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Cinemetrics, Part of the Humanities' Cyberinfrastructure

The subject of this paper, an online application called *Cinemetrics* (see www.cinemetrics.lv), is intended for further study and analysis of cinema. Cinemetrics is an open-access interactive website designed to collect, store, and process scholarly data about films. Its ultimate goal is to create an extensive multi-faceted collection of digital data related to film editing. At the moment Cinemetrics is programmed to handle the aspect of editing known in film studies as *cutting rates*.

1 What are Cutting Rates?

A peculiar thing about the film medium, noticed by many, is that it bridges the gap between spatial and temporal arts. On the one hand, filmmakers, like painters or architects, deal with recognizable spatial shapes; on the other, films unfold in time, as do poems or musical compositions. Though we tend to perceive their unfolding as continuous, most films consist of segments called *shots* separated by instant breaks called *cuts*.

With rare exceptions, films contain a number of different shots. Shots differ in terms of space and in terms of time. We know enough about space-related distinctions between shots, which are easy to name ("shot 1: baby playing; shot 2: man looking") and categorize ("shot 1: medium long high angle shot; shot 2: facial close up"). Time-related differences between shots are more elusive and harder to talk about, for, unlike in music or poetry with their scaled feet and measures, variations in shot length are not ones of distinction, but of degree. The only distinction a critic is safe to make when discussing shot lengths is between *brief* and *lengthy*.

Shot lengths are sometimes convenient to present as the frequency of shot changes, or cuts, hence the term *cutting rates*. The shorter the shots, the higher the cutting rate. Unsurprisingly, cutting rates are linked to the story and its space-time articulations: car chases are cut faster than park rambles, conversations shot in close-ups faster than ones presented in medium shots; likewise, montage sequences meant to cover larger spaces of story time will have higher cutting rates than will sequences shown in real time.

Less evident, but as important, is the relationship between cutting rates and the history of film.

2 What Factors Make Cutting Rates Change Across Film History?

We still do not know enough about this, and it is this gap in our knowledge that Cinemetrics is designed to fill up. What we already know, however, allows us to link changes in cutting rates to various aspects of film history, including the history of film style, the history of film industry, film's cultural history, and the history of cinema as technology.

It was due to technology, for instance, that the first films/shots produced by cinema's French inventors Lumière brothers were all around 50 seconds each (for such was the capacity of their 1895 camera/projector), or that cutting rates jumped each time a new editing device was introduced in the more recent era – Scotch-tape splicing in the 1960s, editing on videotape in the 1980s or digital editing in 1994 (see Bordwell 2006: 155). But to explain why it was in the United States that the fast-paced "American cutting" was born in the 1910s, or how it happened that some ten years later French and Soviet films managed to outstrip American cutting rates, one needs to address, as has been done, the state of the film industry: the specific mode of production then dominant in Hollywood (see Staiger 1985), and, counter-intuitively, the non-dominance of this mode in post-WWI Europe (see Thompson 2004).

Factors of style and culture further complicate the picture. Looking, for instance, at pre-revolutionary Russia with its taste for slow languorous film melodramas, we find Russian film trade papers campaigning against "American cutting," for here it was felt that "psychological" or pictorial acting styles – the main asset of Russian film divas – called for "full scenes" which must not be cut up (see Tsivian 2000, 2004). The 1917 Revolution turned the tables. Young Soviet directors like Sergei Eisenstein took over, declaring that the cinema of the future will need no actors at all – since anything an actor can convey will be much better communicated by means of cutting, or "montage." It was this idea that fueled some of the fastest-cut pictures in the entire history of film, as well as well-known Soviet "montage theories" which claimed that the true constituent of the film is not the shot, but the cut.

