Designing Interactive Narratives

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ABSTRACT

Research has indicated that the design of interactive narratives is a difficult and challenging task. Interactive narratives exhibit features and characteristics from story telling or film and differ from more conventional software systems by being functionally more complex and by addressing a broader and wider audience of users. Interactive narratives include software systems like computer games or training and assessment systems. This paper provides a qualitative study of industrial design processes of interactive narratives based on interviews with two interactive narrative authors. The paper identifies major activities and products of the design process and illustrates how the activities are related. It is concluded that a number of prototypical narrative structures are commonly used to organize and design the narration. These narrative structures are presented and explained based on the study. A possible contradiction between "interaction" and "narrative" is discussed, and a solution, based on an object-oriented methodology combined with literary analysis, is suggested.

Categories and Subject Descriptors

D.3.3 [**Programming Languages**]: Language Contructs and Features – *abstract data types, polymorphism, control structures.* This is just an example, please use the correct category and subject descriptors for your submission.

General Terms

Design, Experimentation, Human Factors.

Keywords

Interactive narratives, design processes, narrative structures, computer games

1. INTRODUCTION

The blooming genre of computer games is continuously becoming more and more advanced and their role in the software industry is becoming more and more dominant. The computer game market revenue is expected to increase to a total of 6.54 billions of dollars by the year of 2002, cf. (Gorriz and Medina, 2000). This is

equivalent to an increase of more than 36% from the total revenue in 1996. Computer games are often interesting to study since people learn to operate them easily without training and often develop strategies for improving their performances with the game, cf. (Grice, 2000). Computer games can be very different with respect to content, purposes, or user groups, however many computer games contain a great deal of narrativity or story telling. Kolstrup (2001) describes and analyses three computer games, *Crosstown*, *Tomb Raider*, and *Riven*, as narratives and states that these three computer games are much closer to traditional narratives than e.g. newspapers and television. Also, Konzack (1999) analyzes the *Barbie Fashion Designer* game as an interactive narrative. Since the release of the computer game *Half-Life*, the value of story telling or narration in computer games has been convincing, cf. (Rollings and Morris, 2000). According to Rollings and Morris, *Half-Life* does not tell you a story but enables you to create one yourself.

The design and creation of interactive narratives is often complex and difficult, cf. (Webb, 1996; Skov and Stage, 2001; Eriksen and Skov, 1998). Most contemporary development methods for analysis and design of computer-based information systems are intended for either administrative or technical embedded software, cf. (Jacobson, 1992; Booch, 1994). But few interactive narratives can be regarded as administrative or technical software, cf. (Webb, 1996), they belong to completely different genres. Also, computer professionals, e.g. designers, programmers, database experts, human-computer interaction experts, have primarily conducted the design of conventional information systems or interactive systems in collaboration with work domain people. However, technologies such as computer games or other kinds of new media do not necessarily have a corresponding work domain associated and hence these technologies pose new requirements on the design process and puts new problems on the agenda.

Game designer Chris Crawford aptly identifies one such problem, the inherent conflict between narration and interaction:

… the basic conflict emerges because the artist insists on taking the audience down a predetermined path (as is the case with conventional stories), while at the same time demanding the audience's active involvement in the course of the experience. The solution is for the author to relinquish control of the path to the audience… Crawford [8]

His solution may be the right one, but how can it be approached and designed? Many techniques for engaging the consumer of a media product presuppose that the author has full control over the product; if this presupposition no longer holds, the techniques are no longer available, and the product easily becomes boring and uninteresting. Take movies as an example: According to Bordwell, the film-viewer continually creates expectations about

what will happen or has happened []. These expectations has the form of schemata (a murder is possible), that generates hypotheses about what one should look for next (vulnerability of the victim); the hypotheses guide the interpretation of what is actually perceived (a knife is interpreted as a weapon, not as a kitchen utensil), and cues in the material fill out slots in already existing schemata (Mr. Schmidt turns out to be the murderer), or generate new ones (not a crime, after all, but a joke). If such expectations are not created, there will be no suspense or curiosity, which again means that there will be no engagement. The problem is not to create expectations (*set ups*) but to ensure that expectations are fulfilled — or explicitly disappointed in order to create surprise (*pay offs*), since, if the author does not know which path a user will take, then how can he plan payoffs?

