points to previous analysis/analyses and asks for feedback on whether the two agree /disagree…etc. It should store this information. With the analysis of characters, for example, the program should ask for explanations, link this with stored information about other characters and form new questions for the student. This is just a general framework. The premise here is the idea of partnership (complementary division of tasks) and incremental intelligence (the machine becomes smarter with more interaction and feedback).

The search box is supposed to include the availability of content-based search, i.e., searching for something beyond single words or phrases. This will be helped by means of interpretative tagging. The html code of the text should include tagging of thematic and interpretative elements which will make searching for them possible. For example, the following tags:

<narrator's interjection></narrator's interjection>

In addition to tagging, search should include the subtexts: the analysis of themes and motifs. In this way, the result will show both the analysis and the relevant text.

iNovel allows the introduction of creative assignments. The different sections can remain editable. For example, students can be assigned characters and asked to complete their profiles or to rewrite certain section from a different POV and post this. The iFormat does not have to be complete but rather a sample like the one cited here can be posted and then students can work on the plain text and provide their own ideas as to how the text can be formatted. By doing so, they practically assume the role of reader/interpreter/writer.

In conclusion, the iNovel prototype is an application of iCriticism. It serves as a showcase of some main principles and points raised throughout this dissertation: the computer's adaptability to different uses and agendas, the heterogeneity, multi-dimensionality, and algorithmic nature of texts, the materiality of texts and interrelation among their different elements, how marking texts is always interpretational, partnership with the computer rather than using it as a tool, introducing fun and excitement, the activity and centrality of the learner, and visual representation and translation between senses.

CONCLUSION

My argument for iCriticism started with a claim that yet new uses for the computer in literary studies are possible. In broader terms, this means more integration of the computer in the type of tasks that we usually do in the field rather than using it as a tool for an already specified set of tasks. One term I frequently used in this context has been "humanizing the computer," in other words, using this incredible and powerful machine by our own terms rather than the ones that dominate its use. Most of the principles of iCriticism and the prototype comply with this general principle.

The two issues that received the most attention in the discussion are understanding the materiality of texts within the context of migrating print texts to the digital and reimagining the relation between the human and the computer because I believe that these are the themes most promising. Along the same lines, work on the prototype was preceded with developing a theoretical model that acknowledges the specificity of the print medium and its material conditions besides redefining the borders between the tasks that the reader/user are supposed to do and those that the program is designed to do.

Another underlying theme is the compatibility between computation a set of methods and literary criticism and the humanities in general. As a general rule, we are safe to claim that the compatibility is a result of the theoretical agendas rather than any inherent character in the computer. The different notions introduced in the dissertation contribute in this direction. The partnering/collaborative model, for example, allows a new understanding of the role of computation within any

humanistic practice. By virtue of this model, we are able to see that any incompatibility is due to the assumption that the computational device is supposed to work independently. If we start to think of it as a full partner, our whole approach will change and incompatibility is no longer an issue. All in all, a collaborative model will definitely alter the epistemological underpinnings of literary studies because the logistics of truth assignment in the field will radically change. A problem will be reformulated not only for human reasoning or intuition but for a machine's "intelligence", based on a complementary distribution of skills and tasks.

Another important conclusion is that computation is irrecoverably anthropomorphic. The strict view of the machine as something "not human" is a misconception, in as much as the view that some technologies, like the book, are natural or human. Technologies might not be natural but they are also not totally artificial. We interact with technologies in a cyborgist way, we become one with them and this interaction happens at different levels. The first one is physical interaction. Our bodies are entangled with machines in cycles of input/output. The second level of interaction is imitation. The camera, for example, is an imitation of the eye, a technologizing of the eye. On a deeper epistemological level, the camera's mechanism of work targets a human consumer; it creates its product for the eye's consumption, based on how the eye perceives reality. If input devices like keyboards, buttons, screens…etc are shaped and molded to the human body, we had better remember that the output is similarly molded to fit human perception.

