Film history in the making
Film historiography, digitised archives and digital research dispositifs
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3.0 Microscopic Visions of the Film-Text: Stylometry, Archival DVD Editions and Film Philology

In this chapter I discuss a variety of software applications for annotating and visualising stylistic features in video content, which have emerged roughly since the mid-2000s. These applications' techniques can be described as 'cinemetric' or ‘stylometric’ because they are concerned with measuring and producing statistics on film-texts to visualise structures and developments in film aesthetics and narration. Broadly speaking, cinemetric techniques produce a text-centred visual methodology for content analysis which counts and categorises image features through methodologically explicit, descriptive procedures to quantify and summarise them with statistical expressions. As a form of content analysis, cinemetric techniques are used for making inferences about historical developments in film style by quantifying image features, such as editing, colour or light, as statistical key variables, to represent patterns statistically in either individual films or larger corpora. Discussing a variety of cinemetric techniques, this chapter's main objective is to outline their underlying methodological procedures and assumptions and to understand how the visualisations they produce (can) achieve a function as epistemic images for historians of film style and film-philology in different media formats. In line with my theoretical framework, I study their knowledge production without idealising nor contesting their research results, but to understand them as formalities and logical processes which manifest themselves in socio-technical, methodological procedures.

The chapter is divided into three parts, discussing respectively historical and epistemological aspects of cinemetric techniques, their overlaps with philological restoration theory and historical-critical DVD editions and, as a case study, their applications within the research project Digital Formalism centred around the Austrian Filmmuseum's collection of films by Soviet director Dziga Vertov. The chapter's first part - 'Cinemetric Techniques for Digital Video Analysis' - considers cinemetric software applications as techniques embedded within specific traditions, in relation to historical and epistemological developments of statistical style analysis in film studies in the 1970s (especially the theories of film history of scholars Vlada Petric and Barry Salt) and in relation to contemporary scientific visual culture. Out of a variety of recent, cinemetric software applications for stylistic analysis I first focus on Cinemetrics, the most emblematic and widely practiced of the

tools to have emerged. My discussion of Cinemetrics will revolve around its introduction of scientific visual analytics into film historiography as a way of reformulating and refining the empirical foundation for statistical style analysis. A crucial aspect of the analysis is the ways in which the tool's users negotiate and produce scientific, historical evidence with Cinemetrics through discussions of scholarly tradition, data collection and the statistical representation of data. Subsequently, in this part I consider related methods such as Cultural Analytics and ACTION as approaches which share representational practice with Cinemetrics, but which can be regarded as an overtly 'humanistic' strand of quantitative content analysis because of a less formalised production of data visualisations as evidentiary images.

The second and third part of the chapter focus on the DVD format as a technical environment in which cinemetric visualisation techniques can acquire a significant, structuring role for historical analysis of archival prints as film-texts. Part Two, 'Navigating Film History's Philological Complex on DVD', focuses on the conceptualisation of the DVD in scholarly circles as a historical-critical format for presenting annotated editions of archival film and related material. It extends on the discussion of cinemetric techniques by suggesting that the historical-critical DVD format shares concerns with the textual focus of cinemetric techniques, and combines it with philological film restoration theory and print criticism. In the third part, 'Visualising Film History’s Philological Complex: Digital Formalism and Odinnadcatyj (The Eleventh Year 1928)', I develop this point throughout a case study of the Austrian research project Digital Formalism (2007-2010) which produced a DVD version of Soviet film director Dziga Vertov's Odinnadcatyj (The Eleventh Year 1928). This release attributed a privileged role to a visualisation produced with ImageJ by using it to structure a stylistic-philological reading of Vertov's editing system and reuse of footage within his films and in films by other directors, notably in a film by German director Viktor Blum.

Conclusively, based on my findings, I argue that the combination of cinemetric techniques and principles of philological scholarly DVD editions, embody and develop methodologies imagined by Petric and Salt in the 1970s. This has created a 'philological' dispositif which combines traditional concerns of stylistic and philological film history, to produce visibilities of both directorial style and print criticism in one visual research format. My conclusion outlines the assumptions and methodological implications of this dispositif in combination with some remarks using the descriptive categories by Albera and Tortajada to characterise its human-machinery interactions.

430 Other tools are ImagePlot, Shot Logger, Lignes de temps, Moviebarcode, ACTION and the software developed by programmer and artist Frederic Brodbeck also named Cinemetrics.
Chapter 3

3.1 Cinemetric Techniques for Digital Video Analysis

Statistical Style Analysis and Representation of Filmic Structure

Before my analysis of cinemetric techniques I would like to return to and expand upon Vlada Petric's pleas for a “visual/analytical” history of film (discussed in Chapter Two). In the mid-1970s, Petric called for closer collaboration between academic institutions and film archives in a plea for rethinking the historian's practice of analysing and representing film style.431 This plea was premised in the contention that the film histories which shaped academic curricula in North America - namely Sadoul's, Low's, Jacobs' and Eisner's - had described film editing and style developments inaccurately, lacking a reliable, empirical basis produced through close readings of archival prints at editing tables in film archives.432 According to Petric, to reliably account for film editing's “historical evolution”, archival prints should be scrutinised as the film historian's “primary documents” to produce extensive and precise analytical documentation of editing patterns in films from canonical genres and periods.433 Furthermore, scholars should develop “visual/analytical” formats for presenting their research results since, according to Petric, written film histories followed the conventions of disciplines which could not faithfully convey cinematic structures' specificities.434 In Petric's view, this could take the form of an example-based lecture format in university settings, which would chronologically walk through the cinephile canon of silent era schools and masterpieces, to allow for “direct analysis of cinematic values” and their evolution, with an emphasis on film editing.435 The format would consist of an introduction, film screenings and a shot-to-shot analysis of sequences using a stop-motion projector for analysis so as to anchor the film analysis visually and “grasp the cinematic structure”.436 However, in spite of Petric's elaborate proposal for a visual/analytical lecture format, it remained largely unrealised.

In several aspects, Petric's call for new methodical procedures shared affinities with the statistical approach to stylistic film history developed by Barry Salt in the same period. Salt equally called

431 Vladimir Petric, op. cit., 21.
432 Ibid.
433 Ibid., 23.
434 Ibid., 24.
435 As Petric specified this comprised: “only the most influential filmmakers (…), and only their most artistic achievement in order to permit a direct analysis of cinematic values”.
into question contemporary scholarly methods for analysing styles of editing, addressing in particular Andrew Sarris’s *auteur* studies of American directors.\(^{437}\) He contended that films should be studied on flatbed editing tables or other viewing equipment to generate statistical data on films' cutting rates, what Salt dubbed Average Shot Lengths (ASL), but also on camera movements and shot scales.\(^{438}\) Salt believed that counting and representing a film's ASL in statistical profiles would privilege comparative, historical analysis of directorial styles and yield new insights into film editing's evolution and norms, paving way for greater objectivity in film studies. Salt's classic study *Film Style & Technology. History & Analysis* (Starword, 1983) developed this method with attention to classic mainstream cinema, polemising against contemporary theories of historiography - critical (French) theory, psychoanalysis and semiotics in particular – regarding them as “irrational”, “relativistic” or “magical”.\(^{439}\) He envisioned that film history, by embracing statistical methods and adopting the natural sciences' general attitude to the study of films, would achieve a firmer scientific foundation for producing objective knowledge.\(^{440}\) Essentially, Salt proffered a film historiography rooted in Scientific Realism in the vein of Karl Popper and Thomas Kuhn, which held that the observation and measurement of real phenomena was possible and that results could be verified through comparison and critical testing.\(^{441}\) He maintained that film historians could adopt similar practices from the natural sciences without, however, going so far as suggesting that film studies would ever become a real, hard science.\(^{442}\)

Different from Petric's suggestions, Salt's style analysis placed less emphasis on citing film examples in knowledge dissemination, favouring instead statistical, reduced forms of representation for the study of film structures. In this regard, it engaged with existing and widely used statistical methods to measure film style. Salt has pointed out that his statistical style analysis in *Film Style and Technology* took its point of departure in the method of lognormal distribution to create histograms for visualising ASL patterns. Lognormal distribution analysis emerged as a method in the late nineteenth century, developed by British scientist Francis Galton as a response to contemporary probability statistics.\(^{443}\) A somewhat simplified explanation of its scope is that it


\(^{438}\) Ibid.


\(^{440}\) Ibid., 2 & 3.

\(^{441}\) Ibid.

\(^{442}\) Ibid.

calculates the probability of a phenomenon’s occurrence from a given data set with the aim of predicting its future development. Its different variants were synthesised in J. Aitchinson and J.A.C. Brown’s classic *The Lognormal Distribution, with Special Reference to its Uses in Economics* (Cambridge University Press, 1957), which has become widely used in economics to predict price developments, in the health sector for the occurrence of illnesses, and in meteorology for weather forecasts.\(^{444}\) In statistical style analysis, beyond the creation of auteur and film profiles, it may be used to predict typical cutting rates in films from various periods. On a methodological level, this implies that the shots constituting a filmic structure are not considered in their sequential order of appearance. Instead, they are grouped into various class intervals or bins to establish normal distributions of shot lengths.\(^{445}\) A film visualised in a histogram according to this method, produces a curve with a simple shape which, according to Salt, is ideal for obtaining a clear impression of a film’s structure and for easily comparing it to other films (see fig. 15).

![Fig. 15 A histogram showing the log-normal distribution of *Lights of New York* (Brian Foy, USA, 1928), taken from Barry Salt's article "The Metrics in Cinemetrics (2011).](image)

This makes it possible to discern recurrent patterns easily and identify films that do not fit into them by superimposing curves onto each other. In addition, it may help identify outliers – shots of unusual length – which can be of analytical interest.

Salt's statistical style analysis has become widely known and influential in film studies, speaking to humanities scholars wishing to systematise their data collection to a greater degree. As film scholar Warren Buckland has noted, the method addressed the fact that data collection in the humanities traditionally tends to be informal and not tailored towards symbolisation in statistical expressions.\(^{446}\) At the same time, the method's rigour has also been subject to heated debate. In their


\(^{445}\) The terms ‘bin’ and ‘interval’ can be used interchangeably and in statistical style analysis refer to the different categories of shot lengths.

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highly critical 1985-review of *Film Style and Technology*, David Bordwell and Kristin Thompson pointed to several shortcomings and inconsistencies in it. For instance, they highlighted that Salt calculated ASLs on the basis of 30 minute samples and not entire films, because he regarded samples of this length as representative of a film’s average.\(^{447}\) This, they argued, led Salt to provide inaccurate data himself if compared to ASLs of entire films.\(^{448}\) Furthermore, Bordwell and Thompson characterised Salt's undertaking as a positivist endeavour which exaggerated the general applicability of quantitative approaches and statistics' descriptive advantages over the written word, arguing that while Salt flagged a tradition of scientific realism he essentially suggested “that science's strongest certainties are those which can be reduced to numbers.”\(^{449}\) Yet, in spite of their elaborate critical observations which also extended to Salt’s periodisations and view of a causal relationship between film technology and style, Bordwell and Thompson concluded, that its core propositions of developing a firmer empirical and statistical basis was needed in light of how film history had hitherto been produced.\(^{450}\) As they wrote:

| His demand for precision of description, including statistical representation, comes as a welcome alternative to the practices of a generation of historians who relied upon memory, reviews, and gossip for their evidence.\(^{451}\) |

With regard to Petric's and Salt's methodological innovations - the latter inarguably the most established – one can conclude from Bordwell and Thompson’s remark that they responded to a need among a number of historians to develop rigorous, empirical approaches for understanding and verifying developments in stylistic film history. They both expressed a strong need to convey results with shot outlines, stop-motion projection and visual representations, proffering that this would enable film historians to capture essential features of the medium's characteristics which the written word cannot, to historicise stylistic developments. In the next section I discuss, from a present-day perspective, how this endeavour and its key concepts extend into and is developed within the software application Cinemetrics.

\(^{447}\) David Bordwell and Kristin Thompson, "Towards a Scientific Film History?", in *Quarterly Review of Film Studies*, vol. 10, no. 3 (1985) 230.

\(^{448}\) Ibid.

\(^{449}\) Ibid., 225.

\(^{450}\) Ibid., 234.

\(^{451}\) Ibid., 226. Bordwell calculated the ASLs of several entire films to compare them to Salt's results based on 30-minute samples, in order to substantiate this argument.
Cinemetrics as Technique of Tradition

The core methodological procedures laid out by Petric and Salt inform the software application Cinemetrics launched in 2005. Conceived by professor Yuri Tsivian at the University of Chicago with computer scientist Gunars Cijvans, Cinemetrics can simply be described, in Tsivian’s words, as “an open-access interactive website designed to collect, store and process digital data related to film editing.”452 The project shares Petric’s and Salt’s conceptual underpinning that film editing is a key – if not the key – distinguishing feature of cinema as an art form. Great directors from Abel Gance and Dziga Vertov to Peter Kubelka and Kurt Kren, Tsivian points out, have measured segments and counted frames in the cutting room to achieve the pinnacle of their art and craft.453 In this view, cinema is an inherently metric art form which invites and urges quantitative approaches in order to be fully understood.454 Therefore, Tsivian contends, scholars ought to study films at editing tables as scientists with attention to Average Shot Lengths, rather than in film viewing halls.455 Departing from these assumptions, Cinemetrics considers statistical style analysis a hermeneutical antecedent and negotiates and transmits its conceptual underpinnings and technical procedures to embed Cinemetrics within this specific scholarly tradition. The linkage between statistical style analysis and Cinemetrics is evident, as it is an application which has become popular among the very scholars propagating statistical style analysis in the first place, such as Barry Salt, Kristin Thompson and David Bordwell. But beyond this, it also refines and rearticulates statistical style analysis' historiography on a more fundamental level both conceptually and technically.

Conceptually, Cinemetrics offers a more theoretically refined vision of film historiography than Petric and Salt proposed, mindful of especially early cinema studies' criticisms of evolutionary models of film history. Tsivian has argued at length, how teleological film history's evolutionary account of film history, obfuscates an understanding of early cinema’s distinct modes of expression.456 In this aspect, Cinemetrics opposes Petric's and Salt's initial propositions by not implying that the statistical scrutiny of film editing in early as well as in late silent cinema, yields an evolutionary history of film.457 Furthermore, differing from Salt’s approach, Cinemetrics does not

453 Ibid., 765.
454 Ibid.
455 Ibid., 765 and 768. This point is also stated at Cinemetrics website in an introduction to the software. See www.cinemetrics.lv, last accessed January 24, 2017.
456 Ibid., 760.
suggest a causal relationship between technological inventions and changes in film style. The two may, as Tsivian has phrased it, “mutually interfere, sometimes for better, sometimes for worse, but (...) do not determine or cause each other”. Consequently, Cinemetrics' approach can be described as piece-meal and case studies-driven. It does not suggest that film style went through general evolutionary steps, but treats limited and local corpora and periods of film history. Taking this stance, Cinemetrics reflects the past, recent decades of accumulated knowledge and critical debates in film historiography instead of making the type of universalist inferences characterising early cinephile and academic scholarship, which arguably resonated in Petric's and Salt's propositions.

