

Exploratory data analysis and film form: The editing structure of slasher films

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Abstract

We analyse the dynamic editing structure of four slasher films released between 1978 and 1983 with simple ordinal time series methods. We show the order structure matrix is a useful exploratory data analytical method for revealing the editing structure of motion pictures without requiring *a priori* assumptions about the objectives of a film. Comparing the order structure matrices of the four films, we find slasher films share a common editing pattern closely comprising multiple editing regimes with change points between editing patterns occur with large changes in mood and localised clusters of shorter and longer takes are associated with specific narrative events. The multiple editing regimes create different types of frightening experiences for the viewer with slower edited passages creating a pervading sense of foreboding and rapid editing linked to the frenzied violence of body horror, while the interaction of these two modes of expression intensifies the emotional experience of watching a slasher film.

Keywords: Exploratory data analysis, time series analysis, order structure matrix, film style, editing, slasher films

1. Introduction

Slasher films have been extensively studied in terms of their themes and narrative (Clover 1992; Dika 1987; Rockoff 2002); the representation of violence in relation to gender, sex, and sexuality (Cowan & O'Brien 1990; Sapolsky, Molitor, & Luque 2003); their appeal to and affect on audiences (Nolan & Ryan 2000; Oliver 1993); and their place in the film industry (Nowell 2010; Wee 2006). However, surprisingly little attention has been paid to their formal structure (beyond the infamous tracking POV shot associated with the killer) and there have been no detailed studies of editing patterns in slasher films. In part this is due to an overriding concern with sociological issues, but also reflects both lack of interest in stylistic analysis in film studies in general (Bordwell 2005: 32-35) and the difficulties of analysing the evolution of film style over the course of a motion picture in particular. In this paper we show how simple how applying time series analysis to the shot length data of four slasher films allows us to understand their editing structure as a dynamic system. Specifically, we aim

to determine if there is a common editing structure to different films belonging to this genre; to determine the key features of their editing structure by identifying changes in editing patterns and clustering of shots; and to understand the functions editing plays in organising the viewer's experience by relating these features to the semantic content of these films.

The rest of this paper is organised as follows. The next section discusses exploratory data analysis as a general framework for studying film style, and we argue this data-driven approach has advantages over functional/interpretational approaches to film style. Section three sets out the method used in this paper, and describes both the sample of slasher films analysed and the use of the order structure matrix as an exploratory method of time series analysis. The results are presented in section four, with each of the films discussed individually and then collectively in order to understand how each the editing of each film functions and to derive some general conclusions about the structure and functions editing in slasher films.

2. Exploratory data analysis and film form

Film style is the systematic deployment of the techniques of filmmaking (mise-en-scene, framing, editing, sound, etc), and film form is the arrangement of a film's constitutive stylistic elements at different relational scales (i.e. shot, scene, act, film). The purpose of stylistic analysis in film studies may be *classificatory*, differentiating between periods, movements, genres, or filmmakers; or *explanatory*, accounting for the presence or absence of particular stylistic elements in a film, the formal relations between them, and the functions they fulfil.

Noël Carroll (2009) distinguishes between two modes of studying film form: the descriptive and the functional. To communicate with others about film style we must provide some account of style and form, and so description is a natural and fundamental component of any formal analysis. For Carroll the descriptive mode goes further than this in its attempts to account for any and all relations between stylistic components so that the form of a motion picture is the sum of those relations irrespective of any principle of selection. Such descriptive accounts are not considered to be analytical: they are 'impracticable,' because the concept of film form employed is too broad, and 'useless,' because we learn nothing new:

the descriptive account of cinematic form is more like a duplicate of a motion picture's form than a guide to what is significant for understanding and appreciating the movie. And the reason for this is that it is not sufficiently selective (2009: 274).

Carroll goes on to argue 'the formal elements and relations in the motion picture that are pertinent for stylistic analysis are those conducive to the realization of the point(s) and purpose(s) of the motion picture' (2009: 275). The form of a motion picture therefore becomes the 'ensemble of choices' intended to achieve those points or purposes. In this respect, the selective nature of the functional mode avoids the generality of the descriptive, focussing on what is important and thereby illuminates our understanding of film form: functional analysis 'does not merely describe the motion picture but explains why it is the way it is, thereby augmenting our comprehension of the work at hand' (2009: 276). John Gibbs and Douglas Pye advance a similar argument, albeit within a different

context. Gibbs and Pye are concerned with establishing the importance of stylistic analysis in the interpretation of films (after VF Perkins), emphasising the relationship between the form ('how') and content ('what') of a film. Stylistic decisions in filmmaking are made within specific contexts and therefore 'style is constitutive – it is the heart of a material process of articulation – so that to understand style we must grasp how it works in its context.' Again, this goes beyond the descriptive mode:

at the level of the individual film the mere presence of a formal element means very little. It is only when we consider the specific decision within the context in which it appears, including the content to which it gives form, that we can grasp its significance. ... The status of formal decisions, not simply the choice of a particular technique, is always crucial to their significance, and status can only be determined by interpretation (2005: 11).

The role of film style in interpreting a film is therefore similar to the functional analysis of film form, and Bordwell's (1989) distinction between 'interpretation' and 'analysis' is not so clear cut. In both cases we seek to understand the formal decision of the filmmakers by evaluating the importance of those decisions to achieving whatever we understand the objectives of the filmmakers to be.

These may be characterised as a *confirmatory* approaches to film form, adopting a top-down schema for studying film style in which the semantic field of the critic is mapped onto the film (Bordwell 1989: 142-145). There is, of course, a place for top-down research on film style and form since what we consider to be relevant to our analyses will often be determined by our knowledge of modes of production, genres, the history of film style, other works by the same filmmakers, and other features. However, both Carroll and Gibbs and Pye intend their respective approaches to be general methods for explaining the form of a film on its own terms that does not depend on such external knowledge, and it is here they run into trouble.

