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Implementing Hitchcock - the Role of Focalization and Viewpoint

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Abstract

Focalization and viewpoint are important aspects of narrative movie-making that need to be taken into account by cinematography and editing. In this paper, we argue that viewpoint can be determined from the first principles of focalization in the screenplay and adherence to a slightly modified version of Hitchcock's rule in cinematography and editing. With minor changes to previous work in automatic cinematography and editing, we show that this strategy makes it possible to easily control the viewpoint in the movie by rewriting and annotating the screenplay. We illustrate our claim with four versions of a moderately complex movie scene obtained by focalizing on its four main characters, with dramatically different camera choices.

1. Introduction

One of the benefits of intelligent cinematography and editing techniques is that they make it possible for the screen-writer to make changes in the script and to immediately visualize how they will affect the movie. In this paper, we choose the example of focalization and viewpoint to demonstrate how subtle changes during screen-writing can dramatically affect the overall feeling of a movie scene.

Borrowing from previous work in camera control [GCLR15] and film editing [GRLC15], we automatically place and select cameras covering the exact same sequence of events from different perspectives. This leads us to reformulate Hitchcock's rule that *the size of an object in the frame should equal its importance in the story at the moment* [TS85] with an explicit model of the focalization and viewpoint chosen by the script-writer.

The paper is organized as follows. In Section 2, we review previous work in cinematography and editing and their implicit or explicit assumptions about focalization and viewpoint. In Section 3, we give a brief account of focalization and viewpoint in film narratology. In Section 4, we revisit Hitchcock rule to take focalization and viewpoint into account. In Section 5, we present experimental results on a short movie scene. In Section 6, we discuss our results and propose directions for future work.

2. Related Work

Automatic cinematography and editing methods take as input a symbolic representation of the script which can be as simple as a list of subject-verb-object triplets [HCS96] or as complex as a story intention graph [Els12].

One may naturally wonder how this symbolic representation is

obtained in the first place. Ideally, the representation of the story should be automatically extracted from the screenplay. Unfortunately the state of the art in automatic story understanding is not yet able to handle complex stories [Mue02]. The next best solution is to obtain the story representation from the scriptwriter himself, with minimal annotation effort [Man12].

One interesting case is when the screen-writer is itself a machine (or a program), as in some recent interactive storytelling systems [RAV05, Szi08, Mon11, NMC13]. In this case, it becomes possible in theory to generate a very rich description of the story goals that can be used to generate a narratively motivated movie. Ronfard and Szilas argue that there is no established *lingua franca* for communicating the story between the screen-writing machine and the movie-making machine and they propose a small vocabulary of *narrative acts* such as telling, showing, revealing, hiding, etc. that could be used to better motivate cinematography and editing in the future [RS14]. But their proposal has not yet been validated experimentally.

As a result, most previous work in automatic cinematography and editing takes as input a list of actions and dialogues in the story, and implicitly assumes an external focalization, where the camera is omniscient and its narrative goal is to show all actions and dialogues in the story from the best possible angles to share all the available information to the audience. This assumption is explicit in the previous work of Galvane et al. [GCLR15, GRLC15] and implicit in many other related works, including [HCS96].

Closer to our goal, some systems have attempted to provide an explicit model of focalization and/or viewpoint either during the screenwriting stage or the cinematography and editing stages. Rishes et al. present an automatic method for converting story intention graphs into natural language stories, with possible variations in narrative styles and moods, including focalization and

viewpoint [RLEW13]. Charles et al. show how a baseline plot can be adapted in order to be told from the perspective of one of the feature characters. They hope that this can "reconcile narrative generation with modern scriptwriting which often takes characters as its starting point" [CPC10]. Porteous et al. [PCC10] describe an architecture for changing character's point of view in interactive drama generation, using the example of Shakespeare's 'Merchant of Venice'.