Another basic technique is to hide information to the audience in order to create curiosity and then disclose it at a later time. The whole genre of detective novels is dependent upon this technique. However, how can the author be sure that the user will not see the information at time T_1 but that he will encounter it at time T_2, given that it is the user who is in control of the system?

In his specification of the *Erasmatron* game engine, Crawford has in fact provided for this technique:

...most of the time you don't care about the audience, but some verbs won't take place in front of the wrong onlookers. For example, you don't knife DirObject in the back in front of a crowd; and you don't punch out that bully unless your girlfriend is watching so she can be impressed. The story engine respects whatever audience requirements you have specified for the verb in the General display... Crawford [9]

Thus, the author not only needs control over "story time" (the events in the fictive world) but also over "plot time" (the sequence in which the events are presented to the audience). There are also global patterns of action that contribute to our sense of pleasure and fulfillment. The popular curve of tension shown in figure 1 underlies millions of narratives, ranging from Greek tragedy to modern soap operas.
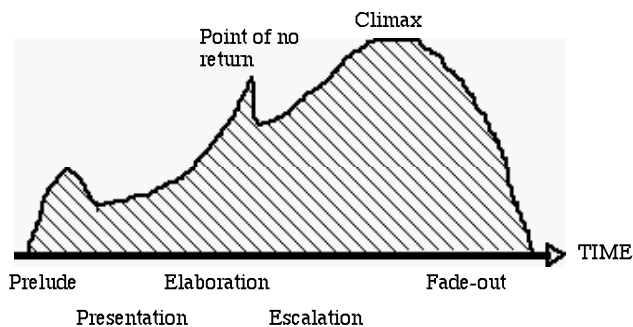

Figure 1. The Aristotelian curve of tension.

Some theoreticians have suggested that we use the opportunity to throw away all these hoary heirlooms, and explore the new medium with fresh eyes: the postmodern, nonlinear open work. This is probably a fruitful approach for the experimenting avant-garde arts, but it may not be very successful if we are concerned with the medium's potentiality as a mass medium, where computer games for many years have set the agenda.

The next section describes techniques and narrative structures that are actually used for handling these difficulties. They are ordered according to their degree of interactivity, the lowest ones first.

2. INTERACTIVE NARRATIVES DESIGN
The findings in this paper are based on a study of industrial design processes of interactive narratives. The study was conducted based on prior selection of two different kinds of interactive narratives that were chosen for identification of potential variations. The two selected kinds of systems for the study are computer games and training and assessment systems.

2.1 The Study
The study is partly based on interviews with two Danish authors working within the field of interactive narratives design. The interviews tried to address their practical experiences in design processes of interactive narratives. Both interviews were planned and conducted as semi-structured interviews. The primary focus during the interview was on activities, concepts, and products applied during a typical design process. The interviews had a duration of approximately one hour each and were taped on a Dictaphone. Afterwards both interviews were transcribed word for word. The two authors in the study have varied experience with interactive narratives and design computer games respectively training and assessment systems.

The first author (from now on called the game author) has been involved in several major computer games productions and of productions of other story-telling applications. He is associated to a number of Danish software houses specializing in developing computer games both for children and adults, e.g. Savannah A/S (http://www.savannah.dk/) and Deadline A/S (http://www.deadline.dk/). He has worked with interactive narrative design for more than five years and have been involved in many projects. He holds a master's degree in communication. Also, he has worked with other aspects of narrativity, e.g. published a collection of poems and worked with major Danish television broadcasting company on an interactive project.

The second author (from now on called the multimedia author) works in a Danish software house, Interact A/S (http://www.interact.dk/), specialized in designing and producing multimedia systems for training and assessment of work situations. He holds a master's degree in English and has worked with creation of interactive narratives for more than four years. Additionally, he has worked with theater and other performances for more than 8 years and he has published a short story in written format.

This chapter contains two sections describing key aspects of designing the narrative part of an interactive narrative. First, the design process of the story-telling part is presented. The focus is on activities and products leading to the description of an interactive narrative. Second, the narrative design structures applied by either of the two authors are illustrated.