It is a significant drawback of the functional/interpretational analysis of film form that we are required to make *a priori* assumptions regarding the purposes and content of motion pictures, as these assumptions will determine those formal features we consider salient in our analyses: we analyse/interpret what is important, but

what is important is what we consider worthy of analysis/interpretation. The result is a partial account of the film's style that serves the opinion of the critic and does not explain the form of the film. For example, Redfern (2001) showed several psychoanalytical studies of Alfred Hitchcock's *Psycho* (1960) to be highly selective in identifying formal elements that supported their specific interpretations of the film, while simply ignoring those formal elements or the relations between them that did not fit their preconceived notions of what *Psycho* is about. At worst such approaches produce circular arguments, using the stylistic choices of the filmmaker to justify the interpretation originally stated as a premise for selecting the pertinent relations of film form. Carroll (2009: 277) partially accounts for this by acknowledging a film is in some sense already interpreted prior to analysis so that a systematic account of film form elaborates upon this first pass; but again this is a confirmatory mode of research reinforcing the opinion of the critic rather than explaining the form of a film.

As an alternative we adopt a bottom-up, data-driven method from statistics. Exploratory data analysis (EDA) is 'a state of mind, a way of thinking about data analysis – and also a way of doing it,' characterised by *scepticism* of methods that may obscure informative aspects of data and *openness* to unanticipated patterns (Hartwig & Dearing 1979: 9). The goal of EDA is to discover 'potentially explicable' patterns in data (Good 1983); with 'an emphasis on the substantive understanding of data that address the broad question of "what is going on here?"' (Behrens 1997: 131). To this end, EDA employs a range of numerical and graphical techniques to maximise our insight into the data by revealing its underlying structure and extracting the relevant features, identifying outliers and anomalies, generating hypotheses, and testing underlying statistical assumptions. EDA places substantial emphasis on resistant and robust methods requiring few *a priori* assumptions about data and which are applicable in a wide range of circumstances. This is clearly different to *classical* statistics in which models and hypotheses are determined before seeing the data, and the purpose of analysis is to confirm the presence or absence of specific features of the data. EDA is often used preliminary to the application of confirmatory hypothesis tests, but a well conducted exploratory stage can reduce or even remove the need for subsequent statistical testing. Exploratory data analysis is therefore a

fundamental part of statistical research, and any study 'that does not include a thorough exploratory data analysis is not complete' (Kundzewicz & Robson 2004: 9).

In contrast to Carroll and to Gibbs and Pye, who specify the function of a film prior to data collection based on what the critic thinks is important and for whom analysis is primarily deductive and confirmatory, an EDA approach aims to discover and explain what is important. In exploratory analysis it is our goal to arrive at an explanatory model of film form based on our analysis of the data. Adopting EDA as a data driven process to identify 'potentially explicable' relations avoids begging the question about the function of film form, and, therefore, places far greater emphasis on the description of film style than Carroll is willing to grant. Certainly, we would never characterise this stage of research as 'merely describing' a motion picture. The basis for EDA is *abductive* and moves from data to hypothesis via a bottom-up process of pattern extraction (Behrens & Yu 2003). From an EDA perspective the descriptive account of a motion picture's form is *precisely* a guide to what is significant for understanding and appreciating the movie, but which avoids description as an end in itself. Beginning any study of film style with an exploratory stage both simplifies and amplifies the analytical process: 'Exploratory data analysis can never be the whole story, but nothing else can serve as the foundation stone – as the first step' (Tukey 1977: 3). Figure 1 shows the difference between confirmatory and exploratory approaches to film form.

Graphical displays play a fundamental role in exploratory data analysis (Ellison 1993), and have a similarly significant function in understanding film style and communicating our analyses. Film style is often described as a system because it 'mobilizes components – particular instantiations of film techniques – according to principles of organization' (Bordwell 1985: 50). In light of this definition, we emphasise that style is a *dynamic* system organised and evolving over the duration of a motion picture and that the dynamics of film style are an essential part of any formal analysis. However, analysing the evolution of just a single element of style over the course of a film is a challenging undertaking given the complexity of the system of style. The use of time-ordered graphical displays allows us to overcome these problems to look at the dynamic nature of style in a simple, quick, and informative manner that encourages

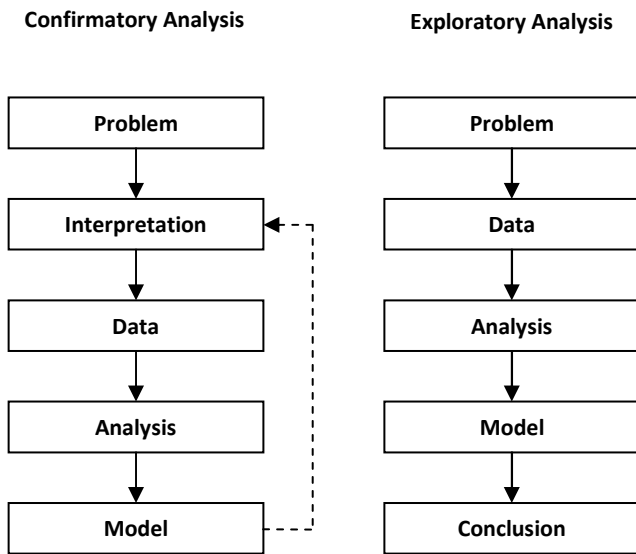


Figure 1 Confirmatory and exploratory models of formal analysis in film studies

interaction between the researcher and the data. Far from merely reproducing a film’s style, such displays make it possible to see the formal relationships across a film and to extract interesting and unusual patterns:

Effective visual presentations highlight interesting and unusual aspects of quantitative information under investigation. This encourages the researcher to pursue these features to identify their sources and implications for understanding the processes that are generating the data in the first place (Jacoby 1997: 7).

The model of the film we produce is an account of these patterns and their causes; but we avoid the need for *a priori* assumptions regarding what is important and what to select because visual representations of data ‘forces us to notice what we never expected to see’ (Tukey 1977: vi).

