
The Malleable Computer: Software and the Study of the Moving Image

By Daniel Chávez Heras

[O]ne can imagine, if still only hypothetically, that one day, at the price of a few changes, the film will find something that is hard to express, a status analogue to the book or rather to that of the gramophone record with respect to the concert. If film studies are still done then, they will undoubtedly be more numerous, more imaginative, more accurate and more enjoyable than the ones we carry out in fear and trembling, threatened continually with the dispossession of the object. [Raymond Bellour] (1)

A computer is a medium that can dynamically simulate the details of any other medium, including media that cannot exist physically. It is not a tool, though it can act like many tools. It is the first metamedium, and as such it has degrees of freedom for representation and expression never before encountered and as yet barely investigated. [Lev Manovich] (2)

As digital technologies permeate every aspect of the production, distribution and consumption of imagery, academic discourses in all related areas are increasingly under pressure to reconfigure their intellectual standpoints in order to accommodate these new developments in a coherent manner. In this respect the so-called digital turn has brought to the fore debates of ontology, in the case of Film Studies pertaining to what seems to be the inevitable downfall of celluloid as the material vehicle of cinema. It is not surprising, then, that Bellour's essay *The Unattainable Text* is being summoned back from the 1970s as a sort of harbinger of the issues of virtuality that surround film theory today.

In the quotation above, the French critic hints at a hypothetical instrument with which to engage this virtual image, an instrument in the broad sense of the term, which not only comprises an actual machine or device but that also, crucially, implies a certain "status" of the filmic image, a state or condition, let us say, that allows film to be *simulated*, and not only accessed through the interfaces of language, technologies of reading and writing that Bellour deems beholden to what he calls "the comparative backwardness of film studies". (3) These observations eventually lead him to a radical conclusion: "We might change our point of view completely [...] and ask if the filmic text should really be

approached in writing at all.” (4) A daunting question, perhaps too daunting in 1975 for the then incipient academic discipline of Film Studies, whose very call for institutional recognition was made in the form of written outputs, and which thus validated itself through the currency of language.

Meanwhile, around the same time in California, two core elements of the digital upheaval were developed: the microprocessor and the GUI (graphical user interface), both of which laid the foundations for the wide adoption of personal computers during the later part of the twentieth century. The second quotation above refers to the ideas behind these developments in the work of computer pioneer Alan Kay who, according to Lev Manovich, conceived the computer as a device capable of simulating all other media under the logic of a unified environment, one that –through its virtuality – would render all media identical at the level of its numerical register, thus enabling algorithmic manipulations through the use of software that were previously impossible. (5)

If we are inquiring about the consequences of the irruption of digital technologies in the academic study of the moving image, we must, in my view, explore the place that the computer occupies within the variegated practices of film and media scholarship, the beliefs and expectations scholars place upon this novel instrument as evinced by the functions they entrust to it. In what follows I set out to address these beliefs and expectations by examining two instances of software currently used to study film: the [Cinematics](#) project, and the [DIEM Project](#). Both of these initiatives stem from neoformalist traditions of film scholarship, and are indebted quite directly to the approach favoured by David Bordwell and Noël Carroll. (6)

I will argue, however, that a close interrogation of each project’s deployments of software, and the intellectual assumptions behind its design, show that the computer is indeed *soft* enough to accommodate a wider range of intellectual frameworks and their concomitant styles of knowledge about cinema. I am referring here to approaches to the study of film whose epistemological basis are not granted by the methods of empirical research and causal explanation, but rather by the exploration of modalities of interpellation that create new concepts and re-arrange existing ones. (7) In other words, traditions within film studies that do not follow natural scientific epistemological models, but thread instead through the less quantifiable grids of psychology, race, gender, embodiment, and political and cultural subjectivity, often under the auspice of philosophical enquiry; some of the approaches directly indebted to Deleuze for example. (8) The arguments hereby presented are thus engulfed in the larger task of claiming the computer as a broad instrument for/of philosophical thought in the humanities, a contestation,

I will go on to suggest, whose intellectual stakes can help to frame Bellour's concerns against the digital onslaught.