2.2 Narrative Creation
The fundamental task during the narrative creation is to conceptualize the overall idea of the future interactive narrative. The purpose is to establish a common ground for the further work in the design projects and set up specific requirements directed towards a customer or towards the rest of the design team. The multimedia author tried to address the key concept for the future

training and assessment system by formulating key requirements to the system. This would usually be done based on a brainstorm of ideas between him, a producer, and the company.

... based on the brainstorm I try to require as much information as possible in order to design a concept for the narration ... I would normally not write anything down from this meeting for myself, it is all about listening and understanding … Multimedia Author

He would also try to determine at an abstract level the underlying narrative structure for the system (narrative structures are explained and illustrated in the next section). Finally, he would advice the programming team on the concept for the narration, but normally not initiate any direct programming tasks. The game author, on the other hand, tries to conceptualize the overall idea of the future computer game by creating a document written in a rich and colorful language. This is primarily done in an attempt to illustrate and define the atmosphere of the game. He is often faced with a different situation since he has to come up with a fictitious world.

When the future system has been conceptualized a deeper understanding and description of the situation the future interactive narrative has to be provided. The primary outcome could be a short story telling the narration at a somewhat detailed level. The two cases vary to some extent in this activity since the situation in the computer game case is fictitious whereas the situation in the training and assessment system to some extent is given beforehand. In the case of designing multimedia systems for train-ing and assessment purposes, the author would try to obtain a deep and varied under-standing of the work situations that have to be demonstrated by the multimedia system. The multimedia author would primarily approach this by interviewing people in the work place or observing the same people in performing their actual work tasks.

… you learn a lot, and it is all about gathering information because you have to write about these figures, and make up figures where they can say – yes I know that guy, he is called Jens and he works in the warehouse … Multimedia Author

However, he did also stress that the figures have to be anonymous in the sense that no individual in the organization should be directly identifiable as one of the figures in the story. He would also study communication and relations between people internally and between different departments. When trying to understand the culture and opinions of people he would normally look for any written material that is accessible like public relations leaflets, internal newsletter etc. As he expressed it:

… the page that contains complaints in the newsletter is often good, I will often sort the information there, but you can find some of the stuff people often think about … Multimedia Author

In opposition to internal newsletters, public relation leaflets would often give a positive and partial picture of the company; however, it can be important in determining the signals the company wants to give its surroundings. In this activity, the game author would be faced with another situation since he is not trying to simulate a real world environment, but instead he has to define and describe a fictitious world where the narration can take place. In certain cases, the situation for the future game is partly given beforehand since the game will serve as the latest version of a series of games for children. The outcome of the activity is quite similar for the two kinds of interactive narratives. It is a description of situations where the narration can take place and description of characters involved in the situations. Also, the interaction and selections made by the future user is also described, as well as the manner in which these interaction and selections influence the narration told.

Last the story has to be written in greater detail and the idea is to write the manuscript in order to create lines and speeches for the characters in the narration. The multimedia author made a clear distinction between writing the story as a short story and writing the lines of the characters in the narration. However, this distinction often caused problems in the communication between the author/producer and the company.

… it is still difficult for the company to understand what is important in the short story ... sometimes they will actually correct words in the short story because they do not want the actual words to be said, however at this point it is not specified what the characters should say … Multimedia Author

The game author stressed that the primary purpose of the manuscript is to make the lines of the characters more cogent, e.g. from whose viewpoint should this line be experienced by the user. Also, he has experienced that the manuscript has to be rather detailed in order to avoid any misunderstandings between him and the rest of the production team. Usually the manuscript will end his participation in the project and any ambiguity or misunderstandings may have severe consequences at this point in the design process.

2.3 Narrative Structures

As outlined above, during the writing of the short story and the manuscripts, the narrative or the story-telling part of the system is developed. The study revealed a number of commonly used narrative structures applied by the two authors. We have identified three, in our opinion significant, narrative structures with different characteristics and different levels of complexity. These structures played a significant role in the writing of the narration and they also played a major role in the control of the design process (also, they form the interaction of the systems).
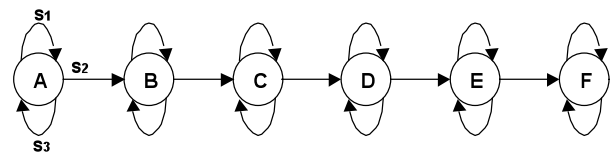