Although EDA emerged in relation to statistics, its principles and methods provide a general framework for researching film style that overcomes some of the problems with existing approaches. In the remainder of this paper we demonstrate the exploratory analysis of the editing structure of slasher movies using statistical graphics. We make no assumptions about the function of editing in these films, though we take it for granted that film form is related to function and that the objective of

formal analysis is to explain why a film is the way we experience it to be.

3. Methods

3.1. Data

We collected shot length data from four slasher films released between 1978 and 1983 (see Table 1), loading them into MAGIX Movie Edit Pro 14 (MAGIX 2008) and analysing each film frame-by-frame. As PAL DVD sources are used a correction factor of 1.0416 is applied to the length of each shot. The data includes titles establishing time, date, and location, but does not include the opening and closing credits unless they are a part of the narrative of the film.

3.2. The order structure matrix

The order structure matrix (Bandt 2005) is a conceptually simple and robust method that provides a global description of the structure of a time series, X_1, \dots, X_T . It is appropriate for the exploratory analysis of shot length data, allowing a researcher to identify clusters of longer or shorter takes, the presence of intermittent cyclical patterns, and to locate change points in the editing of a film that can then be analysed in more detail. The matrix (\mathbf{M}) compares the values of pairs of points at times s and t , where $1 \leq s, t \leq T$, and to construct the matrix we assign a value of 1 if $x_s \geq x_t$ and a value of 0 if $x_s < x_t$. Assigning colours to these values (1 = black, 0 = white) we obtain a graph that makes it easy to visualise the editing structure of a motion picture. The matrix is reflected in the main diagonal and we use the transpose of the order matrix (\mathbf{M}^T) to more easily distinguish editing patterns, representing shorter shots which tend to cluster as white columns and longer takes that may occur in isolation as black columns.

Alongside the order structure matrix with each film we also present the run chart of the time ordered shot lengths; and the run chart of the ranks of the shot lengths, with takes ranked from shortest ($r = 1$) to longest ($r = N$) and average ranks assigned to tied values.

The matrices were created in Microsoft Excel 2007 and the matrix plots and run charts were created using PAST v.2.13 (Hammer, Harper, & Ryan 2001).

Table 1 Four slasher films released between 1978 and 1983

Title	Year	Director	Editor(s)
Halloween	1978	John Carpenter	Charles Bornstein/Tommy Wallace
Friday the Thirteenth	1980	Sean S Cunningham	Bill Freda
Slumber Party Massacre	1982	Amy Jones	Wendy Greene Bricmont/Sean Foley
The House on Sorority Row	1983	Mark Rosman	Jean-Marc Vasseur

4. The editing structure of slasher films

Figures 2 through 5 present the transpose order structure matrices of the four films, along with the run charts of the lengths and ranks of each shot. The descriptive statistics of each film are in Table 2.

4.1. Halloween (1978)

Halloween was the first of the cycle of slasher films to emerge in the late-1970s and early-1980s, and defined the narrative template for the genre. It also defined the formal template for the slasher film; and, in many respects, the other films in this study replay the editing patterns we observe in *Halloween*, either directly or as variations on a basic theme. The main feature evident in the order structure matrix in Figure 2 is the abrupt change in editing that distinguishes the latter part of the film from the preceding editing pattern. This turning point occurs at shot 437 when Michael Myers attacks Laurie in the bedroom of the Wallace house, and marks the

difference between the main part of the narrative in which Michael stalks and kills the teenagers of Haddonfield and the struggle to death between Michael and Laurie of the final girl sequence (Clover 1992). It also marks the transition between the two dominant moods of the film – a sense of creeping dread and the emotional intensity of frenzied violence and the panic of the ‘final girl;’ while transient variations in mood more appear as localised clusters within each section of the narrative.

The first section of the film runs from shot 1 to shot 436, and comprises three separate narrative units all edited more slowly than the final girl sequence. The first unit (shots 1 to 4) depicts the Michael’s original murder and is largely comprised of a single moving camera point-of-view shot running to 258.9 seconds. The other films in this study all adopt a slow editing style when representing the ‘past event,’ though unlike *Halloween* they do not rely on a single take. The narrative then moves to present day Haddonfield, and from shot 5 to shot 234 ($\Sigma = 2158.1s$, median = 4.2s, IQR = 6.1s) sets out the relationships between the main characters while also tracking Michael

Table 2 Descriptive statistics of four slasher films released between 1978 and 1983 (in seconds)

Title	Length	Shots	Min	Q ₁	Median	Q ₃	Max
Halloween	5397.9	606	0.3	2.6	4.2	8.3	258.9
Friday the Thirteenth	5494.2	559	0.3	2.9	5.0	11.9	115.6
Slumber Party Massacre	4472.0	790	0.1	1.7	3.2	6.2	61.3
The House on Sorority Row	5519.0	1101	0.3	1.7	3.0	5.4	74.6

on his return to his home town. The third unit runs from shot 235 to shot 436 ($\Sigma = 2184.3s$, median = 6.2s, IQR = 6.8s), and begins when Billy sees a strange figure enter the house where Annie is babysitting. This point marks a change in the narrative as Michael moves from being an ill-defined spectre in the community to a real and imminent threat; and the onset of this stalk-and-slash part of the film is occurs with a change in editing pattern. Though this first section of the film includes a number of murders, the relatively slower editing serves to de-accentuate the violence and create in the viewer a high amount of suspense without showing the threat on-screen based on the disparity of knowledge between what the viewer knows and the girls do not: Michael is now in the house with them.