Image to Data and Data to Image

In spite of their ubiquity in nearly all spheres of contemporary life (including scholarship), computers as an instrument, and computing as a method, occupy a relatively marginal space in the academic study of film. To be sure, the so-called new technologies are a recurring topic in film scholarship, but they are mostly discussed as such, as a topic; that is, they are discussed in relation to their consequences for films, in terms of production, distribution, exhibition or reception, in the debates concerning CGI, video on demand, or YouTube, for example. Very rarely do these technologies come up in discourse as scholarly instruments, and therefore their place in this respect remains still rather unclear. This is not to say that computers are not used to *do* film studies, as they undoubtedly are. But the focus of this piece is *how* they are being used, what our assumptions about them are, and what place we have given to them in our methodologies of film research. To understand this place, and to question these assumptions, let us examine one instance of software currently used in film studies: the [Cinematics](#) program. (9)

Cinematics is a small piece of software created by film scholar Yuri Tsivian in collaboration with statistician and computer scientist Gunars Civjans. It basically consists of an interface that allows the user to capture in real time the shot length of a given film as it is being watched ([Figure 1](#)). Shown in the screenshot is an advanced version of the interface that also allows the user to simultaneously capture the shot scale; as the film and the software are running, the user inputs (clicks) the buttons labelled with the different available types of shot according to what she or he sees onscreen (e.g. full shot, long shot, close up). Meanwhile, the program records, calculates, updates and displays this collected data so as to indicate the total number of shots, the average shot length, and the length of the last recorded shot. Also displayed is a timer, which can be stopped and resumed if the user wants to have a break. Finally all the captured data from a session is collected into a file and can be submitted via the Cinematics website to a freely available database. The gathered information can then be compared to that of other films, usually in terms of authorship attribution, chronology, genre classification, etc. (10)

This type of stylometrics is indeed familiar to neo-formalist approaches in film studies. For example, David Bordwell's arguments about what he calls "intensified continuity" are supported to a great extent by measurements of a number of style variables, including average shot length.(11) Barry Salt is another scholar who takes this approach. In his

statistical analysis of film style Salt collects data relating to variables over which he considers film-makers to have more control: shot length, shot scale and camera movement, for instance. He then analyses the collected data using familiar statistical tools such as standard deviation so as to detect patterns and anomalies in any given corpus of films. (12) Using celluloid prints (as Salt did when he started measuring his variables more than thirty years ago) demands a lot of patience and considerable skill – not to mention access to the prints – and in this sense software like Cinemetrics has made the whole process considerably easier.

It is not my intention to assess whether this statistical style of analysis is more accurate or, as Warren Buckland argues, “more systematic and rigorous” (13) than its non-statistical counterparts, nor am I interested at this moment in the question of the Cinemetrics program’s effectiveness or lack thereof with regard to measuring film style. I want to examine instead the assumptions behind its creation in terms of the tradition of film scholarship that has engendered it. In principle it should not be very surprising that neo-formalism is, of all scholarly approaches to film, the one that most quickly embraced the use of software. After all, Salt was quantifying, collecting and processing data from films even before computers came along, and in this sense software presented him with a logical instrument for the continuation of his project. But beneath this deceptively fitting marriage lie assumptions about software being an intrinsically rigid and exact instrument, befitting of the natural sciences inasmuch as it is “best suited” for quantitative analysis, and thus “better” deployed by the narrowly focused empirical approach championed by Bordwell and Carroll.

The Cinemetrics program was indeed created under this logic, developed as a measuring tool, a mechanism to alleviate the painstaking technical tasks involved in the collection and processing of data; hence it used the computer for its automation and precision capabilities. Underpinning this organization is the epistemological structure that assumes film style to be a phenomenon that needs to be measured in order to gain knowledge about it, and thus that the more accurate the measurement is, the better the knowledge. On this account, conceived as a measuring instrument, the computer would seem of no use, or at least inadequate, to frameworks that, either, do not base their claims on quantification, or that consider images to be immeasurable; in other words, frameworks whose methods are based in philosophical rather than scientific enquiry.

But to what extent are these assumptions about both images and computers justified? Is it not the case that this role assigned to computing is also a historical construction and that, as such, it too can be challenged? In my view, it is the place given to software in our intellectual frameworks that is responsible for its inadequacy and not vice

versa. The order implied by the Cinematics program is image-to-data, but suppose that we reversed this logic and imagined a piece of software whose order was data-to-image, and that instead of having the computer counting our images to collect data, we asked it instead to create images out of our data. How would this reversal shift the position of computing as an instrument in the study of film? To pursue this thinking, we first need to explore and reconsider some of our assumptions about software.