The conceptual foundation of statistical style analysis is further refined in the discussions hosted by the website, seeing scholars identify alternative, hermeneutical antecedents to the software. In a short thread named “Cinemetrics predecessors” film historians Frank Kessler and Yuri Tsivian point to the significance of German film historian Herbert Birett’s early 1960s work on film statistics as well as the writings of German film historian Georg Otto Stindt in the 1920s for Barry Salt. The latter's article “Bildschnitt” (1926) for the journal Die Filmtchnik, presented comparative shot length studies between US and German fiction films and is therefore highlighted as an early example of ‘cinemetric’ methodology. Likewise, Tsivian has, on several occasions, pointed to early film theorist Hugo Münsterberg’s measurements of cutting rates in the mid-1910s to understand film’s impact on human psychology. In addition, elsewhere on the website a reconsideration of Petric's scholarship on Dziga Vertov's Man With a Movie Camera is offered to retrospectively place his work as a harbinger of Cinemetrics' methodology. In a profile section of Vertov's film, the website includes unpublished shot-by-shot breakdowns created by Vlada Petric of Man With a Movie Camera for his classic monograph Constructivism in Film: The Man With a Movie Camera. A Cinematic Analysis (Cambridge University Press, 1987). As film archivist and historian Adelheid Heftberger points out in an explanatory note, the material did not make it into Petric's final publication as his publishers could not see the general interest of it. However, as the material

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458 Ibid., 759.
462 Ibid.
contained relevant ASL information it could be transcribed and processed with the software to generate a Cinemetrics visualisation (see fig. 16, the features of the Cinemetrics visualisation will be discussed in more depth in the next section). This visualisation, in Heftberger's words, can be considered an “x-ray” of Vertov's film which reveals its inner dynamics and structure, conditioned by the accumulated knowledge of decades of style analysis which now comes to fruition in computational, quantitative methods. As she remarks, the visualisation's production illustrates how scholars “pass the ball to each other, across generations and across borders”, seemingly also suggesting that Petric's “visual/analytic” film history has become real with Cinemetrics.463

By establishing these reference points, past and present, these discussions identify a larger, unifying body of knowledge branching out from 1970s statistical style analysis into both the past and the future. In doing so, it arguably presents statistical style analysis as a constant in film studies suggesting the slow development of a scholarly tradition which has come to fruition throughout generations lending credibility to its own techniques of visualisation. As a consequence, in spite of its novelty, Cinemetrics acquires the status of a tool with a long history, tradition and origin points among its practitioners.464

![Fig. 16 Cinemetrics visualisation of cutting rates in Dziga Vertov's Man With a Movie Camera](image).

Beyond the conceptual and historical reference frame of Cinemetrics and film studies, one may also liken its method to computer-assisted stylometry and attribution studies in literary studies and linguistics.465 Since the early 1960s in particular, these fields have developed methods for counting

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463 Ibid.  
features and discerning stylistic patterns in language, in individual literary works and in larger
corpora, as well as tackling questions of authorial style and authorship attribution. Cinemetrics does
relate itself to such metric traditions of literary analysis in its website's introduction, without
however reflecting the deeper implications of them in its discernment of hermeneutical
antecedents. Yet, it can be placed firmly within them by emphasising how some of the cinemetric
pioneers’ work – in particular that of Herbert Birett – developed at a disciplinary intersection of film
studies and computational linguistics in dialogue with literary scholars.

On a technical level, Cinemetrics engages in a dialogue with Salt’s and Petric’s methodologies by
identifying problems in them and refining their procedures. For instance, a key problem identified
by Tsivian in Salt’s ASL is that it only offers one single datum to characterise an entire film. This
gives little insight into a film's internal dynamics, as it does not convey how cutting rates shift
throughout it in different scenes. Consequently, Salt's style analysis did not allow to analyse
relations between the depiction of events and changing cutting rates. Therefore, Cinemetrics is
designed to enable the user to identify and study a wider range of parameters such as a film’s
cutting swing, meaning how the cutting rate shifts throughout a film's different segments and
diverge from its overall ASL, and its cutting range - the difference between its shortest and longest
shots. In this regard, Cinemetrics enables a more multifaceted data analysis than Salt, possibly
allowing for developing more detailed understandings of film editing's dramatic conventions.

The software's first version launched in 2005, known as the 'classic' version, is semi-automatic
and requires the user's full participation throughout a film's entire playback. During playback the
user runs Cinemetrics in a separate window and clicks a 'Shot Change' button for every new shot
(see fig. 17). Upon viewing, the film’s ASL is calculated based on the input and a graph
visualisation can be generated. With Cinemetrics second version, Frame Accurate Cinemetrics Tool
(FACT), which has currently only been released in a beta-version under testing, shot boundary
detection has become more fine-grained and accurate by allowing users to pause and rewind so as to
perform the shot segmentation with greater exactitude. Furthermore, while this is not yet integrated
into FACT, users have expressed the overall ambition and projected as a future development – as
also stated by Yuri Tsivian already in 2006 - to automate shot boundary detection in Cinemetrics in

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467 See for instance Herbert Birett, “Statistische Filmästhetik oder Ist Absicht zufallsverteilt?” in Hermann Bluhme (ed.), Beiträge zur quantitativen
2017.
469 Ibid.
order to eliminate potential inaccuracies in ASL caused by human reaction time, or to simply make the process of data collection quicker.470 However, there are different stances towards automatisation among cinemetricians and on whether human or computational annotation is most accurate or desirable.471 Inspired by Cinemetrics’ underlying theory, and to complement Tsivian’s initiative, the related software Shot Logger - created by media scholar Jeremy Butler - has taken steps towards developing semi-automatic shot boundary detection.472 In this respect, the ability to show a range of internal dynamics, the FACT acronym's bold claim to accuracy and the ambition to integrate automated shot boundary detection to yield more exact data arguably echo and push further the realism of Salt's style analysis by assuming a closer relationship between film editing as a real-life phenomenon and its description.473

![Cinemetrics Software Interface](image)

**Fig. 17** The interface for the 'Classic' version of the Cinemetrics software. The user clicks the 'Shot change' button at every cut in order to generate a film’s ASL upon viewing.

An additional, significant technical difference between 1970s statistical style analysis and Cinemetrics lies in the latter's relation to the flatbed editing table as an analytical device. Cinemetrics' data collection seeks to reflect the material organisation of statistical style analysis' analogue machinery: stop-motion projectors and flat-bed editing tables, yet works with a different

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471 Ibid.


object of analysis, namely digital video. As Petric and Salt, Cinemetrics departs from the assumption that film's structure ought to be studied at the editing table, but its data is predominantly created from digital video editions of films obtained from both formal and informal platforms. At the same time, however, Cinemetrics consistently refers to and approaches its object of study as analogue film with a measurable length and therefore takes methodological steps to reflect its specificities. For some scholars, such as Barry Salt, this gives rise to concerns over technical issues of digital video in order to keep the standard sound cinema frame rate of 24 fps. As noted by Salt, the well-known diverging frame rates between PAL and NTSC encoded video formats poses a problem, with the former having a frame rate of 25 running 4 percent faster than the latter's 24, requiring compensation for this when calculating ASLs to maintain a sense of analogue film's projection speed.\(^{474}\) Furthermore, Cinemetrics cannot represent silent cinema's varying frame rates and metrics uniquely from digital video sources but only its temporal duration. For silent cinema additional calculations are needed, using historical information on a film's length.\(^{475}\)

Using Cinemetrics' techniques, scholars and enthusiasts upload and compare their results to the website's database. Currently, it counts approximately fifteen thousand film titles, television programs and music videos uploaded by more than thousand users.\(^{476}\) There is no unifying principle of selection or predefined corpora – anything can be contributed by anyone. In a way this reflects the project's piece-meal approach. Rather than sustaining a universalist, evolutionary perspective developed on the basis of a canon, the database's great variety of users produce a heterogenous data mass without clear provenance or technical source details. With a few exceptions, such as the data profiles of Vertov films based on digital transfers from the Austrian Filmmuseum, the majority of data is obtained from DVDs or informal platforms, rather than from archives.\(^{477}\) Browsing through the database leaves the impression that users from academia tend to specify their sources diligently, while general users from outside academia do not. Consequently, as pointed out by Tsivian, some users' data have more credibility than others and have prompted discussions about the possibility of ranking each other's data to achieve greater statistical reliability.\(^{478}\)

To conclude, Cinemetrics takes its point of departure in statistical style analysis and its adherence to the natural sciences' methodological ethos as it was articulated in the mid-1970s by Salt and

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\(^{477}\) These visualizations will be discussed in more depth in section 3.4.

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Petric, yet recasts its methodology and scope in fundamental aspects. First of all, Cinemetrics arguably changes the scale and scope of statistical style analysis' film historiography. Where ASL analysis as practiced by Salt in the 1970s and 1980s favoured comparison between films, representing each film by one single datum to discern evolutionary patterns, Cinemetrics privileges a microscopic perspective on films' internal dynamics, revealing text-internal, otherwise imperceptible patterns, as, in Tsivian's words, “hard facts”. Cinemetrics may potentially allow to switch from a text-internal, micro-perspective to produce and discern questions on film editing's development from a macroscopic perspective, but that is not part of the tool's conceptual point of departure.

A second, more paradoxical consequence, is that Cinemetrics in order to create a closer approximation to structures and dynamics of film editing distances the scholar from the analogue artefact and viewing equipment by using digitised source material. Furthermore, the automatisation which it strives to incorporate beyond the ‘classic’ Cinemetrics tool and the automated procedures in Cinemetrics-inspired software, may potentially recast the scholar's role in this process, in what may be described as reflecting a classic dynamic of scientific image production. As historians of science Lorraine Daston and Peter Galison have pointed out, a distinguishing feature of modern science’s use of graphical expressions is that it attributes greater veracity to images created through mechanised, machinic procedures because it takes automatisation to diminish the level of human, subjective interpretation. If seen from this perspective, the consideration of automated shot segmentation among a number of cinemetricians, as a possibly more reliable and observer-independent scientific procedure, reflects such a dynamic. The 'classic' Cinemetrics tool requires the training of basic bodily techniques – endurance, quick response time and a sharp, discerning eye – to observe cutting rates by the click of a mouse in human-computer interaction. On the other hand, automatic shot boundary detection black-boxes these processes and can appear to be – to lend the words of Daston and Galison - a “more attentive, more hardworking, more honest instrument” producing to a greater degree “images uncontaminated by interpretation”.

To conclude, Cinemetrics offers scholars new techniques for analysing films primarily on the microscopic, text-internal level, in its conceptual and technical rearticulation of style analysis. Yet, as I will discuss in the next section, the development of Cinemetrics also introduces a greater

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479 Yuri Tsivian, "Taking Cinemetrics Into the Digital Age (2005-now)".
480 Ibid.
482 Ibid., 120.
variety of representational practices from the sciences and engenders elaborate debates on how to seriate and visualise the amassed data. In this regard, akin to scientists at work in the laboratory, cinemetricians engage in “speech acts” to negotiate how they might best represent their object of analysis, expanding once again the practice of statistical style analysis. This is the topic of the next section.

The Cinematics Graph as “Oppositional Device”: Negotiating Statistical Representation

Cinemetrics’ website contains a section titled "Measurement Theory". In this section, a core group of scholars – from film studies, archaeology and cognitive psychology – discuss different forms of statistical representations to consider how to best visualise cinemetric data and correlate it to the real world objects studied – the actual films. These discussions shape Cinemetrics' visualisation practice so that it reflects the group’s concerns and internal adversary positions. It is necessary to attend to these discussions to understand the design of the Cinemetrics graph’s elements and its way of structuring readings of the data. To lend the words of science and technology scholars K. Amann and Karin Knorr-Cetina, the "verbal exchanges" of these discussions determine the visualisation’s “analyzability”, indicating that there is no direct relationship between data and representation, but rather that different visualisations serve different analytical purposes and conventions among participants of a certain group.

At a first glance the custom-made Cinemetrics graph appears as a traditional, statistical graph format as it has existed for centuries, with its red graph plotted onto a grid of horizontal lines and the numbered shots appearing as white bars from above in sequential order. The x- and y-axes respectively represent the variables of time code and shot duration and each shot/bar can be annotated and commented by users (see fig. 18). Above the visualisation appear different types of data, such as the number of shots (NoS), cutting range (Range) and cutting swing (StDev). Two of the values appearing – ASL and Median Shot Length (MSL) - are of particular interest for understanding the negotiation of the graph’s appearance. They indicate what can be described in Amann and Knorr-Cetina’s words an "oppositional device”, meaning the patterns of talk, discussion and interaction among scientists in which adversary propositions on the graphical properties of

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484 Ibid., 107.

485 Johanna Drucker, Graphesis. Visual Forms of Knowledge Production. (Cambridge, MA, and London, England: Harvard University Press, 2014) 88-90. As Drucker points out “Before the seventeenth century, the number of statistical graphs – that is, visual expressions of variables charted against each other as abstract quantities – was extremely small.”, but flourished in the following centuries with René Descartes work in analytic geometry.
visual evidence are negotiated to reflect research procedures and results.\textsuperscript{486}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{alam.png}
\caption{Yuri Tsivian’s Cinemetrics graph of Alfred Hitchcock’s \textit{Rear Window} (USA, 1954) added to the database 23 May 2009.\textsuperscript{487} The different values are included in a line above the graph, allowing for combinatoric calculation according to different methodological principles and scholarly standards.}
\end{figure}

The display of the two values designating respectively Average and Median shot length reflects different positions within Cinemetrics' measurement theory.\textsuperscript{488} MSL is a value which has been proposed by British media scholar Nick Redfern as an alternative to Salt's ASL.\textsuperscript{489} The difference between them is that ASL represents a mean value and MSL a median value. ASL is calculated by dividing the film's duration with its number of shots to find its average. MSL, on the other hand, is found by locating the middle, most frequent value of the cutting range to define it as a film's norm. In practice this means that MSL leaves out a film's longest and shortest shots, which can give rise to remarkably different values.\textsuperscript{490} Redfern has argued that MSL is more robust as it is less sensitive to extreme outliers in the cutting range and gives a more accurate impression of the typical shot length which one may expect to see in a film.\textsuperscript{491} As a consequence, in Redfern's view, this should lead style

\textsuperscript{486} K. Amann and K. Knorr Cetina, op.cit., 102.
\textsuperscript{489} Nick Redfern, “Films and Statistics - Give and Take. The average shot length as a statistic of film style”. See: \url{http://cinemetrics.lv/dev/fsgt_q1b.php}. last accessed January 24, 2017.
\textsuperscript{490} Ibid. Redfern gives examples of two Josef von Sternberg films, \textit{The Lights of New York} (USA, 1928) and \textit{Scarlet Empress} (1934). For the former the ASL is 9.9 seconds and the MSL 5.1. For the latter the ASL is 9.9 and MSL 6.5.
\textsuperscript{491} Ibid.
analysts to fundamentally reconsider their choice of statistical representation.\textsuperscript{492} In opposition to using MSL, Salt contends that the practice of leaving out shots alters the data to an undesirable degree in cases where outliers may be relevant.\textsuperscript{493} Furthermore, Salt argues that ASL has now gained such a broad application that it seems dogmatic to wish to abandon it. As he dryly remarks: “Such an idea seems reminiscent of the Catholic church continuing its ban on the discussion of the idea of the earth going round the sun, even after the concept was in wide use”.\textsuperscript{494} Such verbal exchanges illustrate how Cinemetrics is also an opposition device.

