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# How films convey meaning through alternating structures (with an illustrative analysis of *The Sunbeam*)

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Films and texts differ in terms of their possible logical structures and freedom of presentation on an output medium. While texts can be structured at any depth, the capabilities for structuring films are generally limited. In the presentation of textual documents, the sentence order is usually preserved, whereas video documents often allow rearrangements that lead to new alternations of shots. The fundamental difference between textual and video structures is taken as a starting point. Then, based on a detailed analysis of two different layouts of the film *The Sunbeam* by D. W. Griffith, a formal criterion for distinguishing between internal, discursively motivated and external, diegetically motivated alternations is developed. The results enable a new approach to alternation in film analysis and production.

KEYWORDS

**media theory, document theory, film analysis, editing, alternation, crosscutting, Griffith, *The Sunbeam***

## 1 Introduction

Moving image data can be realized in books (e.g., flip books, to take an example from media history), and texts can be integrated into films (with the potential to have a significant effect, even outside the opening and closing credits, in the age of silent film in particular; see below)—but it is only with media convergence as manifested on screens through the World Wide Web that it becomes possible to employ them with equal weight. This is a significant motivation for treating them together with identical basic concepts. The following analysis thus draws on digital document processing, which in recent decades has been refined specifically for multimedia documents and, given the prevalence of electronic documents, is now ubiquitous. In addition to texts, moving image data is increasingly prominent among the content architectures used in multimedia documents. Similar to texts, these are easily structured and may be processed in a grammar-oriented manner. Therefore, the following section, **Three perspectives on documents,** introduces a general scheme for electronic documents. This approach can also be understood as a contribution to a common metalanguage for multimodal corpora.

In the section **Structures in (video) documents,** we initially focus on the logical structure of text and video documents, which already show fundamental differences. Then, we investigate the standard layout principle of alternation for video documents. Speaking generally, a structured video document involves a display of different shots (such as playing cards). If a video document is played back in sequence in an output stream, some cards in the display can

be switched around locally without adversely affecting the whole document; others should remain in order locally, as their sequence is significant. Identifying such orders also makes it possible to distinguish between internal (chosen within a given discourse) and external (grounded in diegesis) forms of alternation.

The motion picture *The Sunbeam* and a prominent remake of that movie will be taken as an empirical basis for the analysis of alternations in video documents. They will be introduced in the section ***The Sunbeam*** and classified according to their phenotypes at the level of the shot, that is, the visual appearance of individual shots. No analysis of the underlying binary data is used additionally.

Using the theoretical tools provided earlier and the example, an empirical analysis of the structure of a story then follows in the section **Constructing the story**. In the empirical analysis, the diegetic space will first be constituted for the entirety of the shots by mapping spatiotemporal events; building on this, the continuous space–time regions represented in scenes will be labeled and the diegetic progression deconstructed into sequences. This yields a basal logical structure of the example document, for which the framework of the story will then be identified.

The section **Progressive spatial transitions and alternations** will be followed by an evaluation. To that end, so-called progressive spatial transitions and progression bridges will be identified in a micro-analysis of video segments. These are critical points of understanding for a viewer and provide the basis for a general criterion for distinguishing between internal and external alternations.

In the section **Discussion**, the results are linked back to the current view of document processing with multimodal content.

## 2 Three perspectives on documents

The constructs that we apply are drawn from a document framework that naturally includes a far broader range of artifacts than films as traditionally conceived in film studies—this locates film, including both narrative and documentary films, against the broader background of video surveillance, video protocols of medical operations, visually displayed temporally dependent information, interactive animations, and many more. For documents in general, one can essentially adopt three perspectives: the content view, the logical view, and the layout view.[1]

The content view perspective covers the typical user interest in a document: that is, assuming for now a range of intended readers, viewers, or hearers, what these will generally orient toward will be the represented content of the document. Although much can be said about such content, we will only consider this view to the extent that it is relevant for building our analytic framework. From the document perspective, the notion of content used corresponds to the body of material that has, by some means, been selected for presentation within some document; with respect to the document, therefore, it can be seen as pre-existing, and the main question concerns the organization that is imposed upon it to construct a document. Content portions can employ various content architectures—for output on a flat surface, this often means plain text, images, or moving images whose data formats can be identified, for instance, by their own MIME types.[2]

Since we will be focusing exclusively on video documents, the content will be taken as raw recordings or creations of some pro-filmic material. This can be taken as corresponding loosely to the various takes produced during filming before being edited into their appearance in the final video document. Therefore, the shot serves as a typical example of a content portion. We will also assume that this content can, at least in principle, be labeled with respect to some place of occurrence and a time of occurrence. This content, therefore, makes available particular space–time slices of some real or created world.

For material to become useful as a document, it is necessary to provide its users (either human or machine) with a way of structuring its content. This is achieved first by imposing a logical organization on that content. This logical view, in essence, covers part-whole relationships, groups content portions into larger structures of related content, and is typically modeled as a tree structure. In a text such as this one, for example, the logical view models such properties as a sentence considered as a part of a paragraph, the paragraph as part of a chapter, and so on. For characterizing the overall structural organization of a document, it is the logical view that is decisive and prior. For the film, the logical organization might then characterize "scenes" as grouped into "acts" and "acts" as making up the entire film (*cf.* Kawin, 1992, pp. 68–69 with application to the crime film *The Godfather*). In this context, the work of basic film interpretation will come down to reconstructing the logical organization based on the audiovisual material presented to a viewer.

Finally, to make a document readable for humans, there is the further step of selecting a particular layout for the logical organization. This prepares rendering of the content of a document for presentation on some output device or display medium, such as a sheet of paper and a display screen. Thus, any document is seen as a collection of logically organized content that is rendered appropriately for display in some output medium. The actual rendering, i.e., selecting and converting content portions, is where the layout process plays its role. This process is responsible for allocating content to particular forms of presentation and allocating these to, for visual documents, geometrically describable layout objects that can then be displayed on the output medium. Typically, such presentations are also more or less richly structured; we term the result of the layout process as layout structure. Any document artifact is, therefore, to be seen as the result of performing a layout process. This determines the final form of the presentation as accessible to its recipients.

1 Portions of this and the following section are based on the studies by Schlupkothen and Schmidt (2022) and Bateman and Schmidt (2011).

2 The following pages operate primarily with the text and video content architectures. These two content architectures were originally specified in the Multipurpose Internet Mail Extensions (MIME) standard as categories for different media types. See https://www.iana.org/assignments/media-types/media-types.xhtml (08.02.2024). A video document consists of content portions of MIME-type video. Every digitized film is a video document if converted to a video MIME-type. We draw a distinction between video as a content architecture and film as a form of presentation (normally with front matter and back matter comparable to that of a book in the guise of opening and closing credits; *cf.* Schlupkothen and Schmidt, 2022, p. 109).

# 3 Structures in (video) documents

## 3.1 Structured documents

Unstructured documents do not provide any viewer-independent specifications for identifying subdocuments (this is the case with many photographs); structured documents do exactly that. For the structured case, both the logical view and the layout view allow decompositions. In both cases, these are seen as hierarchical tree organizations.

In our conceptual framework for structured documents, we use the basic architecture model for document processing in ISO/IEC 8613-2 (1993).

For the logical view of any given structured document, ISO/IEC 8613-2 (1993) defines various types of nodes:

- document logical root.
- composite logical objects.
- basic logical objects.

The document's logical root is the logical object that is the ancestor of all the other logical objects, and it can contain any number and combination of composite and basic logical objects. A composite logical object is the child of another composite logical object or the document logical root. This, in turn, can contain any number (greater than zero) and a combination of composite or basic logical objects. A basic logical object is a terminal node in the tree structure that can host content portions and does not contain any further logical objects. The structural depth of the logical view of a document is simply the number of levels between the document's logical root and the basic logical objects. Figure 1 shows, on the left, a possible logical document structure that will be associated with real-world documents in what follows.

A tree structure can be generated analogously for layouts (see Figure 1, middle). Layout structure and logical structure are independent of each other and can, therefore, diverge. However, as illustrated in Figure 1, both share the same content portions, which are divided between the basic objects of the layout structure in a layout process.