3 Average Shot Lengths

While debates about fast *vs.* slow cutting rates are central to the history of film, the notions of fast and slow will be of little use unless we have an idea of the normal. Distinct from the film critic, the student of film history cannot afford to rely on intuition, for as I have just shown the sense of cutting speed changed depending on when, where and by whom this or that film was made –

saying nothing of different norms intrinsic to different genres. It is for this reason that an increasing number of film scholars resort to numeric data about cutting.

The method which film scholars interested in the history of cutting have been using for more than 30 years is based on calculating the Average Shot Length (ASL) of a film – an index obtained by dividing the length of the film in seconds by the number of shots in it.[1] The result can be used in two ways. If we calculate ASLs for all the films made by the same director or edited by the same editor, and plot the results onto a timeline (diachronic statistics), we will get a better sense of their range of experimentation and creative evolution. Or we may choose to inspect cross-sections of film history (synchronic statistics) and, by comparing their prevailing ASLs, get a sense of how cutting rates changed over the last hundred years.

It was the latter approach adopted by Barry Salt prior to 1992 and by David Bordwell prior to 2006 that yielded an overview of the way cutting rates fluctuate across film history. Having divided the span of film history into 5-year thick "splices" and calculated the mean ASL for each, Salt has shown the growth of cutting rates between 1912 and 1926, their decrease between 1928 and 1939, their relative stability during the forties and fifties, and their upsurge from the 1960s to the 1980s.[2] And Bordwell's more recent numbers show that between 1990 and now Hollywood films continue to pick up pace, the fastest of them reaching an ASL of less than 2 seconds (see Bordwell 2006: 121-124).

I, too, once applied the ASL method in order to compare the last film made by the pre-Revolutionary Russian director Evgenii Bauer with the first film made by his Soviet successor Lev Kuleshov, and when I put the obtained ASLs side by side with the international data collected by others I felt my heart beat faster, for it turned out that between 1917 and 1918 the cutting tempo in Russia had jumped from being the slowest to being the fastest in the world (see Tsivian 1992). Not that the difference could not be sensed without counting, but I felt excited that now we could not only assume but also demonstrate this.

ASL data work, but we need to keep in mind that these data are relational. It is useful to know how long the average shot of a film is compared to figures obtained for other films, but ASL can become misleading if you treat it as an index of the film's dynamic quality. Take *Dragnet Girl* (1933) by Yasujiro Ozu

1 For more details see Barry Salt's and David Bordwell's articles on www.cinemetrics.lv.

2 See Salt 1992: 147, 174, 214, 249, 266, 283, 296; Bordwell 2006: 88-106. Salt and O'Brien group their data by countries, which makes his picture more complex than a brief summary can render.

and *Rashomon* (1950) by Akira Kurosawa. The former has an ASL of 4 seconds,[3] the latter of 13 seconds. Though it may seem tempting to conclude that Ozu's film is more dynamic, those who know *Rashomon* will rightly disagree. The reason why *Rashomon's* ASL is so much longer than *Dragnet Girl's* is because Kurosawa alternates very brief shots with lengthy ones. It is this contrast between activity and stillness in *Rashomon* that its ASL figure fails to convey.

Yes, average numbers round off edges, but this does not put film statistics out of court. The new method I created and made available to film scholars through the Cinemetrics website in November 2005, enables us to obtain and present cutting-related data in a more flexible way than we were able to earlier on.

4 What Cinemetrics Brings to the Study of Cutting Rates

Rather than calculate average shot lengths arithmetically, Cinemetrics does so by taking and storing the time-span of each separate shot. Distinct from the arithmetical ASL, which is a single datum, Cinemetrics treats each film as a database of shots highlighting its individual features. Specifically, it tells us about the film's *cutting swing* (standard deviations of shorter and longer shots from ASL), its *cutting range* (difference in seconds between the shortest and the longest shot of the film) and its *dynamic profiles* (polynomial trendlines which reflect fluctuations of shot lengths within the duration of the film).