All those previous works achieve focalization and viewpoint changes at the expense of a rich semantic representation of the story. Obtaining such a representation from natural language input is a difficult problem in general, making such approaches impractical in many situations. In this paper, we present a lightweight approach, where the screenplay is represented with a sequence of durative actions, which can easily be extracted from the screenplay, and focalization is determined very simply by selecting and annotating actions in the screenplay. Combined with an extended version of Hitchcock's rule, we find that this approach is sufficient for choosing coherent camera positions approximating the chosen viewpoints.

3. Focalization and viewpoint

In Gerard Genette's theory of literary point of view, the mood of a narrative is composed of distance and perspective (focalization) [Gen80]. Genette clearly outlines the distinction into "who tells" (the narrator) and "who sees" (the focalizer). He further distinguishes between zero focalization (when the narrator knows more than the character), internal focalization (when the the narrator knows only what the character knows) and external focalization (when the narrator knows less than the character). Verstraten further separates the film narrator into a visual narrator and an audio narrator, each with their own focalization and viewpoint [Ver09].

Prince [Pri03] defines focalization or viewpoint as the perspective in which the narrated situations and events are presented. Following Grimes [Gri75], Prince distinguishes the omniscient viewpoint (zero focalization), the first-person viewpoint (homodiegetic narration with internal focalization), the third-person subjective viewpoint (heterodiegetic narrative with internal focalization) and the third-person objective viewpoint (external focalization).

Choosing the point of view is recognized as an important element of film-making [Bra84, Bor85], but the relation between viewpoint and focalization remains elusive in the film narratology literature. Branigan [Bra06] reviews ten different accounts by Friedman [Fri55], Booth [Boo61], Genette [Gen80], [Cha90], Wilson [Wil86], Casetti [Cas98], Pye [Pye00], Aumont [Aum89], Kawin [Kaw85] and Zizek [Ziz92] without reaching any definitive conclusions. In this paper, we take the view that focalization is primarily a narrative concept, which is best expressed at the level of the screenplay, and can be translated mechanically to camera viewpoint by a simple extension of Hitchcock's rule.

Focalization in movies specializes to the two mode of ocularization and auricularization [Sch09]. In this paper, we assume a given auricularization borrowed from the original movie soundtrack, and we are interested in the role of cinematography and film editing in controlling the ocularization and its relation to the soundtrack.

4. Implementing Hitchcock

In a conversation with Francois Truffaut, Alfred Hitchcock stated that *the size of an object in the frame should equal its importance in the story at the moment* [TS85], a common sense appreciation which has since been known as Hitchcock's rule.

Despite its simplicity, Hitchcock's rule has proved to be a useful reference for automatic cinematography and editing. Indeed, violations of Hitchcock's rule are easily noticed by audiences, with negative effects. Showing un-motivated foreground objects and actors inevitably creates confusion in the audience, breaking the necessary suspension of disbelief. As a result, Hitchcock's principle appears to be a necessary (if not sufficient) condition for successful cinematography and editing, and has been widely acknowledged in previous work [Haw05].

Implementing Hitchcock's principle is in fact much harder than expected. How should the importance of objects and actors in the story at the moment be evaluated? How should the size of an object or actor in the frame be measured? Although Hitchcock's rule has been invoked many times before, those two important questions remain largely unresolved.

In this section, we review some of the common errors found in previous work and propose an implementation of Hitchcock's rule which appears to be general and robust to large variations in story structure and frame composition.

Most importantly, we show that our implementation of Hitchcock's rule makes it possible to convey the same story according to vastly different viewpoint constraints, making it possible to create interesting narrative variations while maintaining the same basic principles.

4.1. Screenplay

Our main input in this paper is a screenplay describing all the actions and dialogues occurring in the scene. All actions are translated into 3D animation as described in [GRLC15] and synchronized to a given soundtrack. We simulate the effect of internal focalization on each of the characters by selecting the actions that they are aware of. This typically includes all actions where they participate directly and all actions that cause them to react. This selection is performed manually by the screenwriter who can choose precisely which actions should be focalized.

Our implementation of Hitchcock's rule is similar to Galvane et al [GRLC15], where the importance of the characters is measured by counting the number of (focalized) actions where they are taking part, weighted with their roles in the action. As a result, our implementation leads to the following reformulation of Hitchcock's rule, that *the size of an object in the frame should equal its importance in the story as focalized by the film narrator at the moment*.