On broader terms, computing is better viewed as a constitutive condition. We should also remember that human contributions are integral. The constitutive

condition is better understood as a human computer continuum. Along it, information is continuously processed and produced. An interface can be understood from this angle as a collision point of two distinct sets of skills. Attempts at exclusively looking at one point or end creates a partial view. Such a view also means the different elements are approached as independent elements or entities rather than emergent and codependent. This has important implications. Solutions to problems and challenges have to consider both players in this condition, the human and the machine.

One central theme that runs through my argument is that the computer is susceptible to different agendas and consequently uses. To make use of this aspect, a great room for experimentation is required. On these terms, the dissertation is structured to move from theory to application, hence the significance of iNovel at the end. It is needless to say that the engagement with prototype design can be a research activity in and by itself. While the importance of application applies to most fields of knowledge, it remains more true to the computer which lends itself more easily to applicability and concrete results. It follows that work in our field should end with some form of application/design. This might be the path towards the reintegration of the humanities within the terms of the time by translating the painstaking theoretical work into tangible and practical results.

It is necessary to end this conclusion by acknowledging some limitations, which are inevitable in a research that is done in a specific time frame and in an academic context like the present dissertation. It should be pointed out first that self-reflection as a necessary element was not totally neglected in iCriticism. The ability to self-reflect starts from the fact that iCriticism, following the approaches and

theories from which it draws, includes a reconsideration of dominant practices and forms. In other words, iCriticism exists in a context of self-reflection in the field due to the advent of digital technology. Besides, many of the principles summarized in chapter III, like the computer's adaptability, are general frameworks that are meant to guide the use of the computer within the field rather than to dogmatically stipulate any specific plan of action. Some other principles, like the multidimensionality of texts and the interpretational nature of marking, are to be tested through application and thus they are supposed to be continuously under reconsideration and therefore, self-reflection.

Another point that is worth mentioning in this conclusion is related to the prototype, iNovel, and some of its limitations. As explained in the introductory part, it is designed to be a showcase for some principles and ideas rather than a final product. It is also important to note that a full exploration of the iCriticism paradigm would require additional projects/prototypes beyond the iNovel, but these are beyond the scope of the dissertation. The general emphasis of iNovel on young readers and the focus of the administered survey might also give the impression of a tendency to please "the customer" or a commercial flavor. Related to this observation is the fact that certain facets of the iNovel are based on the preliminary feedback from readers about their reading practices; this is necessarily constrained by the self-reporting of these readers' limited experience with e-books. Also, iNovel's foregrounding of the novel as an algorithmic structure and interactivity might preclude the exploration of other possible approaches such as "distant reading," or the types of readings that involve a form of data-mining of texts for larger patterns.

With the acknowledgement of the previous limitations, the prototype still achieves its main purpose which is to reach a new form of reading that is more akin to the digital medium. This cannot be done without taking into consideration how reading on the screen is performed by specific groups of readers. Moreover, many of those limitations are due to the preliminary nature of iNovel. Hence, additional surveys of users of the iNovel prototype itself will be needed to present additional information and thus, more insight. In addition, the pedagogical inclination of iNovel has the advantage of making them realize other aspects of a critical nature like the multidimensionality of texts and their algorithmic nature. In this sense, iNovel as a pedagogical tool is meant to balance between entertainment and education.

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APPENDICES
Appendix A: The Students Questionnaire
1. You have both the book of your novel (let's say, The Great Gatsby) and an electronic text in
the form of an e-book (might be a pdf file); which one of the two would you use for the following activities:
Careful reading (reading the whole text for comprehension)
Careful reading of a selection, a section.
Skimming (to get the gist of the whole the text)
Skimming of a section.
Scanning (non-linear traversal)
Glancing (detecting important elements in the text)
Searching (a word, a section, a thematic element like an event or a certain point in the plot)
Annotating:
Bookmarking:
Navigating:
2. In general, why would you prefer the print text over the electronic? Think of the last three novels you have read in print and factors like convenience, eye fatigue, the experience of reading the book, besides studying mechanics and requirements (understanding, critical reading, thematic analyses ..etc).

