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Uses of player mood modelling in interactive drama presentation”

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Narrative is a mirror in which we discover
what it means to be human.

Marie-Laure Ryan [42, p.345]

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"There are countless forms of narrative in the world", Roland Barthes explains in his *Introduction to the Structural Analysis of Narrative*. [4, p.237] "Moreover," he continues, "in this infinite variety of forms, it is present at all times, in all places, in all societies; indeed narrative starts with the very history of mankind; there is not, there has never been anywhere, any people without narrative; all classes, all human groups, have their stories [...]." [4, p.237] If Barthes is right, we have to regard narrative as both transcultural and transmedial. Similarly Marie-Laure Ryan describes narratology, the study of narrative and narrative structure, as a project that transcends disciplines and media. [41, p.289] Moreover, one of the main attractions of narratives, independent of the medium in which they are presented, is that they elicit emotional response in their audiences. They have an affective impact. [46, p.136] This thesis investigates a recent form of digital narrative, known as interactive drama. Interactive drama shares many similarities with two other forms of narrative, namely filmic narrative and computer games, but there are also significant differences. While this thesis emphasises the identification of these similarities and differences the main focus is on arguing that an

interactive drama, based on a model of the user's affective state, should be able to provide a truly immersive user experience.

1.1 Generative narrative

Writing any form of narrative is a creative process. Some works of narrative are regarded as more creative than others but as long as the final product is, at least to some degree, novel, we have to attribute creativity to the author. The notion of novelty is important for generative systems, systems that basically create new story content "on the fly". As Pablo Gervás proposes, "whatever is generated must be somewhat unexpected or different from what others might have produced." [22, p.49] Another important aspect is the notion of a "creator", an agent which acts in a creative way to create results that "can be perceived or evaluated." [22, p.50] A fascinating pattern of clouds, even if new and unexpected, is therefore not considered as a result of creativity because there is no creator. With the needs of being perceivable and evaluable another factor comes to play: the audience. Gervás simply defines the audience as "the particular person or persons for which the creative action is intended" [ibid.] and henceforth I will stick to this definition for the audience of all kinds of narrative. In interactive systems the audience is not a passive one, and this is exactly what fuels my position that interactive narrative provides exciting new possibilities, not available to non-interactive forms.

In *Computational Approaches to Storytelling and Creativity* [22] Pablo Gervás provides an overview about the history of generative storytelling. The first system Gervás introduces was developed in 1973 and was simply called *Novel Writer* [25] in [22]. It creates murder stories in a story-world represented as a semantic network. The states of the storyworld

constantly change according to probability rules, yet the sequence of scenes is hardwired. As Gervás explains, the set of rules is highly constraining and allows for the construction of only one very specific type of story, the happening of a murder during a weekend party. While the interplay between the characters is generative, the plot itself is not. *Author* [16] in [22], developed in 1981 tries a different approach. It is based on the claim that storyworlds "are developed by authors as a post hoc justification for events that the author has already decided have to be part of the system." [22, p.53] *Author* tries to model the kind of knowledge a real author needs to create a story and also the way this knowledge is organised and accessed. According to Gervás the model has two metagoals, namely to achieve the current narrative goal and to find better narrative goals to follow. "It is this second metagoal [that allows] for changes in direction when unforeseen opportunities arise." [22, p.54] Instead of modelling the author's mind, *Universe* [27] in [22], developed in 1983, models the generation of scripts for soap opera episodes. According to Gervás it is the first storytelling system to devote special attention to the creation of characters. [22, p.54] However, *Universe* cannot be considered as an autonomous system but rather as a tool to aid human authors. Complex data structures are presented to represent the characters but only a small amount is filled in automatically. Most of the actual characterisation has to be done by the user. While *Universe* was the first storytelling system to devote special attention to the creation of characters, Gervás explains, *Minstrel* [56] in [22], developed in 1993, was the first storytelling system to address specifically issues of creativity. [22, p.54] *Minstrel* constructs short King Arthur stories in two stages, a planning stage and a problem-solving stage, the first trying to break down author-level goals into smaller author-level goals, the second trying to solve the goals by adding the required ingredients

to the story. According to Gervás there are two operations of particular interest:

"One involves solving author-level goals, which takes the form of instantiating a set of partially complete character schemas. This is done by querying episodic memory with partially complete schemas and using the results to instantiate the corresponding author-level goal. Another is the way opportunistic goals are triggered. Each time a new scene is created, *Minstrel* revises it to check whether it provides an opportunity to apply one of the author-level goals that ensure consistency or introduces one of the desired literary motifs." [22, p.55]

While these systems are certainly interesting for their pioneering work in generative narrative, they are lacking one important aspect: interactivity. Their only purpose is to generate "new stories" at runtime but the user, or in this case rather the reader, has no influence on this process. While also still lacking the immersive experience we want to achieve in interactive drama, the next system I will present brings us one step closer to the idea of having the user engage in the story generation process.

1.2 Tale-Spin

Tale-Spin was a landmark project that has been carried out at Yale University in the mid 1970s as part of James Meehan's dissertation [32]. The idea behind *Tale-Spin* was to create a system that brings us closer to what Meehan calls a "Metanovel". The idea behind such a metanovel, as presented in Meehan's dissertation goes like this:

"A metanovel is a computer program that tells stories that only a computer can tell, stories of such complexity of detail that only a computer could handle, stories with more flexibility—even reversibility—of events and characters than a human could manage. A metanovel time-sharing system tells a story to many people at once, no two of whom read the same thing, because they have each expressed different interests in the events and characters they want to hear about, and because they may each desire a different style of storytelling. And yet, among all these readers, there is but one story—the metanovel itself—and each reader is only following those threads of the story that interest him."

[32, p.ii]

There have been attempts in digital narrative where users could decide between different paths to continue, similar to "Pick your path"-stories in children books (Figure 1.1); but in these books, and systems, the user just makes a local choice that leads to the next pre-written chunk of narrative instead of having real impact on the narrative structure itself.

Tale-Spin is quite different to these approaches and in a way brings us closer to what we want to achieve in interactive drama. The difference, Wardrip-Fruin explains, is due to the granularity of story processes and data: The system models story as "a relatively fine-grained set of processes and data that are used to generate story events. In the case of *Tale-Spin*, this is accomplished by creating a simulated world, and characters and objects that populate the world." [57, p.116] Therefore the slightest changes can lead to very different stories. The architecture is based on the AI concepts of plans and goals, which are, along with obstacles, also essential elements of narrative structure but it is important to understand that stories produced by *Tale-Spin* are far from the literary



Figure 1.1: Meanwhile:
Pick Any Path [47]

quality of stories a capable human author can produce. Furthermore, we should not mistake *Tale-Spin* for something it was not meant to be: an interactive drama system like the ones I will discuss later on. Nevertheless, understanding the way *Tale-Spin* generates stories can teach us a lot about generative narrative.

The storyworlds in *Tale-Spin* are rather simple, containing only some animals (like a bear and a bird) and some objects (like honey, berries or a worm) and dependencies between them. A basic story would then for example be about a hungry bear, named Arthur, who wants to get some honey, however, only the bird, named George, knows where honey can be found and he only tells Arthur about the location in exchange for a worm. The user who interacts with *Tale-Spin* does not take part in the storyworld by controlling a character but rather by answering questions the system asks. For the story above, the system would have asked for example who the main character is (Arthur) and what his problem is (he is hungry). The possible answers are provided by the system and the

user has to pick one. In this simple world, possible answers to the first question would have been either George or Arthur and to the second hungry, tired, thirsty or horny, respectively.

Tale-Spin stories, like most narrative, are about a main character who has to overcome some obstacles to reach a desired goal and to overcome these obstacles they need a plan. The plan always depends on the given circumstances. If Arthur knows where to find honey he only has to go to that location but if he does not know he has to try something else, like asking George for help. The control structure of *Tale-Spin* is shown in Figure 1.2.

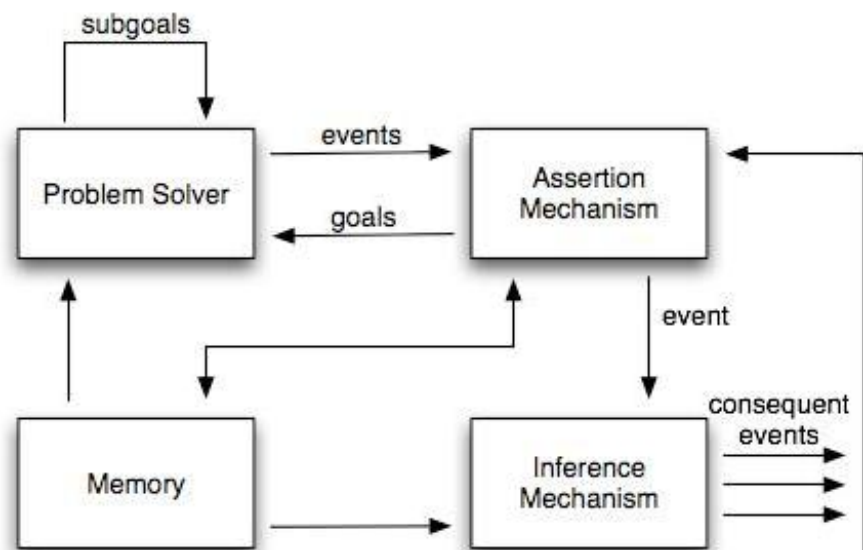


Figure 1.2: Control structure of *Tale-Spin*'s simulator [57, p.128, Figure 5.1]

In the example scenario presented, the user selected "hungry" as Arthur's problem. From this selection *Tale-Spin* creates a so-called dependency expression "Arthur knows that he is hungry". Without going into too much detail on the control structure, the process resulting from Arthur realising that he is hungry can be summed up like this:

1. The assertion mechanism (top right) adds the information that Arthur is hungry to the memory (bottom left) and is indexed as something Arthur knows.
2. The information is passed on to the inference mechanism (bottom

right) which leads to an expression like "Arthur knows that Arthur intends not to be hungry". This information is again asserted.

3. The problem solver (top left) is invoked and the planning process is started. It checks the memory if Arthur knows where food can be found.
4. If he knows where honey can be found the control to get it is invoked, if he does not the memory is checked if Arthur knows who knows where honey can be found.
5. These processes are continued until the problem is solved or until there is nothing left to check and reaching the goal fails. Failed goals are kept in memory.

Whether Arthur asks George about the location of the honey depends on whether Arthur thinks that George is his friend. *Tale-Spin* asks the audience if this is the case: "Does Arthur think George likes him?" Again the audience can select an answer from four possibilities (a lot, a little, not much, not at all). Actually *Tale-Spin* keeps four different states like that in memory, namely whether Arthur thinks that George likes him, whether Arthur thinks he likes George, whether George thinks Arthur likes him and whether George thinks he likes Arthur. The same happens for the relationship variables trust, dominate and feeling indebted. These relationships are used for developing different plans and creating somewhat believable character behaviour. The user does not interact with the storyworld as a character but rather defines how they want the story to evolve. Later on I show that there already exist interactive drama systems, especially for therapeutic use, that pursue a similar strategy.

While *Tale-Spin* creates interesting behaviours, a problem of the system is that a lot of the interesting behaviours happen at system level but never reach the audience. This problem has become known as the *Tale-Spin effect* [57, p.115] which means that, for a layperson, a sys-

tem appears to be very simple but is actually based on very complex technology. In contrast, there are systems that seem to be very sophisticated but are based on rather simple mechanism. This phenomenon has become known as the *Eliza Effect* [57, p.23] after Joseph Weizenbaum's famous computer system. [58]

1.3 Computer games

When talking about interactive drama one question inevitably arises: "Isn't that just like a computer game?" The idea behind interactive drama is to provide the player, who interacts with the system, with a feeling of freedom, by providing a high number of different choices and different outcomes and still maintaining a cohesive story structure. Those familiar with computer games, when reading this description, will most likely think of roleplaying games, or RPGs. After all, as Noah Wardrip-Fruin explains in his book *Expressive Processing*, this is the most story-ambitious genre of computer games. [57, p.44] As we will see, the high number of possible choices in interactive drama as well as in computer games has its share of problems. While it is true that they provide the feeling of freedom, the problem is that the impact of most of these choices on the structure of the narrative is minimal. Therefore, sooner or later, the player will realise that this feeling of freedom is just an illusion. The ultimate goal of interactive drama systems has to be providing choices that "really matter". There is another downside of providing a large amount of user choices, namely the possibility that the user, who is usually not an experienced author, destroys the structure of the narrative. This is a problem far more relevant for interactive drama than for computer games, simply because in games the player does not really interact with the structure of the narrative itself. In an RPG the player character rather interacts with objects and characters in

a fictional world while the execution of the game rules, the presentation of the game world and the actions of the none-player characters (NPCs) are controlled by the computer system via quest flags and dialogue trees, which will be discussed in a moment.

In modern RPGs the premises are often similar. The player character starts in a fictional world, may that be a medieval fantasy world, the post-apocalyptic future or a far away galaxy, without much knowledge of the characters' past (amnesia is quite common) and the future ahead. Then it is up to the player to discover the storyworld, solve some early quests and usually find out that the fate of the whole land or galaxy depends on them. The player engages in many different activities like exploration, dialog, puzzle solving, and, in most cases armed combat. For example the official synopsis of *Fallout: New Vegas*, one of the last years' most successful RPGs, goes like this:

Welcome to Vegas. New Vegas.

It's the kind of town where you dig your own grave prior to being shot in the head and left for dead... and that's before things really get ugly. It's a town of dreamers and desperados being torn apart by warring factions vying for complete control of this desert oasis. It's a place where the right kind of person with the right kind of weaponry can really make a name for themselves, and make more than an enemy or two along the way.

As you battle your way across the heat-blasted Mojave Wasteland, the colossal Hoover Dam, and the neon drenched Vegas Strip, you'll be introduced to a colorful cast of characters, power-hungry factions, special weapons, mu-

tated creatures and much more. Choose sides in the upcoming war or declare "winner takes all" and crown yourself the King of New Vegas. [7]

What is especially interesting for our approach is that "many RPGs give the sense that the story itself is *playable* by offering the player freedom to roam across a world infused by quests that operate on many scales, can sometimes be completed in different ways, and are often optional or available for partial completion. As each player chooses which quests to accept—as well as how, whether, and when to complete them—this creates a different story structure for each playing." [57, p.47] As we will see this is quite similar to what we want to achieve in interactive drama: to truly interact not only with objects in a storyworld but with the structure of the narrative itself. But is this really the case in RPGs?

Despite the variety of experiences that players can have with quests, Wardrip-Fruin explains, it is commonly observed by players and authors that there are a limited number of types of quests. In RPGs what you do when solving a quest is basically going through a checklist that represents states of the game world. (see Figure 1.3)

This checklist is normally directly available to the player via a journal or quest log. In *Fallout: New Vegas* the quest log is accessible through a computer device the player character wears on their arm. Figure 1.4 shows this log for one example quest called *The Advance Scouts*. As you can see the main task is to deal with the White Legs camp. The White Legs are a hostile tribe that is about to attack a friendly tribe to which the player character has offered help. Along with the task itself the log presents two different ways of solving the problem. The player could either simply kill the enemy tribe or they could choose to sneak into the camp and steal the tribe's war totem which causes them to retreat.



Figure 1.3: Part of the storyworld in *Fallout: New Vegas* [7]

In my opinion, this has nothing to do with interaction with the narrative. Granted, between starting the quest and finishing it the player can choose between two different paths to reach the goal and get some reward (money and experience points), but both paths are basically a simple interaction with objects in the game world. The player can choose to interact with the members of the enemy tribe (by shooting them) or with the totem (by stealing it) but this is not where the narrative unfolds or makes any progress at all. Progress of the narrative happens during scripted scenes before and after the quest - during the non-interactive parts of the game. Wardrip-Fruin comes to a similar conclusion:

"Yet given the goal of the audience feeling able to play within the fictional world - not just in areas such as combat but also in terms of the stories being told - the quest flag structure quickly brings game authors to a limit point of complexity, holding back the future development of the form." [57, p.51]



Figure 1.4: Quest log in *Fallout: New Vegas* [7]

Computers are not particularly good in understanding free form dialog. There are systems that try to implement free form dialog, one of which I will discuss in Chapter 4.1, but the results are very limited to say the least. A more common way of dialog in RPGs (and some other genres) is the so-called *dialogue tree*. The user can for example choose one out of five different dialogue options (see Figure 1.5 for an example in *Fallout: New Vegas*) and the system selects an appropriate response (see Figure 1.6) by traversing a hierarchically organised data structure.