4.2. Cinematography

Using Hitchcock's principle to guide the cinematography is a relatively complex endeavor that requires to address challenges in both camera control and narrative information retrieval. As detailed in section 2, there now exist a broad range of techniques to position

and move the camera in a 3d environment while maintaining various camera constraints.

Similar to [GRCS14], we propose to use the notion of activity to guide the placement and movement of the cameras. Activities are defined through set of related atomic actions (*eg.* speak, listen, look-at, walk, punch, kick, etc.). Comparable to idiom-based methods, we associate one or more camera configurations to each type of activity. However, unlike traditional idiom-based approach, our solution does not execute the editing in realtime ; it only handles the cinematography and then performs the editing as a post process. As a result, this approach lightens the burden of creating idioms. This task no longer requires expert knowledge nor tremendous amount of work to anticipate all possible camera transitions. For each type of activity (*eg.* dialog, fight, walking, etc.), it is only necessary to specify the initial and final camera configurations – position of the camera relative to one or several actors. To further simplify this task we use the *Prose Storyboard Language* introduced in [RGB13] to describe camera configurations.

Given an initial and final camera configuration for a shot, computing fine camera motion as to properly adjust the framing to the moving characters is a complex task. The solution used in [GRCS14], and derived from [GCR*13], proved limited in a number of cases. Indeed, due to its reactive nature, this force based approach is sometimes not able to keep up with actors as they move too fast or too close to the camera. This solution also tends to produce unnatural camera motions – in the sense that viewers are not used to experience such camera movements in traditional movies. To provide better inputs to the editing process we here propose to use a more recent technique that takes inspiration from traditional movie practices. This technique, presented in [GCLR15], consist in a three step process. After finding a raw camera path by interpolating initial and final camera configurations, we generate a virtual camera rail – by computing the cubic bezier curve that best fits the raw trajectory – and finally we perform a constrained optimization along this rail to find the best camera motion that satisfies camera velocity and acceleration constraints. As an offline process, this solution is able to anticipate fast movements of the characters to generate proper camera rushes then passed as input to the editing process.

4.3. Film editing

In order to account for Hitchcock principle during the editing step, we propose to use the framework we presented in [GRLC15]. Given a set of camera rushes and a scenario, this approach consist in expressing the editing task as a graph optimization problem. We formalized the problem through a three-term cost function that evaluates the shot quality, the cut quality and the pacing. The shot quality is evaluated mainly through the rule of thirds – which states that important features should be placed approximately at the thirds of the screen – and the Hitchcock principle. The cut quality is computed from a formalisation of a set of textbook rules on film editing. While most of these rules – including the jump cuts, the 180-rule and several other continuity rules – are occasionally broken by film directors to convey specific information on the narrative or for stylistic purposes, we here enforce them to ensure that the final editing will follow a conventional editing style. The evaluation



Figure 1: Overview of the 3D reconstructed scene from *Back To The Future*

of the pacing is based on the observation that the distribution of shot durations in a movie scene follows a log-normal law [LSA01]. Given the overall cost function, the editing is automatically computed through a search in the *editing graph* made of all camera rushes (see [GRLC15] for more details).

Experiments have already been conducted to test the robustness of the framework with regards to the input rushes and to test its capacity to generate multiple variations of an edit simply by changing the desired pacing. We here propose to test the capacity of this framework to produce significantly different edits with different viewpoints or focalizations.

For this purpose the main factor that could trigger noticeable variation in the edit is the Hitchcock rule. Currently, it is evaluated using the relative onscreen area of the actors and their narrative importance extracted from the scenario. To compute an edit of the rushes from a specific focalization, we automatically generate a new scenario by selecting the subset of actions – from the original scenario – that involves the specified "main character". The relative importance of actors are then recomputed to be used in the optimization and produce a relevant edit.

5. Experimental results

To evaluate our approach and the capacity of our system to produce edits from different focalizations, we conducted experiments using a publicly available dataset. After generating the camera rushes and computing several edits through various viewpoints, we analyse the generated results.