Soft Machines

One of the first issues that arise when confronting software is interdisciplinary resistance: its purpose and language seem at first glance foreign to the arts and humanities' own purposes and vocabularies. To bridge this gap it is convenient to frame the issue of software from the perspective of humanities computing, a practice that informally started more than three decades ago but that has only recently gained institutional recognition in the field now known as digital humanities. (14) Since their early beginnings as infrastructural tools for digitisation and indexing, functioning as a replacement for index cards in museums, archives and libraries, computers have become one of the central loci of interest for many of the humanities disciplines, and it is this very transformation that is both echoed and effected by the digital humanists. A way of expressing this conceptual shift is to understand the overarching project of this young discipline as one of rethinking computing by removing its instrument - the computer - from its behind-the-scenes role as a cybernetic assistant for the humanities disciplines and placing it on the centre plateau of humanist intellectual discourse. This is a promotion described below by David M. Berry with reference to a lecture by Willard McCarty:

The digital humanities themselves have had a rather interesting history, starting out as “computing in the humanities”, or “humanities computing”, the early days were very often seen as a technical support role to the work of the “real” humanities scholars who would drive the projects. This was the application of the computer to the disciplines of the humanities, what has been described as treating the “machine’s efficiency as a servant” rather than “its participant enabling of criticism”. (15)

Parallel to this reconsidering of computers lies the second problem: software and the study of images. If, on the one hand, there is this pretended promotion of the computer from a tool in the service of humanist thought to a device with which to think the humanities, on the other it needs to be noted that the addition of the tag “digital” has not de facto erased the hierarchies inherited from the regular, non-digital,

humanities, and especially not the hierarchy that orders verbal and visual representation. Johanna Drucker succinctly frames this second issue in genealogical terms:

Critics trained in or focused on the modern tradition (in its twentieth-century form and reaching back into eighteenth-century aesthetics) have difficulty letting go of the longstanding distinction between textual and visual forms of representation – as well as of the hierarchy that places text above image. (16)

This hierarchy is exercised through the structure of humanities scholarship and reaches all the way down to the textual output of humanities research. It is precisely in this instance that the digital humanities prove their worth, for at its most provocative, this emergent discipline is putting pressure on these structures, on this regime of knowledge founded on the dichotomy between the sayable and the showable. “Can scholarship show as well as tell?” asks Tara McPherson in her introduction to *Media Studies and the Digital Humanities*, arguing in a bold gesture that humanists must “rethink our allegiance to print as the only (or even primary) outcome of our scholarly endeavours”. Computing technologies, she goes on to argue, “allow us to imagine very different scholarly ‘outputs’ at the surface of the screen.” (17)

Consequently, to understand software in these terms means to locate it in an evolving space of negotiation created at the encounter between the quantitative-qualitative vis-à-vis the verbal-visual. Moreover, it means to historically trace its movement through this space, as for example do Schnapp and Presner in their conceptualisation of a second wave of digital humanities:

The first wave of digital humanities work was quantitative, mobilizing the search and retrieval powers of the database, automating corpus linguistics, stacking hypercards into critical arrays. The second wave is *qualitative, interpretive, experiential, emotive, generative* in character. It harnesses digital toolkits in the service of the Humanities’ core methodological strengths: attention to complexity, medium specificity, historical context, analytical depth, critique and interpretation. (18)

Using these coordinates we can map Bellour’s concerns onto the shifting computing models of the digital humanities. In so doing we expose software as a site of contention. Can we ask the computer to do something other than indexing and labelling (counting and naming)? This second wave of the digital humanities, as manifested in the works of

Berry, Drucker, McPherson, Schnapp and Presner, amongst others, suggests that we can, and further suggests that software is indeed *soft* enough to accommodate the demands of qualitative frameworks. Drucker, for instance, examines these possibilities under an approach she calls “speculative computing”, which she bases upon three main strategies: (19)

- a) Generative aesthetics – concerned with form-giving instead of its assessment.
- b) ‘Pataphysics – a concept attributed to Alfred Jarry by which emphasis is shifted from finding norms that describe phenomena to finding exceptions, or unique cases.
- c) Quantum methods – which consider phenomena to be indeterminate, and posit the observer as the determining entity, the creator of the phenomena.

