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The Virtual Real-Time Dramaturge: Formalisation of Dramaturgic Principles

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'...and we don't want to be deceived by the theatre, just because it doesn't yet have any dramaturgy of chance.'
Max Frisch

Abstract. Compared to classic media like movies or theatre interactive digital productions in the field of entertainment computing like VR environments and computer games are typically lacking sophistication in their dramaturgic arrangement. While hardware and network technologies are rapidly gaining quality and speed we cannot observe remarkable improvements in the ability of interactive productions and formats to create empathy. Classical dramaturgic methods for the presentation of conflicts or dramatic situations frequently fail in interactive environments. Often dramaturgy and interactivity are hence labelled as contradicting concepts. In this paper we discuss important aspects of the implicit conflicts on different levels and propose new approaches to solve them. In contrast to previous work, our goal is to facilitate the understanding of dramaturgy in interactive, digital applications from a more general standpoint as a presentation strategy rather than a 'grand unifying theory'. We clarify our arguments by the description of a successful implementation.

1. Introduction

A compelling depiction of events obviously never is the result of an arbitrary progression of events, regardless of the medium into question – be it the movies, theatre, museum, computer games or highly immersive virtual environments. At the same time a successful narration or performance not necessarily needs to obey human reason or even laws of physics. Rather it is the product of a more or less sophisticated, in advance planned form of presentation for the recipient by an author, the dramaturge. The art of presentation – dramaturgy – has a tradition of several thousands of years and until today it experiences constant refinement and differentiation. For a concrete work (movie, computer game etc.) we can hence equate its dramaturgy with a concrete presentation strategy.

Movies can reach a high degree of dramaturgic perfection by the determined use of proven telling structures (e.g., hero's journey) and sophisticated design elements (e.g., cuts, camera shots and moves, light, slow motions etc.). Combining this dramaturgic perfection in classical media with the new possibilities given by interactivity and nonlinear story progressions is a challenge to the development of methodologies and technologies for virtual (real-time) systems and to its formats in particular. Depending on the starting point or the view various formulations for dramaturgies are conceivable:

- Dramaturgy of the Camera
- Dramaturgy of Time
- Dramaturgy of Space
- Dramaturgy of Light
- Dramaturgy of Music
- Dramaturgy of the Situation
- Dramaturgy of the Audience
- ...

We could probably expand such a list by a huge number of more or less meaningful starting points. Evidently there cannot be something like an absolute or 'grand unifying dramaturgy'. Like the above all starting points and formulations will be naive from a certain stage on, a fact, which we deliberately take into account. It is noticeable however that in the above list the individual dramaturgies already differ qualitatively inasmuch as they describe entities, which are unsettled to different degrees within a finally implemented presentation (movie screening, theatre performance, computer game). In a fully edited movie for example the once selected camera angle, the light and the film length are fixed, while in digital media these factors could be varied according to the situation and in real-time. A theatre ensemble on the contrary is even able to 'invent' completely new dialogues if necessary, while it is in turn more strongly bound to the existing location and its scenery than a computer game, which can generate and render arbitrary environments on the spot.

We note two things: First of all, no 'drama per se' exists, it is always the (human) spectator who determines the effectiveness of a production by understanding and interpreting the presented conflict. Secondly mankind possesses a long tradition in the development of methods causing and representing dramatic situations. In this paper we will argue that these experiences and the accumulated knowledge should be utilised all through the design of novel (interactive) formats. We will support our arguments by describing a successful application supporting the presentation of interactive narratives in VR-based environments.

2. Dramaturgy and Interactivity

Supposed, we now permit the before passive recipient to influence the presentation – for example in the course of the development of new formats within the range of digital media. We will consequently be faced with unwonted problems of most diverse nature. Envisage a transition from classical film to 'interactive film': by the choice of the own view the user instantly destroys any camera dramaturgy. The possibility to navigate freely through the environment consequently provokes unplanned lingering of the user at certain places, while other places are rushed through too fast. A time dramaturgy becomes almost impossible. If the user is even able to alter the progress or the order of the events within the story, finally any chance for a scenario, plot or story structure dramaturgy will be lost. Permutations on such a high level might easily change the entire genre of our story. This has often led to the claim that dramaturgy and interactivity are fundamentally antagonistic concepts (Figure 1) ruling each other out. An expression like 'interactive narrative' has subsequently been under suspicion of being a contradiction in terms [1, 21].