Wardrip-Fruin cites Chris Bateman who is rather skeptical about this approach:

"Despite the name, dialogue trees are seldom true trees but rather converging and diverging chains of conversation. They can be a nightmare to work with, and the benefits they provide are somewhat minimal. Nonetheless, some players greatly appreciate the illusion that they have control over what their character can say, with the consequence that di-



Figure 1.5: A question from the dialogue tree in Fallout: New Vegas [7]

dialogue trees remain important, especially in cRPG games."

[5, p.277] in [57, p.55]

However Wardrip-Fruin disagrees with Bateman on the notion of "illusion of control". While a system like that might be an illusion of real conversation, it is still an important method of decision making. Even though we are dealing basically with simple menu selection the choices matter in the game world and the different outcomes can be vast. This is also an important aspect of interactive drama.

These quests and dialogue trees described above are essential for an engaging user experience. As Wardrip-Fruin writes, an RPG uses them "to reward and sustain engagement with its fictional world; establish patterns that, when altered, produce small moments of surprise and pleasure; and direct the audience's attention to a series of things that must be accomplished through play." [57, p.59] So what makes a game compelling enough to keep players continuing for endless hours and even replay the game multiple times after they have finished it? The narrative itself is most likely an important aspect. The player wants to

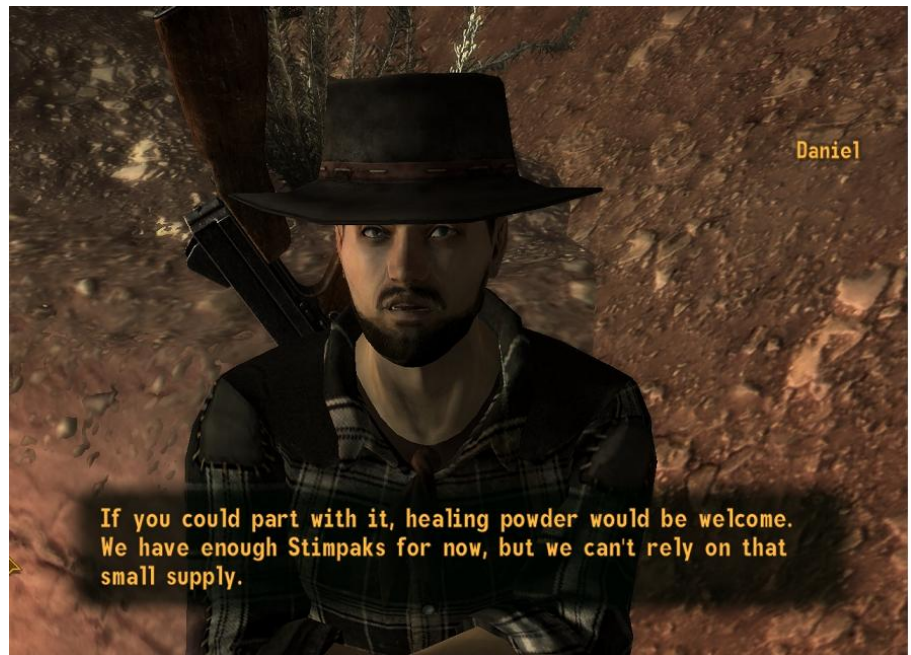


Figure 1.6: An answer given by an NPC in Fallout: New Vegas [7]

know how the story unfolds and how it ends. However, most players of RPGs do not just follow the main storyline but rather engage in numerous optional quests which do not really add much to the narrative itself. So there have to be other reasons for the player to keep exploring the storyworld. The player has to be rewarded for their engagement. In most RPGs these rewards are similar: money, more powerful weapons and items and experience. The latter can be used to "level-up" the player character which means they become more powerful, which again allows them to solve harder tasks which provide even more money, items and experience. Wardrip-Fruin calls this the "just one more thing" mindset that keeps players going for hours upon hours.

1.4 Interactive drama

Interactive drama is a recent form of experiencing narrative. One of the central goals for every interactive drama system is to provide the user with the feeling of agency. Agency is the power to take meaningful

actions and to see the results of the decisions and choices made. An interactive drama offers a world in which the participant can have a real effect on the drama which they are experiencing. It is important to understand that a linear or multi-linear story as found in computer games is clearly not an interactive drama. As we have seen, game genres like roleplaying games provide a large amount of interactivity and story variance but the point here is that in these games the player interacts with objects and characters while following a predetermined story. Even if these games provide different story branches and different endings, each of these branches and ending is pre-written by the story authors. The player does not interact with the structure of the narrative itself. Each time the user participates in an interactive drama they should identify the story as being essentially a new story. To achieve this, the main storyline will need to significantly differ every time the user participates. Insignificant changes, such as only the ending differing or characters having a different trivial conversation will not be sufficient.

The *Oz Project*, led by Joseph Bates at Carnegie Mellon, started under a rather unusual premise. As Wardrip-Fruin puts it, "the Oz Project may be the only computer science research project most famous for an experiment that did not require computers." [57, p.317] What they initially did was creating interactive drama, but quite different from the others I will discuss in this thesis. Instead of using computer simulations, they decided to equip real actors with headsets and guide their actions, when required, by instruction by a human director. Brenda Laurel, one of the pioneers in the research field of interactive drama, defines interactive drama as "[...] a first-person experience within a fantasy world, in which the user may create, enact, and observe a character whose choices and actions affect the course of events just as they might in play." [26, p.6] in [57, p.318] The first Oz experiment matched this definition. The first-person interactor was a test-person who was asked

to enter a simple theatre set, representing a bus station, to buy a ticket. On this set there were also three actors, the clerk from whom the test-person should buy a ticket, another passenger and a young punk, and they all had the goal to make the test-persons task as hard as possible. They acted autonomously, like in an improvisational theatre, but as mentioned above they had headsets to get directions from a director to intervene if things got out of hand. Along with the experimenters, there was also additional audience to watch the play. It turned out, and this is essential for interactive drama, that while the test-person reported an incredibly engaging experience, the additional audience were less excited and sometimes even bored. So obviously the experience in interactive media is quite different to the experience in other forms of media like novels or film. The basic design philosophy of interactive drama was born:

"[P]lacing the audience member as an interacting character within the drama (as an interactor), creating expressive and relatively independent non-player characters (NPCs) within the same environment, and guiding the higher level actions of the NPCs through the interventions of a drama manager tasked with adjusting pacing for the interactor and guiding the story to a successful conclusion." [57, p.319]

Following these guidelines, Joseph Bates led the first effort in applying agent technology to entertainment software in the early 1990s. They developed technology for dramatic virtual worlds and the first of these worlds was called "Edge of intention". (see Figure 1.7)

The creatures inhabiting this world were called "Woggles". The Woggles' behaviour was guided by an agent architecture that integrated reactivity, goal-directed behaviour, and emotions. Three of the four Woggles were controlled by this architecture and one was controlled by the

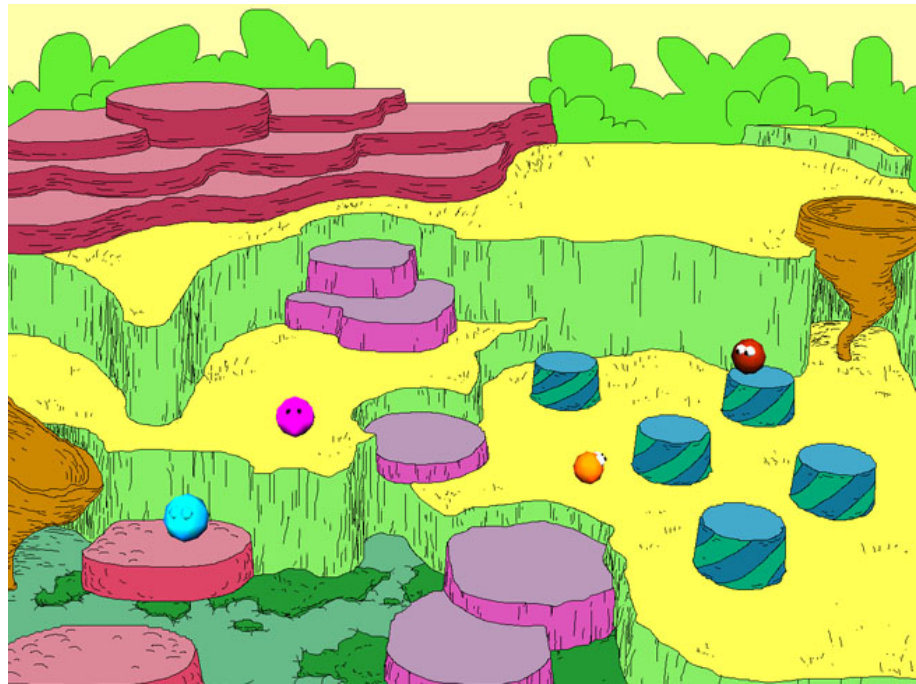


Figure 1.7: *The Edge of Intention* [6]

user who interacted with the storyworld. As Wardrip-Fruin explains, "these characters needed to have both long-term and short term behaviors, with some behaviors supporting others, multiple behaviors able to take place simultaneously, and some reasonable method of what to do at any given time." [57, p.320] In their graphical representation the Woggles were ball-like creatures with eyes that could move around their environment by bouncing. The user, who controlled their Woggle with a mouse, could engage in simple activities like for example a game of catch. Goal success, failure, prospective failure, and decisions that other Woggles made gave rise to happiness, sadness, fear, gratitude, and anger to varying degrees. The authoring language for the agent's behaviour was called Hap. "Instead of visual appearance, it was focused on characters that could act appropriately and autonomously in a fictional world, and do so based on goals and behaviors crafted by authors for that character." [57, p.322] Goals and sub-goals are organized in a tree-like structure and each goal has an author-defined set of possible behaviours that would satisfy it. The problem here is the same as the one I mentioned when discussing *Tale-Spin*: most of the interesting pro-

cesses happen on the inside and never reach the audience. The audience sees only the successful outcomes of the internal "reasoning" processes but all the failures that happened before would be—at least—equally interesting.

Phoebe Sengers, who at that time did her PhD as member of the *Oz Project*, saw this problem. She built a set of extensions, inspired by narrative psychology, which she called the *Expressivator*. Michele L. Crossley describes narrative psychology as an approach that was formulated "as an alternative to dominant quantitative approaches which, in their attempt to numerically categorize experience through quantification and statistical procedures, failed radically to incorporate or address these hermeneutic dimensions of experience and thus lost any sense of the 'lived' nature of human reality and identity." [15, p.361] The central premise of narrative psychology is, as Crossley explains, the existence of an essential and fundamental link between experience of self, temporality, relationships with others, and morality which are "[...] the kinds of stories and narratives through which we make sense of our lives [...]." [15, p.361] If these links are not understood, simply because they are not communicated, the audience fails to interpret why behaviour changes occur, and the behaviour of the Woggles often seems—in Sengers term—schizophrenic. Therefore the idea of the *Expressivator* is to communicate *why* changes are being made. Communicating why things happen is an essential step in creating an engaging interactive drama.

2

A sample story in interactive drama

There are many different interactive drama architectures under development by a growing number of research groups. The system I am most familiar with is called *IDtension* [53], and most of the considerations presented in this thesis are a result of an in-depth investigation of this system. *IDtension* is a playable interactive drama that aims at producing meaningful events while allowing users to deeply interact with the narrative structure and furthermore at creating essentially new stories at each play through. It was developed by Nicolas Szilas at the University of Geneva and has been continuously improved for many years now.

2.1 IDtension

One of the main strengths of this system is that it offers a very large range of possible actions. *IDtension* is based on theories of narrative and the storyworld is based on five fundamental elements, namely goals, tasks, segments, obstacles and values. These elements are not only important for the player-character itself but for each character in the

drama. Each character is represented by an autonomous agent with its own goals and values and they interact with each other's and with the player character to achieve these goals. Additionally there is an agent called the drama manager which should ensure that the drama is consistent and believable. *IDtension*'s architecture consists of five modules, namely the *World of the Story*, the *Narrative Logic*, the *Sequencer*, the *Model of the User* and the *Theatre*. The Theatre is the interface which presents the story to the user. The important aspect here is that the Theatre is strictly separated from the rest of the architecture. This allows for many different possibilities to present the story. At the moment a simple text based user interface is used with the main purpose of testing the underlying system. While a text based interface is not necessarily a bad solution there are many aspects of the current way of presenting the story that need improvements to enhance the user experience. The problem with most of these systems is, that most effort has been put into creating the interactive drama architecture itself. Now that it is time to start thinking of ways how to present the storyworld in a satisfying way for the user, it becomes evident that this separated approach leads to some significant difficulties because many of the design decisions for presenting the story evidently feed back to the very basics of the drama engine. In the next section I will discuss a sample story that has been implemented in *IDtension* called "The mutiny".

2.2 The mutiny

Upon starting the *IDtension* engine and entering the storyworld the user is presented with a short backstory that describe some previous events and the role the user plays in the storyworld. Figure 2.1 shows this introduction.

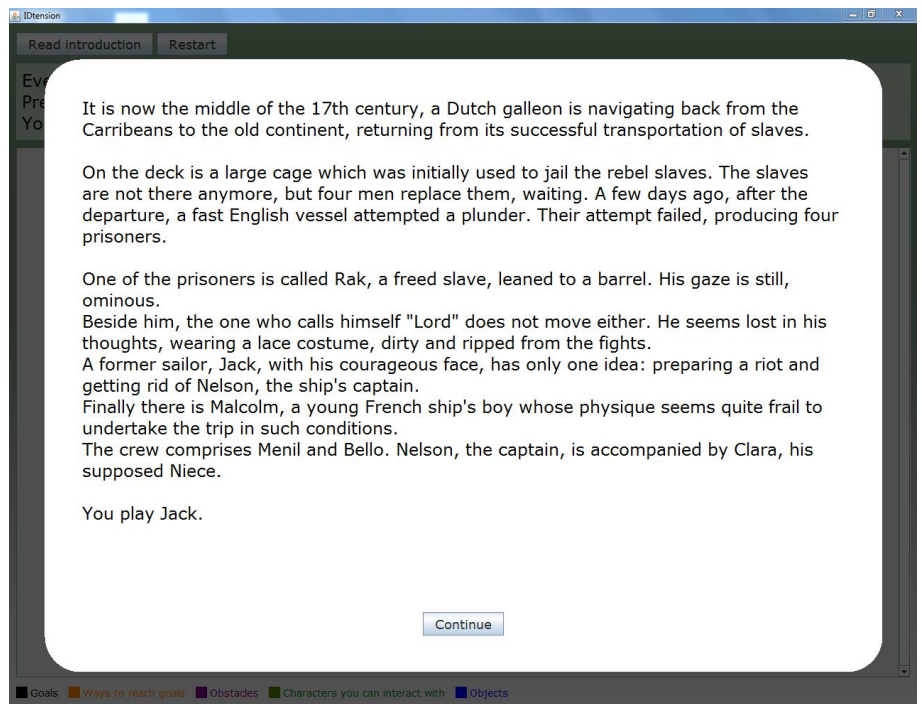


Figure 2.1: The introduction to "The mutiny" in IDtension

This backstory is not interactive and in a way very similar to the backstories and cutscenes presented in computer games. Whether or not we should rely on these techniques in interactive drama is debatable. After the user has read this introduction the actual interface is presented. In the case of *IDtension* the interface is text-based and turn-based, meaning that the user cannot interact with the system in real-time. The interface is shown in Figure 2.2.

The upper part gives a short description of the setting and more importantly of the characters with which the user can interact. Depending on which character is selected the possible choices change. If no character is selected the user "interacts with the scene" for example by trying to open the door of the prison cell or by picking up objects. In Figure 2.3 the user interacts with a character called Rak.