Take, once again, *Dragnet Girl* and *Rashomon* as measured, processed and represented by Cinemetrics (Figures 1 and 2). We can tell at a glance from the ups and downs of these wavy trendlines that the cutting swing in *Rashomon* (numeric value 13.6 seconds) is more considerable than it is in *Dragnet Girl* (3 seconds) and that its dynamic profile shows a marked tendency towards deceleration, while in *Dragnet Girl* changes in cutting rate through the course of the film are barely perceptible.

Let me add that *Rashomon* has a higher contrast of shots scales (Big Close-ups *vs.* Extreme Long Shots) and includes more shots with mobile framing than we find in *Dragnet Girl.* This is not something Cinemetrics accounts for yet, but we are moving there. When the Cinemetrics database grows larger, its client tools become more multi-purpose, and its statistics more wide-ranging, my hope is we may be able to deduce a complex formula, or coefficient, of film dynamics.

3 I use the figure given in Bordwell (1988: 377). The figure I obtained with Cinemetrics is slightly less (3.8 seconds): www.cinemetrics.lv/movie.php?movie_ID=49

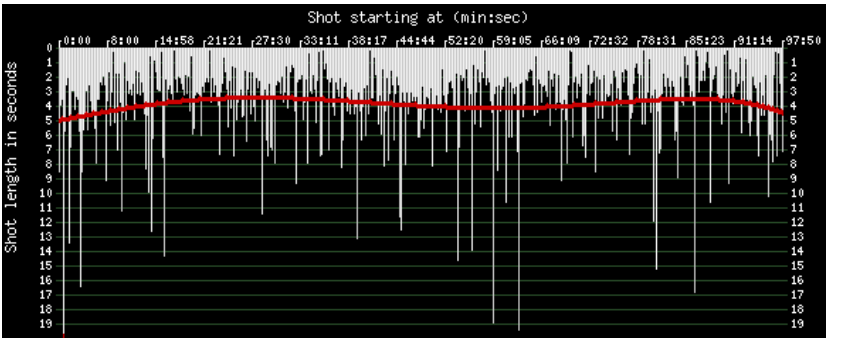

Figure 1. *Dragnet Girl*

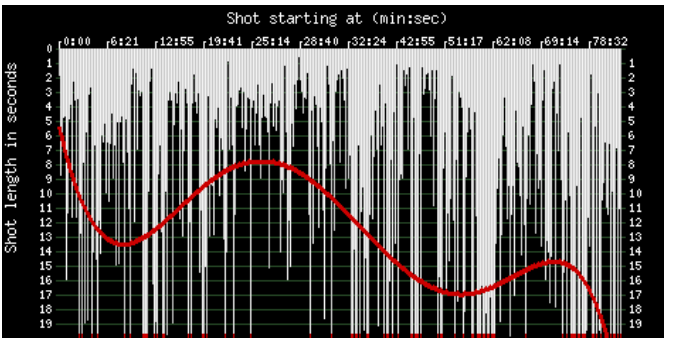

Figure 2. *Rashomon*

5 Inventory

In its present form, Cinemetrics includes: a) a software toolkit used for data collecting (the "client tool") and data processing (the "statistics tool"); b) a database for storing the obtained data; c) accessories: a discussion board, news board, supplementary database, and a library of essays pertaining to its subject.

6 How Cinemetrics Works

The way in which Cinemetrics interacts with its website users can be called a "tools for data" policy. This interaction takes 5 steps. The user (1) downloads the client tool free of charge; (2) uses the tool to measure the cutting rates of a film of his or her choice; (3) submits the measurements to the site; (4) upon submission, Cinemetrics processes these data using its statistics tools, and (5) stores them as part of the Cinemetrics database making the data available to other users.

7 The Client Tool

Technically speaking, the tool is designed to register cuts, not to measure shots. In simple mode, this frequency is established by a mouse-or-keyboard stroke on the "shot change" button each time the user detects a cut. The advanced mode offers 8 buttons instead of one, 7 of them marked with a specific shot scale from BCU to LS. The user can also customize these 8 buttons. As Cinemetrics is designed to measure frequencies, this can be the frequency of anything that recurs: certain words, faces, locations or tunes.