As our first example for discussion, we will take the following five-line text underlying the Christian *ichthus*:

**Ι**ησοῦς
**Χ**ριστός
**Θ**εοῦ
**Υ**ἱός
**Σ**ωτηρ.

In the first instance, this yields a TEI document (see TEI Consortium, 2023), given in truncated form in the following listing that follows the structure outlined in Figure 1.

```
01 <?xml version = "1.0" encoding = "UTF-8"? >
 02  <TEI xmlns = "http://www.tei-c.org/ns/1.0">
  03  <teiHeader > ...</teiHeader >
   04  <text >
    05  <body >
     06  <lg  type = "acrostic" >
     07  <l > Ιησοῦς</l >
     08  <l > Χριστός </l >
     09  <l > Θεοῦ </l >
     10  <l > Υἱός </l >
     11  <l > Σωτηρ </l >
     12  </lg >
    13  </body >
   14  </text >
 15  </TEI>.
```

The document logical root (<TEI>) here is followed first by two composite logical objects (<teiHeader> and <text>). The <text> element contains further elements: the composite logical objects <body> and <lg>. <lg> is followed by five basic logical objects (<l> in each case). Thus, in macro-navigational terms (i.e., in the sense of identifying parts of the document's tree structure), five <l> lines below <lg> can be singled out.

A first general possibility for assigning the content portions of the logical structure to the basic layout objects of the layout structure in a layout process can be formulated thus:

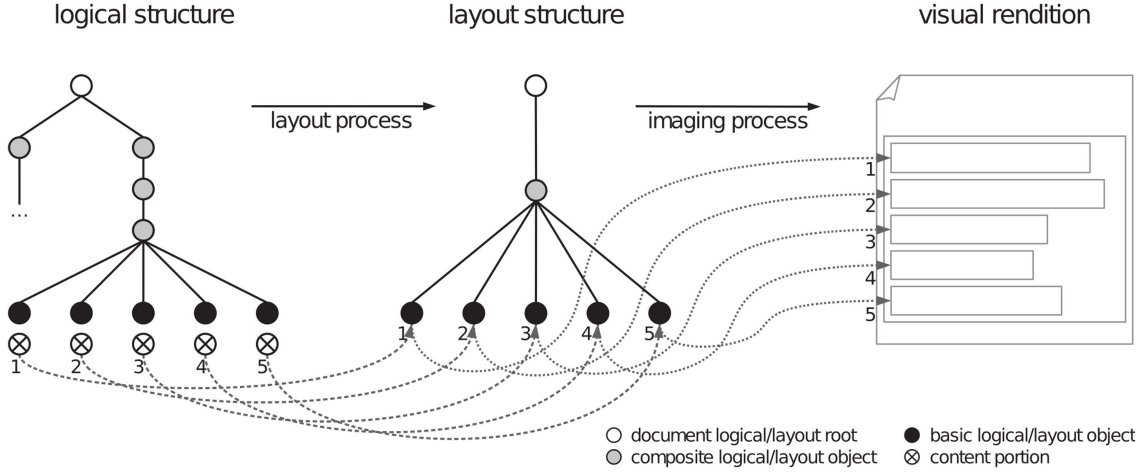


FIGURE 1
A possible layout process and visual rendition.

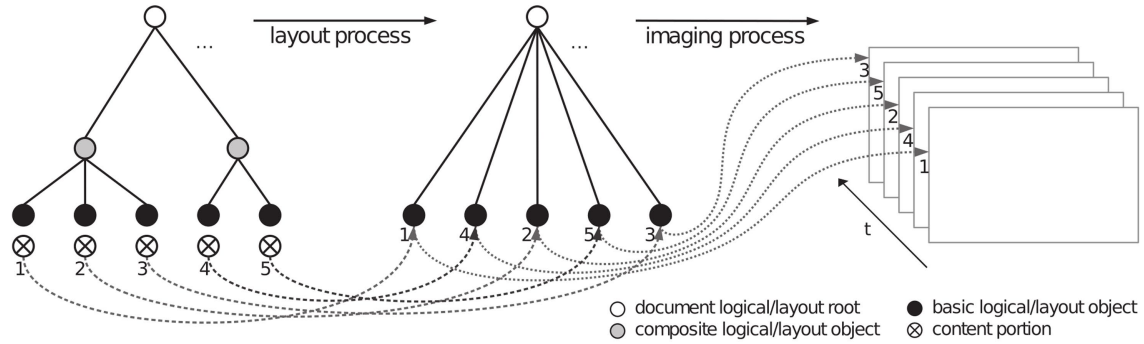


FIGURE 2
Alternative layout process and visual rendition.

> *Definition* 1. A (sub)document has a *document-order layout* if the associated set of content portions can be assigned to a set of basic layout objects in such a way that those objects are arranged (spatially and/or temporally) in the logical order.

For electronic documents in the world of XML, the default positioning of layout objects in CSS is sufficient to meet this requirement.[3] Figure 1 shows a document-order layout for the five content portions of the logical objects (lines) of the five-line text in the listing; this can be seen from the dotted arrows that map out the ordering.

For many documents, the requirement of a document-order layout will be too stringent; this is also true of many video documents consisting of several alternating shots, as is familiar from dialogs or car chases. Taking up the textual logical structure from Figure 1, an alternation with five basal logical objects and five associated content portions is illustrated in Figure 2. Here, the content portions numbered 4 and 5 are inserted between the content portions numbered 1 and 2, and 2 and 3, respectively. The logical structure is not preserved. Here, however, there is a link between the logical structure and the layout, satisfying Definition 2, which is weaker than Definition 1.

> *Definition* 2. A (sub)document has a *basic-order layout* if the associated set of content portions is assigned to a set of basic layout objects in such a way that the order of all the basic logical objects beneath their respective composite logical objects is preserved.

This means that content portions can—as in the empirically important case of alternation in videos—be rearranged without, for instance, the sequential order specified by the logical structure being lost. In the case of a video segment, the content portions in alternating layouts will typically be shots with their own macro-structures grouping the shots. This will be discussed now.

3 This default is found as "normal flow" in, for example, Bos et al. (2011), sec. 9.4.

## 3.2 Structures in video documents

An important question that must be answered in understanding how a presented film works is this: Can a spectator carve up the stream of images rushing past him into meaningful parts? To answer this question, Christian Metz published various studies (*Cf.* Metz, 1968, 1972, 1974b) from the mid-1960s onwards which dealt with two issues in particular:

1 Issues concerning the demarcation of so-called autonomous shots;
2 Issues concerning the combination of shots into autonomous 'syntagmatic' forms.

Metz classified some autonomous segments as syntagmatic, providing so-called a-chronological and chronological syntagmas. The so-called *grande syntagmatique* is the classificatory structure that results from the successive dichotomies that organize the syntagmas.[4]

On identifying autonomous segments, Metz writes:

4 Dudley Andrew offers an early placement of Metz's work within film theory generally (Dudley Andrew, 1976, Chapter 8, pp. 212–241). An early discussion of Metz's approach with respect to the basic semiotic dimensions of language/langue/parole, form/content/substance, paradigmatic/syntagmatic, etc., can be found in the study by Heath (1973). Good introductions and discussions of the grande syntagmatique are given in the study by Stam et al. (1992). Further discussion of subsequent attempts to draw out the paradigmatic and syntagmatic components of the original Metzian scheme can be found in the study by Bateman (2007). In Bateman and Schmidt (2011), chapter 4 "Christian Metz and the *grande syntagmatique* of the image track" is dedicated solely to problems of and critiques raised against the *grande syntagmatique* (Bateman and Schmidt, 2011, pp. 99–128). Important texts of the discussions Metz initiated are translated into English by Buckland (1995); interviews with Metz focusing on his key concepts can be found in the study by Buckland and Fairfax (2017).

> The analyst of classical film is ... entitled to consider as one (single) autonomous segment any passage of the film which is interrupted neither by a major change in the plot, nor by a punctuation sign, nor by the substitution of one syntagmatic type for another (English quote in Colin, 1995, p. 55).

The problems with this criterion are discussed by Colin in *The Grande Syntagmatique Revisited* (Colin, 1995). He showed that the notion of a "major change in the plot" is "rather loose" (*ibid.*), that one can be led astray when searching for a punctuation sign in identifying autonomous segments, and that the issues of autonomous segments and of the syntagmatic classification of a film must be treated separately.

This separation can be done by using key concepts of Metz to classify composite logical objects of video documents. A syntagma then classifies such partial trees of the logical structure of a document, which can be rendered in at least one segment.[5] With this aim, the two basic narrative syntagmas, *scene* and *sequence,* are now introduced. Based on these definitions, a concept of alternation is introduced in section 3.3.

In classic alternations such as the dialogs and car chases already mentioned, shots as content portions depict space–time regions and their goings-on. For the five shots assumed in Figure 2, this can happen in very different ways: 5 shots may depict up to 5 different spaces; furthermore, 5 shots may depict a temporal continuity or represent up to 4 temporal gaps. The actual distribution of these conditions results in major differences in the possible structures of a video document concerning the core of their construction, which we will now discuss for any number of several shots.