Within this first section of the film there are a number of clusters of longer and shorter takes associated with different characters and narrative events. Clusters of longer takes are associated with Loomis searching for Michael, and the scenes between Loomis and the Sherriff of Haddonfield are also slowly edited: for example, the scene in which Loomis arrives at the Myers house and the window is broken by Michael in an effort to scare him off covers the dark band at shots 202-208 and lasts for 219.1 seconds. These scenes serve to maintain Michael's threat in the absence of his on-screen presence, whilst also providing detailed narrative information to the viewer. A cluster of longer takes occurs with the scenes prior to the murders of Bob and Lynda (shots 327-344) as they sneak into the house for illicit sex, and is typical of how the genre represents such activity. Clusters of shorter shots are associated with two different types of scenes in this section of the film. First, they create heightened moments of tension surrounding Annie, Lynda, and Laurie. Such clusters occur during the scene in which the girls are walking home from school and a car driven by Michael goes past, though the identity of the driver is unknown to the girls (shots 93-116); and as Annie and Laurie talk on the phone whilst babysitting (shots 220-233). The second function is to provoke a startle response in the viewer via the unexpected eruption of violence when Michael attacks: the first of these clusters occurs with Michael's attack on the nurse (shots 34-43); while a second example can be seen with the murder of Bob evident as a white column at shots 345-355 in Figure 2.

This rapid editing style also characterizes the sustained violence of latter part of the film as killer and

heroine struggle to the death. The final girl sequence begins at shot 437 when Michael bursts from the wardrobe and stabs at Laurie, and it is immediately apparent from Figure 2 that from this point forward the editing is much quicker than in the first section of the film ($\Sigma = 645.3s$, median = 2.5s, IQR = 1.3s). This change in style not only occurs with the beginning of the final act of the film, but is also associated with a change in the dominant emotion as suspense gives way to the frenzied violence of body horror. The sequence slows when Laurie attempts to raise the neighbours (shots 470-471) and when she thinks she has killed Michael (shots 497-505 and 555-561), allowing the narrative to repeatedly employ the startle response as Michael attacks again and again. The final girl sequence ends at shot 589 after Loomis arrives to save Laurie, and the film closes with a sequence of longer shots (590-606, $\Sigma = 103.2s$, median = 5.4s, IQR = 4.1s). This marks a return to the slow editing associated with the sense of creeping dread based on the knowledge that Michael Myers is out there in the dark.

4.2. *Friday the Thirteenth (1980)*

Exploratory data analysis of the time series of *Friday the Thirteenth* using the order structure matrix (see Figure 3) shows this film to be comprised of six different narrative segments, each characterized by a different editing style. Like *Halloween*, transitions between these sequences are associated with changes in mood.

The first section of the film is the originating event of the murder of two counsellors at Camp Crystal lake in 1958 (shots 1-17, $\Sigma = 294.1s$, median = 6.7s, IQR = 24.0s). This sequence includes several tracking shots from the point-of-view of the unseen killer, with six shots running to more than 19 seconds accounting for the dark column to the extreme left of the matrix in Figure 3. The second section of the films is set in the present, introducing the main characters and establishing the (shots 18-144, $\Sigma = 965.5s$, median = 5.5s, IQR = 7.9s). Within this sequence there are two narrative threads – Annie hitchhiking to the camp (shots 18-74) and the arrival of the new counsellors at the camp (shots 75-122) – with a slight tendency to longer takes in the latter as this part of the sequence is organised around a series of group shots compared to the shot-reverse shot pattern of singles that characterise Annie's interactions with the locals as they warning her about the past of the camp. This sequence ends with the

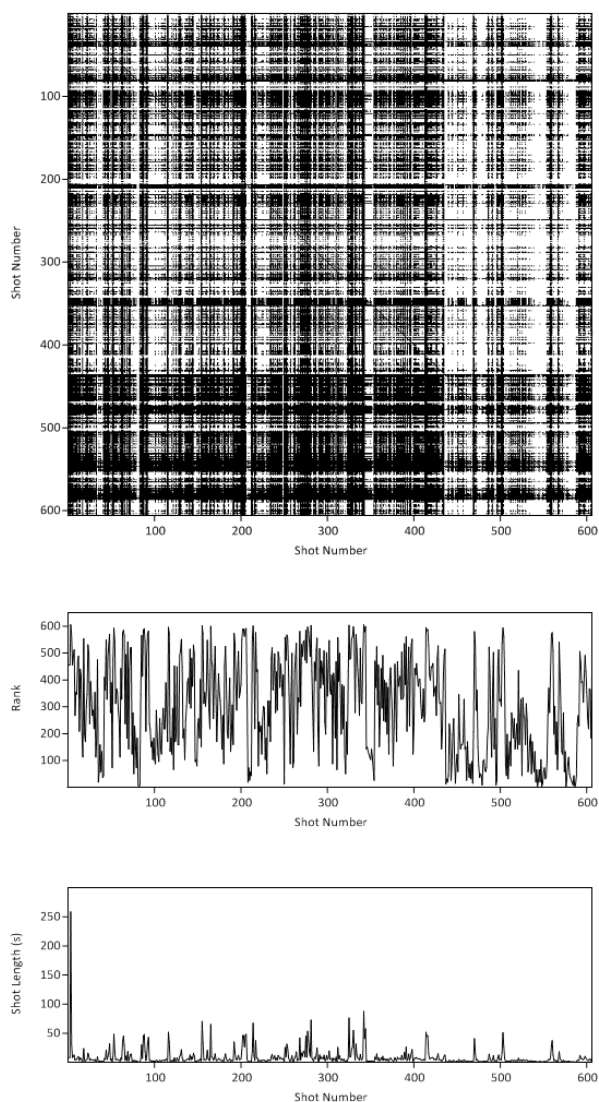


Figure 2 Order structure matrix (top), ranks (middle), and shot length data (bottom) of *Halloween* (1978).