The lower part shows what had previously happened in the storyworld. The entries are read from bottom to top. The highlighted elements of each sentence are the options the user can select and they change ac-

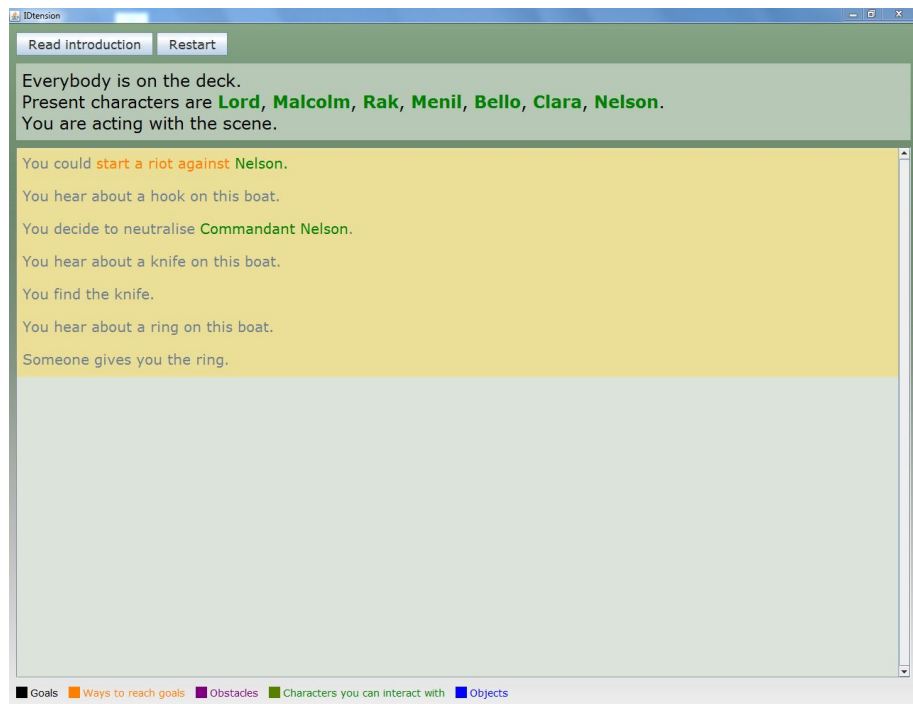


Figure 2.2: The IDtension user-interface



Figure 2.3: Interaction with Rak

cording to the character with which the user interacts. In our case the user interacts with Rak and the interface is shown in Figure 2.4.

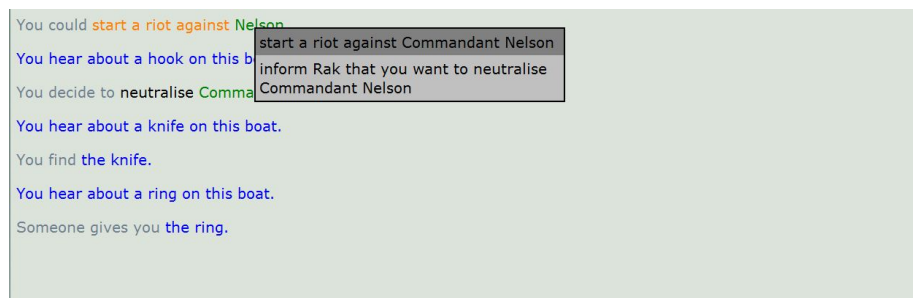


Figure 2.4: Choices when interacting with Rak

When interacting with Rak selecting the option to "start a riot against Commandant Nelson" results in the player character informing Rak that he wants to start a riot against Commandant Nelson whereas when interacting with the scene the same choice results in an actual attempt to start a riot. Every action is first shown in a popup window (Figure 2.5) and then written into the main interaction window (Figure 2.6). Therefore, as the users progresses in the storyworld, more and more actions

become available, peaking at about 100 possible actions each step in the "The mutiny" scenario.

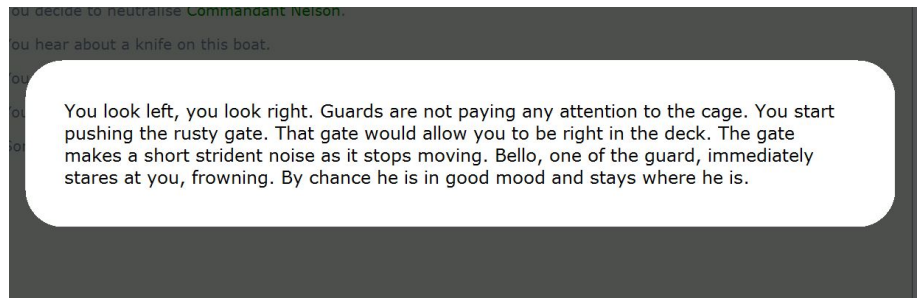


Figure 2.5: Pop-up box



Figure 2.6: New entry

Similarly to other generative systems *IDtension* also suffers from the *Tale-Spin effect*. While it is based on very complex technology the output seems to be rather simple and is often not really satisfying. In the next sections I will identify some of the major problems from a user's perspective.

2.3 Identifying the problems

Most people consume stories to be entertained even though they differ in regards to what they consider entertaining. Some people prefer stories that make them laugh, others prefer stories that make them cry and yet others enjoy the beautiful prose an author uses. Unfortunately *IDtension* does not shine in any of these aspects. While the non-interactive part might have some "story qualities" no one would consider the unfolding story during the interactive part as good prose or especially entertaining for its narrative qualities. If you opened a book and the first paragraph is just a sequence of sentences like presented in Figure 2.5 (read bottom to top) you would most likely close the book pretty soon. This is a problem *IDtension* shares with other storytelling systems presented in chapter 1: They do not produce quality stories. It is unlikely that interactive drama systems will produce stories that match stories created by a human author anytime soon but that does not mean that interactive drama systems have no right to exist. Instead we should rather look for the technology's qualities elsewhere. These systems are still in their infancy and we have to try — step by step — to uncover their limitations and find solutions to deal with them. For now we have to accept these limitations and carefully examine the systems we have on hand.

As mentioned above the interactive part of *IDtension* starts with a few sentences that describe some previous events. In the "The Mutiny" scenario these sentences are:

- Someone gives you a ring
- You hear about a ring on this boat
- You find a knife
- You hear about a knife on this boat
- You decide to neutralise Commandant Nelson

- You hear about a hook on this boat
- You could start a riot against Nelson

The elements relevant for the story are highlighted and clicking on them opens a box with different choices for the user. The relevant elements are defined at the bottom of the user-interface, namely goals, ways to reach goals, obstacles, characters you can interact with and objects. These are central elements of most narratives and the unfolding of *IDtension*'s story is based on them. This resembles early text adventures like *Zork* [2] (see Figure 2.7) that made the user find, combine and use different objects to solve some mystery or reach a specific goal. In my opinion this is a misuse of interactive drama technology. As I

```
Enter 'start' to begin the game
start
You are standing in the entrance room
look
This room has perfume to acquire and hazard is none
take perfume
Congratulations, you now have perfume
take gold
You already have the object from this room?
go east
You are in the stairway
take gold
The gold is not in this room?
look
This room has sword to acquire and hazard is none
grab sword
Congratulations, you now have sword
go west
You are in the entrance room
go north
You are in the hallway
go north
You are in the dining hall
go east
You are in the dragon's lair
look
This room has nothing to acquire and hazard is dragon
kill dragon
Way to go, you used the sword on the dragon
go north
You are in the treasure room
look
This room has gold to acquire and hazard is fumes
take gold
You must first overcome: fumes
bye
Thanks for playing...
```

Figure 2.7: *Zork* [2]

have explained when writing about the *Tale-Spin effect* we are dealing with very advanced systems and yet the output presented to the user makes the system appear inferior to even the simplest linear or tree-

based system because in these systems the author has total control of the unfolding and progress of the story. Even if the user is free to make choices, the story still follows one of the pre-written paths. Not so in interactive drama. With the goal of allowing the user to deeply interact with the narrative structure and of generating stories "on the fly" comes a high price: it is almost impossible to fit the story fragments into causal and temporal sequences. How can we produce meaningful and coherent stories while literally allowing the user to do what they want. This has become known as the *interactive paradox*: "On the one hand the author seeks control over the direction of a narrative in order to give it a satisfactory structure. On the other hand a participating user demands the autonomy to act and react without explicit authorial constraint." [3, p.25] If stories based on the manipulation of objects —and I have already mentioned that NPCs are also treated as objects — are inferior to their linear counterparts a logical conclusion would be not to use this technology for these stories but rather for stories not found in computer games: stories about human relations and the interaction between human minds. In my opinion understanding interactivity in interactive drama as the possibility to interact with objects is mistaken; the simulation of human-like interaction is more likely to be a domain where interactive drama will excel.

IDtension is supposed to produce meaningful events and at the same time allow the user to deeply interact with the narrative structure to create essentially new stories at each play through. However, this ambitious goal has not yet been reached. Actually we are not even close to reaching it. Are the events happening after a specific user choice really meaningful? And if they are, to whom are they meaningful? To the player character or to the player? Take for example the user's choice to start a riot against Commandant Nelson which triggers the event shown in Figure 2.5. The action as such is quite an important one but there

are no real consequences at all to the player. And that is true for every choice the user makes. If the action is successful (e.g. if the player already had the key in the example above) the story moves on but otherwise the user just gets informed that they failed and is free to choose any other action, including the same action again and again. Therefore the user can simply use trial and error until one action is successful without worrying about any consequences. For that very reason *IDtension*, ironically, lacks tension. There is of course the ultimate goal of escaping from the prison cell and neutralising the captain and even the possibility to genuinely fail this endeavour but from the user's perspective there is no significant difference to RPGs with multiple endings. In my opinion interactive drama should not rely on the same mechanism as computer games, namely on reaching a specific goal and being victorious. In interactive drama the purpose should not be winning but rather engaging in the storyworld by making meaningful choices. The user is not rewarded for "beating" the game but rather by narrative pleasure itself, by being immersed in a fascinating and believable storyworld. Chris Crawford comes to a similar conclusion when writing that in tragedy the reward is applause, not victory [14, p.216], meaning that the user should not feel like a player of a game but rather as a co-author of a story who gets rewarded for the quality of the drama created. (we will return to this aspect in the chapter on dramatic narrative and affect elicitation, p. 50). At the moment however, as Ryan explains, interactive drama systems are very similar to hypertext, in that there is no narrative meaning and no immersion into the fictional world. As mentioned above, the number of possible actions at each step is very high to provide the feeling of real freedom of choice and to generate stories that are essentially new at each play through. Unfortunately the notion of stories being "essentially new" is too farfetched. Instead of experiencing a totally different story each time the user will rather feel

like experiencing the same story again and again with the same events happening in different orders (which basically is what happens). Deciding between one hundred different options at each time step might ensure freedom of choice but is certainly not userfriendly. Furthermore, to make things even worse, *IDtension*'s current user-interface does not support the user but is rather confusing and irritating. As Ryan claims, menu-based communication is the most extreme limitation in the use of language [43, p.49] because of a "loss of fluidity, since narrative time must stop until a choice is made. The menu also clutters up the screen with an extra window that takes a toll on the player's immersion in the fictional world." However, at the current state of natural language technology, as we will see, dismissing a menu-based approach seems not feasible. As Ryan argues, "[a] decision has to be made between reasonably natural but narratively limited modes of action and artificial interfaces that suspend game and narrative time but allow much richer interpersonal relations." [43, p.50] *IDtension* tries to deal with the problem of overwhelming the user with a high number of often meaningless actions by implementing a "model of the user". This model is not to be confused with a user-model as proposed in this thesis. Nicolas Szilas [53, p.775] defines the model of the user as follows:

"It is a generic model of a user, which simulates a general user who gathers data specific to the story told so far; it corresponds to the user that a narrator has in mind for predicting the impact of each event."

This model assesses the interest of each proposed action, by giving a score between -1 and 1 to select actions that are potentially meaningful. This indeed makes sense for the current implementation of *IDtension* since the system is based on theories of narrative. In this thesis, however, I argue that we should rather base interactive drama on affect and

human interaction. To do so we have to implement an actual model of the user's affective state. This allows us to handle each user differently and present stories that fit the player's mood. Thereby we will achieve a higher level of immersion and a satisfying user experience. A closer look at the interplay between affective sciences and narrative studies will further illustrate the benefits of affective modelling in interactive drama research.

3

Affective sciences and narrative studies

Emotions are often regarded as an involuntary mental and bodily response related to a specific object, whereas the term affect refers to a larger set of states [12, p.1]. While actual emotions like anger and disgust are important topics of research within the affective sciences, broader concepts like differing mood states are equally relevant to this field of research. With interactive drama, as with other forms of narrative, a somewhat capable author will find it rather easy to elicit emotional response in their audience. A character acting unfairly or aggressively towards the main character can elicit an emotion of anger which is directed at this character. A detailed description of a rotten corpse usually elicits disgust, and a tragic loss elicits sadness. The common denominator of emotions is their "aboutness", they are directed at a specific object. [48, p.256] Both the user and the author understand how these emotions are elicited. On the other hand, creating a desired mood, often defined as an "intrinsically objectless experience" [48, p.267], and sustaining that mood during the whole course of the narrative is a much more demanding task. The emotional stimuli created have to be both

strong and frequent enough, because otherwise the consumer of the narrative may end up experiencing mood states least intended by the author: boredom and frustration.

Considering the user's affective state is essential for creating an engaging player experience. While, as I will show, all forms of narrative aim at eliciting emotions and creating moods, which, according to the author's belief, fit the presented content, interactive drama provides an exciting new possibility: to adjust the presented content and the interaction options offered, to the user's mood. To do so, the system has to be capable to draw conclusions about the user's affective state from what they experienced so far and the way they interacts with the system.

During the 20th century anthropologists and sociologists turned their research interest to observable behaviours such as language, socialisation or ritual behaviour [49, p.4], and in psychology, with the rise of behaviourism, research on emotions was omitted from the realm of scientific research. With the *cognitive turn* one might assume that the focus of research would have also returned to emotions, because no one will doubt that they play an important role in human existence. But that was not the case. The problem was, as Greg Smith explains in his book *Film Structure and the Emotion System*, that "[e]motions, unlike memory or perceptual tasks, could not be simulated on computers, and so emotions were often considered to be 'noise' unique to the human hardware, a possible source of inference with cognitive processes." [49, p.3-4] Smith, who holds a PhD in communication arts and who is also graduate director of the Moving Image Studies program at Georgia State University, attaches great importance to the role emotions play in film, as well as in all other forms of narrative.

"[F]ilm theory has historically paid only spotty attention to emotional affects, although almost everyone agrees

that eliciting emotions is a primary concern for most films. In the modern world's emotional landscape, the movie theatre occupies a central place: it is one of the predominant spaces where many societies gather to express and experience emotion. The cinema offers complex and varied experiences; for most people, however, it is a place to feel something. The dependability of movies to provide emotional experiences for diverse audiences lies at the center of the mediums appeal and power." [49, p.4]

Before we dive head first into a discussion of the intersection between different forms of narrative and emotion, a short history of emotion theories seems to be advisable. Emotions can be described as a combination of physiological arousal, expressive behaviours, and consciously experienced thoughts. [35, p.498] There is a long tradition of research on the interplay between these aspects, especially on the question whether physiological or emotional experience comes first. In the next section I will provide a brief overview of early emotion research to contrast some basic, yet often counter-intuitive, position and will then focus on current models of emotions and affect.

3.1 Theories of emotions and affect

The James-Lange theory asserts that the emotions we experience are the result of feeling our physiological response to emotion-arousing stimuli. [35, p.499] In our everyday life we are used to phrases such as "At the funeral I got really sad, so I started to cry" or "When, during a fast mountainbike downhill, I realised that my hydraulic brakes failed, I got scared and my heart started to race". For most people it would sound odd to say "At the funeral I started to cry, which made me realise that I

was sad" or "When, during a fast mountainbike downhill, I realised that my hydraulic brakes failed, I felt my heart racing, which made me realise I was scared". Yet, this reversed order of the emotional sequence, namely a physiological reaction followed by consciously experienced thoughts, is exactly what James proposes. In their overview of the history of emotion research Maria Gendron and Lisa Feldman Barrett [21] provide a comprehensible outline of James' work, and more specifically they provide an explanation why James is often mistakenly regarded as a basic emotion theorist. Basic emotion theorists believe, that there is a fixed number of emotions, which are innate and universal across all cultures. However, there is some disagreement on the number of these basic emotions. Ekman for example proposed a revised list of 15 (his initial list included only seven) clearly distinguishable emotions: amusement, anger, contempt, contentment, disgust, embarrassment, excitement, fear, guilt, pride in achievement, relief, sadness/distress, satisfaction, sensory pleasure, and shame. [17, p.55] As Gendron and Barrett explain, James regarded emotions as perceiving instinct reactions to stimuli in the world but contrary to other basic emotion theorists he does not regard these reactions as fixed. According to James "there can be variable sets of bodily symptoms associated with a single category of emotions [...]" [21, p.324], and therefore there is no way to define a specific emotion with a single set of bodily symptoms. Gendron and Barrett also point out that concatenating William James' theory with Carl Lange's research into the widely known James-Lange theory is not appropriate because there is a significant difference in their views: "Whereas James stressed that variability in emotional responding is the norm, Lange argued that emotions can be scientifically studied because there is an objective physiological signature for each emotion kind." [21, p.324]

James' theory was criticised by Walter Cannon, an U.S. physiologist who, together with Philip Bard, studied the emotional behaviour of decorticated cats. By showing that these cats still showed emotional responses, even though inappropriate ones, they concluded that the James-Lange theory must be wrong. Cannon argues that the same body response, such as a racing heart, can occur with very different emotional experiences. He writes that: "[...] if the emotions were due to afferent impulses from the viscera, we should expect not only that fear and rage would feel alike but that chilliness, hypoglycemia, asphyxia, and fever should feel like them. Such is not the case." [11, p.110] Furthermore, Cannon argues that visceral changes are too slow to be a source of emotional feeling. In experiments with pictures and also with odours Cannon showed that affective reactions are faster than it would be possible if they would result from reverberations from the viscera. [11, p.112] The alternative Cannon and Bard provide, proposes that the bodily response is triggered at the same time as the subjective experience of emotion.