This discussion has resulted in a mid-way solution in the Cinemetrics visualisation's graphic organisation. The graph which is the most central part of the visualisation - the red polynomial curve also more commonly referred to as the 'trendline' – combines the shots as single data points showing the film's cutting swing in relation to the ASL.\textsuperscript{495} The user can adjust its 'best fit', meaning the flexibility with which the curve combines the individual data points/shots, and subsequently cite the curve in written texts.\textsuperscript{496} The following is the curve for Dziga Vertov's Man With a Movie Camera with the most flexible - 12th degree – curve: \textsuperscript{497} In this sense, Salt's theoretical core – the ASL – remains the backbone of Cinemetrics, yet, as figure 18 shows, the MSL appears in every visualisation above it and can be related to the ASL.

In addition to the negotiations of the Cinemetrics graph a group of participants – Salt, Redfern and Mike Baxter – go a step further in discussing the data's analysability. They explore different ways of visualising the raw shot-by-shot breakdowns, which every film profile gives access to, to approximate various aspects of data and representation to a greater degree. Salt for instance finds that the Cinemetrics graph can appear over-smoothed in its combination of data points, and consequently still finds the histogram visualisation the most appropriate representation.\textsuperscript{498} Challenging that view, Mike Baxter has explored a greater variety of methods and types of diagrams. For example, using the open source software R, Baxter visualises Cinemetrics data

\textsuperscript{492} Ibid.
\textsuperscript{494} Ibid.
\textsuperscript{495} Ibid. Technically speaking the trendline is a 12\textsuperscript{th} grade curve which designates the degree to which it may bend. While there are more flexible curves, these are, for reasons not specified by Salt, not practical to use for Cinemetrics' purposes.
\textsuperscript{497} Ibid. As Salt has humorously remarked with regard to his production of equations upon which his histograms are based – perhaps as a comment to hyperboles of computational methods - “I still use a standard pencil and graph-paper method that dates back to the years B.C. (Before Computers) when I started this enterprise”.

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focusing on their Kernel Density Estimate (KDE) instead of their lognormal distribution to improve comparison between film curves.\(^{499}\) Kernel Density Estimate creates curves that are less skewed than log-normal distribution, which according to Baxter are more easily and productively overlaid onto each other for analytical purposes of small groups of films (see fig. 19).\(^{500}\)

Nick Redfern, having equally tried out a range of visualisation options, adds q-plots and Order structure matrixes.\(^{501}\) In Redfern's view, the latter's structuration of Cinemetrics data allows for an easier identification of clusterings of shots in sequences within films and shifts between segments, while it is less suited for comparison between films (see fig. 20).\(^{502}\)

These alternatives to the Cinemetrics graph introduce a wider variety of computer-generated, graphical expressions of style analysis. While, being static representations, they are less dynamic

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\(^{499}\) For background information on R see: \(\text{http://cran.r-project.org/}\). Last accessed January 24, 2017.


\(^{502}\) Ibid., 22 & 24.
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than the Cinemetrics graph, these alternative visualisations reflect how a growing community of cinemetricians begins to highlight the fact that key features of editing data can be interpreted differently depending on the chosen visualisation type. To use Bruno Latour’s term, the Cinemetrics graph is the primary “inscription device” and evidentiary image used for summarising and distributing data among the site's community. Yet, beyond it, participants continuously call into question its representational accuracy sparking new discussions of the very essential features of film style data to achieve greater objectivity.

![Fig. 20 Order structure matrix of Friday the Thirteenth (Sean S. Cunningham, USA, 1980) created by Nick Redfern.]

To conclude, Cinemetrics' use of computational methods for visualising stylistic data has made the graphical rendering more dynamic than the histograms traditionally used in Salt's approach, producing an increasingly oppositional device. Furthermore it also enables scholars to switch between a wider range of visualisation types to represent and approximate narrative and stylistic features in new ways. Consequently, the Cinemetrics graph can be regarded to some extent as what literary scholar Johanna Drucker describes as a “knowledge generator”, a diagram which supports “combinatoric calculation” of a wider set of values without suggesting one finite, static representation. Seen from that perspective, statistical style analysis has become more multifaceted through the introduction of new procedures of visualisation which result from the discussions of


504 Johanna Drucker, op.cit., 105.
networked scholarship of the digital age.

Yet, the scholars engaging in these discussions hold on to the idea of developing a more realist and empirically sound scientific approach to the analysis and historiography of film style. Cinemetricians still regard the possibility of seriating items precisely according to key features in moving images and summarise their relations in statistical images, to lay the ground for a greater scientificity in statistical style analysis. As such, Cinemetrics reminds us that digitisation does not cause a “radically transformative turn” which strips moving images of their indexicality and make them subject to “practically infinite manipulability”505. As with other types of computer-generated scientific imagery, Cinemetrics' images are considered to have a strong referentiality and a clearly defined functionality which serves to anchor truth claims – in this case of stylistic film history.506

Elaborating on this discussion, I turn to examples in the next section which equally adopt scientific representational practices, along the lines of Cinemetrics, but which to a greater extent emphasise the underlying contingencies of the images' production and which I therefore suggest to characterise as 'Humanistic Cinemetrics'.

Cultural Analytics and ACTION – Towards Humanistic Cinemetrics?

Cinemetric methodology has gained currency beyond Tsivian's initiative, in a variety of conceptually related, quantitative software applications for style analysis. Some of these applications closely resemble Cinemetrics in their analytical focus while others venture into different dimensions of style analysis. For example ShotLogger, which I mentioned above, and Edit2000 measure ASL as a key parameter while producing differently styled graphs507. Three other applications, one developed by software artist Frederick Brodbeck also called Cinemetrics, another called ImagePlot and a third called ACTION focus on movement, light or colour patterns. These methods equally produce scientific visualisations but differ in their understanding of them as epistemic images. Whereas the Cinemetrics graph sustains a scientific conception of visual analytics, these other applications use data visualisations to discover hitherto unrecognised patterns to develop new research questions without necessarily having a preconceived theoretical framework. Therefore, they can be characterised as exploratory and less bound to disciplinary tradition and established methodological operations.

Cultural Analytics is an approach and visualisation toolkit for pattern recognition in large image

505 Philip Rosen, op.cit., 318.
506 Ibid., 308.
sets created within media theorist Lev Manovich’s Software Studies Initiative.\textsuperscript{508} Suggesting a middle way between overt scientism and humanistic approaches, it states interest in scientific visualisation practice by raising the question "What will happen when humanists start using interactive visualisations as a standard tool in their work, the way many scientists do already?"\textsuperscript{509}

Among Cultural Analytics' core applications is ImagePlot, an extension of the open-source scientific visualisation software ImageJ – first known as NIH Image - developed by the National Institute of Mental Health in the US.\textsuperscript{510} Conceived by programmer Wayne S Rasband in 1987, NIH Image – today known as ImageJ - advanced the combination of modern computation techniques with microscopy and gained widespread success in a broad range of disciplines in the natural sciences (see fig. 21).\textsuperscript{511}

The software's success is partly due to the development of NIH Image into the Java-based ImageJ in the late 1990s, when Java programming became considered an “operating system-agnostic” language, compatible between Macintosh and PC.\textsuperscript{512} Maintaining most of NIH Image’s features, notably its simple toolbar interface, ImageJ continued the software’s core functionalities.\textsuperscript{513} Furthermore, the software has always been open-source, enabling users to tweak the application to add functionalities, resulting in around 500 plug-ins by May 2012.\textsuperscript{514} Launched in 2012, Manovich’s ImagePlot added four.\textsuperscript{515} ImagePlot is a macro of ImageJ, meaning that ImageJ remains the basic platform for performing image analysis, while ImagePlot adds a range of additional features to it, such as allowing for visualising image sets as non-reduced scatterplots. Conceived for uses in film and media studies, visual culture and art history, Manovich has conceived ImagePlot's visual analytics within his Cultural Analytics approach. Initially, Cultural Analytics was conceived to respond to the abundant amateur image production and circulation in the digital age, epitomised by image sharing platforms such as Flickr and Instagram.\textsuperscript{516} Considering these platforms as big data


\textsuperscript{510} “About NIH Image”, see: http://rsb.info.nih.gov/nih-image/about.html, last accessed January 24, 2017. ImageJ followed the NIH Image software on the basis of which it was created.


\textsuperscript{512} Ibid., 672. NIH Image had been based on the then standard programming language Pascal. The ‘J’ in ImageJ stands for Java.

\textsuperscript{513} Ibid.

\textsuperscript{514} Ibid., 673.


\textsuperscript{516} “Cultural Analytics”, op.cit.
image sets, Manovich argued that they begged to be analysed with data mining techniques which could match their scale and discover patterns in them.\textsuperscript{517} Manovich saw ImageJ as providing adequate processing capacities and “super-visualization technologies” for analysing patterns in for instance colour or contrast in such image sets.\textsuperscript{518}

\begin{figure}[h]
  \centering
  \includegraphics[width=0.5\textwidth]{imagej.png}
  \caption{A microscope. The logo of open-source software ImageJ, clearly underscores ImagePlot’s scientific provenance.}
  \label{fig:imagej}
\end{figure}

While initially emphasising contemporary, amateur image production, Cultural Analytics’ scope quickly expanded to digitised heritage collections.\textsuperscript{519} For example, at an early stage Lev Manovich and Jeremy Douglass analysed a sample consisting of thirty-five canonical paintings on an x- and y-axis to see whether they would support genealogies based on colour similarities discerned by art historians.\textsuperscript{520} Moving images also soon gained Cultural Analytics' attention, using cinemetric theory and data as clear reference points to explore editing as a key parameter in stylistic film history with statistical representations. Along the lines of Cinemetrics, Cultural Analytics highlighted the formally complex and dense works of directors such as Dziga Vertov and Peter Kubelka to underline why statistical, metric approaches offer particularly appropriate methods for understanding filmic structures. In one experiment, Cinemetrics' database was also used to generate a graph showing cutting rates' historical development in USA, France and the Soviet

\textsuperscript{517} Ibid.
\textsuperscript{518} Ibid.
\textsuperscript{519} For examples of the wider array of visualization formats, see: \url{http://lab.softwarestudies.com/p/research_14.html}. Last accessed January 24, 2017.
\textsuperscript{520} For examples, see: \url{http://lab.softwarestudies.com/p/cultural-analytics.html}. Last accessed January 24, 2017.
Union/Russia. Moreover, as in Cinemetrics, the documentary theory of Dziga Vertov is used to conceptualise the potential of digital tools, aligning their ability to reveal editing patterns with Vertov's conception of cinema as a machine which unveils hidden structures of life to the human eye. Yet, rather than suggesting a scientific approach, Manovich has prominently invoked the documentary theory of Dziga Vertov to conceptualise new media broadly as dynamic and as privileging multiple viewpoints, by analogy to Vertov's staging of editing.

As a cinemetric method, the ImageJ/ImagePlot software developed within Cultural Analytics distinguishes itself by processing films as image sets to create visualisations, instead of extracting metadata to produce reduced, statistical representations. ImageJ breaks down video files into sequences of separate images and seriates them according to specific image features in various visualisation types. For example, the Montage visualisation type orders frames onto a grid according to their sequential order, in rows from left to right, enabling a quick, comprehensive overview of movements between shots. Arguably, this visualisation type can be characterised as more figurative than Cinemetrics' graphical expressions and closer to a visual tradition of early scientific cinematography’s use of sequential photography, such as Etienne-Jules Marey and Eadweard Muybridge (in particular the latter's famous The Horse in Motion, 1878). This format has been used for films by Dziga Vertov to create grids consisting of frames from each shot as a way of grasping his film’s structures (see fig. 22).

Another visualisation type is the summary visualisation, which creates an abstract profile image summarising median values of a film’s colour features by layering each frame on to each other. This produces a visual profile of a film's summed up colour composition and variations within the film frame. While Manovich's team has not made extensive use of this format, it has recently – as I discussed in the introduction - been explored by film scholar Kevin L. Ferguson in relation to various film genres, for instance the western (see fig. 23). Processing image sequences consisting of every tenth frame from fifty classic western films, Ferguson created summary profiles to compare films and evaluate them in relation to his own experience of the films.

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Fig. 22 Montage ImageJ visualisation of frames – the second from each shot - from Dziga Vertov’s *Odinnadcatyj* (*The Eleventh Year*, USSR, 1928) organised in sequential order from left to right from the upper left corner.

More closely related to Cinemetrics, the recent project Audio-Visual Cinematic Toolkit for Interaction, Organization and Navigation (ACTION), developed by Michael Casey, Mark Williams and Tom Stoll at Dartmouth College, equally produces statistical representations of patterns in film style. ACTION uses the open-source software Matplotlib and the programming language Python to visualise “latent patterns” of color, sound and movement to create *auteur* and film profiles. Though not focused on film editing, it takes Cinemetrics' theory as a conceptual point of departure and develops it by putting greater emphasis on automatisation and machine learning to produce precise, clean data. Using algorithms to extract mean values of colour and sound, it charts the results onto order structure matrices of the type also suggested by Nick Redfern for cutting rates. In addition, ACTION produces tabular diagrams where simple numerical data of mean values represent *auteur* profiles to enable comparison. In the experimental diagram below, directors are represented by their initials, AH for Alfred Hitchcock and JLG for Jean-Luc Godard for instance, and are classified according to their mean values of colour use (see fig. 24).