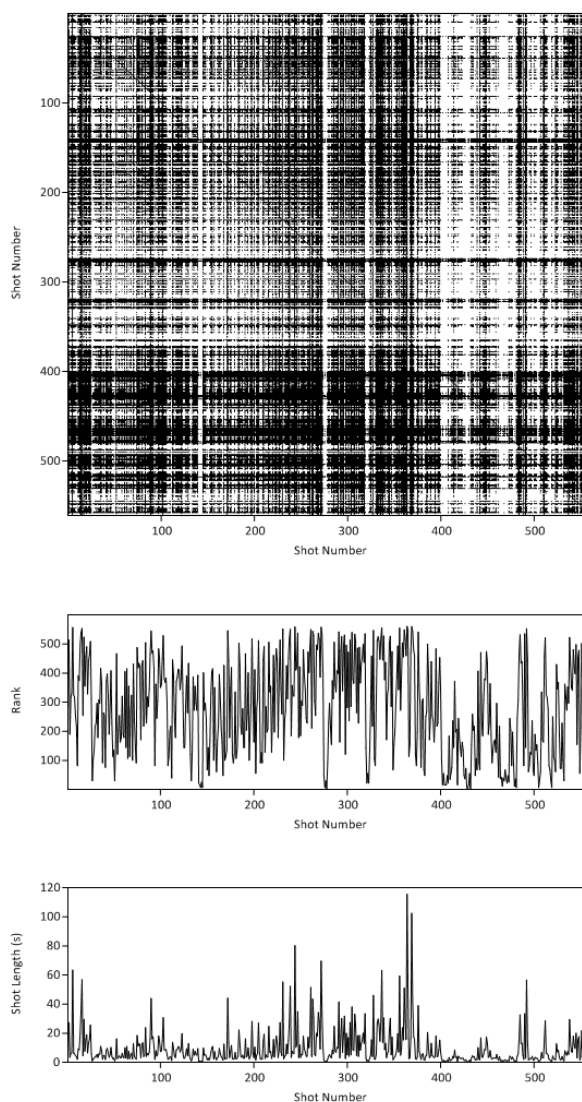


Figure 3 Order structure matrix (top), ranks (middle), and shot length data (bottom) of *Friday the Thirteenth* (1980).

murder of Annie by an unknown assailant, including a series of very short takes that feature as the thin white band at shots 139-144 in Figure 3 as the violence of this assault reaches its peak. From shot 145 shot lengths become increasingly longer until shot 262 ($\Sigma = 1222.1s$, median = 5.5s, IQR = 8.8s). This can be seen in the matrix in Figure 3 as the density of the black columns increases over this portion of the film, and the trend towards higher ranked shots is particularly noticeable in the ranks run chart. This third segment sequence does

not feature any violence and focuses on the creation of sense of foreboding through the near drowning and the snake in the cabin, the warnings of the police officer and 'Crazy Ralph,' and the appearance of a mysterious figure in an oil slicker. This is achieved formally as the film builds tension by progressively lengthening the duration of takes so that over the course of this sequence the pace of the film slows down

Changes in editing style between these first three segments of the film occur when there are large

differences in mood between consecutive scenes. Thus, the transition between the first and second segments of the film occurs with the shift from the violence of the original murders at the camp to the sunny optimism of the present day as Annie sets off to be a counsellor at the camp. (This transition is also separated by the opening titles, which are not included in the data set). Similarly, the shift between the second section ending with Annie's murder and the next section with the other counsellors swimming at the camp is based on a shift between extreme violence and the counsellors relaxing at the lake. These shifts are also marked by the use of white flash transitions that do not appear at any other point in the film, and which are used to cover shifts in time (past/present) and location (Annie/the camp). The use of white flash transitions to cover shifts in location occurs only at the transition *between* different narrative segments and the onset of a new editing pattern, and they do not feature *within* narrative sections even though multiple locations are used (e.g. the shifts between the counsellors at the camp and Annie in the second part of the film).

In the later parts of the film, transitions between editing regimes occur within scenes and are not associated with any particular optical effect as narrative space and time are continuous. The fourth sequence is the 'stalk-and-slash' segment of the film and includes the murders of Jack, Marcie, Brenda, and Steve (shots 263-399, $\Sigma = 2095.0s$, median = 8.4s, IQR = 15.9s). The sequence begins in the middle of a scene with the sudden murder of Jack, and from this point longer takes dominate as the emotional tone built up in the preceding segment is sustained. The use of long takes emphasises the anticipation of violence and creates for the viewer a continuing sense of dread that round every corner lurks a new terror. Though this is the slowest segment of the film, but also contains two clusters of very short takes at shots 273-280 and shots 318-323 associated with the murder of Marcie and the terrorising of Brenda, respectively. These sudden outbursts of shocking violence realise the fears of the viewer and represent a more aggressive form of terror in counterpoint to the dominant mood of the sequence. However, no such clusters are associated with the murders of Jack or Steve which are shot as long takes, and there appears to be a clear difference in the way in which violent scenes are edited according to the gender of the victim.

The shift from the stalk-and-slash section to the final girl sequence also occurs within a single scene when Mrs. Voorhees's demeanour suddenly changes when recollecting Jason's death; and again a change in the dominant mood is accompanied by a change in style. The final girl sequence runs from shot 400 to shot 534 and is edited much more quickly than other parts of the film ($\Sigma = 647.7s$, median = 2.8s, IQR = 2.9s). This sequence is characterised by the heightened emotional intensity of Mrs. Voorhees's psychosis, creating a mood of aggressive intensity that continues through the sustained violence she inflicts on the panicked Alice. Like the corresponding sequence in *Halloween*, this segment also breaks Alice's fight for her life into three rapidly edited violent scenes divided by slower cut clusters as the final girl runs and hides from the killer; and these clusters can be clearly seen as the dark columns in this section in Figure 3. The final sequence of the film comprises shots 535 to 559 ($\Sigma = 269.8s$, median = 9.3s, IQR = 12.9s), and includes Alice's dream of encountering Jason as she floats across the lake in a canoe and waking in the hospital. This sequence begins with a shot of the moon over the camp recalling the opening shot of the film, and like the opening sequence is edited slowly. Like *Halloween*, this coda reintroduces the idea that a threat remains out there, and returns – emotionally and stylistically – to the pervading sense of unease and disquiet of the earlier narrative sequences.