Figure 2: Abstract narrative structure based on a single selection path

The single selection path structure, as illustrated in figure 2, is one of the simplest narrative structures for an interactive narrative (the most simple structure for an interactive narrative would be situations where the user has only one selection to choose from which we will not cover in this paper). At a given point in time, the user will be placed in a particular situation as indicated by A, B, C, D, E, or F. In each situation, the user will be able to make or required to make a selection in the application. Each circle in the figure corresponds to a situation, temporal or spatial, where the user is able to or required to make a decision. In situation A, the user has three selections to choose from where only one selection, S2, has been defined as correct. If the user nevertheless chooses to select either S1 or S3 the user will end up in the same situation forced to choose from the same pool of selections (the chosen one

may in some cases be disabled). Between the selection of a wrong option and the return to the situation, the user will receive some sort of feedback on his or hers action, e.g. a full-motion video sequence, a sound, or a simple text message indicating that the user chose a wrong answer. According to the multimedia author, this narrative structure was often used in applications where the user should be trained in specific work tasks. As implied by the figure, this kind of structure will often be characterized as being highly temporal where situations are happening in a logical timely order and where you cannot normally go back to a previous situation (unless wrong). As a specific example, the multimedia author designed an interactive narrative for training (and assessment) of employees in a major shop. When an employee would use the system then at a given point in time, a customer will ask the employee a specific question, and the user is presented a number of different selections to choose from. In this situation, a wrong answer may be too impolite or too polite in the given situation. Every wrong (and right) selection is registered and used for later evaluation of the user. As a direct result, this structure is well suited for evaluation of practical specific skills and the multimedia author often applied this structure for training of skills of point-of–sale staff. On the other hand it is not well suited for assessment or training of more general skills, e.g. assessment of personal skills of managing an organizational unit of a company. Due to its overall low complexity, this narrative structure could be designed and described in a simple or general tool. The multimedia author would often use a word-processing tool for description of such a structure.
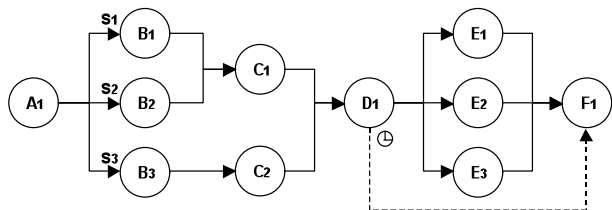

Figure 3: Abstract narrative structure based on multiple selection paths

The second structure, multiple selection paths, has a slightly higher complexity than the previous structure (see figure 3). The user is able to select different paths through the narrative. This implies that different users may have different experiences when they use the system. The basic assumption is that not all users will follow the same path thus experiencing the same situations illustrated by the system. In opposition to the single selection path structure, none of the presented selections are in reality more correct than others. As a specific example of this structure, the multimedia author had been working on a project for designing a multimedia assessment and training system for mid-level managers. The purpose was not to assess specific knowledge of the user, but more to assess general skills as operating manager in a company. Compared to the previous example for the single selection path on sales training, the user will in this case be faced with difficult and complex situations normally experienced by a mid-level manager. In a specific situation, the user, as the recently hired manager in a department, is having a staff meeting with employees in the department. The situation at the staff meeting is represented by full-motion video and at a point in time two employees start to argue. The system now provides the user with an opportunity to intervene by offering a number of selections to choose from. The selections are shown as small text-buttons on

the screen. The various selections have different implications, e.g. the user can ask them to stop and request that the meeting continues or the user can ask the two persons about the problem. Based on the chosen selection the narration will continue on different paths, as in situation D1 where the user has three selections to choose from. The dotted line from this situation to situation F1 represents a timeout, meaning that if the user does not act in the situation within a given timeframe the situation will timeout and the narration continues regardless the lack of action.