In 1962, Stanley Schachter and Jerome Singer [44] proposed that emotions are created by both, our physiology and our cognitions, a theory that has become known as the two-factor theory of emotions. According to the two-factor theory, emotions result from the interaction between a physiological arousal and a cognition about the arousing situation. [39, p.240] While the first determines the intensity of the emotion the cognition determines which emotion we experience. In *The Schachter Theory of Emotion: Two Decades Later* [39] Reisenzein tries to critically assess the current status of Schachter's theory. While both components are necessary to experience an emotional state, Reisenzein explains, the mere presence of these components is not sufficient for an emotion. If we do not perceive a temporal connection between the two components we also do not experience an emotional state. Therefore, Reisenzein ar-

gues, the two-factor theory actually has three components. In addition to the one cognition that characterises the situation in an emotional way a second cognition is required which connects the emotional cognition with the arousal. [39, p.240] Schachter specified two different ways an emotion can be generated, Reisenzein writes, and in both cases "the processes involved include emotional appraisal of the situation, perception of arousal, and attribution of arousal; however, the temporal sequence of these processes differs." [39, p.241]

Recent models of affective states are often divided in either dimensional or discrete models. According to Scherer and Pepper [45], adaptational models of emotions focus on the fact that the emotion system has an adaptational function and is primed by evolution to detect stimuli that are vitally significant for the organism's well-being. [45, p.22] They deal with pre-attentive elicitation, often focused on the emotion of fear and fearful stimuli. These models deal mostly with lower-level evaluations.

Motivational models assume that the major types of emotions can be derived from evolutionarily continuous motivational primitives as described by ethologists. "Thus", Scherer and Pepper explain, "love is seen as a correlate of parental care, fear as a signal of danger, inducing a flight response, and anger as an antagonistic emotion that prepares the organism to fight." [45, p.24]

Related to motivational models, circuit models are influenced by the evolving neuroscientific knowledge on pathways or circuits in the brain. "Based on the assumption that the differentiation and the number of fundamental emotions is determined by genetically coded neural circuits, these models have stimulated a considerable amount of neuropsychological and psychophysiological research with human subjects." [45, p.24]

Discrete emotion models, such as the ones mentioned above, contrast with dimensional models by suggesting the existence of a limited number of basic emotions, usually ranging between 7 and 14 thereof, such as anger, fear, joy, sadness, and disgust. Each of these basic emotions is assumed to have its specific eliciting conditions and their specific physiological and behavioural reaction patterns. To explain the variability that can be found in emotional states, discrete emotion theorists have postulated a mechanism of emotion mixing or blending. [45, p.27]

In contrast, dimensional models are used to define emotions according to one or more dimensions. They dominate socio-psychological work on affective states, research on mood effect on social cognition, and the work on affect in the personality literature. According to Scherer and Pepper, the popularity of these models is due to the economical way offered to capture major differences between emotions.

Most promising for my approach are cognitive appraisal models. In their chapter on appraisal theories, Gerald Clore and Andrew Ortony explain how emotions are modelled as cognitively elaborated affective states [13]:

"In this characterization, we take 'affective' to mean anything evaluative, and we propose that 'states' exist when multiple components represent or register the same internal or external situation in the same time frame. Thus one can think of emotions as involving multiple representations of something as good or bad in some way. Appraisal theories address the nature of such evaluations." [13, p.629]

According to Clore and Ortony low-level bodily, hormonal, and affective reactions get the emotional process started but it is cognitive appraisal processes that shape general affective reactions into specific emotions. Not all researchers agree with the idea that these appraisals

are cognitive in nature because they claim that emotions are too fast or mindless to involve cognition. Nevertheless, Clore and Ortony argue that these arguments against cognitive appraisal are not valid. According to their view most cognitive reactions are mindless, based on learned associations which are often inaccessible (or at least people do not consciously think about them). Therefore cognitive emotional appraisal does not differ from other cognitive reactions.

Addressing the claim that emotional reactions are too fast for cognitive appraisals Clore and Ortony refer to experiments conducted by Moors and DeHouwer [33] which demonstrate that there is no reason to assume that cognitive processes are too slow to produce emotion. Experiments have shown that appraisal judgments can not only be rapid and automatic but also that stimulus valence and motivational relevance can be determined rapidly and automatically. [13, p.629] Clore and Ortony present so-called dual-process models of appraisal which appear to be useful to handle these differing views. One of these models is based on a distinction between "associative processing" and "rule-based processing", the former being guided by subjective similarity the latter involving symbolic reasoning. As they explain, we use both processes in our everyday categorisation and both play a role in emotion elicitation as well. When confronted with a new situation that elicits emotional response, the authors suggest that emotions involve bottom-up processing. Only as the perception of the situation unfolds, reactions become correspondingly differentiated. But more importantly, emotions might also be elicited by associative processes, meaning that prior appraisals get reinstated in similar situations. As they explain, the typically faster, associative process of emotion reinstatement is useful for preparedness, whereas the typically slower, rule-based process of computation affords flexibility:

"There are, therefore, two fingers on the emotional trigger - one from early perceptual processes that identify the emotional value of a stimulus to prepare for action; and one from cognitive processes that verify the nature of the stimulus, situate it, and appraise it." [13, p.634]

Generally speaking, appraisal models maintain that emotions are elicited by a cognitive evaluation of antecedent situations and events [45, p.22]. After an automatic evaluation process of any emotion eliciting stimulus on lower, subcortical levels, additional evaluation processes on higher, cortical levels follow, which determine the significance of the stimulus. There is some disagreement between researchers on how they conceive the evaluation process but, according to Scherer and Pepper, "strong convergence with respect to the central claim, i.e., the idea that a limited number of appraisal or evaluation dimensions or criteria permit to predict which type of emotion will be experienced by an individual on the basis of the result of the appraisal process." [45, p.23] In addition to the individual-centred models of emotion addressed so far, the sociological perspective has provided complementary contributions of interest (which in fact have also been integrated in the appraisal theory framework, e.g. in the popular OCC-model [36]).

From a sociological point of view, both cognitive appraisal and emotional arousal are constrained in interaction by culture and social structure. [52, p.32] Figure 3.1 outlines the essential elements of sociological analysis of emotions as presented by Jane E. Stets and Jonathan H. Turner in their book chapter on the sociology of emotions. The sociological analysis of emotions consists of five essential elements (see Figure 3.1), Stets and Turner explain, with at least one corresponding research tradition. In sociological analysis cognitive appraisals "resolve around the following: general definitions of self, other(s), and situa-

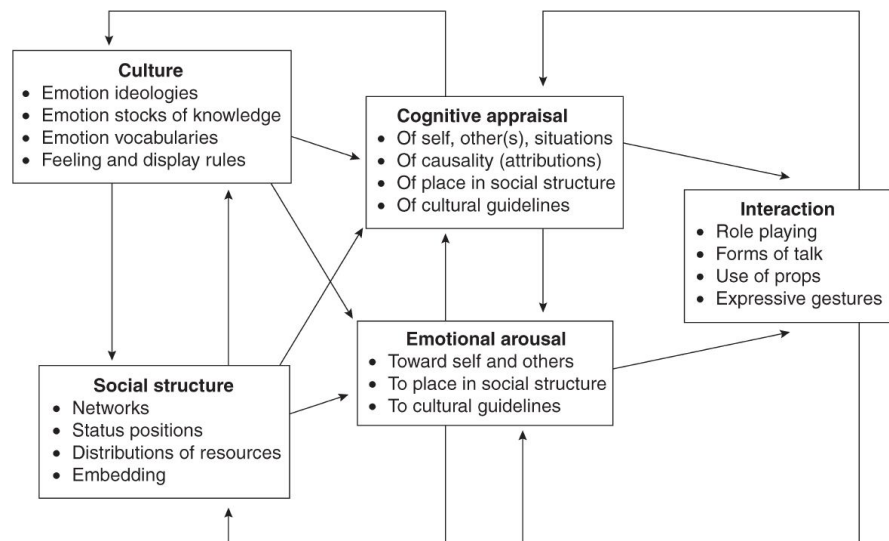


Figure 3.1: Sociological analysis of emotions [52, p.33, Figure 3.1]

tions; attributions for the causes behind situational outcomes; awareness of ones place in social structure; and recognition of cultural guidelines" [52, p.33] As you can see in Figure 3.1 these are also elements of relevance for emotional arousal. "Interaction" is defined as the process whereby the behaviors of one or more persons influence the behavior of one or more others. [52, p.33]

The authors discuss a research tradition called the *dramaturgical approach* which is concerned with culture. More specifically the dramaturgical approaches deals with the influence of culture on our cognitive guidelines for experiencing and expressing emotions. Through socialisation we learn which emotions are called for at which moments similar to the scripts learned by an actor in a stage play or movie (hence dramaturgical approach). The audience in real life are all our fellow humans which whom we interact. Having learned which emotions are adequate for which situation and also having an understanding of the reaction of others to different emotional display comes with another benefit: it enables us to influence and manipulate others to gain personal benefits. To display emotions that we do not feel we must engage in cognitive and behavioral strategies for managing emotions like for ex-

ample thinking about something pleasant to actually increase our mood (cognitive) or by crying at the funeral of a person we never liked (behavioral).

As we will see, narrative techniques based on these findings provide a solid foundation for creating an immersive interactive drama experience.

3.2 Dramatic narrative and affect elicitation

"Narrative is an inexhaustible and varied source of education and entertainment; narrative is a mirror in which we discover what it means to be human." [42, p.345], Ryan claims. But what exactly is "narrative" how is it related to affective science? While the terms "narrative" and "story" are often used interchangeably, Ryan argues that this is misleading. According to H. Porter Abbott the term "narrative" is a combination of story and discourse where "story is an event or sequence of events (the action) and narrative discourse is those events as represented." [1, p.19]. This suggests that the narrative is the way the consumer experiences the story, might that be in a written novel, a movie, in theatre or as in our case in interactive drama. This means that story, unlike a narrative, is a cognitive construct but narrative has the ability to evoke this construct. Ryan offers the following definition of this cognitive construct [42, p.347]:

1. The mental representation of story involves the construction of the image of a world populated with individual agents (characters) and objects. (Spatial dimension.)
2. This world must undergo not fully predictable changes of state that are caused by non-habitual physical events: either accidents

(‘happenings’) or deliberate actions by intelligent agents. (Temporal dimension.)

3. In addition to being linked to physical states by causal relations, the physical events must be associated with mental states and events (goals, plans, emotions). This network of connections gives events coherence, motivation, closure, intelligibility and turns them into a *plot*. (Logical, mental and formal dimension.)

To sum this up: narrative is a certain type of text (including not only written text but also other forms of media) that evokes a certain type of image in the mind, defined by the dimensions mentioned above. The narrative can never present every aspect of this construct and the consumer of narratives must be capable and willing to engage in the storyworld, to make sense of the narrative and to fill inevitable gaps. I agree with Brian Richardson in that we should regard the act of reading as "[...] being construed as dynamic process that always involves anticipation and retrospection." [40, p.354] For that very reason, authors of any sort of narrative should understand the mechanisms that establish this willingness to engage in the storyworld created by the author. The consumer has to experience emotions as well as tension, the authors must create and sustain anticipation during the whole course of the story and finally the user must feel reward for their willingness to continue. But how is the user of interactive drama systems rewarded?

As already addressed earlier (p.35), a possible answer is offered by Chris Crawford, who argues that in interactive drama it should not be victory that is rewarded, but rather the quality of the drama created. This fits with my belief that the user of an interactive drama system should not feel like a player who wants to win the game, but rather like a co-author of a story, which is presented to an imaginary (or even real) audience. This can only work if we succeed in creating and sustaining

a mood state that makes the player truly immerse into the storyworld created. Crawford comes to a similar conclusion:

"The trick lies in shifting the player's self-perception as the protagonist. An actor playing a role simultaneously lives inside the character and outside the character. Consider an actress playing the role of Juliet. She must surely identify with Juliet to do her job. She must feel something like the intense love for Romeo and the agony of losing him. To be 'in character', she must feel the emotional logic that drives Juliet to suicide and appreciate the dramatic forces that require her death. This is immersion at its deepest level." [14, p.215]

It should be clear by now that *understanding* narrative is not only a cognitive task. The goal of every form of narrative, from your grandma's bedtime story to interactive drama, is to elicit emotions in their audience. There are many different ways how we can react to narrative. We can feel empathy for the characters, we can react to happenings in the storyworld, we can create anticipations and we experience emotion when these anticipations are not fulfilled. As we will see, eliciting these reactions is not an easy task for the authors of narrative because different audiences react in very different ways. "Even such straightforward mechanisms as surprise, uncertainty, and suspense depend upon whether the reader, viewer or listener relates emotionally to the agents in a fictional world, is interested in their fate, and prefers certain outcomes of stories to others." [46, p.137]

In his book *Film Structure and the Emotion System* Greg Smith presents an approach which, as he explains, relies on the current understanding in emotional psychology and experimental psychology to "bring to film theory a more nuanced understanding of what emotions are and how

they function." [49, p.9] However, there is one particular aspect of his approach that could prove to be problematic when applied to research on interactive drama. Smith explicitly mentions that his approach is only capable of dealing with storytelling in uninterrupted real-time:

"A crucial assumption [...] is that film takes place over uninterrupted time. Temporal limits for emotionality are built into the emotion system, and so the temporal unfolding of the filmic stimulus is crucial for the way it appeals to this system. A similar audiovisual medium such as broadcast television in the United States is more interruptive and so is structured differently in the way it tells stories." [49, p.11]

Therefore his approach might work for some real-time systems but not for others which are turn based or at least semi-turnbased. Nevertheless, I do argue that many aspects of Smith's approach are still very valuable for dealing with all types of interactive drama systems.

Smith's model relies on recent research on cognitive psychology and neuropsychology with the goal to "provide one coherent explanation of the current state of cognitive research on emotion" [49, p.123] Smith summarises how the emotion system receives information from many different sources of input. Six different subsystems are important to eliciting emotions [49, p.24]:

- Facial nerves and muscles
- Vocalization
- Body posture and skeletal muscles
- The autonomic nervous system
- Conscious cognition
- The nonconscious central nervous system

None of these subsystems alone is sufficient to cause emotions. According to Smith, any model of emotion causation must therefore allow for joint causation [49, p.29]. He proposes an associative network model of the emotion system. Emotions, in this model, are represented by different nodes and are tied to particular memories and thoughts and to patterns of physical reactions. Since arachnophobia is quite common in Western societies it is a good example to facilitate the understanding of this associative network. Like the name suggests, people suffering from arachnophobia associate typical arachnid characteristics like the four pairs of long thin legs, with a strong emotion of fear. For these people, contact with these creatures leads to an activation of many, if not all, of the aforementioned subsystems. Just imagine sitting in front of your computer surfing the web. All of a sudden a big, black, long-legged spider drops from the ceiling right on your keyboard. If you are arachnophobic you will most likely react with a fearful facial expression and a high-pitched scream. You will push back the chair, jump up and make an attempt to run away. Your heart races, there is an increase in your right frontal hemispheric activity and vivid memories of that one spider that almost devoured you as a child come to mind. All these reactions are associated with a strong emotion of fear. Now, if only one of these systems connected with the fear node is activated, it is very unlikely that you experience the emotion of fear. After all you normally do not experience fear each time you go for a jog (fast heart beat). But the more of these subsystems are activated, the higher is the probability that you experience and express the emotion of fear. In Smith's words: "Whether an emotion occurs in a situation depends on how many channels of emotion provide emotion cues and how intense those signals are." [49, p.29] People differ in regard to the channel that most easily elicits a specific emotion and this makes Smith raise the question how films can be structured to elicit dependable responses

from a wide variety of audience members [49, p.41]. This is also a fundamental question for interactive drama because only engineers and authors who understand how the emotion system works can produce an engaging storyworld. We have already seen that emotions themselves are short lived and without redundant cuing a desired emotional state cannot be sustained for very long, and certainly not for the whole duration of an interactive drama. Therefore just presenting a final goal that is meant to be meaningful to the player will not be sufficient to keep the player interested for the whole course of the narrative.