First, we will conceptualize the minimal situation of a single continuous space–time. If at least two shots depict only a single space and also represent a single temporal continuity, a given number of shots can be assigned to a composite logical object in a document tree and classified as a scene. For this, however, two further conditions must be met, as required by the following Definition 3.[6]

> *Definition* 3. A sub-tree of the logical structure of a video document to which at least two shots are assigned as content portions is a **scene** for some set of viewers if:

1 the diegetic spaces of all shots assigned to the sub-tree can be conceptualized by all viewers as being connected;
2 the diegetic times portrayed in the shots can be conceptualized by all viewers as being connected;
3 a layout process exists such that the order of shots created and their diegetic succession can be seen as homomorphic by all viewers—i.e., the shots can be displayed in an order that corresponds to the unfolding of events in the diegetic world;
4 no further shot meeting conditions (1)–(3) exists.

The last condition expresses an implicit maximality criterion: scenes are maximal because the inclusion of a further shot in a scene is not permitted to result in anything but a scene.

In creating video documents, when representing only one spatial region, unimportant parts of events are often omitted. The temporal continuity of the representation is then deliberately eschewed. This directly results in the following Definition 4 of a sequence (*cf.* Bateman and Schmidt, 2011, p. 210).

> Definition 4. A sub-tree of the logical structure of a video document to which at least two shots are assigned as content portions is a **sequence** for some set of viewers if:

1 the diegetic spaces of all shots assigned to the sub-tree can be conceptualized by all viewers as being connected;
2 the diegetic times portrayed in the shots cannot be conceptualized by all viewers as being connected;
3 a layout process exists such that the order of shots created and their diegetic succession can be seen as homomorphic by all viewers;
4 no further shot meeting conditions (1)–(3) exists.

## 3.3 Alternation

If more than one space is to be depicted in a video segment, the scenes or sequences created may be layouted in alternation. Here, it is important to note that we can only speak of an alternation for a given layout structure. Alternation as a classification only applies to segments of the layout structure, not to the logical structure, because it necessarily involves the commitment to a specific layout.[7] This means that alternation is only weakly dependent on the specific logical structure of the document: the logical structure must, of course, support the creation of an alternation via the layout process but does not itself include that alternation. We use the following Definition 5.[8]

> *Definition* 5. A segment in a video document is **n-alternating** with respect to a given layout process and a set of viewers if a partition of the segment exists with n partition sets such that:

1 the segment consists of shots from scenes or sequences;
2 for each pair of partition sets, transitions exist for which a specific symmetric relation holds between some member of the first partition set and some member of the second partition set for all

5 For the chronological syntagmas of Metz, this was initially developed in articles published by Schmidt and Strauch (2002), Schmidt (2004), Schmidt (2008) and refined in the study by Bateman and Schmidt (2011). An analysis of a longer silent film using these methods can be found in the study by Bateman and Schmidt (2011), pp. 245–286. A toolkit for the analysis of non-syntagmatic autonomous segments with continuous events can be found in the study by Schmidt and Becher (2017).

6 This definition, refining Metz's syntagmatic analysis, is found in the study by Bateman and Schmidt (2011), pp. 206 *et seqq*.

7 Metz introduced alternation as a syntagmatic structure. Problems of this approach are discussed in detail by Gaudreault and Gauthier (2018).

8 A general definition of alternation is given by Bateman and Schmidt (2011), p. 297.

viewers of the viewer set, and this relation holds for all transitions between the first and second set—this relation then constitutes the coherence for those viewers of the alternating shots it relates;

3 for all transition pairs between members of the partition, all viewers of the viewer set conceive the source space–time regions of the members of those pairs to be disjointed;

4 in the representation according to the given layout process, there are at least three transitions between the distinct members of each pair of partition sets.

The core of this definition is that (parts of) scenes or sequences are interleaved, and a coherence relation can be stated for the interleaved segment (which, in the case of two scenes/sequences, can label the interleaved segment for a viewer).

The definition does not distinguish whether the alternation is purely a means of representation (a so-called internal alternation based solely on the means of representation) or a diegetically grounded alternation (a so-called external alternation). Thus, no distinction is made between alternations in terms of the paradigmatic difference between internal and external relations: "*internal* distinctions are internal to the text, indicating how the text itself organizes its message 'rhetorically'; *external* distinctions are in contrast 'outside' of the text and are what a text is representing or showing. External relations thus construct relations between the 'world of events' depicted in the story; internal relations construct relations in the *telling* of the story" (Bateman and Schmidt, 2011, pp. 177 *et seqq.*). The question now is whether this distinction is based solely on assumptions on the part of a viewer or whether it is possible to state criteria for it. This will now be discussed on an empirical basis by analyzing and comparing two very different layouts for the logical structure of the silent film *The Sunbeam*. Both layouts lead to presentations of the video material that are particularly suited to micro-analyses of alternating segments. On this basis, it is possible to mark predetermined breaking points of a viewer's understanding of alternating layouts created for scenes and sequences and to carry out an analysis of internal and external alternations.

# 4 The Sunbeam

## 4.1 Original and remake

*The Sunbeam* is a motion picture by David W. Griffith, released on 18 March 1912 by Biograph Company, New York.[9] The picture contains a total of 86 shots. In less than 15 min, they tell the story of a little girl in three apartments and the staircase of a building. The story is summarized by Thompson as follows:

> *"In the opening, a sick mother dies, and her little girl, thinking her mother is asleep, goes out into the hallways of their working-class apartment building. She tries to find someone to play with, but everyone rebuffs her until she manages to charm two lonely people, a bachelor and spinster, who live opposite each other on the floor below the child's home."* (Thompson, 2011).

There is a remake of this motion picture made by Aitor Gametxo.[10] This remake goes beyond the classical filmic montage, i.e., the possibilities provided by the film for ordering sequences of elements in various ways, placing elements in particular orders for particular effects—appropriately labeled "mise-en-chaîne" by Gaudreault (1988), p. 119.[11] In this remake, the layout of the shots is arranged in a two-row, three-column grid, and the original serialization in one output stream is replaced by (in principle) $2 \times 3 = 6$ output streams organized such that the spatial and temporal diegetic events in the apartment building are represented in a largely homomorphic way spatially and, temporally, largely in the diegetic time of the story. Figure 3 is a screenshot showing the dying mother and the girl Sunbeam at the top left; the bottom center, the bachelor mentioned above; and at the bottom right, the spinster from behind.

Both presentations—the original motion picture and the remake—are the very special result of different layouts, each making the same logically structured core of a dataset visible in its own way. Formally, these may also be described by using the progress made in recent decades in the (machine) processing and evaluation of documents; in particular, the separation, now much better understood conceptually, of the logical structure from the layout of a document can be used illustratively.

The logical structure in the original picture and in the remake is dominated by scenes and sequences made very nicely apparent in the remake discussed here, which forms the logical backbone of both layouts. In the layouts of both variants, pivotal points in the diegetic progression can also be identified (see further below). These are predetermined breaking points on the actual reading pathway of a viewer (which may be a machine). Where they occur in alternating use between two spatial regions, they also provide a criterion for distinguishing between internal alternations (which are due to the telling of the story) and external (diegetically grounded) alternations.

Terminological note: Griffith's original will be referred to as *The Sunbeam*, and the variation by Gametxo will be referred to as Var*iation on The Sunbeam* or, for short, as (Gametxo's) *remake*. In the picture, the nameless spinster is already mentioned, and the nameless bachelor is also already mentioned to become a couple. We will refer to them as *Bachelor* and *Spinster* as proper names. The little girl, as the main protagonist, is called *Sunbeam*.

## 4.2 Phenotypes at the level of the shot

The 86 shots of *The Sunbeam* may be categorized into four phenotypes. These four types are either of a textual nature or genuine cinematic shots identifiably depicting a space–time. Both the title cards (hereinafter T) and the genuine cinematic shots (hereinafter S) will here be numbered 1 through 86 in the order of their appearance in Griffith's original, the numbers being initially appended to T or S as indices, thus: $T_1$, $T_2$, $S_3$,…, $S_{85}$, $T_{86}$.[12] There are:

9 The complete picture can be viewed at http://www.youtube.com/watch?v=bjCyzy5KqZ4

10 The remake is available at http://vimeo.com/22696362

11 Translated as "putting in sequence" in the study by Gaudreault (2009), p. 91.

12 This numbering has no theoretical significance. The analogy to the playing-cards metaphor is that a deck of cards is simply numbered consecutively in the order found.


FIGURE 3
A view of the remake of *The Sunbeam* (from Thompson, 2011).