The last structure, multiple exploration paths, is the most complex narrative structure of the three. Opposite the two previous structures, the multiple exploration path structure is not necessarily temporal in its character, but allows more spatial exploration in a narration. The game author for creating computer games for children often used this structure. A number of locations or environments is included in the narration as indicated by A, B, and C in figure 3.
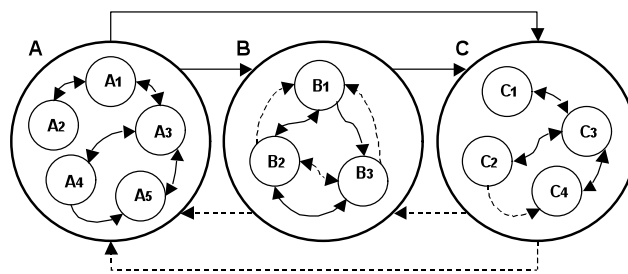

Figure 4: Abstract narrative structure based on multiple exploration paths

Within each location the user will often experience great freedom to interact or play. As shown within the location A, the user can move between a number of situations A1…A5. If the user is placed e.g. in situation A1, the user can choose from two selections leading to situations A2 or A3. The double arrows indicate that it is possible to return to a prior situation if necessary or wanted. Some of the arrows in the figure are shown as dotted lines, which indicate that they could be conditionally active, e.g. you can only move directly from B3 to B1 if you have already found a certain piece of information. The game author gave an example of this narrative structure. He has been authoring a game for children called Cheese War in the Milky Way (direct translation from the original Danish title). The narration contains a number of characters such as the wizard called Bellini, a boy called Dennis, and a dog called Herman. The narration takes place in a number of different locations or environments like A, B, or C in figure 4. Within each location, the user can control and interact with the above characters and each location provides the user a great deal of freedom of interaction and navigation. However, only when certain conditions are fulfilled, the user is able to move from one location to another location. In the game moving from one location to another means moving from one planet to another planet. Also based on the previous selections and actions of the user, different things will happen at the new location.

… for instance you have an inter galactic cheesemonger who trades on the Earth as a starting point, later he can go to other planets and based on his previous record, different sorts of things will happen on his way … Game Author

This narrative structure is applied in many computer games, e.g. action games and adventure games. Action games are often

characterized by the fact that you can only move from one location to another location if certain conditions are exactly fulfilled, e.g. that you have found a specific key to open the door to the next level and thereby move to a new location. The game developer believed that the rigid fulfillment of conditions limits the possibilities for creating an interesting and catchy narrative. He would rather design and create a more open narration where different options are possible. This implies that you can play the game more times and experience something new and different each time.

3. INTERACTION, NARRATION, AND GENRES

The previous section gave some illustrative examples of different kinds of narrative structures applied in interactive narratives. This section discusses these structures and tries to identify solutions to the problem of interactivity and narrativity.

3.1 Interaction and Narration

As mentioned above, the game developer desired to create a more open narration with more options, i.e. there should be a next step beyond the multiple exploration path as illustrated in figure 4. The question is: does this make sense, and, if it does, how can this be achieved?

In opposition to the descriptive genre that structures space, the narrative genre structures time. Normally, narratives build on a conflict between the protagonist's intentions and the resistance offered by his surroundings. According to (Ryan, 1991), the basic tension is between the actual world and the possible worlds of intention, obligation, knowledge, and desires. For example, the actual world may not match the intentions of the protagonist who embarks on a quest to set things right. Additional tensions can be generated by conflicting possible worlds: conflicts between duty and desire (the classical French tragedy), or between obligations and knowledge (Oedipus). (Bremond, 1966; 1970) who defines the basic narrative unit as a modal progression from potentiality via actualization or non-actualization to success or failure supports this analysis.

A skillful narrative will oscillate between these modalities: as Hitchcock knew, the possible is much more scaring than the actual:

...there is no terror in the bang, only in the anticipation of it.. Alfred Hicthcook [14]

The author of a narrative therefore needs to control time as well as modality. However, interaction means that the user too has acquired control of time, in the form of the selections he can make as illustrated by the three narrative structures. In this sense, will the game developer not defeat his own purposes when he desires a more open story with more options, since the more the user can control time, the less will the game developer be able to do it? Bordwell's clues and setups from the introduction will avail nothing, if the user chooses a path that does not contain the corresponding payoffs. Possibly some of the problems lie in the narrative creation process described in section 2.1, where the linear short story was found to be an important design document. Should the basis of the non-linear interactive narrative really be a linear story?