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526 See [https://sites.dartmouth.edu/mediaecology/content-partners/campus-partners/action/](https://sites.dartmouth.edu/mediaecology/content-partners/campus-partners/action/), last accessed January 24, 2017.
While conceptually related to Cinemetrics, these applications' uses of visual analytics distance themselves from Cinemetrics' scientist underpinnings. As Ferguson writes in a rather informal tone, concerning his colour profiles of Western films:

> These shapes and colors are evocative in a way that tea leaves and tarot are: they don’t actually tell you much about what you’re looking at, but they allow you an emotional response confirmed or denied once you come to discover what the image “really” is.\(^{520}\)

In a like-minded fashion, Manovich responds to skeptics who perceive data visualisation as a back-hand operation which pushes humanities closer to science, by evoking statistician John Tukey's tradition of Exploratory Data Analysis (EDA).\(^{530}\) Named after Tukey's key work *Exploratory Data Analysis* (Pearson, 1977), this approach does not depart from a clearly defined hypothesis but instead uses visualisations for exploratory purposes as a stepping-stone to new research questions. According to Manovich, this produces open answers rather than finite, hard scientific explanations.\(^{531}\)

\(^{520}\) Kevin L. Ferguson, op.cit., 2015.


\(^{531}\) Ibid.
Furthermore, Cultural Analytics nods to literary scholar Franco Moretti's quantitative approach to literary history known as “distant reading”. Inspired by *Annales* historiography's quantitative methods, Moretti's approach uses statistics on large datasets of publishing dates to discern trends in literary genres' life cycles to relate them to societal trends and historical events as possible, contextual explanations. Accordingly, Moretti relates changes in politics or outbreaks of war to declining publication numbers of novels. In contemporary digital humanities methodology, distant reading suggests a middle-way between scientific, methodological rigour and hermeneutics, in-between scientific aspirations and the “free play” of subjectivity and interpretation. Cultural Analytics explores this tension by appropriating scientific representation for humanistic purposes, allowing for associative and contextualising interpretations of data visualisations, which highlight their abstract nature. Manovich for instance underscores the limits of ImagePlot's scientific representations when he associates its graphic properties with visual conventions of Soviet photographer Alexander Rodchenko's avant-garde photography, stressing how they may also render

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534 Ibid., 9.

535 Ibid., 1-2.
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reality more unfamiliar rather than revealing its inner dynamics. In this aspect, Cultural Analytics differs significantly from Cinemetrics by inviting associative contemplation of data visualisation in addition to a strictly scientific.

ACTION similarly seems to locate itself midway between scientific and aesthetic contemplation of data visualisations to emphasise its contingencies. This can be seen in the appropriation work One Million Seconds (USA, 2014), which Casey produced using sound classifications of film samples analysed within ACTION. Where Manovich associatively muses on ImagePlot's visualisation in relation to Rodchenko, Casey uses Glenn Gould's famous second recording of Bach's Goldberg Variations (1981) as a template from which film excerpts are retrieved based on their audio similarities with Gould's recording. Thus, Casey creates a frenetic video piece where glimpses of barely recognisable film excerpts replace each other in rapid succession based on their audio similarity to Gould's Goldberg Variations, in which both the films' and Gould's recording are audible.

While tentative, experimental gestures, both Manovich's and Casey's appropriations can be said to point to the uncertainty in their analytic and representational practices, inviting us to think critically about the meanings we assign data visualisations. In this regard ImagePlot - or ImageJ as conceived within Cultural Analytics - and ACTION differ from Cinemetrics because they do not strive towards best practices following positivist aspirations nor idealise data visualisation for stylistic analysis. Whereas Cinemetrics' graph is perceived as a strong evidentiary image among its practitioners, ACTION and ImagePlot embrace the analytical potential of computational stylometry while stressing how data visualisations can also be perceived as abstract and defamiliarise our objects of study. In doing so, they arguably appreciate scientific, graphical expressions within a historically long-standing intersection of science and art to open for less formalised exploratory methodologies. Consequently, Cultural Analytics and ACTION come across as more self-

537 Michael Casey, "Investigating Film Authorship with the ACTION Toolbox". (paper presented at the 55th Annual conference of the Society for Cinema and Media Studies, March 22, 2014)
538 Michael Casey's video appropriation and description of the work can be accessed via the following link: https://vimeo.com/105909439. Last accessed January 24, 2017.
539 Michael Casey, op.cit.
reflexive towards data's visual shapes and may be seen as congruent with a humanistic approach which, as Johanna Drucker defines it, “calls to attention its madeness – and by extension, the constructedness of knowledge, its interpretative dimensions”.

Bearing in mind this observation, I conclude by suggesting that Cultural Analytics and ACTION can also productively be considered consistent with de Certeau's notion of computational history as a “science fiction” referred to in my introduction, by foregrounding both the scientific and poetic dimensions of its making. Concretely, I take them to suggest, lending a characterisation of de Certeau's historiography from Jeremy Ahearne, “a method [which] is alternately scientific and anti-scientific. It oscillates between interpretation and something like anti-interpretation”. Thinking along these lines when visualising data, I believe, may invite especially film historians with reservations about style analysis' scientific realism to move in a new, critical direction - one which restores one of the fundamental tasks of the historian on their terms - namely to emphasise the ambiguity of the relationship between past and present and its construction. By going in this direction, we may underline the enigmatic enterprise of (film) history making by drawing attention to the shifting material basis and underlying procedures of its evidence, while embracing computational methods to study filmic structures and directorial styles in fruitful new ways.

Conclusion: From the Editing Table to the Microscope

Cinemetric techniques recast the tradition of stylometric film historiography, through scientific computational procedures. Using different programming languages and software applications to produce scientific visualisations, Cinemetrics, Cultural Analytics’ use and development of ImageJ and ACTION give evidentiary status to notions such as auteur and film style through visual analytics. Yet, while they share a conceptual point of departure, their forms of visualisations suggest different perspectives on film history. On the representational level, Cinemetrics and ACTION explore reduced, abstract models of data visualisation using graphs, scatterplots and numbers to make statistically supported inferences about stylistic film history. Whereas Cinemetrics proposes a piece-meal approach, focusing on single works or oeuvres, ACTION’s director indexes strive for a strong, comparative film history based on data created through machine-learning processes. However, in practice – and in spite of its emphasis on automated procedures - ACTION appears

542 Johanna Drucker, op.cit., 178.
543 Michel de Certeau, op.cit., 215.
545 Michel de Certeau, op.cit., 215.
more reflexive towards its own methods and results than Cinemetrics. ImageJ/ImagePlot on the other hand relies less on reduced visualisations, but maps image sequences created from video files onto grids, or superimposes them, to discern shot movement or compositional patterns in colour and light, as I have argued, within a scientific visual culture of sequential photography.\textsuperscript{546}

In spite of their differences, these approaches can be said to share a techno-scientific, microscopic vision of film history. Their tools use data visualisations and machinic perception to yield visibilities of textual traits and magnify hidden, filmic structures, below the level of human vision. They master scale by rendering entire films small, manageable entities, allowing to zoom in on its smallest entities referring to the cutting table’s regime of vision; the shot, the frame, and the cut. In this development from an analogue practice performed at the flatbed editing table to computer visualisations, statistical style analysis has been subject to a social dynamics of science, as discussed by Bruno Latour, in which a claim's objectivity or subjectivity is determined beyond its originators.\textsuperscript{547} On the one hand, ASL becomes a stronger, more objective, concept of stylistic film history because it has gained a stronger network of practicians with Cinemetrics and is grounded in the natural sciences' visualisation practices. On the other, it becomes increasingly relativised because alternative practices of scientific visualisation, proposed by Nick Redfern, Mike Baxter, ACTION, Kevin Ferguson and Cultural Analytics, bring statistical style analysis into dialogue with more recent scientific practices and artistic data visualisation. Especially the latter three can be taken to sketch the contours of an emerging trend of humanistic cinemetrics which adds a reflexive layer to cinemetric analysis.

Cinemetric approaches are still scarcely applied to digitised archival film. However, as I will discuss in my case study, they are beginning to offer archivists and historians new avenues for structuring stylistic and philological readings of archival films and tie film-related sources together in DVD editions. As I will go on to argue, these uses announce a 'philological' dispositif, which merges cinemetric methods' conceptual and technical foundation with philological restoration theory to visualise and relate patterns of film editing to both author intention and circumstances of archival preservation. However, before entering that discussion I will first discuss how the DVD became conceived as a historical-critical edition format which can provide a technical environment for cinemetric analysis.

\textsuperscript{546} Virgilio Tosi, op.cit., 61 & 123.
\textsuperscript{547} Bruno Latour, op.cit., 1988, 258.
3.2 Navigating Film History's Philological Complex on DVD

With the exception of the ImageJ montage visualisations of Vertov films, neither of the cinemetric representations discussed above were produced from digitised film with a clearly indicated archival provenance. Instead, they drew their source material from the specialised video repertory which I discussed in Chapter 2 in which archival provenance and restorational interventions are often not explained in great detail. In this regard, the Vertov visualisations are an exception, because they were created in close collaboration between a film heritage institution, the Austrian Filmmuseum, and academic institutions, the Vienna University of Technology and Manovich’s Software Studies initiative, then located at the University of California San Diego. Their creation involved highly formalised methodological procedures of manual and automated semantic content analysis and negotiations of different forms of data visualisation.

In several aspects, those visualisations can be regarded as a congregation of principles from cinemetric methodology and philological film restoration theory. I will argue that their visual properties, to a greater degree than reduced visualisations, strike a chord with the conscientious work of (comparative) print analysis in film archives, which Petric pleaded for in the mid-1970s as a basis for structural, stylistic analysis. Yet, before I embark on my analysis, I want to return to and expand upon my discussion of the DVD format in Chapter 2 to discuss the format’s conceptualisation in academic circles as a format for historical-critical editions of archival film throughout the 2000s. Analysing the DVD as a format for historical-critical editions helps to understand the ways in which data visualisations function as epistemic images for film historians by elucidating the assumptions from which they are attributed evidentiary status.

Philological DVD Editions and Cinemetric Concerns

As discussed in Chapter Two, the 1980s and 1990s saw film archives nurturing inter-institutional collaboration characterised by professionalisation and theorisation of the field's practice. In European film archives, print exchanges for restoration purposes and the creation of inventories are practices testifying to this. Early cinema studies' debates on The Life of an American Fireman's different versions, gave rise to a preservationist conception of archival film which emphasised the object's material characteristics as signifiers of history. This conception found a significant propagator in the Bolognese school of philological film restoration theory and can be said to align with what Giovanna Fossati has described as a 'Film as Original' framework in digital restoration.
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practice. Film archivists who follow philological principles perceive the signs of an archival element's unique, material characteristics as markers of authenticity and historicity and therefore maintain them in the human mediation of film from analogue elements to digital presentation. As discussed in Chapter Two, such an approach is visible especially in the Austrian Filmmuseum’s DVD releases, but can also be said to guide several scholars’ ideas on how film scanning should be tailored to the film historian’s interests. In a recent remark on new scanning techniques, film historian and former director of the Cinémathèque de la Ville de Luxembourg Sabine Lenk reflected this, when she highlighted digital scans' potential usefulness for studying the unique material characteristics of archival prints for early cinema historians:

"As a film historian I am happy that a new scanner will give us the possibility to learn more about the "hidden side" of filmmaking which is not visible on the screen. To study edge marks and slices is of high importance for a better understanding of early cinematography."

While making this comment to suggest future directions for digital scholarship Lenk’s remark can also be said to partly encapsulate the reasoning behind a scholarly conception of the DVD as a philological format, which has developed in recent years. From the early 2000s onwards, scholars have increasingly merged philological principles of print criticism with the DVD format’s information architecture to study the physiognomy of archival prints in relation to contextual, conditioning factors.

Throughout the 2000s, scholarly discussions at a handful of academic forums contributed significantly to conceptualising the DVD as a philological format. In 2002, the University of Trier in Germany organised a conference titled ‘Celluloid Goes Digital – Historical-Critical Editions of Films on DVD and the Internet’. This conference gathered US and European scholars, archivists

549 Ibid.,
552 In the 1990s, prior to the cases discussed in this section, there was a rich experimentation with hyperfilm in CD-Rom formats in film studies, in the US in particular. Several groundbreaking projects were developed such as Lauren Rabinovitz' The Rebecca Project (1995), the multimedia textbook The Virtual Screening Room developed at MIT by Henry Jenkins, Ben Singer, Ellen Draper and Janet Murray between 1992-1999, as well as Yuri Tsivian's CD-Rom on pre-Soviet silent cinema Immaterial Bodies: Cultural Anatomy of Early Russian Films (2000) released in the University of Southern California's Labyrinth project's Cine-Discs series edited by Marsha Kinder. In my research I did seek out and engage with these releases but chose not to include them in my discussion to keep a clear focus on editions conceived within a philological framework. For an early discussion of CD-Roms' potential in film studies see Ben Singer, “Hypermedia as a Scholarly Tool”, in Cinema Journal, vol. 34, no. 3 (1995).
and specialised video publishers to theorise the DVD as a format for critical film editions which could merge philological traditions of text analysis with digital methods.\footnote{553} To articulate the challenges which scholars needed to consider, one of the conference hosts, literary scholar Kurt Gärtner, evoked one of the most classic philological methods, the ‘Lachmannian method’ as an anchor point and ‘definitive model’, to provide inspiration for scholarship in the electronic age.\footnote{554} This method, commonly attributed to German philologist Karl Lachmann, emerged from the 1810s onwards as a scientific and rigorous note system, developing an advanced apparatus for annotating alterations in words and sentences between text variants to evaluate their significance and differences in intention in hierarchically organised footnotes.\footnote{555} By the mid-1800s it had come to fruition through Lachmann's editions of the New Testament, establishing definitive, historical-critical edition standards for especially Greek and Latin religious texts.\footnote{556} As Gärtner suggested, in line with enhanced electronic text editions in literary studies, scholars should transmit such text-critical principles to DVDs to develop an apparatus for presenting annotations on-screen in a manner which relates textual features to a wide variety of contextual sources.\footnote{557} This would require, that DVDs contain carefully conceived ‘...tables of contents, indexes and direct links from each scene to accompanying materials...’.\footnote{558} Through case studies, participants at the Trier symposium suggested different models underlining how the DVD could be an ideal “study center” for combining and navigating filmic and film-related sources from different archives in one and the same format.\footnote{559} With a philological methodology, film scholars would able to present authoritative editions of archival films that would respect authorial vision and the integrity of film-texts against the backdrop of their historical context.