5.1. Dataset

For this experiment, we used the dataset released in [GRLC15]. This 3D reconstruction of a short scene from the movie *Back To The Future* not only provides complex characters' trajectories, but also stages a variety of animated actions. In addition, this dataset contains the script detailing all actions by the four character – Marty, George, Goldie and Lou – occurring in the scene.

5.2. Rush generation

The goal of this experiment is to demonstrate the capacity of our system to produce vastly different edits from different focalization using the same set of rushes. To ensure that focalization is possible, cameras should be placed to always guarantee actors visibility. Using the scenario provided with the dataset, we manually extracted

four activities for each of the four characters. Each of these activities are associated with a single camera, therefore producing a total of 16 different rushes. Bellow is the list of activities defined for each character :

———— Marty
 Observing : Marty looking at Georges
 Dialog : Marty speaking with George and Goldie
 Observing : Marty looking at Lou and Goldie
 Moving : Marty Running after George

———— George
 Observing : George eating cereals
 Dialog : George talking to Marty
 Dialog : George talking to Goldie
 Moving : George leaves

———— Lou
 Observing : Lou looks at Goldie
 Moving : Lou moving in the scene
 Dialog : Lou talking to Goldie
 Moving : Lou moving in the scene

———— Goldie
 Moving : Goldie moving in the scene
 Dialog : Goldie speaking with George and Marty
 Dialog : Goldie talking to Lou
 Moving : Goldie moves in the scene

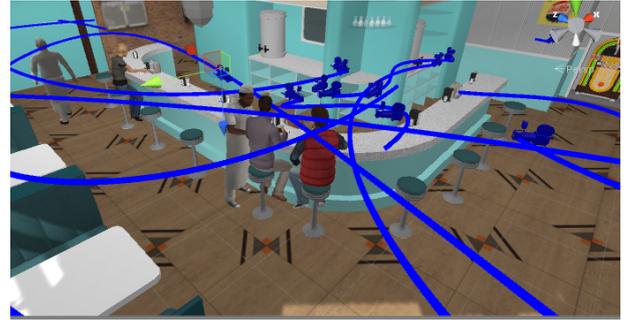
Figure 2: List of activities extracted from the script of *Back To The Future*

As explained in section 4.2 for the generation of the rushes, we used the virtual camera rails method introduced in [GCLR15]. Figure 3 illustrates the 16 camera rails and the 16 associated rushes produced with this approach.

5.3. Rush editing

From these 16 camera rushes, we tested our approach by generating four different edits which focalize on the four main actor’s viewpoint. An overview of the results is given in Figure 5 and we encourage readers to watch the corresponding videos, respectively generated from the viewpoints of Lou (<https://youtu.be/KmTRcfJ8bwY>), Goldie (<https://youtu.be/mLv2IGasfzM>), George (<https://youtu.be/8UiLJgpzxuc>) and Marty (<https://youtu.be/189VQXSod4I>). Figure 5 illustrates all edits by displaying each selected rush along the timeline in a specific color. Globally, we can see that each edit possesses a dominant set of rushes, corresponding to the cameras generated to show each actor’s point of view. This not only proves that the editing process managed to select the right rushes, but also that the rushes were properly computed to best cover characters actions. Rushes shared by several edits imply a strong relation between actors. For instance we can see that Marty’s and George’s edit share multiple rushes which implies the two protagonist are involved in common actions.

Figures 6 to 9 illustrate the correlation between actors’ impor-



(a)



(b)

Figure 3: Overview of the 16 camera rails (a) used to generate the 16 camera rushes (b).