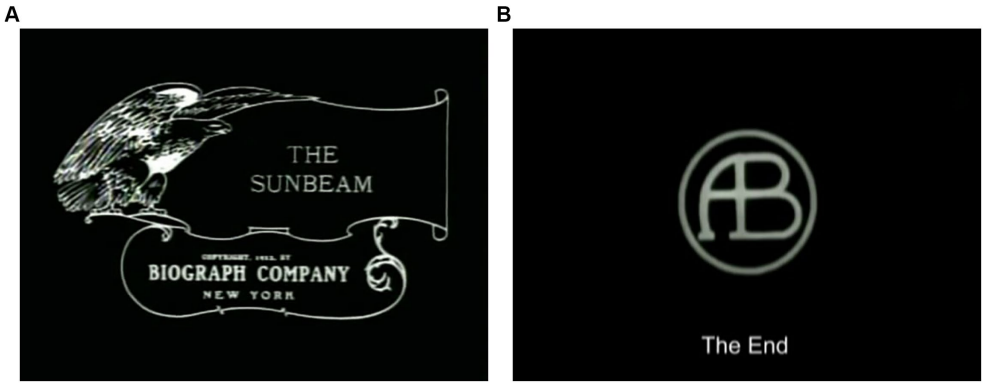


FIGURE 4
**(A,B)** Opening title $T_1$ and closing title $T_{86}$.

1 An opening title (Type_1). This type occurs only once in the layout chosen by Griffith, in the first position $T_1$ of the complete document and.
2 A closing title (Type_2). This type also occurs only once in Griffith's layout, at the end of the complete document in position $T_{86}$. Figures 4A,B show these two types.
3 A further nine intertitles (Type_3): Type_3 is found in the 9 intertitles $T_2$, $T_4$, $T_{10}$, $T_{36}$, $T_{40}$, $T_{45}$, $T_{53}$, $T_{73}$, and $T_{84}$. The text and the line at the top and the logos at the bottom belong to the non-diegetic content of the document. The rest is diegetically related to each occurrence, showing a particular text in each case. In $T_2$, at the very beginning, we find a summary of the story (*cf.* Figure 5). $T_2$ is also found at the top right in Figure 3.
4 All other shots from $S_3$ through $S_{85}$ (75 in all) are not mentioned under points 1–3, the content of which is photographic representations of spatiotemporal events (Type_4). A key frame of the first shot of this type in Griffith's original ($S_3$) is found at the top left in Figure 3, where, at the very beginning, the death of the little girl Sunbeam's mother is depicted (see the above summary by Thompson). In the bottom row of Figures 2, 3 further shots of this type are found.

Using shots of Type_4, the diegetic events are developed in space and time. In what follows, we will, therefore, refer to Type_4 shots as *(diegetic) shots*. Looking at the spatial regions represented in Type_4 shots, we find 5 diegetic spaces: three rooms and two parts of the staircase (not separated from each other) of the working-class apartment building, the arrangement of which may be roughly sketched in Figure 6.

To make clear, in what follows, which of these five diegetic spaces, R1 through R5, is shown in the diegetic shots, we will have the numbering of the diegetic shots preceded by the diegetic space


FIGURE 5
Intertitle $T_2$ with a summary of the whole story.

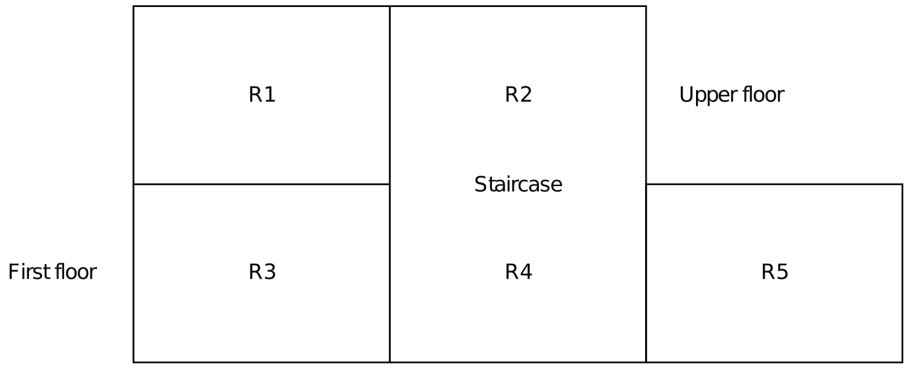


FIGURE 6
Sketch of diegetic spaces represented in *The Sunbeam*.

depicted. Accordingly, shots of space R1 will be labeled $S1_x$, those of space R2 will be labeled $S2_x$, and so on; thus, shot $S_3$ from the top left of Figure 3 will now be $S1_3$.

# 5 Constructing the story

## 5.1 The constitution of space

The space R1, where the little girl (diegetically) lives with her mother, is depicted in the 5 shots $S1_3$, $S1_{17}$, $S1_{35}$, $S1_{83}$, and $S1_{85}$. Of these, shots $S1_3$, $S1_{83}$, and $S1_{85}$ are part of the cinematic framework of Griffith's original. This framework further includes various title cards, specifically:

- the first title of Type_1 in $T_1$, as shown in Figure 4A above;
- the second title of Type_3 in $T_2$, as shown in Figure 5 above;
- the title of Type_3 in $T_{84}$, as shown in Figure 7B;
- the last title of Type_2 in $T_{86}$, as shown in Figure 4B above.

The diegetic beginning in ($S1_3$, $S1_{17}$, and $S1_{35}$) following $T_2$ is visualized in Figures 8A–C using key frames. Here, a viewer learns early on how the girl Sunbeam is present at her mother's death (she dies as early as in $S1_3$) without registering it and finally leaves the apartment at the end of $S1_{35}$ so as not to wake her mother. She makes her way into the core of the building. She then manages "to charm two lonely people, a bachelor and spinster" [see above and Thompson (2011)].

At the end of the picture, we see how Spinster and Bachelor, both charmed by the little girl during the remainder of the picture, together discover the death of the mother and decide to look after the motherless child ("her problem" in $T_{84}$) together (thus solving their problem of loneliness). The ending in ($S1_{83}$, $T_{84}$, and $S1_{85}$) is visualized in Figures 7A–C.

The two closing diegetic shots, $S1_{83}$ and $S1_{85}$, though interrupted by an intertitle in Griffith's original, can be played back-to-back without difficulty—as is done by Gametxo in his remake. We will mark such a series of shots, representing an action without interruption, as a single spatiotemporal continuity by underlining them and will refer to such segments as *scenic*. Thus, we have segment ($\underline{S1_{83}, S1_{85}}$)—concluding Griffith's original—as a scenic final segment.

When using this underlining convention, we consider the three introductory diegetic shots $S1_3$, $S1_{17}$, and $S1_{35}$ from R1; it is clear that these, too, may be classified as a scene within the above meaning and can be played back-to-back without difficulty. Accordingly, this is what Gametxo does for the scenic segment ($\underline{S1_3, S1_{17}, S1_{35}}$) in his remake as well. Here, it becomes apparent from the numbering that the layout of the picture differs significantly from its diegetic progression: The introduction is spread out as far as the 35th shot, which occurs well over one-third into the picture, in only three shots as touchdowns. Thus, it is apparent here that the term scene is a term for the logical structure of a

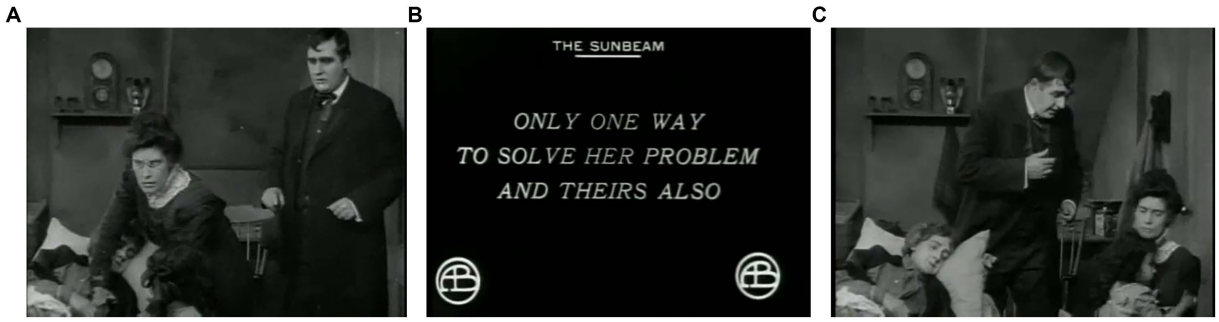


FIGURE 7
**(A–C)** Key frames of the final scene ($S1_{83}$, $S1_{85}$) with intertitle $T_{84}$.


FIGURE 8
**(A–C)** Key frames of the first scene ($S1_{3}$, $S1_{17}$, $S1_{35}$).

document, which may be assigned a default layout (play back-to-back); however, selecting such a layout is by no means obligatory.