It is not my intention to examine these strategies in depth; instead I will use the first one as a departure point, and just touch on the second in order to get to the last one. In this order of ideas, we can begin by asking: what can software do apart from counting and naming? Aside from assessing and categorising images, the computer can *give form* to images. This is indeed one of its most powerful capabilities, and yet, it is also the one whose potential, when it comes to scholarly deployments, is most often overlooked.

This form giving appears around us in the instant rendering of all sorts of images: from the blockbuster at the cinema, to the moving charts of the stock market. At the same time, while ubiquitous in nature, this becoming of images is rarely seen, mainly because its rendering processes are usually concealed from us. Therefore what occurs at the point where information is given a shape is often taken for granted and considered automatic, and the shapes created are presented as natural or even inevitable. The computer in this respect plays an increasingly important part in contemporary regimes of the visible. It allows some images to exist while simultaneously keeping others from existing, even when in many cases this crucial rendering process goes unnoticed in the black box of intangible software, deployed in silence, at ever-increasing speeds and through an algorithmic mode of expression that shields it from social scrutiny. (20)

Drucker’s generative aesthetics are provocative insofar as they draw out software’s elusive capacities in the configuration of visibilities, thereby suggesting a different place for computing in the study of the visual. However, although the terms of the question have changed, it still

remains unanswered: is it possible to harness these capacities in the service of film scholarship? It is one thing to render a graph that plots the ratio between two distinct quantifiable variables, and quite another to render an image with which to think another image. Can the computer live up the high expectations placed upon it by this second wave of digital humanists? How do we go from the Cinematics program to Drucker's quantum digital environment of "plasticine that remains malleable, receptive to the trace of interpretative moves"? In order to help frame this transition let us now take a look at the [DIEM Project](#).

The Dynamic Images and Eye Movements (DIEM) project is based on a sophisticated cybernetic system consisting of two parts: a hardware component (Eyelink 1000) that tracks the eye movements of a human subject, and a software component (Computational and Algorithmic Representation and Processing of Eye-movements, or CARPE) that turns the collected data into a visualisation. Researchers at the Visual Cognition Lab of the University of Edinburgh have applied these two systems to a total of 250 participants watching 85 different videos, from a Wimbledon tennis match, to a clip of a landscape in Antarctica, to a segment of The Simpsons. According to the DIEM website, this setup is designed to investigate the "way we look" and how this looking may influence our perception, memory and feeling of images: "Our goal is to develop a comprehensive theory of active visual perception and cognition." (21)

The hardware in this case collects the data of a physiological response (the eye movements), while the software *renders* it into a visualisation of this response. The result is a sort of gaze-tracking video in which the data from the bodily response is mapped onto the original clip so as to indicate where exactly onscreen the participants are actually fixating their gaze, the specific areas of interest that command their attention at any given point during the clip's playback. (22)

The researchers quickly ran into a peculiar problem: while their piece of hardware collected the physiological data from the viewing subjects very accurately, in its data form (as the numerical locations plotted in X and Y every thousandth of a second and for every participant) this information was quite useless; dissociated from the image that prompted the eye movements in the first place, the gathered data could not serve its intended purpose, namely, to *show* the gaze's fixation points. To address this issue a complementary system was designed (the CARPE software) that would map the data sets onto their corresponding videos. The software renders such mapping as follows: for every frame of the video, the point (X and Y location) of each viewer's gaze is represented using a circle, and the size of the circle is calculated in relation to how long the eyes of this viewer have fixated on this specific point. The same process is

then repeated for all the viewers involved and all the resulting circles are then superimposed back onto the video frame by frame. The result rendered by the CARPE software is a visualisation of the gaze of the participants, which to some extent allows us to see how they see ([Figure 2](#)).