The central assertion of Smith's approach is the interaction between mood and emotion. In a recent article [48] Matthias Siemer explains that there is consensus in emotion research that moods differ from emotions in that effect that they "are not directed at specific objects, and may even entirely lack objects." [48, p.256] The account of moods Siemer presents in his article is called the *dispositional theory of moods*. One common assumption of all dispositional accounts of moods is, as Siemer explains, that moods are, in a sense, temporary dispositions to respond to a wide variety of situations with emotional reactions that correspond to the mood. Basically the dispositional theory of moods proposed in Siemer's article claims that "moods are temporary dispositions—more precisely, temporarily heightened dispositions—to have or to generate particular kinds of cognitions, specifically to make particular kinds of emotion-relevant appraisals." [48, p.257] Mood is the key aspect of the bi-directional interaction between the user who experiences the story and the interactive drama system, which helps creating the story in a storyworld design by the author. Only if we succeed in creating the mood that fits the storyworld imagined by the author, the user will truly immerse themselves into this world. On the one hand the idea of interactive drama is to present a story, which is congruent with the current emotional state of the user and on the other hand changes in the overall

mood of the story should "guide" the user into a specific affective state. The idea here (corresponding to Smith's theory) is, that a specific mood is required as an *orienting state* to fully experience specific emotions and vice versa experiencing specific emotions repeatedly is required to sustain mood. Therefore, according to Smith, the first task for a film is to create such an emotional orientation toward the film. This works best with a "periodic diet of brief emotional moments". [49, p.42] At this point we have to be careful with applying Smith's approach because what works for film might not work for interactive drama. Depending on the way the storyworld is presented, some of the perceptual cues employed by film makers are not available to authors of interactive drama.

"Filmic cues that can provide emotional information include facial expressions, figure movement, dialogue, vocal expression and tone, costume, sound, music, lightning, mis-en-scène, set design, editing, camera (angle, distance, movements), depth of field, character qualities and histories, and narrative situation. Each of these cues can play a part in creating a mood orientation or a strong emotion."

[49, p.42] (see also Arnav Jhala, p. 55)

Just like film, interactive drama can provide a variety of redundant cues, some stronger and some more subtle, depending of the choices and the mood state of the user but it is important to realise that a mood state is not something that can make a 180 degree turn from one second to the other. We have to rather think of it as a process that requires a careful attunement of pace and timing. Occasional moments of strong emotions are required to maintain a particular mood and a high number of more subtle emotions might be required to guide the user into a different mood state.

Smith proposes the so-called *mood-cue approach*, an approach that assumes that films, and I propose that this is true for interactive drama as well, have to use coordinated sets of cues to signal an emotional orientation toward the film. "[L]ater bursts of highly coordinated cuing [...] can bolster or alter the mood". [49, p.44] The approach emphasises the interaction between mood and the arrangement of coordinated cues to evoke emotions. Obstacles that hinder the user from achieving desired goal states are essential for appealing narrative but these obstacles alone are in most cases not sufficient to sustain the user's mood. Other elements are required to provide brief emotional moments. Smith calls these elements of narrative with the primary purpose of eliciting some emotion "emotion markers". [49, p.45] These elements have no influence on the narrative itself and could be omitted without any influence on the cognitive understanding of the story. What would be missing, however, is the emotional experience a entertaining story should provide. As Smith correctly states, few texts, and I might add especially not interactive drama, can rely only on narratively significant moments to provide mood-sustaining emotion. An important task of each author of interactive drama systems will be to find appropriate markers to create the intended mood, might that be some "cheap scare", a sad newspaper article the player character reads or environmental expressions like an upcoming storm, dark lighting or long shadows. Only if these single cues are carefully timed and coordinated they will be capable of establishing the intended mood of the interactive drama.

3.3 Interest

Interest is a topic that requires in-depth investigation. Central to this investigation is the question whether or not interest can be considered as an emotion. A discussion between Carl Plantinga and Ed Tan provides a

good overview about the conflicting views. While this discussion originates from the research field of film theory, I argue that many of the points discussed are relevant for research on interactive drama as well. Central to the discussion is Tan's proposal that "in the affect structure of all traditional narrative films, and possibly other films as well, interest is the dominant emotion." [54, p.23] Plantinga on the other hand questions whether such an overarching, global structure to film affect exists at all. [37, p.2-3] More specifically Plantinga doubts that interest can be considered as an identifiable, distinguishable emotion. He argues that even if we assume that interest is an emotion it would be too broad a concept to be of much value to researchers. The reason for that, as Plantinga writes, is that while emotions other than interest "require that a particular kind of judgment be made about the object, [...] to experience interest, [...] my judgment can be of just about any sort ". [37, p.10] This makes interest differ from other emotions because it lacks a single identifiable concern. Instead of regarding interest as a genuine emotion Plantinga suggests to regard it as a prerequisite for other emotions, simply for the fact that we have to be interested in an object to experience fear, disgust or many other emotions. Whether this is really the case, I would argue, is highly debatable. There is a second aspect of Tan's theory that appears problematic to Plantinga. He criticises that Tan describes suspense, curiosity and surprise as different types of interest and subsequently Plantinga argues that if that were the case we would also have to consider emotions like fascination, anticipation and others as kinds of interest which would make interest a concept "too broad to be of explanatory value ." [37, p.14]

Instead of proposing an alternative to the theory that interest constitutes an overarching motivation for film viewing, Plantinga argues that there can be no theory of global affective motivation for film viewing at all.

"The film viewer may find empathetic reactions to characters to be a fundamental motivation for viewing. Perhaps childhood development has something to do with our fascination for narratives. But so are a thousand other attractions and interests provided by the texts. The sources of these pleasures of the text are too various to be admitted under a single theory of human motivation, or at least, a theory of human motivation that is sufficiently nuanced to be useful in the study of film affect." [37, p.14]

Rather than a grand theory Plantinga proposes a piecemeal theory about film theory, yet, as he writes, this theory must also include the discussion of broader issues, having to do with motivation and psychology. His approach makes the following assumptions [37, p.16]:

- The study of affect is best initially approached at the local level, as the attempt to isolate and describe individual affects or affect trajectories, and the structure that elicits them.
- At the global level, we can best approach a film as an intentional orchestration of multiple affects, rather than as a text that generates a single, overarching affective or emotional state.
- The overarching and unifying principle of a text is its narration, and narration is best described as a formal, not an affective construct. In other words, the unity of affect in a film should be located at the level of narration rather than in the affective experience, and the actual affective experience should be considered to be a potentiality of the text rather than a guaranteed outcome in the spectator.
- Affect is also integral to the cognitive structure of a text, and usually fundamental to a text's meaning and thematic. As such, it plays centrally into a film's aesthetic rhetoric.

Tan partly agrees with Plantinga's proposal, at least in regard to the need of piecemeal research. But contrary to Plantinga he does believe there is an overarching mechanism, and this mechanism is interest. Before Tan goes into more detail on this part of the discussion he starts with providing his view on whether or not interest can be regarded as an emotion. In his opinion interest is indeed a "crucial emotion not only in film viewing but in works of art in general." [54, p.25] He argues that interest is not only elicited by the novelty of a stimulus but also by promise. To keep a user interested in interactive drama a critical aspect of the experience is to create and sustain anticipation. That is exactly what promise is about. It is this promise that keeps the reader of a book, the viewer of a movie or the player of an interactive drama engaged in the experienced story and willing to continue. Tan suggests that cognitive film theory should clarify what parameters constitute promise at any stage of film viewing and I do believe that this investigation is also important for interactive drama. In most cases, Tan argues, the promise is based on the different outcomes anticipated by the viewers but there is also promise with some intrinsic value in different aspects of the storyworld itself. Tan refers to Frijda's law of concern [20] in [54, p.26] which states that there is no emotion without concern. Therefore, if interest should be regarded as an emotion, it has to be clarified what its concern is. According to Tan "the concern that is related to interest is a need for novel experience and engagement, or negatively stated, a need for avoiding boredom." [54, p.26] He refers to this general need for variety or perceiving, seeing and knowing as source concern. [19] in [54, p.26] Combined with the aforementioned promise the concern of interest can be explained with the viewers hope for a preferred outcome or the fear of the opposite. Experiencing emotions normally results in an emotional response or action tendency. Similar to concern the action tendency of interest is not obvious. As mentioned above, Plantinga criti-

sises that Tan is not specific on whether surprise, curiosity and suspense are separate emotions or only examples of interest. Tan indeed suggests that we should regard these three emotions as types of interest because "they all involve a promising prospect of getting wanted knowledge." [54, p.31] As Plantinga argues this notion makes interest a very broad concept and the important question is, if it is not actually too broad to possess much explanation value. Tan does not think so. On contrary he argues that it is exactly this breadth that lends interest its explanatory power. In his opinion interest is the only emotion that explains why a film viewer is ready to go on watching at any moment during a film, interest is "an explanatory concept that because of its breath connects various layers of the cinematic experience, from the micro-processing of events within a scene to the appreciation of an entire film." [54, p.33]

To answer the initial question whether an overarching theory of affect in film viewing is possible, Tan presents a model of emotion in film viewing, which he had already presented in 1996. The Model consists of three layers as shown in Figure 3.2.

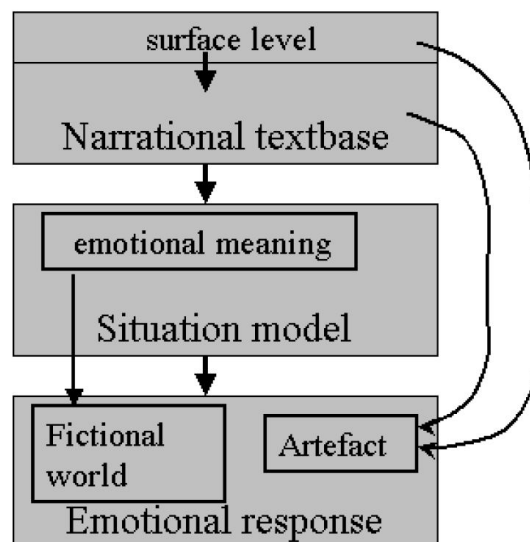


Figure 3.2: Tan's three layer causal model of emotion in film viewing [54, p.24, Figure 1]

The first layer of Tan's model is the narrational text base. As Tan explains, this layer contains propositions obtained from sentences, propositions obtained as a result of inference operations, and structural rela-

tions between groups of propositions. These inferences, Tan continues, are the causal determinant of interest: "[...] explanatory inferences contribute to preliminary understanding, and predictive inferences are the basis for hopes and fears. Unfinished understanding and specific expectations keep perceived promise at level required to sustain interest, or cause even higher levels." [54, p.35] The second layer of the model is called situation model which corresponds to the storyworld in interactive drama architectures. It contains all the objects, events and characters of the presented story. Important to note here, as Tan writes, is that this situation model constitutes the input to emotional appraisal which then results in suspense, curiosity and fear. If the elements of the situation model have emotional significance to the viewer they have an emotional response. This is the third layer of the model. This response consists of three elements [54, p.36]:

1. An action tendency
2. The experience of this tendency
3. The experience of appraised emotional significance of the stimulus

Tan explains the causal relationship between these layers by concentrating on two essential emotions in the experience of any form of narrative: interest and liking. Figure 3.3 shows this inclusive model. The model also includes the notion of A-emotions so a short description of the difference between A-emotions and F-emotions seems necessary. I will go into more detail on this topic in Chapter 5 but for the moment it is sufficient to understand that A-emotions are for example elicited by a film viewer's admiration of an actor or some outstanding stylistic aspect of the story presentation while F-emotions are responses to aspects of the storyworld itself. Therefore, as the model shows, the emotions of liking and interest can either result from the aesthetic enjoyment of the story presentation (A-emotions) or from *feeling with* the protago-

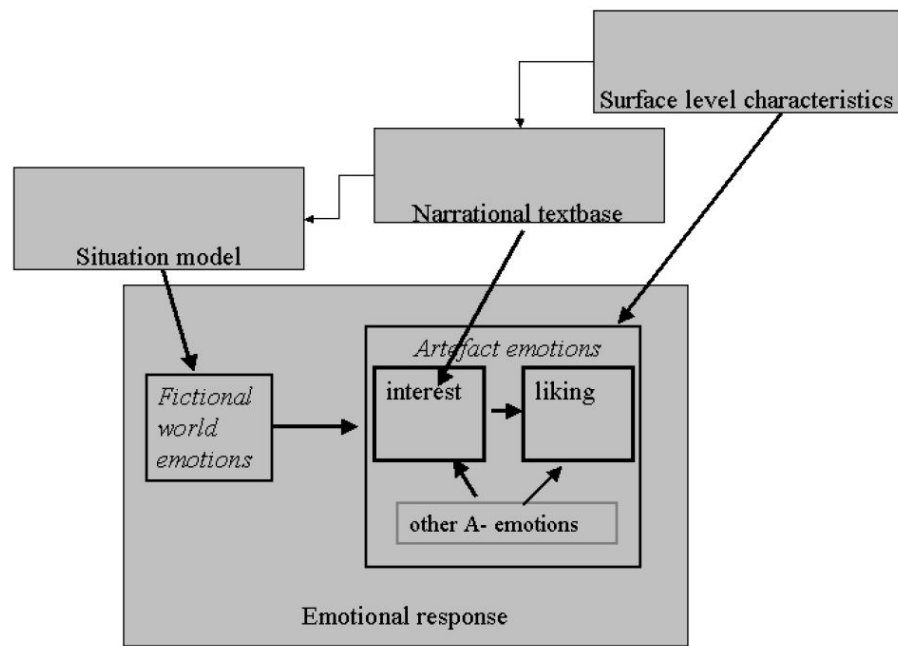


Figure 3.3: The underlying causal relations of emotional response to film [54, p.38, Figure 2]

nist (F-emotions). This causal model of the two core affect variables, interest and liking, Tan argues in reply to Plantinga's critique, "[...] can act as a framework or a scenario for piecemeal research that should aim at testing each of the numerous hypothesis contained in it. [...] In the long run, the larger picture of the complex network of affect structures will gradually arise." [54, p.40] This is indeed a very promising conclusion and I do believe that research on interactive drama is very well suited to contribute to this field of research because we can interpret the user's emotional state at any given moment not only by their introspective explanations but also by the choices made during the course of the narrative.

4

Immersion in a virtual world

I have already mentioned the "interactive paradox" in chapter 2. What we want to achieve in interactive drama is to create an immersive storyworld and thereby an engaging user experience. The problem is that immersion can be achieved by providing the feeling of agency or by telling an interesting story that is close to what the initial story author had in mind. Unfortunately these two concepts seem to contradict each others. To tell an interesting story the user's agency has to be drastically limited and vice versa providing too much user freedom makes it extremely difficult to present an engaging story. We have already seen the "Mutiny" storyworld presented in *IDtension* which, to cite Marie-Laure Ryan, basically "rely[s] on the archetypal narrative pattern described by Vladimir Propp and Joseph Campbell [where] a hero receives a mission, fulfils it by performing various tasks, and gets rewarded in the end." [43, p.50] This is not only true for interactive drama systems like *IDtension* but also for almost all traditional computer games, as I have shown when presenting *Fallout: New Vegas*. This is not to say that these systems cannot provide an immersive user experience. Quite the contrary,

most players would approve that the experience in *Fallout: New Vegas* is quite immersive. However, *IDtension* is not exactly successful in creating that kind of immersion. Computer games rely on different types of immersion than I would suggest as being adequate for interactive drama. Ryan [43] describes four different types of immersion, the first three of which are used in computer games. First, there is spatial immersion. Modern graphic engines are capable of presenting impressive and realistic environments that change according to the players spatial movements. Therefore, by moving around and exploring the storyworld the player feels immersed in a constantly changing world. Second, there is what Ryan calls epistemic immersion. We have seen this type of immersion in *IDtension* and in *Fallout: New Vegas* even though the realisation is quite different. Basically epistemic immersion is the desire to know and it can be achieved by allowing the user to investigate and manipulate objects and my presenting a dialog system that allows the user to gain additional knowledge about the storyworld. Third, there is temporal immersion, closely related to the three narrative effects of curiosity, surprise and suspense. The player is curious about how the story progresses, surprised by unexpected events and experience suspense when they know that the main character can choose between different actions that may have very different consequences. Similarly, Sternberg argues that "suspense, curiosity, and surprise always play a key role in shaping our attitude toward an event, motive, character, worldview, [and] point of view [...]" [51, p.352] and even goes so far as defining narrativity as such as "the play of suspense/curiosity/surprise between represented and communicative time (in whatever combination, whatever medium, whatever manifest or latent form)." [50, p.329]

Additionally, there is a fourth kind of immersion described by Ryan, rarely found in computer games. This kind of immersion is called emotional immersion and is especially interesting for our approach. With

our goal of moving from simple object manipulation to the simulation of interpersonal relations between the human user and the AI-based non player characters one of our most important goals is to get the user to feel emotional bonding with other characters in the world and even experience empathy. Achieving this kind of immersion is also an important aspect of quite a famous interactive storytelling system called *Façade*.