In the original picture, Griffith radically and systematically runs through this latter option, as will now be shown by the following further analysis. To that end, we will discuss the other four spaces, R2 through R5, where the events leading to the happy ending depicted take place, with their corresponding shots. Here, the following quickly becomes apparent: In his original edit, Griffith never depicts the same space in two consecutive shots. In the following lists of shots, there is always at least a distance of 2 between identical space numbers. Thus, the whole picture is—in Griffith's telling of the story—systematically layouted in spatially alternating segments.

The staircase in R2 and R4 is represented in a total of 35 shots—accounting for nearly half of the 75 diegetic shots. While the staircase is represented as two partial diegetic regions, spaces R2 and R4, these will be conceptualized by any normal human viewer as adjoining without separation: in no shot is there a visible separation between them (but nor is there an overlap). The upper space R2 is depicted in the 5-shot segment ($S2_{30}$, $S2_{32}$, $S2_{37}$, $S2_{75}$, and $S2_{82}$). In Figure 9, we show a key frame of shot $S2_{30}$, in which we see Spinster (still rather grumpily) looking back downstairs. The lower portion of the staircase, R4, is depicted in the 30 shots $S4_{6}$, $S4_{8}$, $S4_{11}$, $S4_{13}$, $S4_{15}$, $S4_{18}$, $S4_{21}$, $S4_{24}$, $S4_{29}$, $S4_{31}$, $S4_{33}$, $S4_{38}$, $S4_{41}$, $S4_{43}$, $S4_{46}$, $S4_{48}$, $S4_{50}$, $S4_{54}$, $S4_{56}$, $S4_{58}$, $S4_{60}$, $S4_{62}$, $S4_{64}$, $S4_{66}$, $S4_{68}$, $S4_{70}$, $S4_{72}$, $S4_{77}$, $S4_{79}$, and $S4_{81}$. A key frame of the first shot, $S4_{6}$, can be found in the middle of the bottom row in Figure 3.

Space R3 is the Bachelor's room, depicted in the 24 shots $S3_{7}$, $S3_{9}$, $S3_{16}$, $S3_{20}$, $S3_{23}$, $S3_{26}$, $S3_{28}$, $S3_{34}$, $S3_{47}$, $S3_{49}$, $S3_{51}$, $S3_{55}$, $S3_{57}$, $S3_{59}$, $S3_{61}$, $S3_{63}$, $S3_{65}$, $S3_{67}$, $S3_{69}$, $S3_{71}$, $S3_{74}$, $S3_{76}$, $S3_{78}$, and $S3_{80}$. In Figure 10, we show a key frame of shot $S3_{7}$, which in Griffith's original is also the first time we are able to look into this apartment.

Space R5 is Spinster's apartment. It is depicted in the 11 shots $S5_{5}$, $S5_{12}$, $S5_{14}$, $S5_{19}$, $S5_{22}$, $S5_{25}$, $S5_{27}$, $S5_{39}$, $S5_{42}$, $S5_{44}$, and $S5_{52}$. A key frame of the first shot of R5, $S5_{5}$, and with Spinster can be found at the bottom right in Figure 3. We can tell from the indices here that this space will have no further role in the latter part of Griffith's original, having been left by the protagonist in the diegetic world in $S5_{52}$.

Overall, the 86 shots are grouped into 2 + 9 + 75 shots: Alongside the opening (Type_1) and closing (Type_2) titles, there are 9 intertitles (Type_3). The remaining 75 shots can in turn be grouped into 5 groups, depicting 5 spatial regions in 5 + 5 + 24 + 30 + 11 shots (Type_4), as shown in Figure 11. This very distribution and grouping is the starting point for the remake by Aitor Gametxo.

## 5.2 Continuous spatiotemporal regions: scenes

Of initial importance for the logical structuring of the diegetic shots of spaces R1, R2, R3, R4, and R5 in *The Sunbeam* are those series of shots that can be played back-to-back unbroken in a default layout—as indeed they are in their respective grid window in Gametxo's remake, thus actually depicting diegetic spatiotemporal continuities. These seamlessly depicted series form the scenic segments of the remake, as already discussed in the case


FIGURE 9
Key frame of shot $S2_{30}$ with Spinster looking back "downstairs."

FIGURE 10
Key frame of shot $S3_{7}$ with Bachelor.

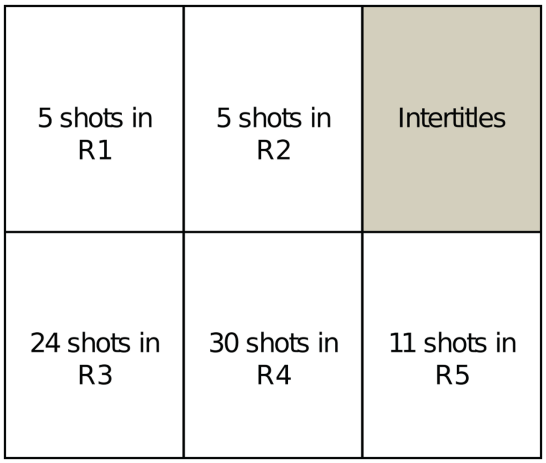


FIGURE 11
Distribution of diegetic shots (Type_4) depicting 5 spatial regions.

of R1. The following scenes rendered as scenic segments in the remake are assumed (structured according to diegetic spaces without underlining):

**R1**: ($S1_{3}$, $S1_{17}$, $S1_{35}$), ($S1_{83}$, $S1_{85}$);

**R2**: ($S2_{30}$, $S2_{32}$, $S2_{37}$)[13];

**R3**: ($S3_{23}$, $S3_{26}$), ($S3_{51}$, $S3_{55}$, $S3_{57}$, $S3_{59}$, $S3_{61}$, $S3_{63}$, $S3_{65}$), ($S3_{69}$, $S3_{71}$, $S3_{74}$), ($S3_{76}$, $S3_{78}$);

**R4**: ($S4_{6}$, $S4_{8}$, $S4_{11}$, $S4_{13}$, $S4_{15}$), ($S4_{18}$, $S4_{21}$, $S4_{24}$), ($S4_{29}$, $S4_{31}$, $S4_{33}$), ($S4_{38}$, $S4_{41}$), ($S4_{46}$, $S4_{48}$, $S4_{50}$), ($S4_{54}$, $S4_{56}$, $S4_{58}$, $S4_{60}$, $S4_{62}$, $S4_{64}$);

**R5**: ($S5_{19}$, $S5_{22}$, $S5_{25}$), ($S5_{42}$, $S5_{44}$).

Thus, across the whole picture of *The Sunbeam*, there are at least $2+1+4+6+2=15$ spatiotemporal regions represented in more than one shot, representing unbroken progressions in the five diegetic spaces.

## 5.3 Partitioning of diegetic progression: sequences

All scenes in *The Sunbeam*—both in Griffith's original and in the remake—are embedded in 5 larger sequences representing the diegetic progression in each of the 5 diegetic spaces. In general, a sequence differs from a scene in that the unification of the points in time denoted in the shots is not conceptualized as continuous by a reference viewer. Thus, somewhere between the shots, there is at least one temporal gap. Sequences may contain scenes as temporally unbroken parts. In addition, the series of shots in the logical structure and the diegetic progression must be such that they can be ordered homomorphically by a classifying reference viewer. All this is present here in the sets of shots assigned to the 5 diegetic spaces.

13 Perhaps only ($S2_{30}$, $S2_{32}$). In the remake, $S2_{37}$ is played immediately following $S2_{32}$, so that a scenic interpretation is possible: Sunbeam enters the staircase immediately upon Spinster's leaving it. Whether this is precisely the case is not critical for the purposes of this analysis. The same is true with minor gaps in the representation of the other diegetic spaces.