3. What kind of sources do you use for locating background information and scholarly notes about a novel?
books
articles,
online study guides like Spark Notes ..etc.?
general search using search engines (Google):
others:
4. How do you prepare before reading a novel, do you read a plot summary, a thematic analysis, a scholarly article? Does this differ from the way you prepare while reading and after finishing the novel?
5. When using these sources, what type of info do you search for:
biography,
history,
literary style,
thematic analysis,
plot summaries?
add your own
6. When you decide to use the e-book, on what platform do you usually read it (the whole text):
laptop,
cell phone (iPhone),
iPad,
e-reader (Kindle, Nook ..etc)?

7. Which one of these platforms (laptop. Phone…etc.) would you prefer if you had to choose one? Imagine you had the option to read The Great Gatsby on one, which one would you pick? Why?

8. In what type of setting or situation would you use each platform (laptop, iPhone, e-reader)

- when you are in motion (walking, riding the bus ..etc).
- when you at home.
- when you are in class?
- when working on the text with classmates
- when preparing for class discussion
- when preparing for a written exam

9. What kind of annotation do you usually use on print novels (comments, questions, underlining, highlighting, ..? If possible, please send some scanned pages to this email.

10. Did you ever annotate using electronic texts? Please give a brief description below.

11. Under what circumstances (technical scenario) would you annotate electronically, you have leeway to imagine? Try to think of note-taking capacities in a program like Microsoft Word.

12. What types of search do you usually need to do on the text of a novel?

13. If you were to have content-based search capacities, i.e., the ability to search for thematic content rather than just specific words or phrases, what things would you like to be able to search for? Navigate for a thematic aspect like industrial revolution; perhaps I can use a specific text for exemplifying.

14. When in class discussing a novel, what activities are you usually engaged in?

•   What kind of notes and information do you bring with you (articles, plot summaries, character analysis ..etc)?

15. When you study in groups, do you share annotations or comments? Have you ever exchange your annotations on the novel's text with a classmate?

16. Suggestions: How do you rate the following envisioned capabilities?

•   Sharing annotations with classmates through an e-text of the novel.
•   Integration of multimedia (video clips of film versions of the book)
•   Read annotations and comments by classmates.
•   Summaries of major articles and plot summaries.
•   Content-based search: you will be able to search for thematic aspects like the figures of speech, where in the text does the author talk criticize industrial revolution ..etc.
•   Add your own*

*If your idea or suggestion is used in any way, you will be acknowledged and credited for this. You will also receive a special gift (besides a free copy of the software) if this idea becomes part of the final software)

Appendix B: The Professors Questionnaire

1. In general, do you prefer that students bring a book or e-book to class?

2. What kind of assignments do you usually give to students? What type of questions do you use in written exams?

3. Do you usually make use of technology, such as PowerPoint presentations or multimedia? Please provide a short description below:

4. Do you use online sources/search engines to prepare for class? What kind of info do you look for?

5. How often do you make references to the text of the novel during the discussion in class?

-1-2

-3-5

-More than 5

6. Do you assign scholarly articles to students? Do you prefer that students locate these articles and read them as preparation for class?

7. Do you approve the use of online study guides which include plot summaries and thematic analyses like SparkNotes? How useful do you think these are?

8. Do you use film versions of novels, either the entire thing or clips? How useful do you think this is? How do you rate it?