In its experimental arrangement, as well as in its design and purpose, the DIEM project might seem closer to Bordwell than to Deleuze, especially since it originates within the framework of cognitive psychology favoured by the former. It is also true that the outcome of this project has been enthusiastically welcomed by Bordwell, who had previously written about gaze-tracking, and who saw in the visualisations a way of confirming his own postulations about film, and crucially also about methodology. In fact, one of the pilot tests conducted by Tim Smith of the DIEM project took off precisely from Bordwell's [analysis of a scene](#) of the film *There Will Be Blood* (Paul Thomas Anderson, 2008). The scene in question unfolds early on in the film (18' 47"). Oil prospector Daniel Plainview, his assistant Fletcher Hamilton and Daniel's son HW receive an unexpected visit from Paul Sunday, who assures Plainview there is oil in his family's property and who wants to sell to the oilman the location of his family's ranch. As they agree on the price, the four men gather around a map and, in a single long take, Sunday points them in the right direction. This last take is the one analysed by Bordwell; broadly speaking he argues that, even though there is no editing, the director Paul Thomas Anderson carefully stages the scene so as to tightly direct our attention ([Figure 3](#)). (23)

These observations about staging were then [picked up by Smith](#), who compared them to his eye-tracking visualisation of the same clip: "Is David right in predicting that, even in the absence of other compositional techniques such as lighting, camera movement, and editing, viewer attention during this sequence is tightly controlled by staging?" asks Smith. He concludes that Bordwell is right, using the gaze visualisations as proof and thus offering what Bordwell would later deem "almost unprecedented in film studies [...] an effort to test a critic's analysis against measurable effects of a movie". (24)

I am not interested in either validating or discrediting Bordwell's analysis, nor indeed his claims about Anderson's staging technique (which for the most part I agree with). Instead, it is the experiment itself that I want to explore: the way visualisations are used, how they are produced and, furthermore, their existence in the first place. Let us first consider the use. Smith regards the gaze-tracking visualisations as a sort of scientific evidence, and in a sense they do prove Bordwell right no less than they prove him wrong. Seeing the circles change position and size, one gets the impression that there is so much more going on with the

gaze: faces are indeed focal points and command our attention, most of the time supported by dialogue and movement, but simultaneously the gaze wanders off all the time to random places in the frame. In the same scene from *TWBB*, for example, as Paul enters the room and halts, there is a point at which there are as many gazes directed at the light as there are directed at his face; a couple of frames later two viewers quickly examine another light source in the very top right corner of the frame ([Figure 4](#)), and right before Paul moves on, one of these wandering viewers sets his eye on an object on the wall behind. Similarly, as Paul moves into the next room, turning his back to the camera and revealing Daniel sitting at his desk, most viewers focus on the illuminated face of the oil prospector; but as he speaks, the lamp next to him also receives some attention, and most interestingly, there are some viewers who direct their gaze towards dark, objectless and even remote areas of the screen, as if expecting something to emerge from the blackness ([Figure 5](#)). Finally, as Paul leaves this scene ends, but the next scene is equally interesting in terms of gaze tracking. It consists of a pan and then a tracking shot that follows Daniel's car behind a train platform; as the car approaches from the distance it becomes the main focal point (although the gazes of some viewers wander to the train tracks) ([Figure 6](#)). The camera follows the car through the whole take, but as the vehicle goes behind the platform and is no longer visible viewers are put in a peculiar position: on the one hand the camera keeps moving as it tracks the car, but on the other a number of objects on the platform also call for attention (a dolly, a red box, a bench and even a dog). At this point the invisible (but moving) car and the visible (but static) objects compete for the viewers' attention, and this produces a far less coherent scenario for gaze tracking ([Figures 7.1 and 7.2](#)).

All these anomalies are left out of Smith's analysis, first because he focuses on a scene with relatively few objects, four human faces and almost no camera movement. But another and more important reason is that Smith uses what he calls "a little visualisation trick" which consists of asking the CARPE software to render a "peekthrough" heat-map that, instead of all the circles, shows only a condensed area where most viewers' gazes converge by blocking out everything else. ([25](#)) From a cognitive-formalist stance, this is the obvious gambit, but we need to consider the logic behind this usage: the heat-map visualisation is reduced, as it grants visibility to the most common cases by selectively erasing the exceptional ones; in other words it favours the normal at the expense of the deviant, and thus the resulting image presents itself as univocal and coherent. And not only are the exceptional gazing moments erased, the gazers themselves are no longer individually represented; by switching from eleven circles (one for each gazer) to a single heat-map, the viewers involved in the experiment are all condensed into one anonymous gazer. So if previously we did not know their race, gender,

age or anything else for that matter, in this visualisation we know nothing even about their individual gazing, which is subsumed into a unifying focal point (and sometimes lost altogether) ([Figures 8.1 and 8.2](#)).