The whole picture *The Sunbeam* thus contains exactly 5 sequences in which the respective diegetic spaces are represented and which, in the remake, are played in their respective grid cells (the embedded scenes leading to scenic segments in the remake are underlined):

- The R1 sequence ($\underline{S1_3}$, $\underline{S1_{17}}$, $\underline{S1_{35}}$, $\underline{S1_{83}}$, $\underline{S1_{85}}$): there are 2 continuous temporal regions and thus exactly one temporal gap;
- The R2 sequence ($\underline{S2_{30}}$, $\underline{S2_{32}}$, $\underline{S2_{37}}$, $S2_{75}$, $S2_{82}$) or ($\underline{S2_{30}}$, $\underline{S2_{32}}$, $S2_{37}$, $S2_{75}$, $S2_{82}$): there are 3 (or, depending on viewers' preferences, See "Footnote 13", 4) temporal regions, one scene and 2 (or 3) temporal gaps;
- The R3 sequence ($S3_7$, $S3_9$, $S3_{16}$, $S3_{20}$, $\underline{S3_{23}}$, $\underline{S3_{26}}$, $S3_{28}$, $S3_{34}$, $S3_{47}$, $S3_{49}$, $\underline{S3_{51}}$, $\underline{S3_{55}}$, $\underline{S3_{57}}$, $\underline{S3_{59}}$, $\underline{S3_{61}}$, $\underline{S3_{63}}$, $\underline{S3_{65}}$, $S3_{67}$, $\underline{S3_{69}}$, $\underline{S3_{71}}$, $\underline{S3_{74}}$, $\underline{S3_{76}}$, $\underline{S3_{78}}$, $S3_{80}$): there are 14 temporal regions (with 4 scenes) and thus 13 gaps.
- The R4 sequence ($\underline{S4_6}$, $\underline{S4_8}$, $\underline{S4_{11}}$, $\underline{S4_{13}}$, $\underline{S4_{15}}$, $\underline{S4_{18}}$, $\underline{S4_{21}}$, $\underline{S4_{24}}$, $\underline{S4_{29}}$, $\underline{S4_{31}}$, $\underline{S4_{33}}$, $\underline{S4_{38}}$, $\underline{S4_{41}}$, $S4_{43}$, $\underline{S4_{46}}$, $\underline{S4_{48}}$, $\underline{S4_{50}}$, $\underline{S4_{54}}$, $\underline{S4_{56}}$, $\underline{S4_{58}}$, $\underline{S4_{60}}$, $\underline{S4_{62}}$, $\underline{S4_{64}}$, $S4_{66}$, $S4_{68}$, $S4_{70}$, $S4_{72}$, $S4_{77}$, $S4_{79}$, $S4_{81}$): there are 14 temporal regions (with 6 scenes) and thus 13 gaps;
- The R5 sequence ($S5_5$, $S5_{12}$, $S5_{14}$, $\underline{S5_{19}}$, $\underline{S5_{22}}$, $\underline{S5_{25}}$, $S5_{27}$, $S5_{39}$, $\underline{S5_{42}}$, $\underline{S5_{44}}$, $S5_{52}$): for R5, there are 8 temporal regions (with 2 scenes) and thus 7 temporal gaps.

These sequences structure the diegetic shots, jointly creating the maximal chronological partial document (*cf.* Bateman and Schmidt, 2011, p. 205) of the document *The Sunbeam*. In contrast to natural languages with local sentence structures, sequences can extend over the whole video document and can, in principle, continue to alternate, interleaved in their alternation up to the end. In rendered video documents, the end of a sequence is only reached when its space is depicted for the last time: in the case of the remake of *The Sunbeam*, the respective grid cell in the "dollhouse" (*cf.* above and Thompson, 2011) is vacated after such a last shot.

## 5.4 The basal structure of *The Sunbeam*

The whole structure of *The Sunbeam*, then, is based on 75 shots of Type_4 contained in 5 sequences. These contain a total of $2+3(4)+14+14+8=41$ (or 42) spatiotemporal regions represented continuously, of which $2+1+4+6+2=15$ are represented scenically in more than one shot in the remake.

No two diegetic shots from one diegetic space follow each other immediately in Griffith's original layout—not even where they can scenically represent one process, meaning they can be played back-to-back without difficulty in Gametxo's remake. The progression of the original picture is thus subject to constant changes. This also applies to the 15 scenes underlined above. This shows how far Griffith had departed from stage conceptions as early as 1912: he even rips apart possible scenic segments as a matter of principle. In particular, the opening scene in the mother's death chamber is, in Griffith's original, drawn out far into the motion picture. This scene, and all others, are reassembled in their default layout in Gametxo's remake, with the shots in their spaces played consecutively. To put it simply, Gametxo re-stages Griffith's dramatic composition in his remake.

The common conceptual starting point of the structures of scene and sequence (*cf.* Definitions 3 and 4) is their reference to a measurable spatial unit in the shots. Where an action diegetically transcends spatial regions in two shots adjacent to the layout, there is a spatiotemporal transition. For a viewer, special singular spatiotemporal bridges then function as predetermined cognitive breaking points for understanding the diegetic progression, as will now be shown.

## 5.5 The backbone of the story: sunbeam's itinerary

To reconstruct the story of the picture, we use the itinerary of the heroine Sunbeam in the original picture *The Sunbeam* and in the remake. This itinerary forms the backbone of the whole picture and is restrictive in the following way: Any part of a shot that includes a depiction of this itinerary cannot diegetically overlap with a part of another shot that includes a depiction of this itinerary. In the remake, this becomes apparent because we can follow Sunbeam without difficulty, as she only ever appears in at most one grid cell. Sunbeam is represented in the following segment, an explanation of which (including the bold emphasis) follows:

> $\underline{S1_3}$, $\underline{S1_{17}}$, $\underline{\mathbf{S1}_{35}}$, //Sunbeam is present at the death of her mother without noticing it.
>
> $\mathbf{S2}_{37}$, //Sunbeam enters the upper part of the staircase.
>
> $\underline{\mathbf{S4}_{38}}$, $\underline{\mathbf{S4}_{41}}$, //Sunbeam is in the lower part of the staircase.
>
> $\underline{\mathbf{S5}_{42}}$, $\underline{\mathbf{S5}_{44}}$, //Sunbeam charms Spinster in her apartment.
>
> $\underline{\mathbf{S4}_{46}}$, $\underline{S4_{48}}$, $\underline{\mathbf{S4}_{50}}$, //Sunbeam is in the lower part of the staircase.
>
> $\underline{S3_{51}}$, $\underline{S3_{55}}$, $\underline{S3_{57}}$, $\underline{S3_{59}}$, $\underline{S3_{61}}$, $\underline{S3_{63}}$, $\underline{\mathbf{S3}_{65}}$, $\mathbf{S3}_{67}$, $\underline{\mathbf{S3}_{69}}$, $\underline{S3_{71}}$, $\underline{\mathbf{S3}_{74}}$, $\underline{\mathbf{S3}_{76}}$, $\underline{\mathbf{S3}_{78}}$, $\mathbf{S3}_{80}$,
>
> //Sunbeam charms Bachelor, first on his own, then with Spinster present, in his apartment (note: three scenes).
>
> $\mathbf{S4}_{81}$, //Sunbeam, carried by Bachelor, is in the lower part of the staircase.
>
> $\mathbf{S2}_{82}$, //Sunbeam, carried by Bachelor, is in the upper part of the staircase.
>
> $\underline{\mathbf{S1}_{83}}$, $\underline{S1_{85}}$. //Sunbeam, along with Bachelor and Spinster, is in her dead mother's apartment. Her death is noticed by Bachelor and Spinster. They decide to look after Sunbeam together.

Sunbeam is thus only seen in 29 of 75 diegetic shots. However, this visible time of Sunbeam covers almost the entire diegetic time of the picture: There are very few time intervals in Gametxo's remake where Sunbeam is not seen at all.[14]

14 This happens in the representation of shot $S_{66}$ (apart from a minor and negligible initial overlap with shot $S_{65}$, where Sunbeam is seen), in the representation of all of $S_{68}$, of a middle portion of $S_{79}$, and the beginning of $S_{83}$,


FIGURE 12
**(A–F)** Segments ($S1_{35}$, $T_{36}$, $S2_{37}$) and ($S5_{44}$, $T_{45}$, $S4_{46}$) with intertitles $T_{36}$ and $T_{45}$.

The entire Sunbeam itinerary contains 8 scenes (again marked by underlining in the above list), which in turn—as is apparent from the above list—cover a large portion of the itinerary. These scenes have no unusual features; in the remake, they are put in their default play back-to-back layout. Anyone who understands these scenic segments will understand a large part of the itinerary.

To understand the full itinerary, it is necessary to master the critical starting and end points of these scenes, and the shots are not part of any scenes. These points are decisive moments for the content of the Sunbeam itinerary and thus of the whole picture. These are the points emphasized in **bold** above. Where two critical points occur in succession, two types are distinguishable:

- There is a spatial transition between two adjacent critical shots; or.
- Two adjacent critical shots are part of the same sequence; thus representing one and the same diegetic space.

For the first case in this list, the following spatial transitions between adjacent shots are present in *The Sunbeam* within the Sunbeam itinerary: $S1_{35}$ ($T_{36}$) $S2_{37}$; $S2_{37}$, $S4_{38}$; $S4_{41}$, $S5_{42}$; $S5_{44}$ ($T_{45}$) $S4_{46}$; $S4_{50}$, $S3_{51}$; $S3_{80}$, $S4_{81}$; $S4_{81}$, $S2_{82}$; $S2_{82}$, $S1_{83}$. Among these, the first and fourth spatial transitions also include the intertitles $T_{36}$ and $T_{45}$, as shown in Figures 12B,E.