9. What type of preparation would you like students to have before discussing a novel in class?

10. Below, please describe the scenario of a typical class:

Appendix C: Analysis of the Questionnaire

E-Book Questionnaire – Students:

1. The question was about use of e-books and traditional books in terms of different types of readings. The following table shows the analysis of the answers:

1. You have both the book of your novel (let's say, The Great Gatsby) and an electronic text in the form of an e-book (might be a pdf file); which one of the two would you use for the following activities:

Novel	Print	E-Book
Careful reading (reading the whole text for comprehension):	**93.3% (14)**	6.7% (1)
Careful reading of a selection, a section:	**73.3% (11)**	26.7% (4)
Skimming (to get the gist of the whole the text):	**53.3% (8)**	46.7% (7)
Skimming of a section:	**53.3% (8)**	46.7% (7)
Scanning (non-linear traversal):	**53.3% (8)**	46.7% (7)
Glancing (detecting important elements in the text):	**66.7% (10)**	33.3% (5)
Searching (a word, a section, a thematic element like an event or a certain point in the plot):	26.7% (4)	**73.3% (11)**
Annotating:	**73.3% (11)**	26.7% (4)
Bookmarking:	**57.1% (8)**	42.9% (6)
Navigating:	**60.0% (9)**	40.0% (6)

2. The question was about the reasons for preferring a print book. These are the main ones:
   A. Convenience: lighting, eye strain, distraction, marking pages. Quote some of them.

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B. The experience of reading: turning the page…etc. "Reading is not electronic"
C. Permanence: "susceptible to damage"
D. Interactive functionalities: Orienting, navigating, annotating… "more complicated on e-book".
E. Comprehension and absorption of content: concentration, ability to reread, analyze..
F. Accessibility: easy to order…

3. The question was about the sources used for locating info:

3. What kind of sources do you use for locating background information and scholarly notes about a novel?		
	Response Percent	Response Count
books:	53.3%	8
articles:	53.3%	8
online study guides like Spark Notes ..etc.:	40.0%	6
general search using search engines (Google):	**73.3%**	**11**

The order of these sources based on use is:
1. General searching.
2. Books and articles.
3. Online study guides

4. The question was about how a student prepares before reading a novel; most of students answered one of the following:
A. Don't prepare.
B. Read back of the book.
C. Descriptions or reviews (like on Amazon.com).
D. Summary.
E. Depend on class discussion.
5. The question was about what type of info they search for; these are:
A. Thematic analysis
B. Plot summaries.
C. Literary styles.
6. The question was about the type of platform they use to read e-books:

laptop,	42.9%	6
cell phone (iPhone),	0.0%	0
iPad,	7.1%	1
e-reader (Kindle, Nook ..etc)	**50.0%**	**7**

The order is for platforms based on use is: 1) e-reader, 2) laptop, 3) iPad, 4) iPhone (almost never used)

7. The question as about the reasons for preferring a certain platform. The main reasons provided were:
A. Owning the device.
B. Familiarity with it.
C. Resolution and technical specifications.
D. Accessibility to copies.
E. Functionalities (navigation…etc.)
F. Similarity to books.
G. Convenience.
8. The question was about which type of book they use in different types of settings:

when you are in motion (walking, riding the bus ..etc).	0.0% (0)	35.7% (5)	**64.3% (9)**	14
- when you at home.	**64.3% (9)**	0.0% (0)	35.7% (5)	14
- when you are in class?	42.9% (6)	0.0% (0)	**57.1% (8)**	14
- when working on the text with classmates	**57.1% (8)**	0.0% (0)	42.9% (6)	14
- when preparing for class discussion	**64.3% (9)**	0.0% (0)	35.7% (5)	14
- when preparing for a written exam	**78.6% (11)**	0.0% (0)	21.4% (3)	14

9. The question was about the type of annotations they use. These were one of the following:
A. On a separate piece of paper.
B. Highlighting.
C. Short comments.
D. Sticky notes.
E. Writing on the margin (questions for the class) "connects to page…".
F. Underlining.
G. Flagging.
10. The question was about how they annotate using e-books. They use one of the following:
A. Word "add comment" function.
B. For fun not study.
C. Handwritten on a separate piece of paper.
D. Many don't, it takes effort.
11. The question was about under what circumstances they would annotate electronically. The answers were:
A. When editing.
B. For class discussions.
C. To save the notes.
D. Group work.
E. Have no access to a print copy.
F. In-class.
G. If required.
12. The question was about the types of search they perform on the text of the novel. They provided the following answers:
A. Key words.
B. Historical piece of information.
C. Citations.
D. Background info.
E. Bibliography.
F. Names (people and places).
G. Themes, style, and symbolism.
13. The question was a hypothetical situation about what things they would like to be able to search for, if they had content-based search capacities, i.e., the ability to search for thematic content rather than just specific words or phrases. They provided these topics?
A. Subtext – hidden themes.
B. Figurative language (images, metaphor…etc.).
C. Characters.
D. Quotes by characters.
E. Critical theory topics.
F. Genre.
14. The question was about the type of in-class activities they do in novel courses. They do the following:
A. Notes.