Taking the cue from the Trier event, the annual FilmForum and MAGIS Spring School organised by the University of Udine on the topic of “Critical Editions of Films and New Digital Techniques” in the late-2000s, extended these theoretical pursuits.\footnote{560} As film scholars Giulio Bursi and Simone Venturini pointed out, the initiative aimed to “bring together archivists, curators, programmer

\begin{footnotesize}
\footnote{553} Among the participants were for instance the Criterion Collection’s Robert Fischer and Barry M. Schneider of the Labyrinth Project of the Annenberg Center for Communication at the University of Southern California which pioneered the CD-Rom format for film historical scholarship with their release of Yuri Tsivian’s study of pre-revolutionary Russian silent cinema \textit{Immaterial Bodies} (1999). \footnote{554} Kurt Gärtner, "Philological Requirements for Digital Historical-Critical Text Editions and Their Application to Critical Editions of Films", in Martin Loiperdinger (ed.), \textit{Celluloid Goes Digital. Historical-Critical Editions of Films on DVD and the Internet}. (Trier: Wissenschaftlicher Verlag Trier, 2003) 51-52. \footnote{555} Sebastian Timpanaro, \textit{The Genesis of Lachmann's Method}. (Chicago and London: The University of Chicago Press, 2005 [1981]) 43 & 178n44. \footnote{556} Ibid., 84. \footnote{557} Kurt Gärtner, op.cit., 53. \footnote{558} Ibid.}
\end{footnotesize}
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technicians, editors, cinema philologists, restorers, filmographers, cinema historians, not to mention conventional textual bibliographers and philologists”. These events nurtured an interdisciplinary setting for the development of a critical, scholarly DVD apparatus utilising shot segmentation, annotation and hyperlinking for comparative study of film versions – especially multiple language versions and different cuts. While sharing the Trier conference’s conceptual point of departure, the Udine initiative differed by drawing on the Bolognese school’s restoration theory to a greater degree. In this respect, it flagged a slightly different lineage of philological theory than that of Lachmann, namely that of “ecdotics” in an Italo-French line of thinking. Ecdotics differs from the Lachmannian tradition by attending not primarily to internal, stylistic traits of texts, but also on material, technical specificities of sources and aspects of graphic design, such as typography and page set-up. As film historian Casper Tybjerg has argued, this means that ecdotics places greater emphasis on textual features in relation to contextual factors, whereas the German tradition of textual criticism to a greater degree highlights author intention in relation to style. Arguably the most rigorous attempt at theorising a philological DVD format in the Udine initiative's context was articulated in the article “Critical Editions of Films on Digital Formats” (2006), penned by film scholars and archivists Natascha Drubek and Nikolai Izvolov. The article critiqued current DVD commentary formats such as audio commentaries and explanatory text boxes appearing in-frame for being too information-laden and confusing. It instead suggested the development of a text-critical annotation apparatus using Hypertext Markup Language (HTML). To achieve this, they argued that film scholars need to distinguish between a textus and an apparatus in DVD editions. The textus is understood as all the existing variants of a film title

559 Robert Fischer, op.cit., 51-52. Fischer’s characterization of the DVD as ‘a study center’, he points out, is taken from a review of the Criterion DVD release of Stanley Kubrick’s Spartacus (USA, 1960) by then Cahiers du cinéma critic Clélia Cohen.


562 Ibid.


564 Casper Tybjerg, “The Case for Film Ecdotics”, (paper presented at NECS conference, Lodz, Poland. Manuscript provided by the author via e-mail July 4, 2016).


566 Ibid.

567 Ibid., 204.
with one variant being presented as the most known, "canonical" version. The apparatus consists of footnotes in the canonical text, appearing as clickable numbers on-screen which provide access to contextual information such as details on archival provenance or digitised film-related materials for instance paper clippings, scripts or stills. Along the lines suggested by Gärtner, a film can thus be explored as a hypertext, or as suggested by the authors a “networked index” or form of “hyperkino”, which enables navigation between textual segments. To develop this in practice, the programmatic article resulted in the annotated Hyperkino/KinoAcademia DVD series of Russian and Soviet classics launched in 2008, first under the auspices of German DVD publisher Absolutmedien and later the Russian Cinema Council (RUSCICO). In the past years, the series has gained a reputation as a highly esteemed scholarly publication format, receiving the stamp of Il Cinema Ritrovato’s DVD awards where it was honoured with prices and nominations for its special features created by noted film historians such as Bernard Eisenschitz and Yuri Tsivian.

In the film edition that inaugurated the Hyperkino DVD series, Lev Kuleshov’s directorial debut Proekt inzhenera Prayta (Engineer Prite’s Project, USSR, 1918), these principles were applied. It

Fig. 25 Example of a note as it appears in a Hyperkino edition, in the first KinoAcademia edition: Lev Kuleshov’s debut feature Engineer Prite’s Project (1918).

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568 Ibid., 206.
569 Ibid., 207-208.
570 Ibid., 209.
presents an apparatus and a textus on two discs. Disc one - the apparatus – provides an annotated version with footnotes appearing in the frame’s upper right corner (see Fig. 25). Disc two offers the textus subtitled in seven languages.\footnote{The languages are russian, english, french, german, spanish, italian and portuguese.} The footnotes created by Nikolai Izvolov and Natascha Drubek for this edition contain two thematic layers discussing respectively Kuleshov’s directorial style in relation to Soviet montage filmmaking and the film's archival life. Kuleshov’s film tells the story of young engineer Prite’s ambitious plans to develop an electricity generator which can produce energy from peat and his combat against his industrial rivals who wish to put an end to his ambitions. It is a fast-paced film full of action and intrigues of industrial espionage.

Often regarded as a film which played a crucial role in the Soviet montage film's use of editing and mise-en-scène inspired by popular American and Scandinavian cinema, several of the release's annotations highlight these aspects.\footnote{The film makes references to especially Griffith-inspired cross-cutting, analytical editing, Mack Sennett, Orville Wright and Nordisk films.} The annotations point to details supported by film-related material to show how \textit{Engineer Prite} introduced rapid editing and dramatic stylistic elements known from these cinemas. As the explanations and material in footnote 20 observe, \textit{Engineer Prite} had an outspoken ambition of appearing foreign, above all American and with clear intertextual references to Scandinavian films.\footnote{See hyperkino edition note "20. Americanisms" .} The costumes contribute to this; though they are not distinctly American, they did create the impression of a foreign milieu and sufficed to convey an American setting to contemporary audiences. Furthermore, several names in the film have a foreign sound to them of which some are intertextual references. As note 13 points out regarding the name of a company in the film's story: "Nordish Naphta, the name of the trust resembles Nordisk, the name of one of film companies, whose films Kuleshov highly valued."\footnote{See hyperkino edition note "13. Names"} Likewise, the footnotes explain how foreign montage principles are visible in the film, for instance through uses of close-ups used for analytical purposes.

Going beyond stylistic observations, the footnotes equally engage in a comparison of the film's different archival versions. The film had a troubled archival life and until the DVD release circulated abroad in a version without intertitles, established by Kuleshov’s editor Vera Khanzhonkova in 1965, presumably in part from memory, leaving the impression among several scholars that the film was unfinished.\footnote{Kristin Thompson, October 25, 2010, "More revelations of film history on DVD", \url{http://www.davidbordwell.net/blog/2010/10/24/more-revelations-of-film-history-on-dvd/}, last accessed January 24, 2017.} The last footnote - “The film's archive life and
reconstruction” - addresses this by discussing the 1965-version in relation to the newly reconstructed version by Nikolai Izvolov based on the film’s libretto which re-emerged in 1979.\textsuperscript{578} This discussion indicates doubts concerning the accuracy of the film's montage, which, apart from the new intertitles, is largely maintained in Izvolov’s version.

![Frames from the scanned elements of Lev Kuleshov's Engineer Prite's Project (USSR, 1918) included in the Hyperkino DVD edition. The frames illustrate editing marks between positive and negative elements that can either support the montage established by Khanzhonkova or suggest that Kuleshov’s montage was unfinished.\textsuperscript{579}](image)

The point in question is that there are marks in the film's existing elements which create doubts as to how precisely the film should be edited. An example of such an ambiguity in the editing choices is illustrated by the inclusion in a footnote of a scan of six frames showing the transition between two sequences – one positive and one negative - with editing marks on the element used

\textsuperscript{578} See hyperkino edition note ”27. The film's archive life and reconstruction”

\textsuperscript{579} See hyperkino edition note ”27. The film's archive life and reconstruction”, section C and E.
(see fig. 26). The footnote explains that these marks have been taken as a reliable indication of the
film’s intended montage because they support the film’s cross-cutting style. Yet, it is also remarked,
that those marks may indicate that the desired montage was not finally established. In this way the
release's use of a digital scan to show the element's material characteristics brings the viewer close
to the editing table's scopic regime; exposing, to recap the words of Sabine Lenk, the 'hidden' side
of early cinema and the intricate uncertainties of versions.

The footnotes' two layers that address, respectively, stylistic and archival aspects align with the
different conceptualisations of philological DVD editing discussed above. On the one hand, they
scrutinise different text versions in relation to authorial vision and style, and on the other investigate
the film's material characteristics in relation to contextual circumstances of preservation. In this
way, the historical-critical DVD edition creates an approximation to the film artifact which
previously only the flatbed editing table as an analytical device could offer. Developing the DVD
format to this end, Hyperkino brings a philological film history into the user's reach, informed by
early cinema studies' focus on film form and scrutiny of the archival life of its source materials.

To conclude, the philological DVD's mode of vision shares concerns with cinemetric tools but is
not quantitative nor mechanised in a similar way. It uses shot breakdowns to highlight particularly
significant shots and makes content- and object-specific comments, drawing on a great variety of
archival sources. However, though the historical-critical DVD edition does not follow cinemetric
methodological procedures, I would argue that it conditions and paves the way for a philological
use of cinemetric visualisations. As I will argue in the next section, such a use can be discerned in
the DVD release of films by Soviet director Dziga Vertov, produced within the Austrian project
Digital Formalism. As I will suggest, this release can be seen as an assemblage of cinemetric and
philological theory and techniques which constitutes, beyond the specific example of Vertov, a
'Philological’ dispositif of digital film history. Such a dispositif combines the analytical approach of
stylometry with the contextualising environment of enhanced, critical editions.

3.3 Visualising Film History’s Philological Complex: Digital Formalism and Odinnadcatyj

The double-DVD edition of Dziga Vertov's films Sestaja cast’ mira (A Sixth Part of the World,
USSR, 1926) and Odinnadcatyj (The Eleventh Year, USSR, 1928), released in the Edition
Filmmuseum series, marked the end of the Austrian collaborative research project Digital
Formalism. This digital research project on Vertov’s work and theory ran from 2007-2010 involving
media scholars at the University of Vienna, archivists from the Austrian Filmmuseum and computer
scientists from the Vienna University of Technology.\textsuperscript{580} Though not an official partner, Manovich’s Cultural Analytics joined forces with the project in 2009 to create montage visualisations of Vertov films, using data collected by the Digital Formalism research team.\textsuperscript{581} While the DVD release contained two Vertov films, it is the presentation of \textit{The Eleventh Year} which interests me because of its use of cinemetric techniques and which I will discuss in this section in relation to historical-critical DVD editions.

The release of \textit{The Eleventh Year} did not rely on an apparatus of footnotes similar to Hyperkino's. However, it shared its historical-critical concerns via a different methodological set-up, which combined manual annotations with cinemetric and semantic visualisation techniques. Elaborating on the previous two parts, I discuss how this methodological combination was motivated in relation to existing Vertov scholarship to produce a stylistic and philological historical understanding of his editing system. In particular, I attend to the project's production of different visualisations and its choice of the montage visualisation as a structuring template for analysis. Discussing the visualisations' underlying methodological procedures I argue that, beyond Vertov scholarship, the project opens up a new avenue of digital, visual analytics for philological analysis.\textsuperscript{582} Conclusively, I contend that this combination of methodological procedures can be regarded as a ‘philological’ research \textit{dispositif} with broader relevance and possible applications for film historians.

As a backdrop for this analysis I would like to first sketch and relate some developments in the critical and scholarly reception and preservation of Vertov's work to the Digital Formalism project – from its distribution in early, cinephile circles to its preservation at the Austrian Filmmuseum.

\textit{Imagining Vertov Historiography and the Vienna Vertov Collection}

While Dziga Vertov’s \textit{Man with a Movie Camera} is arguably one of the most canonised and lauded works in film history today, the historiography and archiving of his films predominantly gained momentum posthumously, in the 1950s.\textsuperscript{583} In comparison to for instance Eisenstein, Vertov was not a unanimously acclaimed director nor a film club darling in the late 1920s.

\textsuperscript{581} “Visualizing Vertov’ - new article by Lev Manovich with 33 visualizations for download”, see: \url{http://lab.softarestudies.com/2013/01/visualizing-vertov-new-article-by-lev.html}, last accessed January 24, 2017.
\textsuperscript{582} In addition to numerous articles published in international edited volumes and journals, a special issue – vol. 55, no. 3 - of the Austrian theatre, film and media journal \textit{Maske und Kotharn} stands out as providing a theoretical and technical overview of the Digital Formalism conceptual underpinnings and on related computer-aided projects on Vertov.
\textsuperscript{583} Take for instance the 2012 edition of the hugely popular Sight & Sound “Top 50 Greatest Films of All Time” list on which \textit{Man With a Movie Camera} ranked number eight, jumping from the 27\textsuperscript{th} place in 2002, surpassing Eisenstein's \textit{Battleship Potemkin}.  

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marginalised within the Soviet Union due to Stalinist cultural politics, of which he was a dissident, and his works met hugely varying, often lukewarm, critical reception in Western European countries.\footnote{Graham Roberts, *The Man With the Movie Camera*. (London: I.B. Tauris, 2000) 93-94 and 99.} In the context of contemporary discussions of documentary film in the UK, spearheaded by John Grierson, Vertov’s films were perceived as being too formalist and without ability to faithfully depict reality.\footnote{Ibid., 99.} In Germany, Vertov enjoyed mixed receptions, from critics sharing Grierson’s view to those hailing *Man With a Movie Camera* as a masterpiece.\footnote{Ibid.} Discussions in French ciné-club circles equally reflected these responses. In for instance Léon Moussinac’s monograph *Le Cinéma Soviétique* (Gallimard, 1928) written before *Man With a Movie Camera*, a short section on Vertov discusses his collective work form and the basics of his kino-glaz theory, that the camera enables a revelatory machine vision penetrating layers of reality inaccessible to the human eye.\footnote{Léon Moussinac, *Le Cinéma Soviétique*. (Paris: Librairie Gallimard, 1928) 174-175.} While highlighting the exceptional qualities of Vertov’s films, Moussinac regarded his method as limited to a scientist belief in machinic vision and overconcerned with filmic formalism at the expense of an emotional depth and political clout visible in for instance Eisenstein’s and Pudovkin’s films.\footnote{Ibid., 177-178. \%
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Vertov’s work was rediscovered from the mid-1950s onwards in the post-Stalinist era, when it gradually became more legitimate to engage with his work and theory. In the Soviet Union, this is marked by the publication of Nikolai Abramov’s 1962 Vertov-monograph and the 1966-volume of selected Vertov writings edited by Sergei Drobashenko, which inspired film scholars in the West, such as Georges Sadoul, to conduct new archival research on Vertov.\footnote{Jeremy Hicks, *Dziga Vertov: Defining Documentary Film*. (London: I.B. Tauris, 2007) 132. The publications in question are Nikolai Abramov, *Dziga Vertov*, (Moscow: Izd. Akademii Nauk, 1962) and Sergei Drobashenko (ed.), *Statii, dnevnikî, zamyśli*, (Moscow: Izd. Iskusstva, 1966).} This renewed interest spawned translated editions of Vertov’s writings and new academic studies in especially North America, Germany and France in the following decades.