For the second case, there are the following critical points emphasized in bold: $S3_{65}$, $S3_{67}$, $S3_{69}$, $S3_{74}$, $S3_{76}$, $S3_{78}$, $S3_{80}$. Here, as the indices and their distances show, a viewer must create an understanding of shots that are not part of Sunbeam's itinerary. This may also involve the beginning of an alternation or an insertion [within the meaning of "broad syntagmatic types" according to Bateman and Schmidt (2011), pp. 171 *et seqq.*].

## 6 Progressive spatial transitions and alternations

### 6.1 Progressive spatial transitions and progression bridges

The comparison of the two layouts of the original version by Griffith and the remake by Gametxo now allows for micro-analyses of the relation between a viewer and the layouted document, leading to a differentiation between internal and external alternations.

A transition from a given spatial region to a different spatial region diegetically represented later can occur from several spatial regions (including diegetically simultaneous ones). We will call these transitions *progressive spatial transitions*. Among these, we will (following the language of graph theory) mark as *progression bridges* those progressive spatial transitions for which diegetic progression can only occur through a transition that is unambiguously defined within the whole document and which a viewer must cross to make any temporal diegetic progress in absorbing the content of the document for a given layout. To put it simply, this is a bridge a viewer must cross to take the next step in understanding the whole document. Conceptually, this requires a preliminary boundary point in diegetic time from which one can only progress through an unambiguously defined transition of diegetic place. These bridges are essential hinge points of a motion picture and predetermined cognitive breaking

negligible in the overall tally. These "Sunbeam-free" phases must be added to the diegetic time of the "Sunbeam" phases to determine the approximate diegetic time of the story.

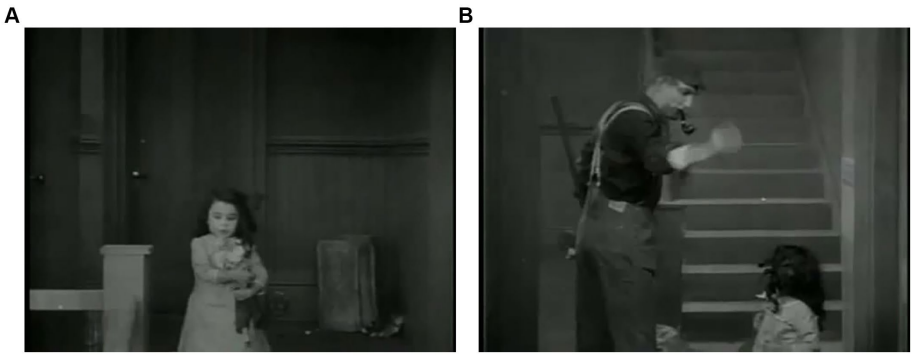


FIGURE 13
**(A,B)** The first progression bridge in ($S2_{37}$, $S4_{38}$).

points for understanding the diegetic progression, which we will now show in another round of analysis from the diegetic beginning to the diegetic ending of the picture.

## 6.2 Singular spatial transitions

The first two progressive spatial transitions in the above list in ($S1_{35}$, $T_{36}$, $S2_{37}$) and in ($S2_{37}$, $S4_{38}$) provide a set of examples for distinguishing between a simple progressive spatial transition and a progression bridge: In the first transition, visualized in Figures 12A–C, there is no bridge; in the second transition, there is a bridge. By way of justifying this, the progression from the diegetic beginning in $S1_3$ up to and including $S4_{38}$ will now be sketched in the approximate temporal order of the shots.

The first scene ($S1_3$, $S1_{17}$, $S1_{35}$), visualized in Figures 8A–C, covers the entire exposition of the picture in temporal diegetic terms so that more than one-third of the shots in the picture occur during the exposition. The second scene ($S2_{30}$, $S2_{32}$, $S2_{37}$), as the indices show, grows out of this portion. In segment ($S1_{35}$, $T_{36}$, $S2_{37}$), Sunbeam leaves the space R1—with the intertitle "BETTER GO OUT AND NOT WAKE MAMMA" in $T_{36}$ (*cf.* Figure 12B)—and, in $S2_{37}$, enters the upper part R2 of the staircase. In the layout of *The Sunbeam*, this is a progressive spatial transition but not a progression bridge since it is apparently also possible to diegetically progress from $S2_{32}$ to $S2_{37}$.

In contrast, there is a bridge in the next transition, from $S2_{37}$ to $S4_{38}$, as shown in Figures 13A,B. At the end of $S2_{37}$, the temporal diegetic progression reaches a point where it is only possible to "move on" by a spatial transition to R4, the lower portion of the staircase. The segment ($S2_{37}$, $S4_{38}$) marks the **first progression bridge** (in the whole picture). Sunbeam here transitions to the lower part of the building, linking the exposition to the rest of the diegetic events. This transition must absolutely be understood by a machine or human viewer. Otherwise, the story will disintegrate into 2 components, an "upper" component with Sunbeam and the death of her mother, and a "lower" component with Sunbeam's attempts at social contact.

This first progression bridge is followed by a **second** progression bridge in ($S4_{41}$, $S5_{42}$) and a **third** in ($S5_{44}$, $S4_{46}$)—in the latter case with an intertitle $T_{45}$, as visualized in Figure 12D-F.

Following her scenically represented stay in the hallway R4 (in Griffith's original, scene ($\underline{S4_{46}, S4_{48}, S4_{50}}$) is interspersed with shots $S3_{47}$ and $S3_{49}$ from the R3 sequence), Sunbeam, in a progressive spatial transition in ($S4_{50}$, $S3_{51}$), enters the Bachelor's apartment in $S3_{51}$. This spatial transition ($S4_{50}$, $S3_{51}$) is not a bridge, as $S4_{50}$ seamlessly follows $S4_{48}$ in parallel to $S3_{49}$ so a diegetically progressive reading path is possible via both the segments ($S4_{48}$, $S4_{50}$, $S3_{51}$) and ($S4_{48}$, $S3_{49}$, $S3_{51}$).

## 6.3 Series of spatial transitions

Having reached space R3, Sunbeam, first on her own with Bachelor and then joined by Spinster, initiates the happy ending. The core structures here are the scenes ($\underline{S3_{51}, S3_{55}, S3_{57}, S3_{59}, S3_{61}, S3_{63}, S3_{65}}$), ($\underline{S3_{69}, S3_{71}, S3_{74}}$) and ($\underline{S3_{76}, S3_{78}}$). With these scenes, Sunbeam's story in this picture is almost complete. The transition to the actual happy ending from $S3_{78}$ only remains.

In the first R3 scene, in Griffith's original layout, $S3_{51}$ is followed by the segment ($\underline{S3_{55}, S3_{57}, S3_{59}, S3_{61}, S3_{63}, S3_{65}}$), edited to alternate with the R4 segment ($\underline{S4_{54}, S4_{56}, S4_{58}, S4_{60}, S4_{62}, S4_{64}}$), as shown in the tabular sketch of the temporal diegetic relations in Figure 14 (progressing vertically for clarity, with R3 on the left and R4 on the right).

In the given layout, there are no progression bridges here, only progressive spatial transitions.[15] Each shot in this alternation can be reached in at least two ways in the spatiotemporal progression.

From $S4_{60}$, a children's prank is introduced as a subplot, in which several children affix the sign "SCARLET FEVER," already shown in $S4_{43}$, to the door of Bachelor's apartment and then fetch the police—to alert them to Bachelor as a possible epidemic focus and so to annoy him (Bachelor has no friends in the building, as we have already been told by the title card "EVERYBODY HAS FRIENDS BUT HIM" in $T_{10}$ in Griffith's original).

In Griffith's alternating edit, the layout depicts the temporal diegesis homomorphically according to its progression; however, this depiction is not defined unambiguously. With the same diegesis, various transpositions can be made to the alternating layout while retaining the playback of the diegetic progression, such that the two largely parallel (in temporal diegetic terms) spatiotemporal regions are

15 Progressive spatial transitions include those where two diegetic times are the same, as in $S3_{54}$ and $S4_{55}$, for example.

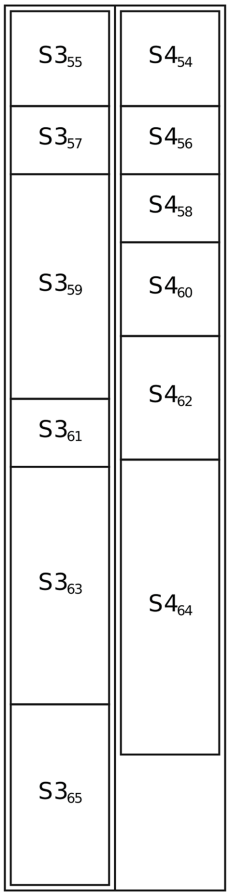


FIGURE 14
Progressive spatial transitions in ($S3_{55}$, ..., $S3_{65}$).

represented each in the right order. Thus, in the layout, $S3_{57}$ could easily be swapped for $S4_{56}$. Thus, there are degrees of freedom that still meet the boundary condition of some diegetic progression. The underlying structure can be alternated such that the telling of the story can represent the diegetic progression in multiple ways.