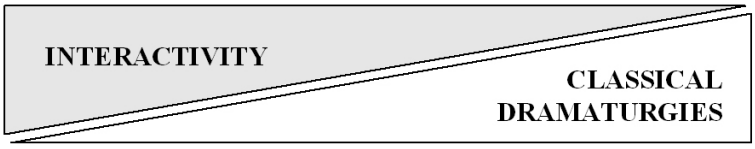

Fig. 1: Interactivity vs. Classical Dramaturgies

Regarding a simple application of classical dramaturgies to interactive formats – particularly within digital media – we can definitely agree with such a claim. Due to the fact that in a running digital scenario a steering factor like an actor, a director, a moderator or a conductor is always missing, the absolute control of the author is destroyed by the interactivity of the user. Dramaturgies in their classical application will thus fail. This may be however no reason to regard the employment of dramaturgically effective methods for interactive scenarios as doomed to failure. Rather a goal of future research efforts has to be to provide the basis for the developments of a virtual analogue of a dramaturge, which directs or moderates the interactive scenario in real-time.

For this purpose it is necessary to classify and to formalise generally valid artistic methods and to transfer them into the language of mathematics and computer science. In doing so, we do not so much think of strict rules to be processed, but of principles. The screenwriter and author Robert McKee [14] describes the slight but significant difference as follows: "A rule says, You must do it this way. A principle says, 'This works...and has through all remembered time." It may justly be doubted that creative artistic work could ever be explained by a final theory building and be poured into formulas, nevertheless the existence of aesthetic principles is not at all denied. In the following a few terms (teachings, doctrines) from the realm of art and music are listed, which stand for such principles:

- Symmetry, Asymmetry
- Perspective, Vanishing Points
- Proportion
- Contrast
- Rhythm
- Harmony

This gives rise to the question whether we can at all succeed in reducing considerable parts of dramaturgies sufficiently well to principles and formalise them in such a way that a translation into the language of computer science is possible. By such a translation only we create the basis for the development of a virtual real-time dramaturge for interactive digital productions. Section 3 describes an encouraging development in this context. The importance of finding formalisations for narratives in a more computational context is further reflected in several publications dealing with general narrative models [13], agent-based views [15], logical consistency [19], structure and design [20], or interactive, nonlinear storytelling [4, 22].

3. Dramaturgical Principles of Cameras

Based on many years of research and a century of experience, there exists an accepted and quite well understood set of basic dramaturgical principles in the field of classical cinematography for visualising stories, i.e., screenplays. Work specifically focusing on models and formalisations for dramaturgical principles of cameras and their application in VR environments is commonly based on [2, 11]. In [3] a virtual camera system based on constraint satisfaction is described. [10] creates a camera working with film idioms implemented as hierarchically organised finite state machines. [5] is based on encapsulating camera tasks into well-defined 'camera modules'. [9] deals with a camera system designed for games, especially focusing on predictive camera planning and frame coherence. Yet, most of this work deals with established, clearly defined rules for camera control or purely geometrical issues, while ignoring the importance of dramaturgical aspects of narratives based on the given story,

situation, or emotional states of characters. [6, 12, 23] present cinematographic systems focusing on methods considering the dramaturgical aspects of interactive narrative applications. A fundamental insight of classical cinematography is the fact, that the visual interpretation of a picture is based on a process of identification of the spectator with the camera standpoint and view [2]. This directly implies, that there is no such thing as an 'objective' visualisation of a story, and that the presentation (as the interface between story and viewer) has a strong influence on whether the intended dramaturgy and interpretation is preserved or transformed.

Fig. 2: Effects of Different Camera Angles

Attempts to formalise these basic principles of classical cinematography into a set of rules have been described by Arijon [2] or Katz [11]. By dividing a story into atomic events, it is possible to work with a base set of so called shots in order to convey an intended meaning of a narrative situation as illustrated in Figure 2, which gives a simple example. Although the two scenes show the identical situation, choosing the elevated camera position (left) conveys the feeling of an intimidated person, while the person on the right hand side reminds us of a furious mad scientist.