Let us apply a complete different perspective. The task of the author is not to provide a narrative structure at all, but merely this is the task of the user. As Crawford puts it:

...this artificial distinction then vests total control in the hands of the artists, and none in the hands of the plebians. I would ask, are the plebians so stupid, so dense, so utterly lacking in artistic sensibility, that we cannot afford them some measure of artistic control? The fact that some people are more artistically advanced than others does not argue for total control on their part, only control at a higher level of indirection... Crawford [10]

This "control at a higher level of indirection" could consists in constructing a world in which it is easy for "plebians" to generate interesting narratives. The artist is a world-maker, not a story-teller. In this case we would have solved the problem of the double control over time: the user has that control, and the author now controls the conditions for the user's control. This is also supported by two other experienced game authors, Rollings and Morris, who claim that games should provide the user with the opportunity to create their own stories [].

This is clearly not the normal way of constructing narratives, but there are a number of precedents. One of the most successful ones is the work of J.R.R. Tolkien, cf. (Tolkien, 1977). He wrote two novels, *The Hobbitt* and *The Lord of the Rings*. But in addition, he provided a world of the kind we are looking for, *The Middle Earth*, which many other authors have used as a model for their books. The Middle Earth universe was built up long before the first novel was written and continued to develop throughout Tolkien's life. However, the notes were only published after his death under the title of *Silmarillon*:

Not only, however, does The Silmarillion relate the events of a far earlier time than those of The Lord of the Rings; it is also, in all the essentials of its conception, far the earlier work.[...] it became long ago a fixed tradition, and background to later writings. Tolkien 1977: 7

Maybe the future of interactive narratives will see authors construct Silmarillons that users can exploit to generate interesting narratives? If this is true, then an interesting question arises: can we characterize those worlds that are particularly good for generating narratives? However, before we begin to answer such questions, we should consider the issue of genres.

3.2 Interaction and Genres

Interactive narratives do not form one single genre. For example, training of skills requires the author to exert much more control than in systems designed to teach more general attitudes (Karin Levinsen, Courseware, personal communication). Skills can be imposed from the outside; attitudes need to come from within. For this reason, we cannot claim that more interaction yields better systems.

Another important qualification concerns the target of the interaction. Wibroe *et. al.* uses the distinction between story and plot from Section 1 to distinguish between two main types of interaction *story* and *plot interaction* []. The story is the fictive sequence of events as they unfold in the fictive timeline whereas the plot is the sequence in which information about the story is presented to the user. Usually these two timelines are different. For example, in detective stories, the murder is the first event to happen, but the last one to be fully told. The reason is that detective stories are based on a conflict between the possible

world of knowledge and the actual world. Both detective and reader lack knowledge, and the novel is about the manner in which this lack of knowledge is liquidated.

Most games allow the reader to influence the plot, but the not story. In the action games described above, the user can move his character around in a landscape, collect information and gather the necessary tools. But it is information about a given story, and tools to solve given tasks. The basic story ticks inexorably away behind the scenes. Thus, although the interaction with the plot is high, the user may not "feel interactive" at all, since he cannot alter the underlying story. How can we make the story interactive? World making may provide the answer.

3.3 World-making

In the specification of worlds we have to change the notions in figures 2, 3, and 4 where the basic nodes are *situations* and the transitions between nodes represent user selections. In a world definition, the basic units should be *actors* and their *methods of interaction* — a well-known set-up in object-oriented analysis and design. In fact there is a genre of games that actually use this method of design, namely simulation games like SimCity.
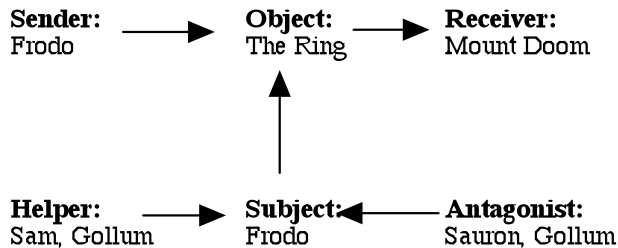
Figure 5. Actant model of the Lord of the Rings

A possible candidate for a specification of a world (a "design pattern for narrative systems") is what is known as *thematic analysis* in text analysis. A thematic analysis backgrounds the temporal structure and describes the themes and conflicts as they unfold everywhere in the work. A popular example of a thematic analysis is the actant model illustrated in figure 4 that represents one of the conflicts in *The Lord of the Rings*. It focuses on Frodo's quest of destroying the Ring and describes the relations of the main actors to this event: Frodo wants to throw the ring into the fire of Mount Doom, Sam helps him, and Sauron strongly opposes. Gollum is divided between opposing Frodo and claiming the ring for himself, and helping him to get rid of it.