4.3. *Slumber Party Massacre* (1982)

Slumber Party Massacre (see Figure 4) was originally intended by screenwriter Rita Mae Brown as a parody of the genre only for her script produced as standard slasher fare (Shary 2002: 161), and this film is an example of the derivative filmmaking of the genre.

The first section of the film is edited relatively slowly (shots 1-701, $\Sigma = 4302.7s$, median = 3.6s, IQR = 4.7s), and, since the film does not include many of the narrative events common to the slasher film (e.g. the original murders, the killer Thorn's escape, the warning of the young community, etc), comprises a single prolonged stalk-and-slash sequence. Consequently, there are no shifts in style between different narrative sections similar to those in *Halloween* and *Friday the Thirteenth* until the beginning of the final girl section. This first section contains a number of clusters of

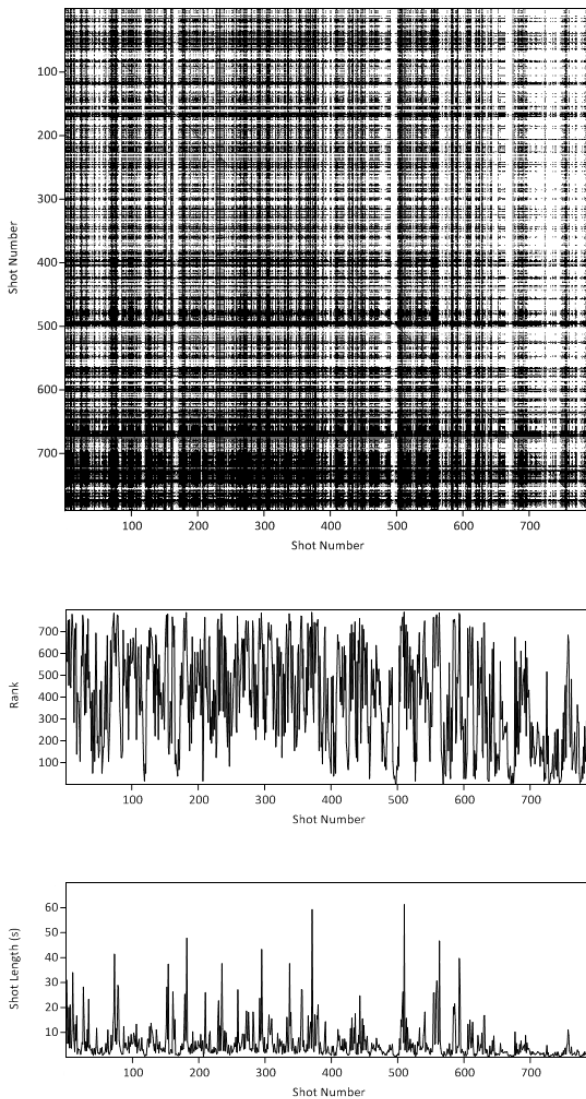


Figure 4 Order structure matrix (top), ranks (middle), and shot length data (bottom) of *Slumber Party Massacre* (1982).

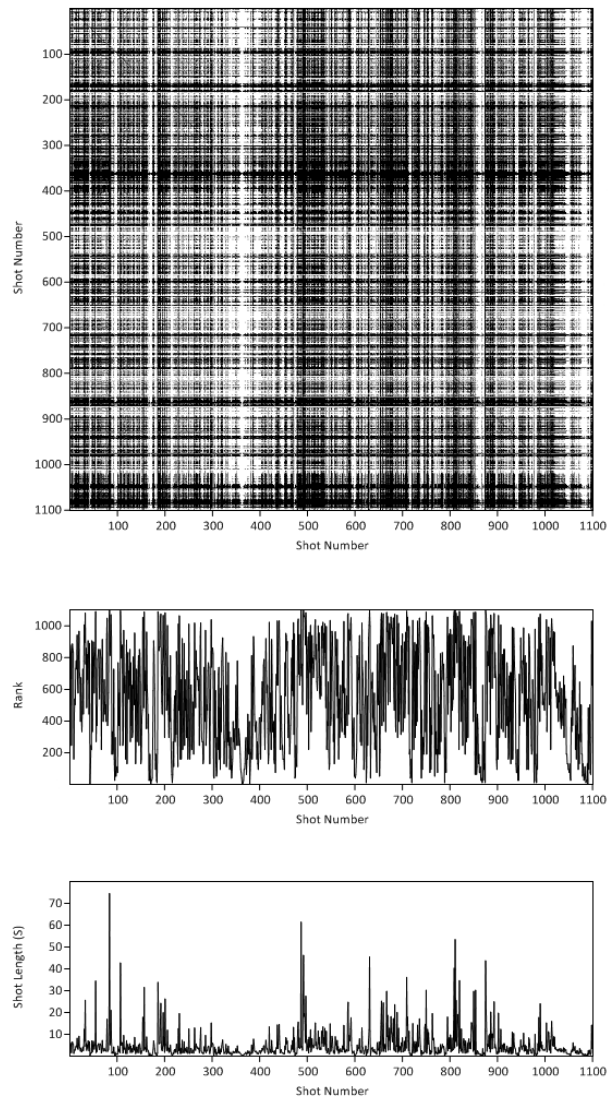


Figure 5 Order structure matrix (top), ranks (middle), and shot length data (bottom) of *The House on Sorority Row* (1983).

longer and shorter takes associated with specific narrative events.

In *Slumber Party Massacre* clusters of longer takes in the first half of the film are associated with sequences in which the girls are naked in the shower and locker room (shots 72-88), and at the slumber party (shots 266-276) as Jeff and Neil watch the girls undress. Later, as the body count starts to rise, we note dark areas in Figure 4 indicating longer takes associated with as the film slows prior to its inevitably violent denouement. An example of

this slower editing pattern is the sequence running from shot 504 to shot 565, which lasts for 573.2 seconds and focuses on Valerie and her worries that something strange is happening next door, the girls at the party trying to make themselves safe, and Thorn hiding the bodies of those who have so far been unfortunate. Instances of rapid editing occur at shots 165-177, in which the viewer is fooled into expecting violence when the drill comes through Coach Jana's door only to find it is someone installing a peephole in the door; in the

sequence that cross cuts between Valerie watching a movie and Jeff's murder, with the most violent part of this sequence edited most rapidly (shots 462-503); and in shots 659 to 676 when Thorn attacks the Coach at the party.