However, as mentioned in the previous section, the problem of the divergence between intended and actual interpretation of a story becomes much more difficult in the setting of interactive stories based for example on dynamically evolving virtual environments. Here the author's control on the dramaturgical flow is restricted, while the viewer gains additional control. Hence, these basic dramaturgical principles cannot be applied directly to interactively experienced stories, but have to be modified in order to consider the problem of dynamically changing settings and the increased control of the viewer.

In the context of the VR research project 'alVRed' [4] we investigated such classical cinematographic concepts and their applicability to interactive narrative media [6, 7]. A new formalism was developed, which tries to ensure a narrative visualisation conforming with the story as well as with the constraints imposed by the interacting viewer. Based on the concept of narrative events, we characterised single, atomic situations (e.g., a dialogue between two persons) by a set of 8 basic parameters. We found that these parameters sufficiently describe a narrative situation, such that appropriate camera parameters for the visualisation can be chosen and the interpretation of the situation by the viewer is guided into the intended direction. These parameters also allow for handling basic logical as well as temporal dependencies between these events, which is important for cinematographic notions such as establishing shots. However, as we will discuss in the next section, the investigation of shot sequences in the context of interactive narratives is still an important and open research problem.

We implemented the above concepts in the form of a real-time camera agent for virtual and interactive story environments [6], primarily focusing on narratively consistent rather than only geometrically consistent visualisation. Narrative events described by the above mentioned parameters and geometrical information about the participating objects are generated by an arbitrary story application. These events are interpreted in real-time by the camera agent, which then produces all necessary information for the graphical application to generate an appropriate camera shot. To demonstrate the effectiveness and practicality of our system, we successfully integrated the camera agent into the freely available source code of the computer game 'Half-Life' [24], which was one of the first interactive 3D games combining elements of pure action games (e.g., shooting) with narrative elements such as dialogues or intermissions.

Fig. 3: First Person and Third Person View (Half-Life)

Originally, the player perceives the whole game from a first person perspective. Hence the player is able to escape certain important situations as for example story-driving dialogues. Our system fundamentally changes the character of the game by transferring the user's view into a third person view, interpreting corresponding narrative events and choosing proper visualisations in conformance with the above mentioned dramaturgical principles.

Fig. 4: Camera Shots Dialogue and Fight Scene (Chosen by the Camera Agent)

Our qualitative evaluation with non-professional audiences as well as professional cinematographers showed, that the resulting visual language was able to strongly emphasise the narrative content of the game. Similar observations found in the above mentioned related work show the importance of considering cinematographic concepts even of simple, atomic events in

interactive stories. Otherwise the effect on the interacting person can diverge completely from the author's intention and thus put the outcome of a whole application in question.

4. Sequences, Time and Story Structure

We should ask now, which other dramaturgy types might be suitable to be analysed with regard to principles and to be formalised in a similar way, in order to utilise them for interactive formats as in the preceding example. Instantly plausible would be the parameterisation and the situation-dependent, dynamic choice of sound qualities and volume. This would have to go along with a focus on melodies, with which continuous loops could be designed, since the time spent at certain events by the recipient varies. The computer game industry has already made substantial contributions to this topic since the early days of the Arcade games.

In the following we give three further possible starting points for future research on formalisation, which differ however qualitatively a great deal from the rather local choice of a camera perspective or volume due to their much more global influence on the total progress.

4.1. Sequences

The importance of considering intra-narrative dependencies between single events in a more global context was shown in an experiment conducted by L. Kuleshov in 1919. He showed that a simple juxtaposition of unrelated images induces the viewer to interpret both images as parts of a related sequence. In these experiments, a neutral face was presented after showing images with different moods (Figure 5). Depending on the preceding image, the same facial expression led to a completely different interpretation by the viewers.