8 Statistics Tools

After the film has been measured and its data submitted, Cinemetrics automatically processes them, displaying the resulting information as a) statistical figures and b) statistical graphs. The figures are: average shot length; number of shots; minimum and maximum shot lengths and the range between them; and standard deviation. The graphs show: the distribution of shorter and longer shots (calibrated in seconds) within the duration of the film calibrated in minutes (see the white "icicles" against the green-barred "night" on Figures 1 and 2). The straight red line that runs across the "icicles" (go to the *Sunrise* entry on www.cinemetrics.lv/movie.php?movie_ID=1955 to see how the line works) is a trendline which shows whether the film in question gathers speed as its story unfolds (in *Sunrise,* it does). Underneath, a box named "Degree of the trendline" is found. When you change the degree and click on "Redraw" the trendline turns into a curve that reflects fluctuations in shot lengths with closer approximation (at degree 6, *Sunrise* looks like a hill, at 12, like a mountain ridge). In order not to succumb to the illusion of smoothness which trendlines tend to provoke, it is important to read your trendline against the more chaotic "icicles" whose behavior the trendline summarizes.

If the advanced mode of the client tool has been used, as is the case with *Sunrise*, you can color-code the "icicles," and, by checking and un-checking the "Display?" boxes, select and isolate the feature you are interested in (in the *Sunrise* analysis this is the distribution of dialogue and expository titles).

9 Cinemetrics Database

The Cinemetrics database is a shared-use open-submission collection of data collected by people that use the client tool and processed by the statistics tools. Its default sorting is alphabetic by film titles, but it can also be sorted by other

parameters, such as year, submitter's name, submission date, simple *vs.* advanced mode of measuring, and by the film's average shot length. By clicking on a film title the user gets access to the page that provides basic statistics and interactive graphs related to this film.

As counted on September 20, 2006, the database contains information on 150 film titles dating from 1915 to 2005, submitted by 17 contributors from 8 countries. Every new submission is announced on the "News" board – go to it to get a sense of the growing rate of submissions. Film scholars and teachers, such as Charles O'Brien of Carleton University, Canada, Casper Tybjerg of the University of Copenhagen, or me, submit films along the lines of their research interests. A unique feature of Cinemetrics is that by submitting your film measurement data you receive their analytical picture in return.

The majority of Cinemetrics contributors, however, are students from American campuses – University of Chicago, NYU, Pittsburgh University, and University of Madison, Wisconsin. Indeed, Cinemetrics has proven a good educational device. There is a "Comments" box on each page of the database that can be used to communicate with contributors – go to *Citizen Kane*, for instance, to see the way these boxes can be used in a teacher-student interaction. Cinemetrics' "Discussion board" with its 13 topics opened within 10 months is another place where the educational process takes place.

10 What Cinemetrics Adds to What We Know

It may sound a truism, but it is one worth repeating: in science as in scholarship, progress is measured not by new answers given to old questions, but by new questions put to old answers. What narrative factors make cutting rates change within the duration of a film? What correlations are there between staging and editing, between the scale of a shot and its duration? These are just two questions out of the many to come.

I only developed the method in 2005, but it has already caused a notable response. My Cinemetrics analysis of Griffith's famous *Intolerance* that yields telling variations in cutting rates between the four epochs pictured in the film (Tsivian 2005a/b) moved prominent French film theorist Raymond Bellour (2006) to connect the dynamic profile(s) of this film to the concept of "the present moment" by the acclaimed psychologist Daniel N. Stern, and to the *time-image* concept propounded by philosopher Gilles Deleuze. It does seem that Cinemetrics helps to generate questions that are of use not only to the history, but also to the theory of film.

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