It is not hard to see from this perspective the deep implications of the process by which data is given form. Of course this does not mean there is no knowledge to be gained from the peek-through visualisation, or that this knowledge is necessarily less valuable, but it does mean that we must recognise that implicit in this rendering is an epistemological regime founded on the principle of normalisation. But what if we turned to a different regime - a 'pataphysical one for example? We could then ask the CARPE software to render a visualisation that erased the fixation moments in order to see the instants of exploration, of indecision, to see where we see when we are not seeing what we are supposed to be seeing. As we can see in the following screenshot, the CARPE software offers these selective capabilities already ([Figure 9](#)). Furthermore, there is information that appears to be absent, such as blinking: in the circles visualisation, when a viewer blinks, her or his circle simply disappears for a frame or two ([Figures 12 and 13](#)), while on the heat-map, because the viewers are not distinguishable from one another, we cannot tell when someone has blinked. But it is important to note that this information, while seemingly absent, does exist, and is still information; it emerges as the "negative" data when compared to the "positive" data. Consequently we could even ask the software to erase everything other than the instants we missed by blinking, thereby producing an uncanny new visibility: a visualisation of the unseen. This is something that, this time, is far closer to Deleuze than it is to Bordwell.

This experiment might indeed be unprecedented in film studies, in its scholarly form at least, but not because of the reasons posited by Bordwell. These visualisations might have been created following the principles of cognitive psychology - as Smith puts it, "Reducing complex processes down to simple, manageable, and controllable chunks" ([26](#)) - but something unexpected happened: the simple, manageable and controllable chunks that can be counted and named were in this case so small and so spatialised that they became impossible to unbind from their image. As a result, researchers had to ask the software to put all the chunks back together, to give this information a form. In the process the data became once again complex and unmanageable, unquantifiable and to a certain extent unnameable; it became another image.

Information is in this way revealed to be bound to its visual representation rather than existing independently from it, and the form-giving process undertaken by software is also revealed to be a site of dispute, producing different visibilities on the face of different regimes of knowledge, or in other words, determining phenomena by observing them

in a specific way. This notion brings us back to Drucker's quantum aesthetics, but it also reminds us of Deleuze's luminosities:

Visibilities are not to be confused with elements that are visible or more generally perceptible [...] [Visibilities] are not forms of objects, not even forms that would show up under a light, but rather forms of luminosity which are created by the light itself and allow a thing to exist only as a flash, sparkle, or shimmer." (27)

The predominant luminosity in the study of the moving image institutionalised as Film Studies has been writing. This luminosity has rendered certain visibilities, many of which have been, and still are, undoubtedly valuable. But if we are after new visibilities, and seek a glimpse or a shimmer of that which is still unseen and which by its invisibility is yet unthought, we must turn our attention to other luminosities. Therefore, key to these reflections about the DIEM project is the question of its method, fundamentally the fact that before the image is verbally described, it is accessed in the first instance through another image: a metapicture. Admittedly, this metapicture is again updated by language in Smith's analysis, and in mine, but this order reversal is hardly a minor alteration; on the contrary, it enables the possibility of a far-reaching epistemological shift whose strategies do not assume that films *need* to be translated into writing, and that opt instead to formulate visual *énoncés* as their primary task, in other words: visualisations of the visual.

Moving image studies as discipline can then become removed from its ontological anchor; it is neither the film nor the metapicture that constitutes the object of study, but the simulation involved in the picturing process. Consequently, the intellectual stakes of such luminosity lie not only in what we can picture, but, most importantly, in what we can think of picturing and how. In this sense the use I suggest for the computer is closer in its purpose to the avant-garde than it is to cognitive psychology; it is through the process of conceiving the image, by performing its design and subjectively manipulating its simulation, that images can be used to investigate other images.

We have grown accustomed to think of computers in binary terms, operating under the inflexible logic of ones and zeros that is often cited as its structural core at the hardware level. But a careful examination of software reveals computing as site of symbolic dispute: its sophisticated algorithmic system is not at all foreign to notions of infinity, contingency, or paradox, which in turn suggests its deployment is no more natural to science than it is to philosophy. In my view, this re-thinking of the computer as an instrument with which to think cinema is one of the great

possibilities afforded by a digital re-birth of film studies as a discipline. Perhaps the day that Bellour anticipated, in which the filmic text could be approached not only through writing, is closer than we think, and paradoxically, it might be the utter dispossession of the filmic object that enables this possibility.