4.1 Façade



Figure 4.1: The *Façade* user interface

According to Chris Crawford, *Façade*, developed by Michael Mateas and Andrew Stern and released in 2005, is "without doubt the best actual working interactive storyworld yet created." [14, p.318] The official description of *Façade* goes like this:

"*Façade* is an artificial intelligence-based art/research experiment in electronic narrative—an attempt to move beyond traditional branching or hyper-linked narrative to create a fully-realised, one-act interactive drama. Integrating

an interdisciplinary set of artistic practices and artificial intelligence technologies, we have completed a five year collaboration to engineer a novel architecture for supporting emotional, interactive character behavior and drama-managed plot. Within this architecture we have built a dramatically interesting, realtime 3D virtual world inhabited by computer-controlled characters, in which the player experiences a story from a first-person perspective." [38]

Façade is loosely based on a play by Edward Albee that premiered on October 1966, called "Who's Afraid of Virginia Woolf". The initial setup in *Façade*'s modernised version of that play goes like this: the player character is invited for dinner to the apartment of two old college friends, who are now a married couple. It soon turns out that their marriage is about to break apart. Only the player's actions can save their marriage, but of course only if this is the player's intention. A screenshot of *Façade* is shown in Figure 4.1. While most contemporary interactive drama systems rely on turn based interactions and interaction via menu selection, in *Façade* the player can move around freely inside the apartment and interact with the NPCs using free text entry. Of course the system is far from flawless, but as Wardrip-Fruin writes: "*Façade* doesn't always work, but more often than not it does, and with this it demonstrates that the dream of interactive drama could be made a reality." [57, p.330]

When I discussed the *Oz Project*, I mentioned that Joseph Bates and his colleagues regarded a *drama manager* as an essential part of interactive drama and since Michael Mateas was one of the final PhD students participating in the *Oz Project*, it is no surprise that *Façade* also reintroduces this concept. However, *Façade* uses a quite different structure than *Oz* that is based on "beats", a concept of action/reaction behaviours

which "shape the turning of a scene" [31, p.37] in [57, p.331] Therefore the whole drama is built up by a large number of short scenes that can be swapped and mixed according to the players actions. The drama manager ensures that the drama unfolds in an Aristotelian way by increasing the tension of succeeding beats until the drama reaches climax, after which the tension diminishes again.

The natural language interface is another strong point of *Façade*, but also comes with some limitations. As mentioned earlier, a computer is far from understanding natural language in a way humans do, therefore *Façade* has to rely on tricks to reduce full sentences to keywords that fit approximately to *Façade*'s discrete discourse acts. Of course this leads to many mismatches, but often these go unnoticed by the audience "due to the clever ways that *Façade* deflects and recovers in many circumstances." [57, p.340]

While *Façade* does not really succeed with creating emotional immersion it still is a noteworthy achievement in interactive drama presentation. However, *Façade* misses another opportunity provided by the medium, namely creating emotional immersion by relying on aesthetic qualities. Ryan already gave the example of the beautiful landscape where exploration is an end in itself, but she underestimates the power of aesthetics in art works (and interactive drama is supposed to be a work of art) for eliciting various affective states.

4.2 Aesthetics and emotions

Interactive drama, like film and also classical drama, differs from written literature to that effect that it can not only rely on its narrative structure to elicit emotions in its audience but can also borrow from other art forms to create the desired effects. As I have mentioned earlier,

psychology of emotions did not get the attention it deserves during the twentieth century and the same can be said about psychology of arts and aesthetics. But as I will show, there has been some interesting development at the intersection of these approaches that allows us to research interactive drama as what it is supposed to be: an art form that creates an engaging emotional experience. However, this leads to new questions, most prominently to the question whether emotions elicited by interactive drama or other art forms can be considered as genuine emotions.

4.2.1 Appraisal theory of aesthetic emotions

"What can the humanities contribute to an understanding of aesthetic emotions?" Tan asks at the very beginning of his chapter on "Emotion, Art, and the Humanities". [55] While early research was focused on elitist texts, the field of research now also includes images and theatrical performances as well as film and other forms of new media, therefore opening the door to include research on interactive drama technology.

According to Tan art works have to fulfill the following criteria [55, p.117]:

1. Art works are human-made artifacts resulting from some deliberate design
2. Art works attract attention to themselves as objects
3. Artworks represent meaning that extends beyond themselves
4. Art works can have various functions, ranging from purely aesthetic to religious and entertainment or plainly functional uses.

The essential question Tan tackles now is whether or not emotions elicited by art work should be regarded as a genuine emotion. Tan defines two different types of emotions in the appraisal of art works called A-emotions and R-emotions. A-emotions are the emotions related to the artifact itself, e.g. the beauty of a painting whereas R-emotions are



Figure 4.2: A-emotions and R-emotions in war photography [23]

emotions resulting from the appraisal of the represented world. One might wonder why Tan uses a different term now, since F-emotions were already defined as responses to aspects of the fictional storyworld which seems to be a quite similar concept. The main difference may be that in an art form like interactive drama we feel with the player character even though we know that this is just a fictional world. Still we have an understanding of the emotions a real person would feel in a situation that is similar to the situation of the fictional world. Experiencing sadness when the player character is confronted with a tragic loss would then be an F-emotion. An R-emotion on the other hand would be the sadness we experience when seeing a picture of a dead soldier (Figure 4.2) and realise that his family will have waited for ever for him to come home. But how should we classify the emotions we experience when watching an intense battle scene in a war movie? Are these F-emotions because we are aware that these are only actors and fake bullets and blood, or are this R-emotions because we are aware that the horrors we watch on our screens did really happen to real people?

R-emotions associated with images like the one above could be R-

compassion, R-sadness or R-disgust. [55, p.120] However this does not mean that we do not experience A-emotions as well when viewing such pictures by admiring for example the quality of the picture itself or the courage of the photographer who risks their life to take pictures like this. Still, Tan reminds us, these R-emotions are only the response to an imagined situation because the stimulus, like the war photograph above, is only a representation, “[...] the emotional response is a feeling - that is, an emotion with a virtual action tendency, because the action repertoire is essentially empty”. [55, p.120] This is a topic where researchers on interactive drama should sit up and take notice. As Tan correctly explains, most art works call for passivity but it is evident that interactive drama, per definition, does not. While looking, listening and reading might be the appropriate responses to most art forms, interactive drama, as the name suggests, is designed for interactivity and thereby opens new doors for researchers on art and emotions. Yet many aspects of Tan’s theory are relevant for passive art and for interactive media alike. The core of appraisal, he writes, is challenge mixed with promise [55, p.120] and the search for understanding, which constitutes the challenge in passive art, is in my opinion also essential to interactive drama.

An interesting concept is the concept of "themes" which he defines as “materials available in the physical and cultural world that have an emotion potential, that are already on people’s minds - ready, as it were, to be launched wrapped up in some representation. Themes, then, are the major causes of R-emotions.” [55, p.121] So what are these themes that are capable to elicit emotional response in the majority of audiences. The first category of themes Tan mentions are popular themes like incest or the revenge of angry gods but also eternal themes like death, love, betrayal, good versus evil and so on. Tan argues that these themes elicit an emotional response because the touch on basic concerns and contain core components of emotional meaning, like valence and dif-

ficulty. Directly portraying emotions as such by simply showing for example faces in different emotional states, or other bodily displays of emotions can also function as themes but there are also art forms like music that cannot rely on such techniques. Nevertheless these art forms, Tan argues, are also capable of mediating emotional affect.

While, like mentioned above, themes induce R-emotions, Tan argues that “[t]he concept of A-emotions is in large part based on the assumption that style is a source of emotion in its own right.” [55, p.123] He defines style as follows:

"[...] style, whether it is defined for schools, oeuvres, or individual works, is a characteristic pattern in the choice of techniques made with some set of constraints. The choice is not necessarily a deliberate one, and the constraints may arise from a number of different sources, including historical convention specific to an art form or genre, the availability of technological means, and contemporary ideology and tastes." [55, p.123]

Tan describes two different appraisal processes in style-evoked aesthetic emotion, the first being a simple perception of a pattern, the second a deeper understanding of the problem and the solution. As I have already argued, provoking and sustaining interest is essential to provide an engaging experience with interactive drama systems. Tan argues that identifying the problems and possible solutions creates both a challenge and a promise to the user and determining the optimum ratio between the two of them is the subject of research in experimental aesthetics.

4.2.2 The make-believe theory

Tan claims that emotions cannot exist without a stimulus that has at least some reality value. [55, p.126] The question he asks with regard

to art works is, what the reality of the stimulus we perceive is. An answer to this question, he proposes, might be found in the so-called make-believe theory which states that the viewer of art work engages in an act of imagination of make-believe. Emotion, he continues, is both part of the imagination, and a result of the vividness of imagination. The beholder imagines that they sees events happening to characters and this elicits an empathic response. He refers to some of his previous work where he made the following suggestion:

"[...] the film viewer imagines him- or herself to be physically present in a fictional world, and [...] it is very difficult to resist this illusion. [...] [T]he film viewer's imaginary position in the fictional world is identical to the witness position people take or are forced to take in the reality of daily life." [55, p.126]

While this witness position is distinct from the role the user plays in an interactive drama, I do believe that the make-believe theory is valuable for researchers in this field as well. It is plausible for three reasons, Tan explains, from which the first is that it does not require likeness between substitutes and what they stand for. [55, p.126] Like a child can use about anything as a substitute for anything when playing, a viewer of art works is quite capable to stretch their imagination when experiencing for example a picture or a movie. This suggests that a user of interactive drama who actively immerses themselves into the storyworld will experience genuine R-emotions.

The second reason why Tan regards the make-believe theory as plausible is that the theory does not imply that viewers of an art work actually believe, that they perceive a real event. The picture of a dying soldier is still what it is: a picture. Tan argues that situations might occur where viewers actually forget for a moment that what they are experiencing is

not real, but this is only a momentary effect. Of course a film maker or a creator of any other form of media wants to achieve an engaging experience for the viewer or user but, at least at the current state of technology, we are not capable of providing an experience that makes the audience forget that what they are experiencing is just an illusion.

For research on aesthetics and emotions, Tan argues, the most relevant reason why the make-believe theory is plausible is the fact that it links imagination to emotion. He believes that from a functional perspective “it is obvious that imagination in the sense of simulation of events and other people’s mental states can result in real emotion, because being aware of the relevance for concerns of an imaginary situation (and ensuing mandatory and possible courses of actions) before the fact rather than afterward, has adaptive value.” [55, p.127] The intensity of Remotions in the experience of art, he continues, may then be a function of the imagined possibilities that it opens up to the beholder. This, in my opinion, is even more relevant for interactive drama since in this field of research, while the events are still fictional, the possibilities to intervene in the characters fate are real.

In the next chapter we will see that the concept of make-believe is very important for interactive drama. While we are not able to provide a fully immersive experience — that would be Murray’s “Holodeck” [34] — there is hope that a willing user uses their cognitive capabilities to complete what is presented on screen to build a cognitive construct in their minds that substitutes a fully immersive storyworld.

5

Uses of player mood modelling in interactive drama presentation

We have seen now that there are various ways to elicit different affective states in interactive drama systems, not only through engaging narrative but also through different presentation techniques that have already been studied in research fields such as (cognitive) film theory and philosophy and psychology of aesthetics. However, little has been said with regards to why affect elicitation in general and player mood modelling in particular are especially important for interactive drama systems. While the systems we have investigated thus far were first and foremost developed for entertainment purpose some researchers have realised the potential of interactive drama systems for therapeutic and pedagogical use. In these systems understanding and responding appropriately is of highest relevance because the idea behind these systems is to support the user in developing coping strategies to deal with real life problems. Affective states are essential for adaptive regulation of cognitive behaviour [9, p.65] and therefore for developing appropriate

coping strategies. However, as I have explained earlier, mood changes cannot happen from one second to the other. Rather the system has to "understand" the current state of the user and use subtle cuing to guide them into different affective states. Before I will present three interactive drama systems that have been developed for therapeutic or pedagogical use, let us focus our attention on cognitive-affective behaviour regulation, to see that the influence of different mood states on cognitive processes and (social)behaviour is even more profound than one might assume.

5.1 Cognitive-affective behaviour regulation

In their book chapter "Mood and the Regulation of Information Processing and Behaviour" Bless and Fiedler present the concept of "regulation" by which they refer "to all kinds of adjustment processes that serve to keep stimuli and reactions within an appropriate range, and to prevent them from exceeding critical boundaries." [9, p.65] More specifically they discuss how individuals' mood states influence the regulation of a wide spectrum of cognitive processes and behaviours. The most interesting for us are:

- Regulation of exposure to pleasant or unpleasant information
- Regulation of transgression versus conformity
- Regulation of abstractness of thinking
- Regulation of elaboration versus truncation of thinking and problem solving

Understanding the influence of different mood states on these regulations will allow us to infer from the user's choices their momentary

mood-state and thereby generate an appropriate user model that allows us to fit content and presentation style individually to the user's current mood-state. There is however one important aspect to consider here, namely that these conclusions can only be drawn under time pressure because unlimited processing time helps to overcome all mood effects on cognitive processes and behaviours. [9, p.65] The consequence of this claim will be discussed in the next chapter. For now let us examine the influence of differing mood states on cognitive processing and behaviour.

Evidently individuals prefer being in good mood to being in bad mood and therefore strive to maintain positive and avoid negative affective states. To do so they have developed a behavioural and cognitive repertoire that serves this function. [9, p.66] To support this claim, Bless and Fiedler refer to experiments that showed that helping behaviour increases with sad mood, indicating that what appears to be altruistic behaviour is rather an individual's attempt to increase their own well-being. Nevertheless, individuals also engage in activities that might decrease their mood-states for the sake of gaining self-relevant information or achieving a higher goal. Not surprisingly, people in a happy mood are much more willing to do so. For this very reason depressive patients "have been shown to be unable to deliberately expose themselves to negative stimuli, or to accept a short-term disadvantage in order to gain a stronger long-term advantage. Their ability to sacrifice part of their payoffs for the sake of curiosity, explanation, or higher social goals is reduced." [9, p.69] Most importantly, this is not only true for seriously depressed patients but also for individuals who are just momentarily depressed because they have consumed sad media.

Transgression of social norms often leads to undesirable consequences. Since we just heard that individuals in sad mood try to avoid unpleasant situations, it comes as no surprise that happy people show more

norm-deviant behaviour whereas sad or even depressed people show more norm-conforming behaviour. This has also been studied in human communication where "happy people engage in more impolite and less restrictive and controlled social behaviours than dysphoric people, as well as the complementary findings that recipients perceive the same communications as less impolite when they are in a good — than in a sad — mood state." [9, p.69]

Bless and Fiedler present evidence that individuals' affective states have direct influence on the level of abstractness of thinking. More specifically they present evidence that positive affect results in increased integrative complexity. [9, p.70] Experiments have shown that happy participants are more likely to assign atypical exemplars to a category, to sort stimuli into fewer groups, to cluster information into larger chunks, to have a higher level of spontaneous clustering and generally show an increased flexibility of categorisation processes.

Furthermore Bless and Fiedler propose, that happy moods are associated with heuristic processing strategies, whereas sad moods are associated with a systematic elaboration of the information that is presented [9, p.62] Strong evidence supporting this claim comes from studies on persuasion and person perception showing that participants in happy moods were less influenced by message quality — they are equally persuaded by strong and weak arguments — and that happy participants are more likely to judge others based on stereotypes. In general it can be said that "individuals in a happy mood are more likely to rely on heuristics or stereotypes, whereas individuals in a sad mood are more likely to attend to the specific information provided." [9, p.73] Basically this means that happy people are less motivated to invest cognitive effort than sad people. However, Martin et al. [29] have shown that the willingness to invest cognitive effort is sometimes task dependent. If participants performing a task were asked to continue as long as they enjoyed

it, happy people continued longer whereas when asked to continue until they were satisfied with their performance sad people continued longer.

5.2 Interactive drama in pedagogical and therapeutic use

Interactive drama is more than just a new breed of entertainment software. As different research projects have shown, these systems can also be used for pedagogical and therapeutic purposes. The goal of these systems is teaching sophisticated problem solving skills by allowing the user to interact with compelling stories that have didactic purpose. [28, p.301] Empathy is important for all interactive drama, but even more important if the drama should serve pedagogical or therapeutic purpose. In interactive drama systems that serve entertainment purpose, the user might be willing to play characters essentially unlikeable, when for example playing the villain, but if the system is intended to teach correct behaviour or problem solving skills to the user, empathising with the character is essential. Basically the idea of interactive drama in pedagogical or therapeutic use is that the user plays a character in a story-world which faces problems similar to those the user faces in real life. These systems can be applied to a wide range of different conflict systems, from young children dealing with bullying at school, over soldiers dealing with military conflict, to health care professionals dealing with moral conflict in their everyday life. In this section I will present three of these systems.