B. The text of the novel.
C. Previous notes.
D. Discussion.
15. The question was about whether they share annotations. The answers were one of the following:
A. They don't share.
B. They share when in group study.
C. They share the annotations or comments verbally.
16. The question was to evaluate some envisioned capacities for e-books. The results were as follows:

Not Good	Fine	Good	Very Good	Excellent	Rating Average	Response Count
Sharing annotations with classmates through an e-text of the novel.	20.0% (2)	20.0% (2)	**30.0% (3)**	0.0% (0)	**30.0% (3)**	3.00	10
Integration of multimedia (video clips of film versions of the book)	0.0% (0)	**40.0% (4)**	20.0% (2)	20.0% (2)	20.0% (2)	3.20	10
Summaries of major articles and plot summaries.	20.0% (2)	0.0% (0)	**30.0% (3)**	**30.0% (3)**	20.0% (2)	3.30	10
Content-based search: you will be able to search for thematic aspects like the figures of speech, where in the text does the author talk criticize industrial revolution ..etc.	10.0% (1)	0.0% (0)	20.0% (2)	20.0% (2)	**50.0% (5)**	4.00	10

There was also the option of suggesting some capabilities. Students provided the following suggestions:
A. Characters and their interactions.
B. Sharing notes and comments.
C. Suggestions for similar texts.

The professors' part of the questionnaire included 10 questions about the pedagogical practices in teaching novels as pertaining to the use of e-books.

1. The question was about which type of text they prefer students to bring to class: print of electronic. Most accept either.
2. The question was about the type of assignments and questions they give to students:

   Assignments:
   A. Readings.
   B. Journaling.
   C. Online questions' prompts.
   D. Responses.
   E. In-class group assignments.
   F. Short daily assignments.

   Questions:
   A. Interpretations.
   B. Short essays.
   C. Content-based objective tests.
   D. Definitions.
3. The question was about the use of technology. They use one of the following:
   A. PPT.
   B. Multimedia.
   C. Moodle.
   D. Doc cam.
4. The question was about their use of online sources in the preparation for their classes. They use these sources for the following reasons:
   A. Biographical-historical.
   B. The library online sources.
   C. Cortical articles.
   D. Google, Wikipedia, names, dates…
5. The question was about the frequency of in-class references to the text of the novel:

How often do you make reference to or read excerpts from the text of the novel in class?

	Response Percent	Response Count
3-5	25.0%	1
6-10	**50.0%**	**2**
More than 10	25.0%	1

- The question was about whether they assign scholarly articles to students. Most do not assign these in undergrad classes, others said they discuss these in class or incorporate them in students' presentations or group discussions.

6. The question was about their approval of students' use of online sources. Most had no reservation about this: "help orient themselves"

7. The question was about the use of film versions of novels as full versions or clips: "texts and adaptations".

8. The question was about the type of preparation they prefer students have before classes. They mentioned the following:
   A. Reading the text.
   B. Contextual materials.
   C. Have generated questioned.
   D. Identified key passages.
   E. Have their own idea about the text.
   F. Have the basics of plot, characterization, and theme.

9. The question was about the scenario of a typical class. They mentioned the following activities in a typical class:
   A. Open discussion.
   B. Guided discussion.
   C. General discussion.
   D. Mini-lecture.
   E. Prompted group discussions.
   F. Review of daily assignments.