As noted previously, this association between short takes and the intensity of the violence is common to the slasher film; and in *Slumber Party Massacre* this editing style is characteristic of the sustained violence of the confrontation between the killer and the final girls (Valerie, Trish, and Courtney). Again, the final girl sequence is edited much more quickly than the first section of the film, with a median shot length two seconds lower than the longer stalk-and-slash section of the narrative (shots 702-790, $\Sigma = 170.3s$, median = 1.4s, IQR = 1.4s). In this sequence the variability of the shots is also much lower than in the rest of the film, and there is no shot longer than 11.1s. The black column that can be seen at shots 755 to 760 occurs when the supposedly dead Thorn rises from the pool to attack for the last time. This moment comprises only a few shots, but they are much longer (4-10 seconds) than those in the action that surrounds them.

4.4. *The House on Sorority Row (1983)*

Like *Slumber Party Massacre*, the editing in *The House on Sorority Row* is much quicker than *Halloween* and *Friday the Thirteenth*; while the distribution of shot lengths exhibits less variation than the other three films. Consequently, the differences in the editing of the different parts of the film are smaller than those evident in the other films. Nonetheless, there are still distinct editing patterns associated with particular narrative events (see Figure 5).

The main feature in Figure 5 is the confrontation between and the girls that begins at shot 302 and runs until shot 440. This sequence is edited very quickly ($\bar{\Sigma} = 362.2s$, median = 2.0s, IQR = 2.1s), but it is clear from Figure 1 that from shot 302 to shot 366 the length of the shots actually get shorter as the scene reaches its peak: the girls force Mrs. Slater into the swimming pool at gun point and the moment of greatest tension – as Vicki fires a shot into the pool – is the point at which the editing is most rapid. From shot 367 the sequence slows down using longer shots, and this can be clearly seen in the order structure matrix and the run chart of the ranks.

There is clearly a relationship between the way in which this scene is edited and the way in which the emotional impact of the scene is generated; and while it is self-evident from watching the scene that it is edited very quickly it is easier to appreciate how this scene is structured by looking at the time series given the difference between shorter and longer shots may only be a couple of seconds.

Other clusters of shorter takes are similarly related to moments of intense emotion. The onset of the cluster beginning at shot 165 coincides with Mrs. Slater's rejection of the girls under her care as she tears the photographs of to shreds, and again this a change in editing pattern linked to a localised change in mood. The cluster of short shots from shot 855 to shot 874 depict Vicki brutal killing in the graveyard and is typical of the rapid editing associated with violent murders in a slasher film. Clusters of long takes also serve to create an emotionally powerful atmosphere for the viewer based apprehension and dread, while also presenting key narrative information. Examples can be seen at shots 655-692 as we follow Katherine searching for her missing sorority sisters and exploring the attic room of Mrs. Slater's murderous son, Eric, where she discovers narratively important objects (e.g. the jack-in-the-box); and in the sequence from running from shot 797 to shot 854, when Dr. Beck responds to Katherine's call for help and proceeds to explain the back-story surrounding Mrs. Slater and the deranged Eric.

The final girl sequence begins at shot 985 ($\Sigma = 434.4s$, median = 2.7s, IQR = 2.1s), and here *The House on Sorority Row* does show some differences to the other films. In this instance we have a progressive increase in the cutting rate over the course of this sequence, and the shift to shorter shots is particularly marked in the run chart of the shot ranks. The first part of this sequence is edited relatively slowly as Katherine makes her way through the sorority house to the attic, and this can be seen in the dark column at this point in the matrix in Figure 1. This is different to the other films in which this corresponding sequence begins when the killer attacks the final girl (as can clearly be seen at shot 437 in the matrix for *Halloween*): in *The House on Sorority Row* the final girl goes looking for the killer. Once the struggle between Katherine and the killer begins (shot 1063) we see the same rapid editing observed in the other three films, but we do not find the fast-slow-fast pattern noted

as the struggle between Eric and Katherine is temporarily suspended. This is due to the postponement of the killer's return once we think he has been killed, and the last shot of the film is a close-up of Eric's eye as we discover Katherine has not defeated him and that the fight goes on.

4.5. General discussion

Having analysed these films we are in a position to make some general observations regarding the editing structure of slasher films. Dika (1987: 87) notes the impetus toward replication of content, characterisation, and narrative is a hallmark of the slasher film; and it is clear from these results the genre is characterised by a common editing pattern to such an extent that the films that followed *Halloween* may be described as stylistically formulaic. The stalk-and-slash sequences of each film are the slowest edited sections, while the final girl sequence is the section edited most quickly in each case. When present, the opening sequence depicting the original murders in the past is edited slowly, as is the coda at the end of the film. The narrative structure of these films follows a strict pattern and this is reflected their editing patterns to such a degree it is possible to determine the one from the other. The individual narrative events common across these films are edited in the same manner: sex and nudity are presented in long takes, as are scenes in which the 'seer' provides key narrative information about the impending danger (Dika 1987: 94); while moments of heightened tension and violence stand out as clusters of shorter takes. In fact, the only notable difference in the editing of these films is that the two later films are edited more quickly than *Halloween* or *Friday the Thirteenth*, though whether this tendency is characteristic of the evolution of the slasher film in general will require a study based on a larger sample.