Figure 4: Colormap used to display values in $[0,1]$. Lowest values (0) are displayed in blue and highest values (1) in red.

tance and their relative size on the screen – values are displayed using the scale of Figure 4. The figures clearly highlight that for each of the edits the relative onscreen area of actors is strongly related to their importance in the scene. While this observation is not sufficient to assess the overall quality of the edits, it does prove that the Hitchcock principle was properly enforced through the editing process. These figures also highlight the correlations between actors. For instance, Figure 9 clearly shows that Lou is only involved in actions with Goldie. On the other hand, Figure 8 shows that Goldie interacts with all other three characters. This same observation can be made by looking at Figure 5. Indeed, we can notice that the cameras used in Lou’s version are barely used in any other edits while the cameras selected for Goldie’s point of view are also selected in all other edits.

Finally, figure 10 shows the distribution of shot durations for each of the four edits. These durations distributions are overall similar but we can observe some slight variations. Mainly, we can see that the edit computed under Marty’s point of view contains many short duration shots. This can be explained by the fact that Marty also appears in rushes generated for other characters’ point of view, therefore offering a greater choice of rushes to the editing process.



Figure 5: Four different edits using the same set of rushes with different focalization. Selected rushes are displayed along the vertical timeline. Each color represents a different camera.

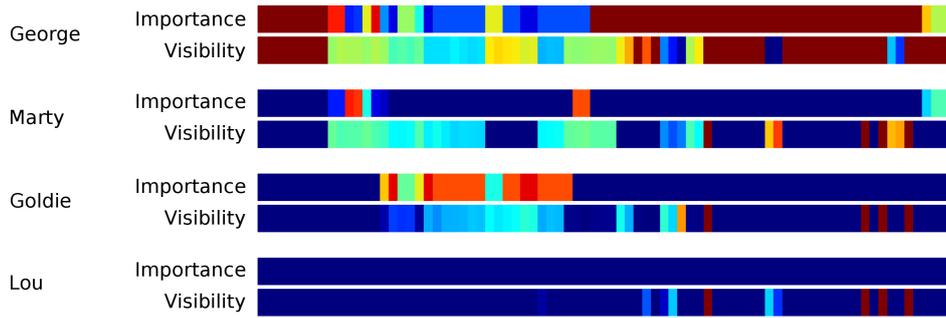


Figure 6: George's movie: Importance and relative screen size (visibility) of the main characters when focalizing on George

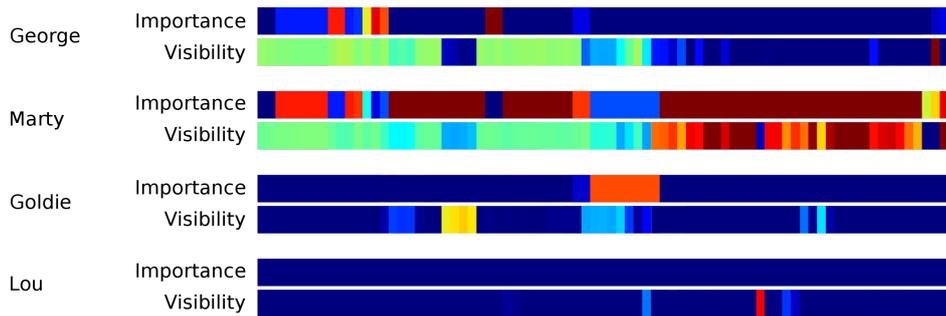


Figure 7: Marty's movie: Importance and relative screen size (visibility) of the main characters when focalizing on Marty

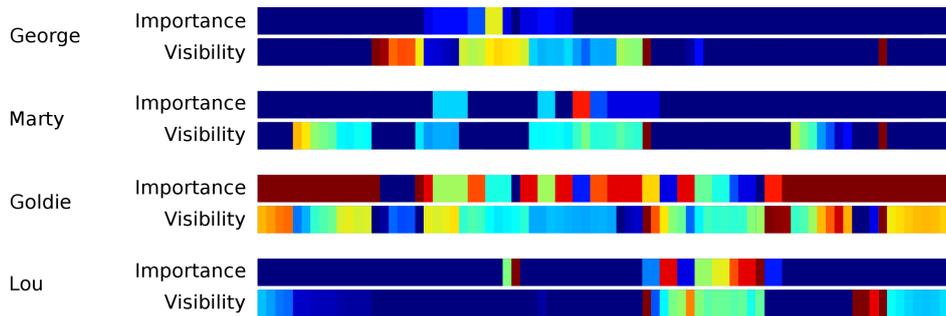


Figure 8: Goldie's movie: Importance and relative screen size (visibility) of the main characters when focalizing on Goldie