Figure 5 is a thematic analysis since the split personality of Gollum is depicted as a single state containing contradictions. However, the two terms of the contradictions are temporally distributed over the whole novel: Gollum starts as the owner of the ring, looses it, and sets out to regain it. He is divided in his intentions until the end, sometimes helping Frodo, sometimes looking for ways of betraying him. As Sam says, Gollum is not to be trusted. However, when Frodo claims the ring himself, Gollum grabs it, but tumbles down into Mount Doom where he and ring is finally destroyed. Thus, Gollum ironically helps Frodo when he intends to oppose him.

But figure 5 does not tell us very much about how to design a computer system to generate interactive narratives! One obvious idea is to collect at set of interesting events and actors and implement the events as methods that take actors as parameters.

But if Hitchcock is right in claiming that there is no terror in the bang, only in the anticipation of it, we get into trouble. What he is really saying is that it is not the execution of the method, but the process of passing parameters to it that is interesting! This is certainly true of The Lord of the Rings. The main theme of the book is: who is going to claim the Ring? In the beginning we learn that Sauron will, but as the story unfolds, the following persons are tempted: Gollum, Boromir, Saruman, Gandalf himself and in the end poor Frodo. Thus, we have a verb *claim* whose object is fixed throughout the story, namely the Ring, but whose possible subject changes, and it is the changing probabilities of actors to become the subject that drives the whole narration.

If we used a naïve approach, we would need to write something like this in our design: Claim (Sauron, TheRing), Claim (Gollum, TheRing), Claim (Boromir, TheRing)…, not meaning that the Claim method is executed, but merely that it has a chance of being executed with these varying parameters. This is clearly nonsense.

One way of making sense of this idea is to design the verbs as objects, and associate a subset of the well-known thematic roles to them (Jurafsky & Martin 2000: 609): *Agent, Experiencer, Force, Theme (objekt), Result, Content, Instrument, Beneficiary, Source,* and *Goal*, plus the circumstancial roles of *Manner, Time* and *Location*. If roles are objects too, each verb-object can be associated to one or more of the role-objects. Frodo's quest, throwing the Ring into Mount Doom would be represented as an instance of the *quest*-object to which an agent and destination object is associated. Parameter passing is represented by *glue*-objects that associate actors to thematic roles. The glue object represents the probability of the actor filling that role. Possibly three factors should be included: obligations, desires and capabilities. In the example below, the obligation part of the glue is strong, the capability part very weak:

I will take the Ring, he said, though I do not know the way Tolkien 1974, I: 259.

The glue-concept enables us to represent the fact that several actors strive to fill the same role. For example, the *claim*-verb takes an agent and a theme, and its theme is always The Ring, but many actors glue to the agent role (Sauron, Gollum, Boromir, etc.). The suspense of the book lies in the way the strength of this glue changes. From this follows that the effect of the events is to change glue! Sauron wants to *take* the ring from Frodo (role = source), and the effect of his attempt to *capture* Frodo is therefore to increase Frodo's ability to play the role of source for the *take*-verb. Similarly, Frodo's attempt to hide from Sauron aims a decreasing his chance of playing this role.

Whereas physical events influence the capability component of the glue, communicative events influence its obligation part. An example is the meeting in Rivendell where Elrond Halfelven *appoints* Frodo to be the ringbearer.

In section 3.1, we quoted Ryan (1991) for the thesis that good stories are based on conflicts between the actual world and the possible worlds of desire, obligation, intention and knowledge, or internal conflicts between the latter. These conflicts can now be represented by the components of the glue-objects. For example, Frodo suffers from the conflict of desiring to take on the ring, and a prohibition against doing so:

He felt that he had from now on only two choices: to forbear the Ring, through it would torment him; or to claim it, and challenge the Power that sat in its dark hold beyond the valley of shadows. Already the Ring tempted him, gnawing at his will and reason. Wild fantasies arose in his mind....   Tolkien 1974, III: 154

This can be represented as a strong positive desire component and a strong negative obligation component of the glue binding Frodo to the agent role of the verb *take on.*

Four other provisions are necessary to get going:

1. An event has a modal value that is calculated on the basis of the glue of its thematic roles.

2. An event executes when its modal value is above a certain threshold.

3. Changes of the modal value of an event must be staged.

4. The execution of an event must be stored together with information of its relations to other events at the time of execution.