As film scholar Seth Feldman convincingly suggests, the Vertov historiography, which has emerged since the 1960s, tends to bifurcate into two different types of Vertov histories.\footnote{Seth Feldman, ”Vertov after Manovich”, in *Canadian Journal of Film Studies – Revue canadienne d’études cinématographiques*, vol. 16, no. 1 (2007) 42 & 43.}
Chapter 3

Feldman does not use those exact terms, one could describe them as respectively contextualising and presentist. Contextualising histories take the cue from the post-Stalinist perspective suggested by Abramov and Drobashenko, to place Vertov firmly within his historical context of production and approach him as a misunderstood director, whose work and personal ambitions may be better appreciated from a post-communist perspective.\(^{591}\) They tend to downplay the political implications of Vertov’s work because they do not see his political vision as successfully communicated nor essential, focusing instead on his works’ formalism and the relationship he establishes with reality through his use of mobile cameras and editing.\(^{592}\) According to Feldman, this historicisation is developed in more recent, scholarly works by Vlada Petric, Yuri Tsivian and Graham Roberts. Digital Formalism showed a particular interest in this type of Vertov history in that it wanted to develop a better sense of Vertov’s formal system of editing. As film scholar and archivist Adelheid Heftberger has pointed out to me, to study Vertov is very different from studying for instance Eisenstein, who was a very prolific theorist next to his work as a director.\(^{593}\) While Vertov was also a prolific theorist, his theoretical writings remain scattered in comparison to Eisenstein, and central words in their English translations are often ambiguous just as they sometimes lack Vertov’s original illustrations.\(^{594}\) Therefore, to understand Vertov’s formal system properly simultaneously requires a great deal of rigour and imagination, reading again his original articles in Russian to seek to understand his vision. In this regard, the project in particular reconsidered the famous text “WE: Variant of a Manifesto”, co-published with his \textit{kinoks} collaborators (first published in Russian in 1922 as “My Variant Manifesta”).\(^{595}\) In this manifesto, Vertov and his \textit{kinoks} advocated a filmmaking practice that considered filmic segments as phrases representing various motifs through different types of movement, intervals and tempi.\(^{596}\) As I discuss in the following section, Digital Formalism sought to develop descriptive categories and annotate all these types of phrases.

In a second branch of Vertov historiography, scholars tend to map their own media theories onto his films so as to imagine and historicise them as harbingers of contemporary concerns and/or

\(^{591}\) Ibid., 43.
\(^{592}\) Ibid.
\(^{593}\) Interview with Adelheid Heftberger conducted 28 September, 2015 via Skype.
\(^{594}\) Ibid.
\(^{595}\) The group of documentary filmmakers referred to as the ‘\textit{kinoks}’, or ‘kino-oki’ in Russian, counted among others film editor and wife of Vertov Elizaveta Svilova and Vertov’s brother cinematographer and director Mikhail Kaufman.
innovative media practices. As argued by Feldman, this results from a distinct openness and inherent complexity in Vertov’s work, which invite genealogies between contemporary technological imaginaries and Vertov’s. Georges Sadoul’s widely influential monograph *Dziga Vertov* (Editions Champ Libre, 1971) is emblematic in this regard. It provided the conceptual vocabulary for contemporary documentary filmmakers through its translation and discussion of Vertov’s writings on documentary practice. The labelling of 1960s French and Canadian documentary filmmaking employing lightweight equipment to capture and describe real life events as “cinéma vérité” – epitomised by works of Jean Rouch, Michel Brault and Pierre Perrault – took up a direct translation by Sadoul of Vertov’s newsreel series *Kino-Pravda*. More recently, in a similar vein, Lev Manovich’s widely known new media theory, articulated in *The Language of New Media* (MIT Pres, 2006), suggested that Vertov could be considered a precursor to the non-narrative, navigational regime of databases. In Manovich’s media genealogy, Vertov’s cinema, which continuously appropriated the same footage to different ends, was a database *avant la lettre* which exposed the paradigm underlying sequentially ordered narratives by arranging moving images into categories which could be constantly reassembled in new combinations.

Thinking along the lines of Manovich, Digital Formalism paralleled Vertov’s system of image appropriation with the non-linear information architecture of databases. Furthermore, it invoked Vertov’s belief in cinema's revelatory, machinic perception to motivate using data visualisations to analyse his films formal structures. Participants in Digital Formalism have suggested that the use of digital methods for knowledge organisation and visualisation is crucial to understand Vertov’s filmmaking, because he anticipated them. As Kropf and others articulated: “…Vertov’s highly elaborate techniques of filmmaking anticipate digital media, the digital tools form a method that is contained implicitly in the material itself.”

Turning to the archival history of Vertov’s work, which formed the basis for Digital Formalism,

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597 Seth Feldman, op.cit., 40.
598 Georges Sadoul, *Dziga Vertov*. (Paris: Editions Champ libre, 1971) 139-140. This reference was however an eloquent failure as Sadoul points out, in the sense that he had taken the title of Vertov’s newsreel series *Kino-Pravda* to be a theoretical concept while it simply referred to the title of his newsreel series.
600 Ibid., 230.
602 Ibid.
603 Ibid., 121.
one can say, from a present-day perspective, that the Vertov collection at the Austrian Filmmuseum is one of the most significant ones. However, as film historian Thomas Tode points out, Vertov did not historically have strong ties to Vienna, where few of his works were projected in the 1920s just as the Filmmuseum’s initiatives in the 1960s and 1970s remained in the shadow of other countries more extensive engagement with Vertov's work.\(^{604}\) The appraisal of Vertov's work in Austria coincides with the Austrian Filmmuseum's collection building in the 1960s and persistent efforts to integrate the director's works into it. When Peter Kubelka and Peter Konlechner set out to create a film collection for the Austrian Filmmuseum in the early 1960s, Vertov films and other Soviet titles were a high priority and a wish-list – compiled with help from Jay Leyda – was sent to the Gosfilmofond in 1963, resulting in a unique donation of prints.\(^{605}\) This donation's uniqueness launched the institution’s history with Vertov, allowing it to organise a first retrospective around the filmmaker's work in 1967.\(^{606}\) It was also an important reason for its acceptance into FIAF.\(^{607}\) These circumstances led the Austrian Filmmuseum to achieve a significant voice as an institution preserving Vertov’s legacy.\(^{608}\) In the 1970s, several initiatives such as the now renowned 1972-restoration of Dziga Vertov's *Entuziazm* by Edith Schlemmer and Peter Kubelka, which resynchronised the film to its soundtrack and the Filmmuseum's 1974 Vertov-exhibition, consolidated this position.\(^{609}\) Yet, in spite of the institution's persistent efforts to promote Vertov's legacy, large parts, if not the majority of the collection, were kept secret throughout the 1980s and the 1990s because of political tensions. As film scholar Barbara Wurm has pointed, some of the material was labelled for several years as “*Offiziel nicht vorhanden*” ('Officially non-existent').\(^{610}\) The changed political climate of the late-1990s, according to Tode, again saw the Austrian Filmmuseum becoming a central institution for scholarly re-appraisal of Vertov's work, beyond


\(^{606}\) Ibid., op.cit., 40.

\(^{607}\) Ibid.

\(^{608}\) Ibid., 42. As Tode points out, the translations of Vertov's diaries in the East German editions were for instance more rigorous and precise.

\(^{609}\) Ibid., 45.

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Austrian borders. For the Austrian Filmmuseum a stated goal with the Digital Formalism project was to develop a film-philological research and scholarly annotation of the Vertov collection and it contributed an array of digitised films and documents from its collection.611 In addition to the emerging methodologies of cinemetric visual analytics and philological DVD editions discussed in the previous sections, these historiographic strands and institutional aspects of Vertov’s archiving conditioned the Digital Formalism project. In the following section I analyse how these research traditions and techniques came together in Digital Formalism to produce and study Vertov within a digital, philological regime of vision.

Merging Cinemetric Analysis and Film-Philology with Vertov

As the cinemetric techniques discussed above, Digital Formalism defined key variables as a basis for its image analysis. However, in comparison, Digital Formalism relied on a more varied, multifaceted descriptive scheme. The analysis and visualisation of digitised Vertov films relied on data collected using an annotation template containing six descriptive categories for semantic and material aspects of the films: Types of Shots; Duplicates; Material; Sound; Camera Movement; and Editing. Each of these categories contained subcategories enabling deeper levels of description. For instance the field ‘Intertextual Duplicates’ under ‘Duplicates’ was used to indicate multiple appearances of the same footage in different Vertov films. Or, ‘Film Damages’, under the ‘Material’ section, was used to describe physical signs of damage to the footage.612 Following this template, first the analogue prints were described, then the digitised films were meticulously annotated shot-by-shot, primarily by Adelheid Heftberger, using the open-source video annotation tool Anvil.613

As film director and scholar Stefan Hahn explains, this annotation template was regarded as a “ground truth”, reflecting how Vertov’s films were conceptualised as objects of study among the composite group of participants. In many respects, this ‘ground truth’ combined key insights from existing Vertov scholarship with cinemetric and philological methods. The core categories of ‘Editing’ and ‘Camera Movement’, used broadly in statistical style analysis and specifically for Vertov by Petric, reflected this. Specific types of camera movements, shapes and angles, circular camera movements for instance, recur frequently throughout Vertov’s films, and were annotated along the

lines of Petric's 1988-monograph.\textsuperscript{614} Using these categories in combination with existing Vertov scholarship, recurrent visual patterns were annotated to allow for semantic recognition.\textsuperscript{615} An illustrative example was Vertov's collation of object shapes through editing, for example pots and buckets, as a way of linking situations through visual cues, rather than using continuity editing.\textsuperscript{616} In addition, the ‘Editing’ field’s subcategory of 'Existing Segmentations' enabled the inclusion of prior, scholarly segmentations of Vertov films, among which Petric's was considered, alongside general annotations on cutting rates.\textsuperscript{617} Further, in line with cinemetric methods of auteur classification, Digital Formalism wished to understand the 'inner logic' of Vertov's style, its 'vocabulary' and rhythmic compositions.\textsuperscript{618} To this end, it pleaded for using the flatbed editing table's mode of vision for viewing film prints in combination with cinemetric techniques to facilitate quantification of the complex, metric features of Vertov's editing style.\textsuperscript{619}

As mentioned above, an important aspect of the project was to understand the organisation of what Vertov refers to as 'phrases'. In “We: Variant of a Manifesto” it is described how film-phrases should dynamically interplay so as to both depict and fantasise the rhythm of life, using the specific capacities of cinema to edit and manipulate speed as an almost scientific means to convey the chaos and relativity of reality.\textsuperscript{620} Seeking to interpret and elucidate this terminology, the researchers indexed sequences according to features of content and style to suggest a new understanding of what Vertov could have meant with his idea of 'phrases'.\textsuperscript{621} In their annotation, the researchers in Digital Formalism discerned four characteristic types of phrases with distinct textual functions – \textit{Episodes}, \textit{Echoes}, \textit{Relais} and \textit{Accelerating-Dynamizing} - in his late silent and early sound films.\textsuperscript{622} \textit{Episode} phrases constitute individual narrative sequences, \textit{Echoes} present different variations of

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\begin{itemize}
\item \textsuperscript{614} Ibid.
\item \textsuperscript{615} Matthias Zeppelzauer, Dalibor Mitrović and Christian Breiteneder, op.cit., 1.
\item \textsuperscript{616} Ibid., 5.
\item \textsuperscript{617} Stefan Hahn, op.cit., 132.
\item \textsuperscript{618} Adelheid Heftberger, Michael Loebenstein and Georg Wasner, op.cit., 138.
\item \textsuperscript{620} Ibid.
\item \textsuperscript{621} Interview with Adelheid Heftberger conducted 28 September, 2015, via Skype.
\item \textsuperscript{622} Adelheid Heftberger, Michael Loebenstein and Georg Wasner, op.cit., 179. The annotated films were \textit{Kinoglaz} (Soviet Union, 1924), \textit{Kinopravda 21} (Soviet Union, 1925), \textit{Odinnadtsatyy} (The Eleventh Year, Soviet Union, 1928), \textit{Shagay, sovet!} (Stride Soviet, Soviet Union, 1926), \textit{Entuziazm (Simfoniya Donbassa)} (Enthusiasm, Soviet Union, 1931), \textit{Tri pesni o Lenine} (Three Songs of Lenin, Soviet Union, 1934). In addition to this, two films of German director Albert Viktor Blum which reused footage from Vertov films were annotated: \textit{Im Schatten der Maschine} (In the Shadow of the Machine, Germany, 1928) and \textit{Arbeit in Österreich} (Work in Austria, Austria, 1928).
\end{itemize}
one or more motifs depicted in an episode, a Relais functions as a bridge between episodes (often depictions of electricity production), and finally Accelerating-Dynamizing phrases show rapidly edited industrial motifs of labour and transportation.\textsuperscript{623} In this way, Digital Formalism combined standard cinemetric techniques for measuring cutting rates, with tailor-made descriptors for Vertov’s film theory and practice.

The template also reflected philological concerns. The field 'Material', for instance, contained descriptors for common physical characteristics and types of damage in archival film such as shrinking, dirt, blurred images or missing segments.\textsuperscript{624} For several reasons, such artifacts were not removed with digital restoration algorithms although they complicated the development of automatic, semantic recognition of the films' image features. A significant reason was that digital restorational interventions would create new image artifacts or remove image features which were relevant to the project's image analysis.\textsuperscript{625} Thus, digital restoration would further complicate the annotation work. Furthermore, the visibility of material signs of ageing fits within the Austrian Filmmuseum's preservationist deontology of restoration which considers them unique, historical signifiers integral to the prints. Therefore, an important reason for describing material damage was to understand how they complicated semantic recognition techniques by distorting the appearances of objects and motifs.\textsuperscript{626} Consequently, the project's computer scientists were “fully integrated into the archive” to develop a shared understanding of and descriptors for the film material.\textsuperscript{627} This produced a distinction between three types of damages: global, which affect an entire frame's appearance; local, affecting only a small part of it; and temporal, meaning missing segments.\textsuperscript{628} Such philological concerns were integrated into the project's descriptive regime merging with them cinemetric and Vertov-specific descriptors. Consequently, the project forged a hybridisation of the viewing table's mode of vision, computational methods, and film-philology.

In comparison to Cinemetrics, where digital video remains the primary referent, Digital

\textsuperscript{623} Ibid., 142-145.

\textsuperscript{624} Stefan Hahn, op.cit., 131.

\textsuperscript{625} Matthias Zeppelzauer, Dalibor Mitrović and Christian Breiteneder, op.cit., 16.