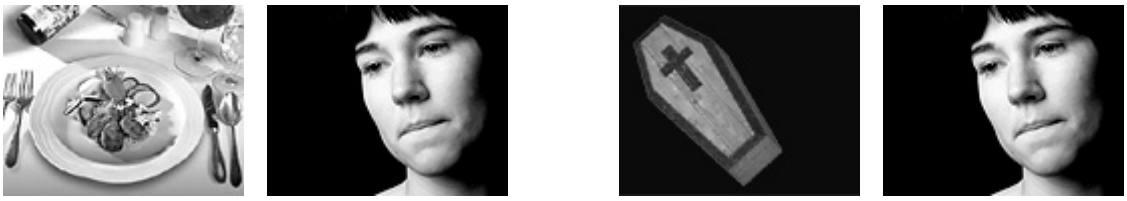

Fig. 5: Kuleshov Experiment: Facial Interpretation as Appetite or Sadness

Classical cinematography attempts to guide the viewer's interpretation by establishing a visual continuum through sequences of single events. The strategy of the continuity style consists mainly of two aspects, namely to provide means of visual recognition between shots and to create a relation between the shots by implication or inference. For instance, new scenes are generally introduced using so called establishing shots, while closer shots are used in the following to involve and integrate the viewer into the narration.

Interdependencies can generally be classified into three categories: spatial, temporal, and logical connections. Classical cinematography knows several established and well understood concepts for each of these types, such as the Line-Of-Action and the triangle system for establishing spatial coherence, or 'question and answer' patterns for logical connections. Further important aspects are for example the visual rhythm induced by shot sequences, the duration of shots, the necessity to refocus after a cut, etc. In static narrative environments these concepts can easily be handled using classical concepts as long as the representation of the story has appropriate means for modelling sequences of events.

In our context however, the question of an appropriate visual realisation of event sequences is dominated by the degree of interactivity and thus the variability of a story. A person interacting in real-time with a narrative creates a new domain of problems that is currently not covered by classical ideas of film making and directing. While local dependencies can be handled quite well as shown in the previous section, story events of the immediate future are potentially unknown, rendering the applicability of classical principles such as the visual continuum style to genuinely dynamic, interactive storytelling doubtable. This raises the question, if there could even be a necessity to replace these principles by completely new concepts. The transfer of existing knowledge from classical cinematography alone does not satisfy the demands and possibilities of interactive storytelling. On the other hand, some important cinematographic concepts like transitions between narrative situations are difficult to transfer at all because of the unpredictable nature of interactive stories. Considering the interactivity and non-linearity of narratives based on virtual reality applications in contrast to linear, predefined narratives like movies, the finding of new stylistic devices has to be a further field of future research.

4.2. Time

To date literally no attempts for an even more difficult time dramaturgy exist at all. Some elaborate time structures for certain, widely used formats (daily soap, sitcom etc.) are well-known. For interactive media however we have to find solutions for the conflict between narrated time (duration of the events) and narration time (duration of the narration). Time related concepts such as acceleration, delay, ellipsis, duration, frequency etc. have to be classified before they can be used in running scenarios in the form of variable requirements for the user (handicap, quickening) and as structuring elements (e.g., repetition, rhythm, coincidence). From existing productions three different approaches should be mentioned:

Stop&Go: Almost all computer games of the adventure game genre and a few 'interactive movies' (e.g., Tender Loving Care [26]) make use of a trivial stop&go procedure. Storytelling and play sequences simply alternate. On the bottom line the production thus disintegrates into sequences of movie chunks on the one hand and of free navigation in game situations on other.

Fig. 6: Real-Time Thriller '24', Never-Ending Drama 'Switching'

Equating narrated time and narration time: The Fox TV Thriller '24' runs in real-time. This means that the film shows parallel actions, which in addition happen at the correct (outside world) time. Even during commercial breaks the film time continues to run accurately and is

repeatedly inserted into the picture. In doing so the film thus in addition acquires a strong augmentation component. The producers had to 'pay' for this strategy with an enormously high density of the content. For an application in interactive productions it would have to be further guaranteed that user's selection of a parallel content stream should not lead to a total loss of the understanding of the global story told.

Infinite loops: The Danish interactive movie production 'Switching' (in DVD format [18]) deals with a couple's love story and shows 24 hours of their life at a time, when this very love is threatened to break apart. Not only that the pair seems to be imprisoned in a hopeless situation and squirms in emotional circles, the film also persistently returns in loops to earlier, already seen scenes, it has no genuine end and potentially lasts infinitely long. The user can interact via the remote control and thus give another direction to the continuation. Repeating sequences convey completely new meaning in almost any rerun (the movie could hence also serve as a prolonged Kuleshov experiment).The movie stops at no time and thus acquires its unbroken continuation by repetitions. It is a prime example for the fact that for interactive nonlinear stories complex structure considerations are necessary (a cut-out of this structure can be seen on the right in the above figure). Again we are faced with completely new demands for the content. A similar production with film material conceived for a linear movie will not be possible, without provoking boredom after only a short time.