Point 3 is crucial: we must be *told* of the changing odds of Sauron claiming the ring, and the system must display Frodo's agony when obligation strives with desire, even if Sauron never succeeds in claiming the ring, and Frodo never take on the ring. Changing variables are no good if they are hidden to the user.

Point 4 reminds us that the execution of an event may not be presented to the user at the time of execution, since we may sometimes need to have different timelines of story and plot. If the execution of an event is presented later than storytime, the system must contain a record of it that can later be retrieved and displayed.

At this point the reader may have grave misgivings about the practical relevance of our analysis. However, the ideas behind Crawford's *Erasmatron* engine are not very far from the ones presented above:

...an Event is like a sentence; it is a record of one actor doing some verb to another actor...There's a lot of information stored in an Event, but the core information is short and sweet: subject, verb, and direct object. An Event will always have these three components... Crawford [11]

Figure 6 summarizes the above ideas (shown with the UML-notation). There are four main classes in the system, *actants, events, glue* and *roles*. An actant is associated to zero or more glue-objects, whereas a glue-object is associated to exactly one actant and exactly one role. A role-object may associate to zero or more glue-objects (potential fillers of the role) and is the property of exactly one event. Events affect glue-objects, and contract "narrative relations" to other events to be used in the record (examples: an event triggers another event, or is executed to prevent another event). Finally, we need to represent the emotional relations between actants (the *sympathy* association in the diagram).
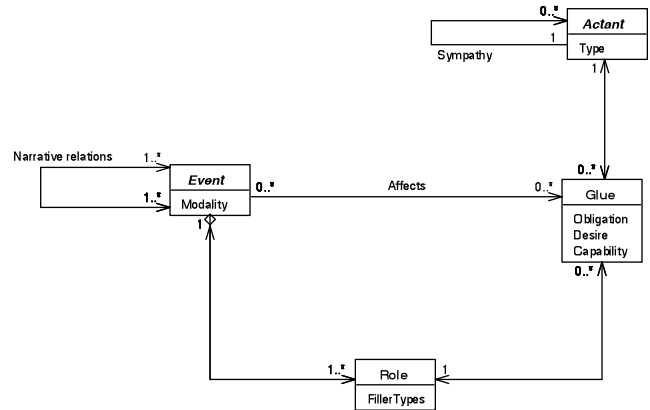

Figure 6. UML diagram of a possible narrative system.

If a system is specified in this way, the story would be interactive too for the very good reason that the system contains no explicit representation of a story at all! It only contains possible events and interactions associated to the actors of the story. The narrative itself will be an *emergent* phenomenon; it will emerge when the actors are set in motion in a given actual world (a phenomenon described in Rollings and Morris 2000: 25, 39). The purpose of the design process is to select a set of possible events and interactions that will often let interesting narrative emerges.

Tolkien knew how to do this. Why not us?

4. Conclusion

Research has found the design of interactive narratives to be a difficult and challenging task. The introduction of narration as a key element of the future system and the presence of a high degree of interaction with the system makes it hard to design and predict the use of the system. Also, new skills of the design team are often required since IT professionals with no training or experience often makes conventional software when writing stories or plays.

This paper is based on a study of two interviews with narrative authors, both working with design of interactive narratives. A typical design process of an interactive narrative consists of primarily three activities, namely concept formulation, narrative structure design, and narrative content design. The design process has often a highly iterative nature where focus is continuously shifted between the three activities. Also, we have found three commonly used prototypical structures for organizing the narration. The structures vary in complexity and they may be applied to different genres of narratives.

A major problem in interactive narratives was identified, namely that both user and reader need to control time. Therefore a fourth step in complexity was suggested: in this method, which is very close to ordinary OOD, the designer creates a world model of a special kind which the user exploits to generate interesting narratives. This method will still have concept formulation but will supplement narrative structure design by world design and experimentation (cf. similar ideas in Rollings and Morris 2000: 32).

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