In contrast, the segment ($S3_{65}$, $S4_{66}$, $S3_{67}$, $S4_{68}$, $S3_{69}$) immediately following diegetically predetermines the alternation. Here, for the first time in this picture, we find a classic alternating layout of the form change of place as time goes on. Whereas, up to now, a viewer was able to go through the picture in scenic segments with occasional spatial transitions, beginning with $S3_{65}$, this is no longer possible: in ($S3_{65}$, $S4_{66}$, $S3_{67}$, $S4_{68}$, $S3_{69}$), for the first time, a viewer definitely cannot progress scenically through the picture but is diegetically compelled to jump back and forth four times between R3 and R4, as shown in Figures 15A–E. What is crucial here: Each individual jump is a progression bridge—we here have the **fourth through seventh progression bridges** of the picture in succession, externally determining an alternating layout. This is—singularly in *The Sunbeam*—an **externally determined alternation**.

From the R3 part of the itinerary, there now remains the final R3 scene ($\underline{S3_{76}, S3_{78}}$), which is linked in alternation to the preceding R3 scene ($\underline{S3_{69}, S3_{71}, S3_{74}}$) via $S2_{75}$ and to the rest of the picture via $S4_{77}$, $S4_{79}$, and $S4_{81}$. This chosen alternation, however, is not defined by external diegetic conditions. If the underlying structure can be considered suitable for alternation at all (this, after all, requires the specification of a coherence relation on the part of a viewer), it is only suitable for homomorphic alternation, but the diegesis does not define a default layout for the progression represented.

Sunbeam's whole itinerary ends with her being carried up the stairs and so (by means of the **eighth** and **ninth progression bridges** in her itinerary from $S4_{81}$ to $S2_{82}$ and from $S2_{82}$ to $S1_{83}$) returning to her dead mother's apartment R1 for the concluding scene, the happy ending ($\underline{S1_{83}, S1_{85}}$).[16] This ends Sunbeam's itinerary through the picture. The picture ends with the closing title card $T_{86}$.

## 6.4 Internal and external alternations

In Gametxo's remake, progression bridges are exactly those points where the forming of connections in understanding the content must necessarily transcend grid cells, moving from one cell to another, in order for the understanding to reach the end of the document. In the given document, none of these points is sensational in content: they are all situations of movement and/or (partial) itineraries. For that reason, they are inconspicuous in Griffith's original. Only in comparison with the remake by Gametxo can they be identified as predetermined breaking points in understanding the diegetic progression of the picture.

By introducing progression bridges, it becomes possible to mark **external alternations**. Where an alternating layout consists solely of such bridges, the underlying bridge structure, through the assumed diegesis, defines an alternating default layout—in the same way as the seamless playback of the shots is the default layout for a scene. If, however, instead of a progression bridge, there is only a progressive spatial jump, no unambiguously defined default layout for the representation of the diegetic progression is predetermined. To the extent to which a structure suitable for alternation is desired, the creator then has liberties in ordering the layout, which can be used in designing **internal alternations** without violating a viewer's temporal diegetic intuitions.

This result takes up an old discussion in Metz himself: Metz, at one point, terms examples of external alternation pseudo alternation to differentiate them from alternation proper as a discourse strategy (Metz, 1974a, p. 164n). The result here is that if an alternation is based on progression bridges, it is an externally based alternation for which a default layout applies. Otherwise, the organization of alternations can be based on reasons internal to the discourse.

# 7 Discussion

The silent film *The Sunbeam* by Griffith and its remake by Gametxo seem to be special in their film-theoretical context, but they

16 The fact that only bridges are present here and no parallel plot is represented suggests the interpretation that the happy ending should now occur rapidly, without beating about the diegetic bush, as would be suggested by a different spatial transition. Overall, the picture *The Sunbeam* contains 10 bridges: 9 in Sunbeam's itinerary and one more in ($S3_{78}$, $S4_{79}$), leading us out of Sunbeam's itinerary.


FIGURE 15
**(A–E)** External alternation in *The Sunbeam* in ($S3_{65}$, $S4_{66}$, $S3_{67}$, $S4_{68}$, $S3_{69}$).

fit seamlessly into today's view of document processing with multimodal content, as described in the introduction.

It is striking that the whole of Griffith's original document, which brims with alternations, actually contains only one externally determined alternation suggested by the diegesis—in the out-of-line segment ($S3_{65}$, $S4_{66}$, $S3_{67}$, $S4_{68}$, $S3_{69}$) with the four progression bridges. This is exactly what gives Griffith the liberty to edit in an extremely alternating fashion and also what makes the external alternation conspicuous. This liberty is made possible by the generally weak conditions in which the logical structure of a video document according to Definition 2 specifies for the layout and thus for the representation of a document. This can also be calculated, as will now be shown for the 75 diegetic shots of *The Sunbeam*.

*A priori*, a document with n content portions has n! (i.e., n x (n-1) x ... x 2 × 1) possible arrangements of these content portions at n places in the layout, if no other specifications are made. For content portions obtained from multimodal corpora, further restrictions may apply, resulting from the rules for mapping the logical structure into a layout, as specified, for example, in Definitions 1 and 2.

For a structured text with 75 sentences as 75 content portions, if one is forced to maintain the logical structure in the layout according to Definition 1, there would only be 1 possible solution for this text. For many texts, such a requirement makes sense to preserve the sentence order; for video documents, however, more freedom is often allowed, which quickly leads to a wide range of possibilities for the mise-en-chaîne.

In *The Sunbeam,* there is a document that does not contain 75 arbitrary diegetic shots but only 5 sequences. The definition of sequences used here stipulates that the associated shots can be arranged in such a way that the order of shots created and their diegetic succession can be seen as homomorphic by all viewers. This, in turn, means that with a layout according to Definition 2, the shots can be displayed in an order corresponding to the unfolding of events in the respective diegetic space.

The distribution of the number of shots in *The Sunbeam* over the 5 diegetic spaces, R1 to R5, is as follows: There are 5 shots for R1, 5 shots for R2, 24 for R3, 30 for R4, and 11 for R5. If the respective order of these shots is not changed in the layout of the overall document according to Definition 2, the number of the 75! possible arrangements is reduced by (5! 5! 24! 30! 11!), a reduction of almost $10^{68}$ possibilities. This leaves a maximum of 75! / (5! 5! 24! 30! 11!) different solutions for the diegetic shots only. Despite the significant reduction due to the denominator, this still results in a 42-digit number:

$2.622574105812443685154768942058491098 24\times10^{41}$.

As a result, Griffith had a great deal of freedom for his montage of *The Sunbeam* in an order that satisfied his wishes. However, if the shots are not arranged directly one after the other for each diegetic space (for example, first the R1 shots, then the R2 shots, etc.),[17] shots from different diegetic spaces must necessarily alternate when brought into a chain. This can be done with internal (discursively motivated) or external (diegetically motivated) alternations. It is, therefore, necessary for both production and analysis to look for justified restrictions of possible alternations. A significant restriction was specified here in the identification of external alternations, which determines the layout by default for a number of shots.

17 The video "Deconstructing Griffith - A Girl and Her Trust (1912) prior to editing" by Jim Middleton even shows the shots of the individual camera positions for the silent film "The Girl and Her Trust," starting with the interior shots and followed by the exterior shots. See https://www.youtube.com/watch?v=BzGIETh-Olg (16.03.2024).

Gametxo has subjected Griffith's original to detailed analysis at the level of shots. This analysis led to his remake as an independent work. With the current state of document processing, such a variation with its tabular layout can be generated from the same logical structure as Griffith's version. This can be realized by two stylesheet specifications, one for alternating presentation of the 5 sequences and the other for presentation in the 5 table cells which are assigned to the diegetic spaces R1 to R5.[18] The original by Griffith and the remake are to be seen today as different layouts for a screen output of a common logical structure, as introduced in the first three sections of this study.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

18 This can even be done on the user side alone. In general, a layout is determined by the intentions of the creator (leading to "author styles" in the terminology of CSS), existing and chosen output options (leading to "user agent styles" in the terminology of CSS) and a viewer's needs (leading to "user styles" in the terminology CSS; *Cf.* Bos, 2016, sec. 6.4).

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