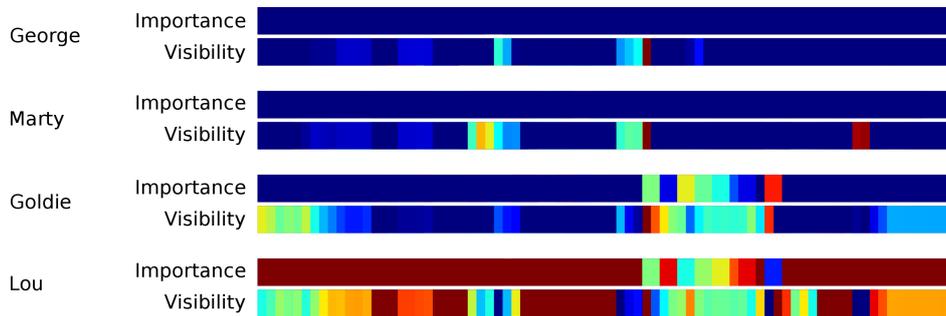


Figure 9: Lou's movie: Importance and relative screen size (visibility) of the main characters when focalizing on Lou

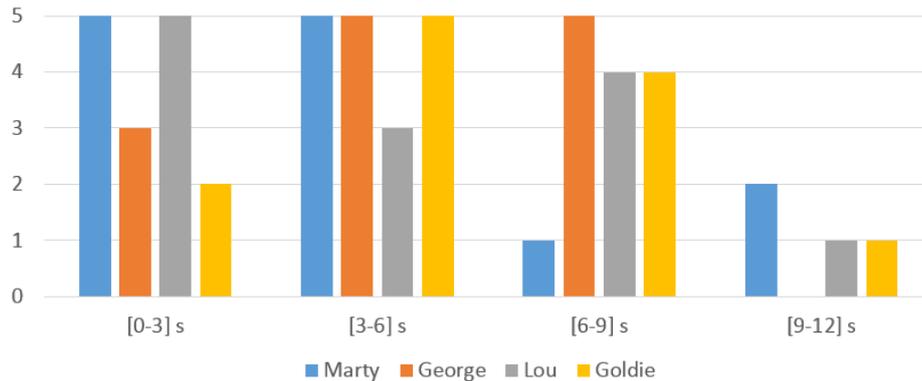


Figure 10: Shot duration distribution for each edit.

6. Limitations and future work

We have demonstrated how to extend Hitchcock's rule to implement internal focalization, taking the point of view of each of the character in the story, by way of rewriting the actions in the screenplay. This simple strategy is limited, and future work is need for implementing more subtle narrative constructions such as external focalization or viewpoint changes. The 'lingua franca' proposed by Ronfard and Szilas may be better suited to such situations [RS14] and Hitchcock's rule may need to be further specialized to follow the screenwriter's instructions even more precisely.

Our system is currently limited in many ways. First, we never change the soundtrack, so that the audio focalization can be in conflict with the visual focalization. Second, the animation was created for the movie version, which was focalized on Marty. As a result, the animation of the other character's actions can be failing at times. In future work, we would like to build data sets from other movie scenes with more options and viewpoints.

Another limitation of the system is that activities need to be manually specified in the screenplay. Using pattern matching techniques to identify activities from the list of actions explicitly mentioned in the script is an interesting avenue for future research.

7. Conclusion

In this paper, we have reframed Hitchcock's rule to include the narratively important concepts of focalization and viewpoint, and described an implementation of the modified version of the rule as part of a prototype cinematography and editing system which was used to generate dramatic variations of the same movie scene with different viewpoints.

One important finding of our work is that focalization and viewpoint are narrative choices, determined by the screenplay, that can be effectively translated into cinematographic and editing choices by strictly adhering to Hitchcock's modified rule.

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