\textsuperscript{626} Ibid., 11.

\textsuperscript{627} Adelheid Hefterberger, op.cit., 2012, 2.

\textsuperscript{628} Ibid., 13. In several aspects, the choice of these descriptors seem to echo the terminologies suggested in discussions on philological film restoration theory. For example, they bring to mind Paolo Cherchi Usai's distinction between different lacunae in archival film such as for instance 'synchronic lacunae' – dirt or scratches appearing throughout an uninterrupted segment – or 'diachronic lacunae' - meaning lacking segments. See, Paolo Cherchi Usai, “Il film che avrebbe potuto essere, o l'analisi delle lacune come una scienza esatta” in Simone Venturini (ed.) Il restauro cinematografico. Principi, teorie, metodi. (Pasian di Prato: Campanotto editore, 2006) 130.
Formalism arguably succeeded in integrating the editing table more rigorously into its methodology. As Heftberger, Michael Loebenstein and Georg Wasner put it, this template combined the viewing table's 'close reading' with machine readings to zoom in on patterns of for instance cutting rates, movements or changes in light to connect observations to film-related material.

The data resulting from this work allowed and invited for exploration of both text-internal and material patterns by hybridising analogue and digital analytical procedures with visual analytics. With regard to the latter, just as Cinemetrics, ACTION and Cultural Analytics, Digital Formalism's project participants negotiated different data visualisation formats. The Cinemetrics graph was used to shed light on the internal editing dynamics of *Man with a Movie Camera* in a manner which combined viewing-table based and automated style analysis closely. Hosted by the Cinemetrics website, this exploration took the form of an online discussion between the project participants and Yuri Tsivian focusing on cutting swings in *Man With a Movie Camera's* different acts. As a basis for the discussion prints from respectively Vienna, Riga and Amsterdam were scrutinised. This led to the observation of a peculiarity in the Riga print's structure, which invited the use of Cinemetrics to shed light on the film's overall composition anew. Whereas the Vienna and Amsterdam prints had an animated number 1 rising before the first act's beginning, the Riga print also contained numbers at the beginning of reels two, three and four. This suggested that *Man With a Movie Camera* was made up of acts, each containing a beginning, an end and closure, rather than, as hitherto analysed, being organised as one long sequence. Using Cinemetrics to visualise and contemplate the acts individually, it appeared that the first part of *Man With a Movie Camera*, depicting mainly early morning events before the city wakes up, had an overall lower cutting rate compared to the frenetic urban life depicted in the last reel. Using Cinemetrics, the researchers could visualise how the cutting rates in *Man With a Movie Camera*, appear to change according to the pace of events, arranged in different acts, rather than supporting a narrative structure throughout a feature length film, much in line with Vertovian theory. Using the scientific terminology of Cinemetrics, Tsivian

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629 Adelheid Heftberger, Michael Loebenstein and Georg Wasner, op.cit., 138. This process -- from the editing table to the Cinemetrics visualization -- can be studied online at Cinemetrics' site: http://www.cinemetrics.lv/movie.php?movie_ID=1780, last accessed January 24, 2017.
630 Ibid., 138 an 147. As the authors write (p. 138): "So findet unsere Arbeit mit den Filmen – ‘close readings’ am analogen Sichtungstisch, in der Kinoprojektion und mit digitaler Sichtungs- bzw. Annotationssoftware am PC – eine Parallele in der Auseinandersetzung mit den in der Wiener Vertov-Sammlung konservierten nicht-filmischen Materialien: Vertovs Schriften, vor allem aber die Autographen werden transkribiert und übersetzt, und zu Erkenntnissen in Beziehung gesetzt, die aus den ‘close readings’ der Filme gewonnen werden”.
631 Adelheid Heftberger, Yuri Tsivian and Matteo Lepore, op.cit., 60.
632 Ibid., 62.
633 Ibid.
suggested this could be seen as evidence of an “ED-rule” – ED stands for “Event Driven” – at work in Vertov's films.634

Beyond the Cinemetrics graph’s focus on cutting rates, also the visualisation software Matlab was used. Film scholar Vera Kropf used the resulting visualisation, created by Adelheid Heftberger, to explore the organisation of phrases in Vertov's films, to create a deeper understanding of their rhythmical interplay (see fig. 27).635 In these visualisations one can see the durations of individual segments in frames on an x-axis, and compare them to variations on similar or different motifs on a y-axis.636 This added an analytical layer to the “ED-rule” visualised with Cinemetrics, making it possible to observe and zoom in on the cutting rates of individual phrases and their relation to motifs and events as if reading the film as a score of graphical notation.

Fig. 27 Matlab visualisation created by Adelheid Heftberger and used by Vera Kropf to show the different types of ‘phrases’ in Vertov’s The Eleventh Year distributed on the y-axis and their temporal duration on the x-axis.

The uses of Matlab and Cinemetrics for data visualisation in Digital Formalism yielded new insights and scholarly discussions on the formal composition of Vertov's films. Yet, neither of them produced the primary inscription device associated with the project. The montage visualisations created with ImageJ, of which that of The Eleventh Year is included above, became preferred as the primary form of visualisation and has since been associated with the project when discussed by scholars online and at conferences to reflect upon digital methods's potential for media studies.637 It also played a crucial role in the DVD release of The Eleventh Year that concluded the research

634 Ibid., 78..
636 Ibid., 107.
project. As I will argue in next section, the format's use in the DVD release can be characterised as a philological research dispositif which to a greater degree achieved a combination of cinemetric techniques with the editing table's regime of vision, reflecting Petric's plea for a visual/analytical film history. By going full circle back to Petric's plea discussed in the chapter's beginning, I thus conclude that it managed to appeal more broadly to film archivists and academic scholars because it successfully merged the conscientious, comparative analysis of prints, as experienced by the cutting table, with stylistic analysis.

The Montage Visualisation and the Philological Research Dispositif

During the Digital Formalism project, the research team joined forces with Lev Manovich's Cultural Analytics to visualise Vertov data with ImageJ/ImagePlot. Several montage visualisations of Vertov films resulted from this collaboration and were used for studying the formal aspects of their style and archival life, in particular of The Eleventh Year. As discussed above, the montage visualisation is less abstract than reduced statistical representations used within conceptually related cinemetric methods. It resembles early, sequential scientific cinematography such as the iconic, tabular organisations of photographs produced by Muybridge. Furthermore, one may argue that its structuration of film shots lies within the lineage of Petric's visual/analytical history. The DVD release of The Eleventh Year seems to suggest this. As if echoing Petric's plea from the mid-1970s, the visualisation's caption in the DVD area 'Digital Formalism: Visualisierungen/Digital Formalism: Visualizations', which displayed the general results of the project, presented it as a “Visual representation of a film structure”. 638

In addition to this general introduction, the visualisation of The Eleventh Year saw two different uses in the DVD release for analysing respectively the style and philology of Vertov’s editing system. First, it served as a template for illustrating Vertov’s formal system of phrases, as understood by Digital Formalism. Second it was used to investigate the reuse of a segment from Vertov's film in the compilation film Im Schatten der Maschine (Germany, 1928) by director Viktor Blum, and in a related investigation of a possible identification of footage missing from The Eleventh Year. The visualisation represented each of the film's shots by its second frame, organised in such a way that their sequential appearance could be followed from left to right from above,

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638 Michael Loebenstein, Adelheid Heftberger and Georg Wasner (DVD-Supervision), Sestaja cast' mira / Odinnadcatyj (Vienna: Edition Filmmuseum, 2009) See: file:///Volumes/VERTOV NYMAN DVD2/ROM/HTM/VIS.HTM. The section also provides a link to the Flickr page of Cultural Analytics where additional Vertov visualizations can be glanced.
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giving an overview of the entire film. Different colour-coded versions of the visualisation were used for different analytical purposes.

The first use appears in the ROM-section of the DVD set which provides access to Digital Formalism's research results. In the section “Odinnadcatyj: Vertov’s ‘Phrasen’/Odinnadcatyj: Vertov’s ‘Phrases’”, the visualisation is used as a template in combination with video examples to explain the functions of three annotated types of phrases - Episodes, Echoes and Relais. When entering the 'Episode' sub-section, the visualisation appears in a colour-coded version using the complementary colours green and magenta to indicate and separate episodes that make up individual, narrative units (see fig. 28). Clicking on an episode activates its playback in a window on its right side. Each of the episodes can be viewed one by one. In the following subsection, 'Echo', an example of a motif's repetition can be viewed. Here, a detail of two frames from the visualisation is showed, each representing a shot which can be clicked to activate the echo's playback in its two different variations.

![Fig. 28](image)

Using the montage visualisation created with ImageJ as a template, the segments that make up different episodes in Vertov's The Eleventh Year are indicated using two colours to indicate shifts between episodes. Clicking at a frame in an episode enables the user to view it in a box on the right.

In the 'Relais' subsection, the entire montage visualisation appears again, but with only a green colour added to indicate shots which have been annotated as relais-phrases. As in the ‘Episode’-subsection, each of these shots can be clicked and viewed. Thus, throughout the sections, different

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colour-codings guide the user to relevant sections of The Eleventh Year, highlighting their functions within Vertov's formal system, as discerned through Digital Formalism’s 'ground truth'. Arguably, this visual arrangement gives form to one of the project’s main objectives, which was to analyse Vertov’s system of image organisation as a database, using the descriptive and representational possibilities of digital tools, in this case ImageJ.

The montage visualisation’s second appearance in the extra material occurs in the documentary short Vertov in Blum. An Investigation (dirs. Adelheid Heftberger, Michael Loebenstein & Georg Wasner, Austria, 2009). This section attends to and analyses the specific, philological problem referred to as the “Blum Affair”. The “Blum Affair” was a series of accusations of plagiarism against Vertov, which were brought forth upon the first screening of The Eleventh Year in Germany in 1929, where it was said to copy the compilation film Im Schatten der Maschine (In the Shadow of the Machine, Germany, 1928). In the Shadow of the Machine, compiled by communist director Viktor Blum, critically interrogates the relationship between man and machine in modern, industrial societies. The film premiered in November 1928. A large part of its footage was taken from unreleased Ukrainian films, among which happened to be The Eleventh Year and Aleksandr Dovzhenko’s Zvenigora (USSR, 1928), both produced by the Ukrainian VUFKU and finished in 1928. Blum used excerpts predominantly from the last part of Vertov’s film, maintaining to a large degree the sequences’ original montage, while framing them in a remarkably different way. Whereas Vertov enthusiastically hailed technological progress, Blum’s editing gave the material a pessimistic, technophobic undercurrent.

According to Thomas Tode, Blum's film was positively received, described as more precise and visually enthralling than Walter Ruttmann’s famous city symphony Berlin – Die Sinfonie Der Grosstadt (Germany, 1927) in its depiction of modern life. Due to the acclaim of Blum’s compilation film, footage from Vertov’s film became known to German film club audiences, for

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641 Ibid. Presumably compiled in collaboration with director Leo Lania.

642 Ibid. At this time Dziga Vertov made his films for the Ukrainian VUFKU having been, according to several accounts of his filmmaking career, marginalized in the Russian film industry in the late 1920s as a consequence of recent Stalinist film politics.

643 “Memorandum Concerning the Blum/Vertov Affair”, in Yuri Tsivian (ed.), Lines of Resistance. Dziga Vertov and the Twenties. (Pordenone: Le Giornate del Cinema Muto, 2004) 380. Viktor Blum described his own film’s depiction of machines with the following words to underline its difference from Vertov’s work: “Machines invented by humanity for the purpose of serving humanity more and more are becoming the rulers of humankind. Yes, in the final analysis humanity becomes nothing more than a helper, a slave of the machine itself.”

644 Tomas Tode, Adelheid Heftberger and Aleksandr Derjabin, op cit. 1.
which reason, when touring with his film in 1929, audiences accused him of plagiarism.\textsuperscript{645} Vertov responded by considering Blum’s use of his sequences a clear-cut case of fraudulent plagiarism, polemicising against the promotion of Blum's film without mentioning his name.\textsuperscript{646} Blum, however, maintained that his reuse had not sought to hide the authorship of Vertov, and stressed that it had been done in the collective spirit of reusing footage for socio-political, propagandist purposes, a practice which Vertov had himself endorsed.\textsuperscript{647}

![Fig. 29 Using the montage visualisation, shots from Vertov’s *The Eleventh Year* appearing in Blum’s *In the Shadow of the Machine* were indicated with a green border around the shots in question.](image)

In the documentary *Vertov in Blum*, the interrelations between the two films are illustrated with the help of the montage visualisation. The voice-over first explains how the Austrian Filmmuseum’s print of *The Eleventh Year* was compared to a print of Blum’s film from the Bundesarchiv-Filmarchiv on a viewing table before annotating each of the digitised version's 654 shots manually, in combination with automated, semantic recognition of image shapes and motifs among other things.\textsuperscript{648} These methodological steps identified 30 shots from the last reel of Vertov’s in Blum’s,

\textsuperscript{645} Ibid., 2.


\textsuperscript{648} *Vertov in Blum. An Investigation* (dirs. Adelheid Heftberger, Michael Loebenstein & Georg Wasner, Austria, 2010), 03:03.
and were subsequently indicated by a green border around the shots in question in the visualisation (see fig. 29).

This use of the visualisation, one can argue, elucidated a philological problem from an ecotic, context-centred tradition. While the emphasis was on establishing the authenticity of Vertov’s claims concerning the reuse of footage from his films in Blum’s compilation film, the visualisation also allowed for making general inferences about practices of reusing and reediting footage in documentary and newsreel filmmaking in the late silent era. Consequently, the visualisation went beyond an auteur-perspective, to also comprise contextual circumstances of, to recall Lenk’s words, the hidden side of cinematography and editing history.