The structure shared by these films is characterised by multiple regimes of editing. Adams, Dorai, and Venkatesh (2000) and Dorai and Venkatesh (2001) observed that in Hollywood narrative cinema, large changes of pace occur at the boundaries of story segments, while smaller changes in pace are identified with local narrative events of high dramatic import. Our findings show that while change points in the time series may coincide with the end of one narrative segment and the beginning of the next this is not always the case; and that for slasher films

changes in the dominant editing patterns are consistently associated with large differences in the mood of the film. This suggests the editing structure of these films is organised at different scales with a particular editing pattern dominating the macro-structure across whole acts or sequences, and, as noted above, localised variations linked to specific events that are manifest in the order structure matrices as clusters of longer or shorter takes.

The different editing styles are associated with different types of horror and their emotional impact on the viewer. This supports the findings of earlier research on editing and pace in motion pictures and their relationship to affective content. Hanjalic and Xu (2005) used variations in the length of shots as a means of describing the affective content of video, with shorter shots creating stressed, accented moments and longer takes used to de-accentuate an action. In slasher films, the slower edited sequences function to create a sense of suspense for the viewer by contrasting a fearful context with neutral visual scenes. For example, in *Halloween* we watch as Annie performs a series of mundane tasks (making popcorn, using the washing machine) while Michael observes her on several occasions. Research on the neuroscience of fear has shown that the apparent neutrality of such scenes is transformed by the viewer's knowledge even though the visual information is not fearful in its own right (Willems, Clevis, & Hagoort 2011), and this effect depends on the disparity of knowledge between the viewer, who knows the killer is 'out there,' and the characters that are unaware of the threat that surrounds them. The use of a slow editing pattern at this point in the film de-accentuates the action so that Michael's threat to Annie is created in the minds of the viewer rather than presented to them.

Telotte (1987: 125) points out that 'simply knowing that horrors do, in fact, exist 'out there' is insufficient, however; the full consequences of this knowledge also have to be thrust home.' The slasher film must deliver to the viewer a series of brutal murders as the psychological horror of the suspenseful gives way to the physical violence of body horror, and in these moments adopts a different editing style. Kang (2003) identified rapid editing as characteristic of scenes in which the dominant emotion was fear; and Wang and Cheong (2006) noted that the excitement level of a scene increases as shot lengths decrease, so that action scenes are typically edited more

quickly than dialogue scenes. These associations are certainly evident in slasher films, and, as noted above, the most emotionally intense and physically violent moments of these films are associated with rapid editing. Additionally, there is no new narrative information to be processed in these scenes and therefore no need for the viewer to store information for later reference. The use of shorter shot lengths does not compromise the forward flow of the narrative, and allows these films to present extreme events to the viewer without loss of coherence.

We tend to speak of the style of a film in singular terms as though it definitely has one – and only one – mode of expression, but our analysis indicates it would make more sense to talk of the *styles* of these films with different editing patterns used to create different types of horror.

However, these different styles should not be regarded as separate but as operating in conjunction. Emotional priming is an extensively studied phenomenon in which a subject's responses to stimuli are modulated by their active motivational state, and empirical research has shown the amplitude of the startle reflex to be augmented when a subject is already in a state of fear and is inhibited if a subject is primed with pleasant stimuli (Lang & Davis 2006; Lang, Davis, & Öhman 2000). The viewer's responses to the abrupt onset of the final girl sequence in *Halloween* or Marcie's murder in *Friday the Thirteenth* are intensified because he/she is already in a state of fear created during the slowly edited stalk-and-slash segments of these films. Arousal is also a factor in modulating the startle response with the greatest reflex associated with the most unpleasant images, including mutilations, animal attacks, and human attacks (Bradley et al. 2001). Such images are the standard fare of the slasher film and also intensify the level of our reaction to the onset of violent sequences. An interesting feature of the emotional modulation of the startle reflex is that it does not seem to depend on novelty, and persists even when a subject is presented with the same picture stimuli (Bradley, Lang, & Cuthbert 1993; Lang, Bradley, & Cuthbert 1998). This may account for the fast-slow-fast editing pattern of the final girl sequence, enabling a film to repeatedly generate a startle response in the viewer as the killer rises to attack again and again without loss of effect. Thus in *Halloween*, Michael Myers can attack Laurie three times in a short space of time and scare the viewer on each occasion because the intervening slow cut

segments prime the viewer by re-creating a sense of suspense prior to the onset of the next attack. Again the difference in the knowledge between the viewer and the final girl is relevant: the final girl loses track of the killer, hides where she cannot see him, or turns her back thinking him dead while the viewer is shown that the killer continues to present an imminent threat and will strike again.

Finally, several studies have looked at the relationship between violence and the gender of victims in slasher films (Cowan & O'Brien 1990; Weaver 1991; Sapolsky, Molitor, & Luque 2003), and though they noted that female characters tend to be shown in a state of fear for longer than their male counterparts they did not find any significant difference in the number of male and female victims. These studies focussed on content only and did not consider the way in which instances of violence were presented. From the films in this study we note that while individual films may use different editing styles for victims of different genders, but there is no evidence of a relationship between the gender and form across the genre in general. The violence inflicted on Annie, Marcie, and Brenda in *Friday the Thirteenth* is edited much more quickly than that visited upon Jack or Steve; but the same rapid editing pattern can be seen in the editing of Bob's murder in *Halloween* and Jeff's murder in *Slumber Party Massacre*, while the deaths of female characters may also be edited slowly (e.g. Lynda's murder in *Halloween*).

5. Conclusion

Exploratory data analysis provides a framework for studying film form that removes the need for prejudging the significance of the elements of film style on the part of the researcher. In this paper we used the order structure matrix as a simple, fast, and robust method for exploring the editing structure of motion pictures. Applying this method to slasher films we were able to locate change points in their editing patterns and to identify clusters of shots as potentially explicable relations of film style. Linking these features to content we found these films to be characterised by multiple regimes of editing associated with different types of horror but which nonetheless operate in unison, that there is a close relationship between the large scale narrative structure and editing structure while localised

relations are associated with specific narrative events, and that these relations of film style were common across the sample of films studied. We are therefore able to define the functions of editing and to explain how the slasher film creates a terrifying experience for the viewer.

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