5.2.1 Carmen's Bright IDEAS

In *Interactive Pedagogical Drama* Marsella et al. describe an agent-based approach to realising interactive pedagogical drama. Unlike in systems like *IDtension* the player does not control the characters actions but only the characters emotional state. This fact puts the system

presented here somewhere between generative storytelling systems and interactive drama. The approach presented by Marsella et al. is based on four design principles [28, p.301]:

- Characters in the drama choose their actions autonomously following directions from the learner and/or a director agent.
- Director and cinematographer agents manage the action and its presentation in order to maintain story structure, achieve pedagogical goals, and present the dynamic story so as to achieve the best dramatic effect.
- Multimedia presentation makes the story more accessible, particularly for learners with language or literacy problems.
- The overall goal is to ensure that the resulting presentation is dramatically effective and achieves high artistic and pedagogical standards, while permitting significant learner control and dynamic interaction.

The system designed to realise these principles is called *Carmen's Bright IDEAS*. It is intended to help mothers of paediatric cancer patients to deal with the strong emotional, physical and financial strains they face. The problem solving approach taught by the system is called *Bright IDEAS* (hence the system's title) and "[e]ach letter of *IDEAS* refers to a separate step in the problem solving method: Identify a solvable problem, Develop possible solutions, Evaluate your options, Act on your plan and See if it worked." [28, p.301]

The story presented in *Carmen's Bright IDEAS* is that of Carmen, mother of a nine-year-old son suffering from leukaemia and a six-year-old daughter. The story has three acts. The first acts provides a back story by, for example, showing Carmen interacting with her boss who complains about her neglecting her work or with her daughter who behaves defiant because of a lack of attention from Carmen. These scenes should help

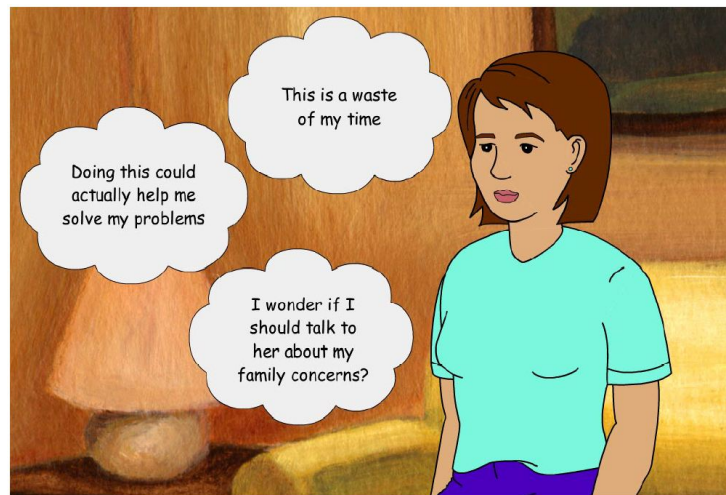


Figure 5.1: User's choice of thoughts for Carmen [28, p.303, Figure 2]

the user to empathise with Carmen. The second act plays mostly inside the office of Gina, a hospital counsellor, who proposes the *IDEAS* problem solving approach to Carmen. She supports Carmen with the initial three steps, namely identifying the problem, developing possible solutions and evaluating the options. During this scene the user can make choices about the inner thoughts of Carmen (see Figure 5.1). These choices influence the emotional states of the character and have direct impact on her thinking and her behaviour and thereby influence the development of the drama. In the third act finally, Carmen carries out the actions she has decided on with the counsellor. It is presented as a linear sequence but the choice of presented scenes depends on the decisions made in the second act.

Interactive drama systems like *Façade* or *IDtension* are immersive, letting the user themselves play a role in the presented storyworld. *Carmen's Bright IDEAS* adopts a presentational approach, with the user being able to influence the course of action without actively participating as a story character. Marsella et al. explain that, in addition to some technical limitations, there are also clinical reasons for this choice. [28, p.302] The goal of the system is not for the user to deal with severe emotional dilemmas in a virtual world, in addition to all the problems she faces in real life but rather the user should empathise with the character

and learn problem solving skills from her, without having to make demanding decisions herself. This is indeed a delicate decision to make. On the one hand I argue that immersive interactive drama allows for even more empathy with the character but on the other it is certainly true that this could be an additional burden to the mother struggling with many problems in her everyday life. I would suggest that the choice between presentational and immersive drama should be decided based on the intended audience.

5.2.2 Prom Week



Figure 5.2: The Prom Week Interface

Prom Week is not exactly an interactive drama system but rather "a social simulation game about the interpersonal lives of a group of high school students in the week leading up to their prom." [30, p.1] Nevertheless, the system generates interesting stories based on the user's choices and interactions. *Prom Week* differs from the other systems in this chapter to that effect that it does not provide the user with control over one specific character's actions but rather the user is free to

"indirectly sculpt the social landscape by having characters engage in social exchanges with each others." [30, p.1] *Prom Week* features more than 3500 social considerations that are managed by an artificial intelligence system called *Comme il Faut* (CiF). This system allows the player to engage in so-called social physics puzzles where the "smallest social change reverberates and impacts the entire system leading to emergent solutions and surprising, yet satisfying, outcomes." [30, p.1] The gameplay of *Prom Week* features different goals such as making the class nerd the prom king within a limited number of steps. Most importantly the artificial intelligence system ensures character believability even though there are innumerable solutions to each problem. As mentioned above, the player's role is that of an external observer who is free to select which social action all characters take. The story in *Prom Week* emerges from the actions the player takes in a storyworld created by the system's designers who also define the initial situation, the possible goals and the available interactions. The authors claim that the system "create[s] recognizable social situations [...] which are rich with the potential for drama." [30, p.2]

5.2.3 FearNot!

FearNot! is a virtual role-play approach with autonomous agents as social partners in scenarios related to exploring coping strategies for bullying. [18, p.1] Similarly to *Prom Week* the player in *FearNot!* takes the role of an external observer. The children, for whom the system was developed, watch a scene where a character is bullied at school. They then are free to give advice and suggest different coping strategies. By doing so, they are expected to empathise with the victim and transfer this attitude to real life situations, thereby becoming motivated to stand up against real life bullying. The main objective of *FearNot!* is to use the systems immersive power to fight bullying in schools and

thereby prevent long term effects such as academic regression, social anxiety and somatic and psychiatric symptoms. The authors describe *FearNot!*'s working mechanism as follows:

"By interacting with the victimised virtual character, we hope to prompt empathic reactions within the child user. [...] Apart from [that], *FearNot!* prompts reflection on a variety of coping strategies that the learner can suggest to the character in order to help him or her. If the learner runs out of ideas, the system will provide further coping strategies through the interaction with the characters."

By that the authors hope that the users really come to want to do something against real world bullying and additionally have a broad knowledge about possible coping strategies. In vein with what I have argued in the previous chapter, the authors of *FearNot!* believe that immersion is an essential precondition for every system with the goal of changing the user's attitudes and behaviour. In *FearNot!* character design — including the modelling of the agents' minds as well as the narrative structure of the learning experience — is the groundwork for an immersive user experience. The believability in *FearNot!* is on the one hand a result of engaging storylines and drama and on the other hand of the presentation of the virtual characters. More specifically, the authors prefer a cartoon style look over realistic character presentation because of a phenomenon called "the uncanny valley paradox" which says that character believability decreases when the character appearance becomes too realistic. I agree with this design decision and would also prefer a stylised art approach based on aesthetic considerations over a life like presentation. I will present a prototype of such an approach in the next chapter.

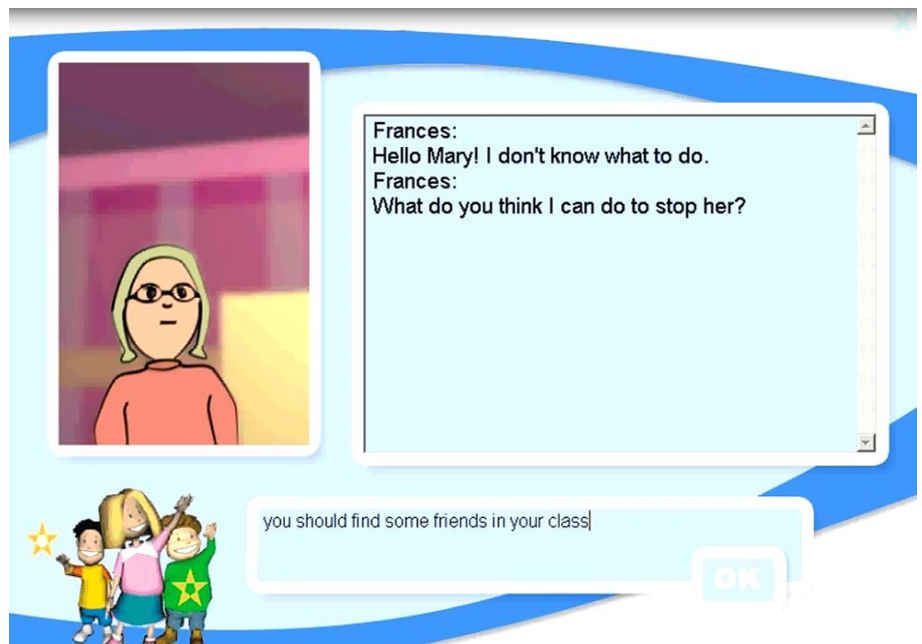


Figure 5.3: The *FearNot!* Interface

FearNot! is based on a multi-agent system with each agent being equipped with an "emotion-driven architecture named FAtiMA that is based on cognitive appraisal theory and on findings from research on coping." [30, p.3] This architecture produces narrative that dynamically emerges from interaction between characters. The system has been evaluated in the UK and in Germany with 1180 learners and preliminary results have shown that pupils empathically engage with the characters. Whether or not this is transferred to real life situations has yet to be shown.

6

Integrating the ideas

In this chapter I will provide some design considerations for interactive drama systems as well as a sketch of how such a system could look like. Basically this is supposed to serve as a summary of the approaches and research fields discussed so far. First, I want to present a list of aspects I would consider as being essential when designing interactive drama systems. Some of these aspects are potential subjects of change as technology advances.

- Interactive drama should be based on interpersonal relations and not on interactions with objects in a storyworld.
- "Save the princess" stories are not appropriate for interactive drama; they are already implemented very well in traditional computer games.
- Interactive drama has to be presented in real-time because unlimited processing time helps to overcome all effects of affective states on cognition and behaviour; it would therefore render any affective model useless.
- Each user has to be treated individually and to do so modelling the user's affective state is inevitable.
- To build this model an understanding of the influence of affective

states on cognition and behaviour is necessary, so that we can infer from the user's choices their affective state.

- Stylised presentation based on findings within the philosophy and psychology of aesthetics should be preferred over realistic presentation to avoid the "uncanny valley paradox"
- While natural language interfaces would be the preferred form of interaction, we have seen that with the current state of technology the negative aspects might outweigh the benefits. Therefore, for now, we have to find creative ways of making menu selection as convenient as possible.
- To elicit emotions and create affective states we should not rely only on the power of the narrative itself but also use every other possibility provided by the technology, such as visual effects, colouring, lighting, camera angles, sound effects and music amongst others.
- The purpose in interactive drama should not be winning but engaging in the storyworld by making useful choices.
- The interface has to support the user and must not be confusing or irritating; it has to be kept simple and intuitive because otherwise it takes a toll on the player's immersion in the virtual world.
- Emotion markers have to be used throughout the drama presentation to create and sustain desired mood states.
- Emotional immersion is essential for interactive drama; the user has to feel empathy for characters in the virtual world.

How could an appealing interactive drama system that is based on the findings and considerations discussed in this thesis look like? First of all the user interface has to be simple and intuitive because the audience of these systems, especially in pedagogical or therapeutic use, cannot be expected to be expert users. Most people however, are familiar with basic office applications and even more with web applications. Enter-

ing text into text boxes, clicking clearly labeled buttons and scrolling through list boxes using sliders could be expected from users.

Due to the shortcomings in natural language approaches I would discard a natural language interface like *Façade's* but also simple menu based selection as seen in *IDtension's* "The mutiny" scenario. A good and efficient compromise could be free text entry with auto completion as found for example in web-based search engines. However, the system cannot simply rely on auto completion based on string comparison because the list of available choices would again be too extensive to be manageable in a convenient way, especially when dealing with time pressure in a real-time system. Like the visual presentation of the drama itself we need algorithms to adjust the presented list according to the user's affective state. Thereby, choices most likely to be picked by the user are presented first and highly unlikely choices could be moved to the bottom of the list. Unfortunately building a really accurate model of the user's affective state is quite a hard task, especially at the beginning of the drama presentation when there is no significant history of the user's previous actions. Therefore, in the prototype presented in this chapter, there is also the possibility for the user to explicitly state how they feel about the current situation by using the 7-steps slider which automatically changes the facial expression of the avatar from very happy to very sad (see Figure 6.1 and Figures 6.2-6.6), similar to what has already been done with the so-called Self-Assessment Manikin, a "a non-verbal pictorial assessment technique that directly measures the pleasure, arousal, and dominance associated with a person's affective reaction to a wide variety of stimuli." [10, p.49]

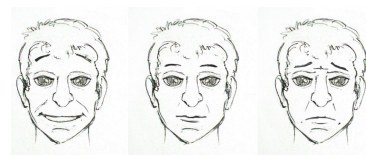


Figure 6.1: Portraits of different mood-states

As for the visual presentation I would suggest a semi-abstract approach to, on the one hand, avoid the "uncanny valley paradox" and, on the other hand, because it is easier to realise. A system like *Façade* that is only supposed to present one specific scenario could use a very detailed depiction of the scene and the characters because the visual artists have only to create the scenario once. Not so in a system like *IDtension*, which is designed to be basically capable of presenting an unlimited number of different dramas and storyworlds? I have already explained that in *IDtension* the theatre (the visual presentation) is strictly separated from the rest of the architecture to be able to rely on many different ways of presentation, from text based presentation over abstract approaches to nearly realistic, life like presentations. For the prototype presented here I would suggest to take the notion of theatre quite literally by presenting each scene as a virtual real-time stage play with actors and requisites. Figure 6.2 shows how this could look like.

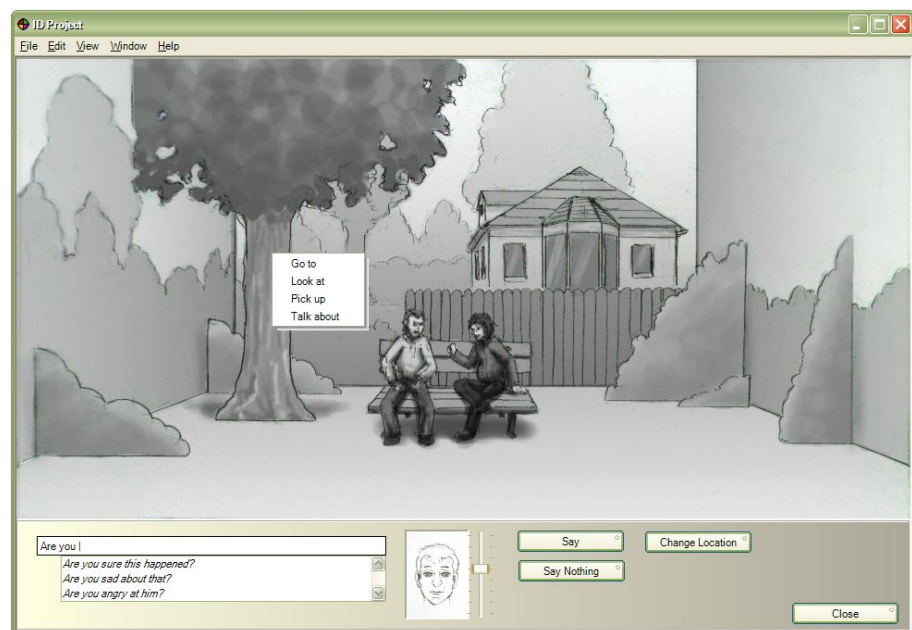


Figure 6.2: Scene 1 -
Happy mood

As you can see, the setup is simple. There are three walls that have to be "painted" with some background images and some painted requisites like a tree, bushes and a bench which could basically be swapped, removed, added and moved on the fly. Additionally there are two char-

acters which, while clearly distinguishable, are still rather abstract and generic. With appropriate computer tools, animating these characters is a fairly easy task. The scene you can see in Figure 6.2 shows a quite peaceful scenario of, say, two friends sitting on a bench talking about last nights' football match. Now have a look at Figure 6.3.