The Vertov in Blum-documentary contains another example of a related use. This concerns the investigation of an irregularity which was observed during the comparative analysis between The Eleventh Year and In the Shadow of the Machine. During this process, the researchers surprisingly observed that Blum’s In the Shadow of the Machine contained more shots in the last reel than The Eleventh Year. Where the last reel of Vertov’s The Eleventh Year stops, In the Shadow of the Machine continues in a montage style resembling Vertov’s. This spawned curiosity because the Gosfilmofond and Austrian Filmmuseum prints of The Eleventh Year were believed to be missing footage amounting to either nine or seventeen minutes.649

To investigate whether this additional footage could indeed be Vertov footage, the last sequence appearing in In the Shadow of the Machine was compared to all of the annotated footage. Interestingly, this created matches with round shapes in shots from the print of Man With a Movie Camera held at the Nederlands Filmmuseum (now EYE Filmmuseum). In Man With a Movie Camera a car is glimpsed in shots in reverse and forward mode - shots which also partly appear in In the Shadow of the Machine’s final sequence. This gave a clear indication that the footage could have been used in The Eleventh Year as it is well known that Vertov continuously reused footage from his moving image repository in different films (see fig. 30).650 Therefore, though not providing conclusive evidence, this analysis showed that the additional shots in In the Shadow of the Machine could indeed have been derived from The Eleventh Year.651

In this example, the montage visualisation was used for both stylistic and philological analytical purposes. Adding to the visualisation of phrases, it possibly furthered the understanding of Vertov’s

649 Ibid., 00:00:36
650 Ibid., 00:08:16. Vertov’s reuse of footage is epitomised in the famous sequence where his wife and editor Elizaveta Svilova sits by the cutting table in Man With a Movie Camera.
651 Ibid., 00:08:57 - 00:09:02. As it is pointed out on the commentary track concerning the editing of this additional footage: “…in many regards, this montage has the filmmaker’s name written all over it…”
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reuse of footage by seeing it as a philological complex of circulating footage, appropriated to different ends. In addition, used in combination with automated, semantic analysis, it suggested a possible reconstruction of the *The Eleventh Year*'s missing parts, by combining and merging the cutting table's close reading, with the machine reading's microscopic vision of the film-text. Beyond Vertov, Digital Formalism's combination of techniques – the visual/analytical montage visualisations, meticulous, philological print comparisons and cinemetric visualisations - arguably creates a philological dispositif with much wider relevance for practitioners of digital film historiography, by combining an analytical focus on philological and stylistic aspects.

*Fig. 30* Using semantic recognition techniques to identify shapes, in particular round shapes, in Vertov's films, the researchers could identify matching footage between Blum’s *In the Shadow of the Machine* and Vertov’s *Man With a Movie Camera.*

The analytical functions of montage visualisations within the Austrian Filmmuseum's DVD publication of *The Eleventh Year* hybridised the strands of Vertov historiography and philological editing principles discussed above. They reflected auteur and text-centered framings of Vertov's work in the lineage of Petric's and Tsivian's scholarship by elucidating its inner, structural dynamics against the backdrop of its historical context. Although arranged differently, the *Eleventh Year* DVD edition resembled the Hyperkino format, in its use of historical-critical principles to interrogate differences between text versions of footage in Vertov's films. Especially the release's focus on the 'Blum affair' reflected an ecdotic, context-oriented approach to text analysis, to emphasise the film's distribution history and archival life rather than solely its directorial style.

Arguably, the DVD's 'Phrases'-subsections established a microscopic perspective on the film-text by structuring a navigation from the *The Eleventh Year*’s largest unit, the entire filmic structure and its 'Episodes', to its smallest, the 'Relais'. By combining these traditions and their accumulated
knowledge in a present-day historicising format, Digital Formalism's visual analytics lent a strong(er) evidentiary status to the structural, cinematic analysis of archival film. To echo the words of Petric, its 'visual-analytical' nature allowed to grasp the cinematic structure of style and express intrinsic, philological features of its archival history. In comparison to written accounts and the abstract, representational forms of cinemetric approaches, the montage visualisation created an approximation to the object of study which simultaneously conveyed (parts of) its metrics while maintaining its indexical features.

However, while this visualisation is perceived as creating a closer approximation to archival film, I would argue that an important reason for this should paradoxically be found in its black-boxing of the film archive as a site of knowledge production, which distances the scholar at the user-end from the object of analysis. The colour coded montage visualisation enables the scholar to browse through the structure of archival prints, that come from different remote locations. It offers an authoritative visibility of philological interrelations between archival prints. It displays knowledge whose accumulation would have traditionally required traveling afar between film archives to meticulously create shot outlines with pen and paper for philological comparison in research and publications, as scholars have increasingly done since the 1970s.

The black-boxing of such processes, I argue, reflects the staging phase in Digital Formalism's “historiographical operation” in which results are arranged and logically ordered into a dispositif to distribute the symbolic insights yielded at the research sites. In this sense Digital Formalism has at the same time developed new ways of foregrounding and visualising archival research, while, as a representation of research, it reflects a specific tradition and historical discourse. This process could also be explained by comparing once again the montage visualisation to Muybridge's sequential photography. As commented by art historian Jonathan Crary, by recording, breaking down and plotting the movement of a physical object onto a tabular, photographic format which can be easily circulated and exchanged, Muybridge’s motion studies claim an “...instaneity of vision from which space is deleted”. The montage visualisations, created from video annotations, claim visual instantaneity of the film archive's and, as discussed in the example above, the Vertov films’ philological complex relying on specific historiographical assumptions, in a way which does not reflect all the less formalised steps of the underlying research procedures which led to them. This

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653 Ibid. As de Certeau writes int this regard, "There is no historical narrative where the relation to a social body and an institution of knowledge is not made explicit. Nonetheless there has to be a form of 'representation'. A space of figuration must be composed."
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potentially recasts the role of film archives as sites of knowledge acquisition, by delivering stilled, visible evidence of philological relations which can be circulated and contemplated outside of it, in the “study center” of historical-critical DVD editions. Embedded in a specific research tradition of philological and formalist analysis, this allows to comprehend aspects of the 'hidden side' of film prints' editing history in a new publication format, a dispositif, which could hitherto only be contemplated with analogue viewing equipment.

3.4 Conclusion: A Philological Dispositif

In this chapter, I have analysed the methodological procedures and representational practices of a variety of stylometric and philological digital scholarly projects. In section 3.1, I concluded, with regard to the tradition of statistical style analysis which emerged in the 1970s, that the introduction of scientific data visualisations occurring with digitisation nurtures a shift towards more dynamic and varied data representations. The Cinemetrics graph’s combinatorial properties illustrated how techniques and visual analytics developed within a larger network of scholars gave rise to ‘oppositional devices’, which simultaneously caused a strengthening and challenging of the key parameter of ASL. Using the perspective of literary theorist Johanna Drucker I subsequently argued that the development of statistical style analysis in related applications such as Cultural Analytics and ACTION, can be seen as a form of humanistic cinemetrics. This form of cinemetrics attributes less firm evidentiary status to data visualisations in favour of exploratory, methodological procedures without the same level of formalisation as Cinemetrics. As I pointed out, computational methods give rise to new scientific rationalities just as much as to science-fiction.

In my subsequent discussion of historical-critical DVD editions of archival film, centred around the key example of Hyperkino’s annotations, I suggested that this format provides a technical and conceptual environment in which cinemetric visualisations can acquire an evidentiary function and structuring role in the analysis of a film’s style and archival life. I developed this point in my case study of the montage visualisation’s use in Digital Formalism’s DVD publication of Vertov’s The Eleventh Year, where the historical-critical DVD edition was employed as a visual format for discerning both stylistic and film-philological features of editing. As a scientific image, the montage visualisation was used both to unravel and imagine textual, stylistic structures within Vertov’s films while visualising at the same time the philological complex of footage relations and reuse in his own and Blum’s films. In the DVD’s otherwise non-linear regime of navigation, the visualisation gave density to the publication as a methodologically rigorous and scientific, philological historical
study of Vertov. To lend the words of Michel de Certeau, one can argue that this representation’s “semanticizisation” and presentation of film data facilitates a form of historical writing, or rather a visual dispositif for a digital, philological film history.\textsuperscript{655} It constitutes a machinery of seeing, which produces visibilities of stylistic and philological features of digitised archival film as a fundament for comparative stylistic and print analysis. It results from a series of historiographical assumptions and methodological procedures, which imply specific human-machinery interrelations.

Based on my chapter’s discussion of the philological dispositif, I would like to outline the following set of methodological steps, assumptions and features which underpin its making, visual arrangement and the interaction with it. First of all, the most fundamental choice which characterises this dispositif is to focus on films as, echoing Petric’s words, quantifiable “primary documents” and historical sources from which to produce annotations, metadata and statistical representations. The sources are approached with philological rigour within a preservationist restoration philosophy (Rosen) or film as original framework (Fossati) with attention to the contextual aspects of a film’s distribution/exhibition history and archival life.

<table>
<thead>
<tr>
<th>The Philological Dispositif</th>
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<tbody>
<tr>
<td>1. Source material/Metadata</td>
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<tr>
<td>Films (and related documents)</td>
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<td>2. Restoration philosophy</td>
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<tr>
<td>Preservationist (Rosen) / Original (Fossati)</td>
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<tr>
<td>3. Provenance</td>
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<tr>
<td>Film Archives (and Home Video Editions)</td>
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<td>4. Analytical level</td>
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<td>Textual/Contextual</td>
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<tr>
<td>5. Taxonomy of features</td>
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<tr>
<td>Element of style/stylometry or physiognomy</td>
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<td>6. Techniques</td>
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<tr>
<td>Annotation/Semantic recognition</td>
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<tr>
<td>7. Visualisation</td>
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<tr>
<td>Diagram, primarily non-reduced</td>
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<tr>
<td>8. Format</td>
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<tr>
<td>DVD</td>
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<tr>
<td>9. Regime of navigation</td>
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<tr>
<td>Non-linear and variable, but closed</td>
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</tbody>
</table>

Fig. 31 Features of the philological dispositif

In Hyperkino and Digital Formalism there was a preference for an archival hardware aesthetics which foregrounds the archival elements’ material features as containers of historicity, regardless of whether this complicated the application of digital tools. Along these lines, they processed archival sources shaped by a preservationist hardware aesthetics. In addition, the dispositif is equally invested in visualising inner textual features and dynamics of film style to suggest a combined textual and contextual focus. To yield such a combined focus, the analysis of the sources is prepared

\textsuperscript{655} Michel de Certeau, op.cit., 1988 [1975]) 93.
by conceiving a taxonomy of relevant characteristics which constitute a ground truth, to annotate stylistic and material features. Annotating the films either manually, automatically or semi-automatically, the data obtained is processed to produce, depending on the tools used, both reduced and non-reduced diagrams. The former type of diagrams, such as the Cinemetrics graph, are used primarily for analytical reasoning throughout the research process to make inferences about editing and segmentation. The latter type, such as the montage visualisation, equally fulfils a significant analytical function with attention to these parameters, but acquires a more prominent role in the discernment of philological relations between prints and in the dissemination of research results. In a DVD format it guides the user’s attention throughout a stylistic and/or philological reading allowing for non-linear, but closed, navigation and analysis within a formalist tradition of film analysis. In the table above I have outlined the features of the philological dispositif in the order I have described them here (see fig. 31).

In addition to this outline, I would like to consider some of Albera and Tortajada’s five descriptive categories to understand the dispositif’s human-computer interaction at the user-level. In particular, I find it relevant to consider the first three types of interrelations which focus primarily on the encounter between human and machinery. To remind the reader these are: 1. The relation between the spectators and the machinery; 2. The relation between, on the one hand, the spectators and, on the other, the machinery and the representation; and 3., The relation between the spectators and the representation.

One can conclude by first considering the interrelation between scholar and machinery that this dispositif is practiced predominantly by a lone user. The production of a cinemetric representation and its appearance within a historical-critical DVD edition, is tailored to smaller (computer) screens in either private or institutional settings for a single scholar. Yet, at the same time, its ties to institutions and tradition remain conceptually strong and reflect a social acceptance of its analytical practice, in this case stylistic and philological research traditions. In the second interrelation, it is characteristic that most users can contemplate the dispositif’s visualisations without being able to intervene in the machinery to alter the representation. All of the visualisation techniques discussed in this chapter – Cinemetrics, ACTION and ImageJ/ImagePlot – shared the trait that they rely on predefined techniques for data collection, to varying degrees, in which users generally cannot – or do not - directly intervene. Cinemetrics, for instance, offers a tailor-made technique of data collection and visualisation, developed by Yuri Tsivian and Gunars Cijvans, while ACTION uses

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656 François Albera and Maria Tortajada, op.cit., 2010) 37.
off-the-shelf open-source software, Matplotlib, to develop automated pattern recognition. ImagePlot arguably diverges in this regard as it offers plug-ins to a scientific open-source software – ImageJ – which can be tweaked to the user’s own ends. However, generally the users discussed in this chapter do not develop their own plug-ins or codes for data collection, but adopt technical, automatic practices from the natural sciences without changing their basic techniques fundamentally.

However, in the third type of interrelation, which involves deciphering and contemplating visual signs, scholars engage, as I reflected on in this chapter, in lively discussions about how to best give shape to and visualise historical data on film style and philology. For instance, through active uses of Cinemetrics’ forum option, scholars clearly show an advanced set of skills and informed opinions. Take, for instance, the debate on ASL versus MSL, and the negotiation of these parameters’ integration into the Cinemetrics graph in order to establish visual evidence. Yet, it is characteristic, that in the dispositif which I discerned in this chapter, the core visualisation remains figurative as opposed to reduced and abstract. This creates, as I argue, the closest approximation possible to its object of study, film, in the lineage of Petric’s proposed historical method, specifically with regard to understanding cinematic rhythm and composition of segments.

To sum up, though Digital Formalism remains an isolated and still singular, one-off project, its representational practice forges a complex congregation of methods from quantitative, stylometric content analysis, state-of-the art scientific visualisation software, philological restoration theory and digital text edition practice. In spite of its complexity, it seems pertinent to suggest that because its dispositif relies on open-source software - Anvil and ImageJ - and analyses relatively small corpora of digitised films, it offers a form of visual analytics which is easy to pick up and which holds the potential of becoming a more widely used inscription device for philological film history, if not on DVD then on curated, scholarly websites. For this dispositif I see several research topics where its application could be relevant. For instance for comparative studies of multiple language versions made in the transitional period from silent to sound cinema or remakes of films by the same or different directors in different countries. Furthermore, it could also be useful for studying complex sound-image relations in the silent era which raise problems of reconstruction for historians today.

In February 2013, I attended a conference lecture by German musicologist Jörg Jewanski - a specialist in synaesthesia and the relationship between colours and tones - in which he presented his research on possible ways of matching Walter Ruttmann’s colourful abstract animation Opus III (1924) to Hanns Eisler’s score for the film from 1927. As a task which has puzzled film historians and archivists because of the film’s unclear segmentation in relation to Eisler’s score, Jewanski
presented various, yet inconclusive, hypotheses on possible combinations based on different colour-coded shot outlines and tables which reflected the film’s colour patterns.\footnote{For an elaborate discussion of this case see Jörg Jewanski, “Walter Ruttmann's abstrakter Kurzfilm OPUS III (1924) mit der Musik von Hanns Eisler (1927). Möglichkeiten und Grenzen einer Rekonstruktion”, in Kieler Beiträge zur Filmusikforschung, No. 12 (2016)} I would be intrigued to see how also such research might benefit from the tools used in Digital Formalism. I imagine how a montage visualisation of the film might, in a critical edition, allow for navigating the colour-coded segments in Ruttmann’s film in combination with different segments from Eisler’s score to study the shot outlines and tables associated with them to contemplate the qualities of the different combinations. If the philological dispositif becomes more widely practiced, such research might become more feasible in the future.