4.3. Story Structure

Even considerations as far-reaching as the generalisation and formalisation of entire story structures, which might serve as the basis for future structural dramaturgies are not new. Goethe and Schiller already searched for a classification of all conceivable 'tragic situations'. In the year 1868 Georges Polti [16] categorised dramatic situations and came to the surprising conclusion that there can exist exactly 36 substantially different such situations. He specified for example:

- Crime Pursued by Vengeance (dramatic situation No. 3)
- Rivalry of Kinsmen (No. 14)
- Madness (No. 16)
- Obstacles to Love (No. 28)
- Loss of Loved Ones (No. 36)

A complete translation of stories into formulas was described by Vladimir Propp [17] in the year 1928 for the however very special category 'Russian fairy tales'. Nowadays these structuralistically dominated considerations still play a subordinate role within productions, but also screenplay experts like the above already mentioned Robert McKee are searching and describing typical 'Archeplots' or principles for story processes.

$$i6^1e^1b^1A^1B^1C\uparrow \left\{ \frac{Д^1Г^1_{neg}Z^1_{neg}}{\partial^7Г^7Z^9} \right\} R^1Л^1\downarrow Пр^1\,[Д^1Г^1Z^9 = Сп^4] \times 3$$

Fig. 7: Formalised Russian Fairy Tale (V. Propp)

In the domain of computer science narrative structures developed to date seem much less spectacular and are usually limited to structurally very simple basic patterns like 'linear structure' (e.g., movie), 'linear structure with dead ends' (Cul-de-Sacs), 'tree structure with or

without forced path', 'parallel streaming' (e.g., i-TV), 'branching with bottleneck' and 'multiple exploration path' (adventure games) as well as combinations of these [25]. The interesting possibilities of the complex combination of these basic patterns are for the most part not yet understood regarding their significance for story presentation and have to be investigated intensely.

If we want to develop dramaturgies for the above described entities, it might be worth to have look at reflections of the German dramatist Max Frisch, which he described in order to refurbish the theatre of his time. Future, novel formats of digital entertainment productions will depend on an intelligent fusion of narrative and time structures since a virtual real-time dramaturge will have to incorporate them. The challenges of finding such formalisations will probably be very similar to those, which Frisch was referring to during a speech he gave in 1965: "[..the search] for a dramaturgy, which accents eventuality; if you want: a dramaturgy of disbelieve; the dramaturgy of permutation – perhaps... I do not know it"[8].

5. Conclusion

In this work we interpreted the term 'dramaturgy' as 'strategy for presentation'. Depending on the respective (naive) starting point we can put together most diverse forms of dramaturgy and examine basic, dramaturgically effective principles, i.e., methods functioning nearly all of the time. If possible, these very principles should be formalised, in order to serve as a basis for the creation of a Virtual Real-Time Dramaturge. This virtual analogue to a conductor ought to steer digital applications and stagings, which are neither controlled by (trivial) inflexible structures nor by a human. Such a virtual analogue to a conductor might for example be a software agent. The above described successful development of an autonomous camera agent shows, that the possibility of a complete formalising of aspects of dramaturgy is indeed achievable. The integration of the camera agent into the computer game Half-Life, which draws its attraction from a combination of fast user (re)actions and narrated story, illustrates the potential of the classical dramaturgy forms, which to date are nearly completely unused for interactive worlds. Our last remarks dealt with the question, which further domains from dramaturgy are applicable for comparable steps. First approaches for future dramaturgies of time and story structure were discussed trusting to win a broader audience from art and research communities.

Regarding user interactivity the development of digital content and (substantially) new formats could not yet keep up with the rapid development of available hardware and networks. All described areas – camera, time and structural dramaturgy – as well as for numerous dramaturgy forms not even mentioned here require an intensive research work of interdisciplinary groups of artists, designers and computer scientists. Also representatives of the disciplines system theory, psychology and any 'prognosis sciences' (e.g., economists or actuaries) could make valuable contributions, if it is our concern to invent again completely new approaches for interactive digital productions.

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