Figure 6.3: Scene 1 - Sad mood

I suppose you will agree with me that this scene has quite a different impact. The scene is essentially the same. From a technical point of view not much has changed. There are still the same backgrounds, the same objects and the same characters but the mood has changed. The whole scene is considerably darker, there are long shadows and you might also imagine hearing some ominous music and distant thunder growling, instead of e.g. birds singing in the previous scene. All these effects do not add to the narrative itself but to its affective quality. This is what we have already come to know as affective cuing. It supports eliciting specific emotions and — over time — changes the user's mood. Of course in a running implementation the change would not be that drastic but rather gradually changing, mostly unnoticed by the user. Bühling [8] et al. have implemented a similar approach by using soft and progressive deformations of scenery objects (Fig. 6.4) to change the emotional

mood of the scene. The juxtaposition above rather serves demonstrative purpose.

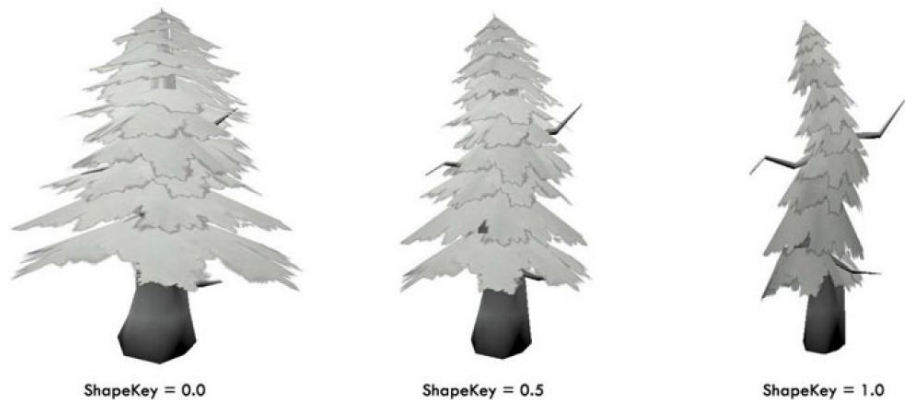


*Figure 6.4:
Dramaturgically
adjustable object at three
shape-deformation steps.
[8, p.292, Fig.1]*

Figure 6.5 shows a different scene, again in a lighter tone. There are still the three walls of the virtual theatre stage, some objects and two characters. Again the technical changes are insignificant but the scenario as such creates a different mood as Figure 6.3 even though it is bright, without shadows or ominous music and sound. Nevertheless, lying on a psychiatric's couch is generally considered as being less cheerful than sitting in the garden with a friend.



*Figure 6.5: Scene 2 -
Neutral mood*

Figure 6.6 might be considered as being the most unsettling because of the unpleasant scenario and the dark mood cues.

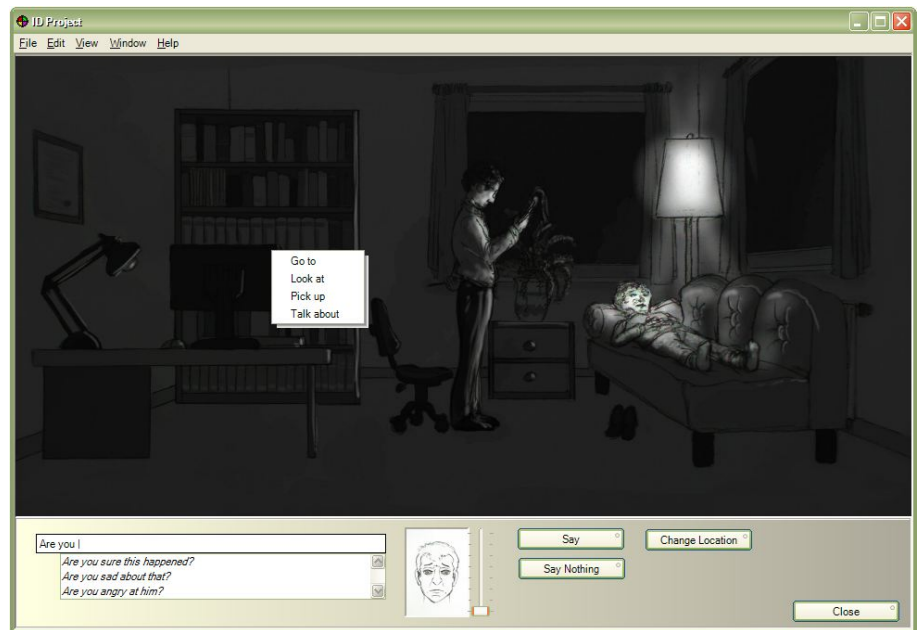


Figure 6.6: Scene 1 - Sad mood

However, some users might also consider this image as less unsettling than Figure 6.3 because the visual effects fit to the presented scenario. For that very reason, extensive user evaluation all along the development of interactive drama systems is of highest importance.

As already mentioned (p.35), in addition to these visual changes, effective camera techniques can be used to create different moods. In his PhD thesis Arnav Jhala states that "[t]he camera is a communicative tool that conveys not just the occurrence of events, but also parameters like the mood of the scene, relationships that entities within the world have with other entities and the pace/tempo of the progression of the underlying narrative." [24, p.30] He illustrates this with three screenshots taken from a movie, which show the progression of a character in the narrative from dominant to submissive. (Figs. 6.7 - 6.9)



Figure 6.7: Dominant character [24, p.32, Fig. 2.2(a)]

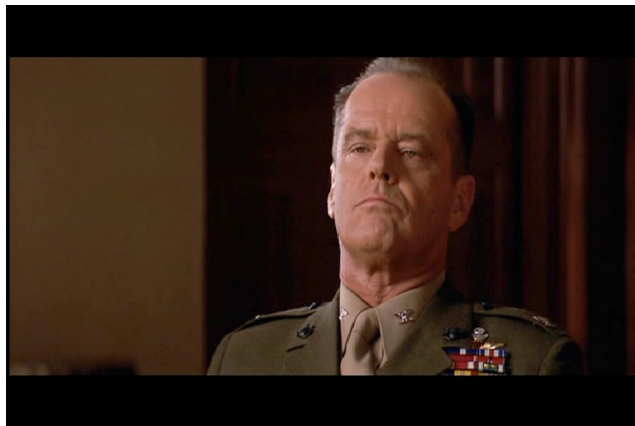


Figure 6.8: Neutral character [24, p.32, Fig. 2.2(b)]



Figure 6.9: Submissive character [24, p.32p.32, Fig. 2.2(c)]

During the course of this thesis cooperation between narratology and cognitive science has been taken for granted but there are also researchers who are much more sceptical about that. In 2009 Marie-Laure Ryan addressed this cooperation in an article fittingly called "Narratology and Cognitive Science: A Problematic Relation" where she argues that the contribution of the so-called "hard" cognitive sciences, such as neuroscience, to narratology should be taken with a grain of salt. More specifically she referred to recent MRI studies which claimed to have proven that, when experience narrative, mental simulations actually take place. Ryan does not challenge this claim per se because she used the concept of mental simulation herself in her studies on immersion but rather she doubts that narratologists actually gain something from these MRI studies. She argues that these studies only confirm what common sense tells us but "[...] current techniques of brain imaging have not yet reached the necessary precision to tell narratologists something truly new and in-

teresting concerning the cognitive foundation of narrative." [43, p.472] While MRI technology can show that there is neural activation in the same brain region when seeing a dog and when reading the word "dog", the configuration of active neurons that actually mean "dog" cannot be identified with current technology. Therefore, Ryan claims, MRI technology is of limited usefulness for narrative studies "for narrative, like any mode of signification, involves a cognitive level whose basic elements are symbols and not neurons." [43, p.473] This is a claim hard to refute but maybe there are other research approaches where cooperation between narratology and "hard" cognitive science is more fruitful. I suggest that research on interactive drama is such an approach.

The dilemma we face, Ryan argues, is the problem of the relation between speculative disciplines and experimental disciplines. What can they learn from each others, she wonders, and under what conditions is interdisciplinary cooperation possible? As we know cognitive science covers various disciplines such as philosophy, linguistics, (cognitive) biology, psychology, artificial intelligence, neuroscience and other disciplines with an interest in the study of the mind. If we regard narratology as one of these disciplines it would be situated somewhere next to philosophy as a speculative discipline whereas neuroscience and artificial intelligence are situated at the other end of the spectrum as experimental disciplines. Now remember for example the description of *Façade*, which I have already cited in chapter 4.1, where the system is defined as an "artificial intelligence-based art/research experiment in electronic narrative" [Mateas, Stern] and also reflect on the different research approaches and projects presented in this thesis. It becomes evident that research on interactive drama technology, especially with emphasis on affective modelling, is a highly interdisciplinary endeavour that draws — and has to draw — from at least the following disciplines:

- Narratology (storyworld, structure of the narrative, narrative effects)
- Aesthetic research (visual design, audio design)
- System engineering (user-interface design, implementation)
- Artificial intelligence research (multi-agent architectures, modelling)
- Cognitive psychology (affective research)
- Clinical psychology / psychoanalysis / psychotherapy
- Media psychology (system evaluation)
- "Creative minds" (authors, artists)

The growing number of related research groups provides striking evidence for this development. While the Expressive Intelligence Studio at the University of California, Santa Cruz¹ is dedicated to exploring the intersection of artificial intelligence, art and design, the Intelligent Narrative Computing group at the Georgia Institute of Technology² researches artificial intelligence, storytelling, and entertainment computing. The Liquid Narrative research group at North Carolina State University's Computer Science Department³ works in the area of procedural content generation – the creation of content for interactive games and other virtual environments – that uses models of narrative to build stories and tell them automatically whereas the School of Interactive Arts and Technology (SIAT) at Simon Fraser University⁴ is an interdisciplinary research group school where technologists, artists, designers and theorists collaborate in innovative research and immersive study. Finally, the Centre for Advanced Research in Technology for Education⁵ is, amongs other things, interested in drama-based learning environments, in models of emotion and in models of social interaction.

1. <http://games.soe.ucsc.edu/eis>

2. <https://research.cc.gatech.edu/inc/>

3. <http://liquidnarrative.csc.ncsu.edu/>

4. <http://www.siat.sfu.ca/>

5. <http://www.isi.edu/isd/carte/>

Not only are researchers from all these disciplines indispensable for the development of a truly engaging and immersive interactive drama system, maybe even more importantly, a cooperation ensures a high quality intellectual exchange and offers new perspectives for each researchers respective discipline. Quite an exciting prospect, if you ask me.

Abstract

This thesis investigates a recent form of digital narrative, known as interactive drama. One of the main attractions of narratives, independent of the medium in which they are presented, is that they elicit emotional response in their audiences. They have an affective impact. In this work I argue that an interactive drama, based on a model of the user's affective state, should be able to provide a truly immersive user experience.

One of the central goals for every interactive drama system is to provide the user with the feeling of agency. Agency is the power to take meaningful actions and to see the results of the decisions and choices made. An interactive drama offers a world in which the participant can have a real effect on the drama which they is experiencing. It is important to understand that a linear or multi-linear story as found in computer games is clearly not an interactive drama. Some game genres like role-playing games provide a large amount of interactivity and story variance but the point here is that in these games the player interacts with objects and characters while following a predetermined story. Even if

these games provide different story branches and different endings, each of these branches and ending is pre-written by the story authors. The player does not interact with the structure of the narrative itself. Each time the user participates in an interactive drama they should identify the story as being essentially a new story. To achieve this, the main storyline will need to significantly differ every time the user participates.

In this thesis I argue, that we should base interactive drama on affect and human interaction. To do so we have to implement an actual model of the user's affective state. This allows us to handle each user differently and present stories that fit the player's mood. Thereby we will achieve a higher level of immersion and a satisfying user experience.

Only engineers and authors who understand how the emotion system works can produce an engaging storyworld. Emotions themselves are short lived and without redundant cuing a desired emotional state cannot be sustained for very long, and certainly not for the whole duration of an interactive drama. Therefore just presenting a final goal that is meant to be meaningful to the player will not be sufficient to keep the player interested for the whole course of the narrative. Just like film, interactive drama can provide a variety of redundant cues, some stronger and some more subtle, depending of the choices and the mood state of the user but it is important to realise that a mood state is not something that can make a 180 degree turn from one second to the other. We have to rather think of it as a process that requires a careful attunement of pace and timing. Occasional moments of strong emotions are required to maintain a particular mood and a high number of more subtle emotions might be required to guide the user into a different mood state.

With our goal of moving from simple object manipulation to the simulation of interpersonal relations between the human user and the AI-based non player characters one of our most important goals is to get

the user to feel emotional bonding with other characters in the world and even experience empathy. Interactive drama is more than just a new breed of entertainment software. As different research projects have shown, these systems can also be used for pedagogical and therapeutic purposes. The goal of these systems is teaching sophisticated problem solving skills by allowing the user to interact with compelling stories that have didactic purpose. Empathy is important for all interactive drama, but even more important if the drama should serve pedagogical or therapeutic purpose.

It becomes evident that research on interactive drama technology, especially with emphasis on affective modelling, is a highly interdisciplinary endeavour that draws - and has to draw- from many different disciplines.

Zusammenfassung

Diese Diplomarbeit untersucht eine neue Form von digitalen Erzählungen, auch bekannt als interaktives Drama. Einer der Hauptgründe für die hohe Anziehungskraft von allen Erzählungen, ganz unabhängig vom Medium in dem sie präsentiert werden, ist die Tatsache dass sie in der Lage sind Emotionen auszulösen. In dieser Arbeit argumentiere ich, dass ein interaktives Drama, basierend auf einem affektiven Modell der Benutzerin bzw. des Benutzers, in der Lage ist ein immersives Erlebnis zu bieten.

Ich bin überzeugt davon, dass Affekt und menschliche Interaktion die Ausgangsbasis für erfolgreiche interaktive Dramen darstellen sollten. Um diese Ausgangsbasis zu schaffen muss einem interaktiven Drama System ein affektives Modell der Benutzerin bzw. des Benutzers zugrunde liegen. Dadurch ist es möglich jeder Benutzerin bzw. jedem Benutzer eine individuell angepasste Erzählung zu bieten, die sich der aktuellen Stimmungslage anpasst. Dies führt zu einem immersiven und zufriedenstellendem Erlebnis. Aus diesem Grund müssen sowohl Autorinnen bzw. Autoren als auch Entwicklerinnen bzw. Entwickler von interaktiven Drama Systemen die grundlegenden Mechanismen des menschlichen Emotionssystems verstehen. Da Emotionen an sich meist von kurzer Dauer sind muss ein interaktives Drama, wie auch andere Medien, immer wieder Auslösereize für neue Emotionen bieten. Dies führt dazu eine beabsichtigte Stimmungslage, entsprechend der Vorstellung des Autors, aufrecht zu erhalten.

Da es das erklärte Ziel von interaktiven Drama Systemen ist, sich von einfacher Objektmanipulation wegzubewegen, hin zu einer Simulation von "interpersonellen" Beziehungen zwischen einer menschlichen Benutzerin bzw. einem menschlichen Benutzer und KI gesteuerten Charak-

teren ist es wichtig eine Art emotionaler Bindung zu erzeugen, die im Idealfall sogar bis zu einem Gefühl von Empathie führt. Interaktives Drama ist viel mehr als nur eine neue Form von Unterhaltungssoftware. Beispielsweise zeigen unterschiedliche Forschungsprojekte, dass diese Systeme auch für pädagogische und therapeutische Zwecke genutzt werden können. Bei diesen Systemen geht es darum, den Benutzerinnen bzw. Benutzern Problemlösungsstrategien in einer virtuellen Umgebung beizubringen, die dann im realen Alltag eingesetzt werden können. Aus dieser Vielzahl an unterschiedlichen Einsatzmöglichkeiten ergibt sich die hohe Interdisziplinarität dieses Forschungsbereichs.

EDUCATION**Master degree:**

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Philosophy, University of Vienna, 2009

Secondary education:

Berufsreifeprüfung 2005

Bundesrealgymnasium Linz, Landwiedstrasse 82, 1993 - 2001

PROFESSIONAL DEVELOPMENT

WIFI training: Software Developer in Visual Basic .Net 2003

WIFI training: Rhetorik und Verhalten I 2011

WIFI training: Rhetorik und Verhalten II 2011

LANGUAGE

Fluent in English

Basic knowledge of French and Latin

Native German

WORK EXPERIENCE

Apprenticeship as IT-Technician 2001 - 2005 Gruber Aertzliche Datenverarbeitung

ADDITIONAL SKILLS

Programming skills (Python, MATLAB)

Statistic skills (SPSS)

Interests

Mountain biking, Ski touring, Snowboarding, Wakeboarding, Hiking
SOS-Kinderdorf Patenschaft, Pro Juventute Österreich regular supporter, Licht für die Welt regular supporter

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