Endnotes:

(1) Raymond Bellour, "The Unattainable Text", *Screen* 16, no. 3 (1975), 19.

(2) Lev Manovich, *Software Takes Command* (Digital book draft; Software Studies Initiative, 2008), 71 (PRC version).

(3) Bellour, "The Unattainable Text", op. cit., 19.

(4) *Ibid.*

(5) Manovich, *Software Takes Command*, 21-35.

(6) See: David Bordwell and Noël Carroll, *Post-Theory : Reconstructing Film Studies* (Madison: University of Wisconsin Press, 1996).

(7) For a clear and concise discussion of these approaches and their specific methodological strategies see: D. N. Rodowick, "An Elegy for Theory*". *October*. 1 (122): 91-109.

(8) One example of these approaches is the work on cinema and the senses of Laura U. Marks, whose embodied spectatorship theory served as a sort of counterpoint to Bordwell for the purposes of this piece. See: Laura U. Marks, *The skin of the film: intercultural cinema, embodiment, and the senses* (Durham: Duke University Press, 2000).

(9) Cinemetrics Ver. 1.0, Yuri Tsivian and Gunars Civjans, Chicago (2010).

(10) When version 1.0 of Cinemetrics was released at the end of 2006 it had 500 submissions. Version 2.0 is scheduled for 2011 and as of July 2011 there were 7444 measurements submitted to the database. Gunars Civjans, e-mail to author, July 19, 2011.

(11) David Bordwell, "Intensified Continuity: Four Dimensions" in *The Way Hollywood Tells It: Story and Style in Modern Movies* (Berkeley: University of California Press, 2006), 121-137.

(12) Barry Salt, *Moving into Pictures: More on Film History, Style, and*

Analysis (London: Starword, 2006). See also Salt's notes about his methods on the Cinemetrics website: www.cinemetrics.lv/salt.php.

(13) Thomas Elsaesser and Warren Buckland, *Studying Contemporary American Film: A Guide to Movie Analysis* (London; New York: Arnold; Oxford University Press, 2001), 116.

(14) Joseph Raben, "Introducing Issues in Humanities Computing", *Digital Humanities Quarterly* 1, no. 1 (2007).

(15) David M. Berry, "Digital Humanities: First, Second and Third Wave", in *Stunlaw: A Critical Review of Politics, Arts and Technology* (2011): <http://stunlaw.blogspot.com/>. Accessed on July 7, 2011.

(16) Johanna Drucker (and Bethany Nowviskie), "Speculative Computing: Aesthetic Provocations in Humanities Computing" in *A Companion to Digital Humanities*, ed. Susan Schreibman, Raymond George Siemens, and John Unsworth (Oxford: Blackwell, 2004), 434.

(17) Tara McPherson, "Introduction: Media Studies and the Digital Humanities", *Cinema Journal* 48, no. 2 (2009), 120, 122.

(18) Jeffrey Schnapp and Todd Presner, “Digital Humanities Manifesto 2.0” (2009): <http://manifesto.humanities.ucla.edu/>. Accessed on July 14, 2011. (Emphasis in the original.)

(19) Drucker, “Speculative Computing”, op. cit., 434.

(20) See Joseph Raben’s “Blackboxing” in “Introducing Issues in Humanities Computing”, op. cit.

(21) “Dynamic Images and Eye Movements”:
<http://thediemproject.wordpress.com/>. Accessed July 14, 2011.

(22) See the videos at <http://vimeo.com/visualcognition>.

(23) David Bordwell, “Hands (and Faces) across the Table” in *Observations on Film Art*, ed. Kristin Thompson and David Bordwell (2008): <http://www.davidbordwell.net/blog/2008/02/13/hands-and-faces-across-the-table/>. Accessed July 1, 2011.

(24) Tim Smith, “Watching You Watch *There Will Be Blood*” in *Observations on Film Art*, ed. Kristin Thompson and David Bordwell (2011): <http://www.davidbordwell.net/blog/2011/02/14/watching-you->

[watch-there-will-be-blood/](#). Accessed July 1, 2011.

(25) *Ibid.*

(26) *Ibid.*

(27) Gilles Deleuze and Séan Hand, *Foucault* (Minneapolis: University of Minnesota Press, 1988), 45.

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