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Lecture Notes on Interactive Storytelling

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Preface

These lecture notes collect the material used in the advanced course 'Interactive Storytelling' organized biannually at the Department of Future Technologies, University of Turku, Finland. Its aim is to present the key concepts behind interactive digital storytelling (IDS) as well as to review proposed and existing IDS systems. The course focuses on the four partakers of IDS: the platform, the designer, the interactor, and the storyworld. When constructing a platform, the problem is to select an appropriate approach from tightly controlled to emergent storytelling. On this platform, the designer is then responsible for creating the content (e.g., characters, props, scenes and events) for the storyworld, which is then experienced and influenced by the interactor. The structure and relationships between these partakers is explained from a theoretical perspective as well as using existing IDS systems as examples.

This material aims at providing a condensed summary of the topics – the essence in a straightforward fashion. As such, this is not intended to be a polished literary work, but a by-product of a larger endeavour. For this reason, the topics are sometimes discussed only cursory without further explanations, examples and excersises used in the classroom situation.

Acknowledgements This manuscript has had valuable input from the students over the years, and we are indebted to everybody who has attendend the courses on interactive storytelling at the University of Turku in 2004–2019.

Furthermore, the authors would like to express their gratitude to Harri Hakonen for playing a crucial and critical role in the preparation of this material.

Chapter 1

Introduction

> In all fictional works, each time a man is confronted with several alternatives, he chooses one and eliminates the others; in the fiction of Ts'ui Pên, he chooses – simultaneously – all of them. He creates, in this way, diverse futures, diverse times which themselves also proliferate and fork.

The quotation above comes from the short story 'The Garden of Forking Paths' by Jorge Luis Borges from the collection *Labyrinths* (1941), whose influence has been acknowledged by many seminal writers such as Murray (1997, pp. 30–32), Ryan (2001, p. 61), Aarseth (1997, p. 8) and Montfort (2004, pp. 45–46). In this and other short stories such as 'The Library of Babel' and 'The Book of Sand', Borges expresses the idea of infinite texts that could be read anew, and each time they would provide a new story according to the reader's choices. This summarizes well the intention of interactive storytelling, to create a work that would include the reader as active, acting agent in the storyworld and that would be a source of (almost) perpetual novelty.

The most influential metaphor for interactive storytelling is the concept of holodeck. It even was the impetus behind Janet Murray's book *Hamlet of the Holodeck*, ponders on the question can a computer provide the basis for an expressive narrative form. The holodeck was first introduced in *Star Trek: The Animated Series* episode 'The Practical Joker' in 1974, but entered the public consciousness later in the series *Star Trek: The Next Generation* (1987–91) and *Star Trek: Voyager* (1995–2001). Murray (and many others) regards the concept of the holodeck as an ideal model of interactive storytelling.

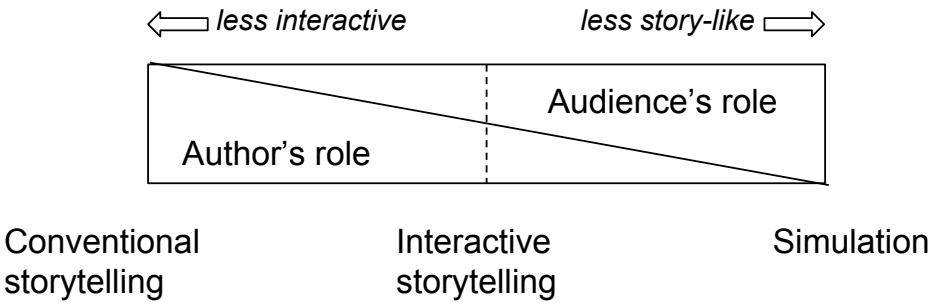

Figure 1.1: Spectrum of interactivity

1.1 Interactive storytelling

Storytelling is always interactive. Even an author is working alone in an isolated island has the potential reader in their mind, and this interactive thought process affects how the story is being constructed. But we do not have to get so far, because normally the sounding board is close to the author – family members, colleagues, the editor.

But there is a difference between reading a book and attending a live action role-playing (LARP) game. The interaction in larping is richer and more immediate than in reading a text. In the former, the participants can affect how the story forms in real time, whereas a book gives you a readily formed story to enjoy.

If we look close, we can recognize that the interactivity of storytelling form a spectrum illustrated in Figure 1.1. On one end, we have conventional storytelling (e.g., books or films) where the author has a full control over everything that happens in the story but audience has no control. On the other end, we have a simulation (or a sandbox) where the audience (e.g., spectator or player) is free to choose whatever they want to do but the author has no control over the possibly emerging stories. One could say that in this case there is no author, but a member of the audience becomes their own the author typically telling a story to themself.

When people are talking interactive storytelling, they are usually referring something that resides in the middle of this spectrum. Leaving aside the simulation, we can compare how conventional storytelling and interactive storytelling (see Figure 1.2). In a conventional storytelling, the author has special place when constructing the story. One could argue that this construction phase is only place where interaction (between the author and the storyworld) happens. Once the story is finished, it is ready to be presented the spectators (or readers) who will form their own experienced story indi-

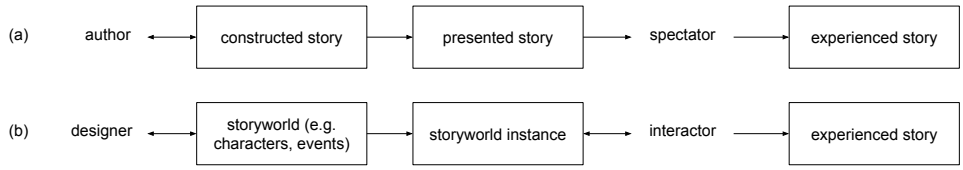

Figure 1.2: Comparison of (a) conventional storytelling and (b) interactive storytelling.

vidually. All in all, the story is handed down without any real feedback loop or possibility to interaction.

In contrast, interactive storytelling puts the interactor in a key role. The designer is now providing the characters, props and external events forming the storyworld. Based on this and the interactor's choices a story instance is generated, which the interactor then experiences.

1.1.1 Partakers

We have now introduced two key partakers in interactive storytelling: the one who creates the work and the one experiences it. In the literature on interactive storytelling the former is often called the author but – as one can discern in Figure 1.2b – we have opted for the term *designer*, which is also favoured by Adams (2013, pp. 8–9). One could even argue that 'author' is a special case of a 'designer' when the situation is limited to conventional storytelling. Moreover, within the game industry 'narrative designer' is now established as a professional title, but, for the sake of conciseness, we use omit the qualifier 'narrative' unless we specifically refer to the profession in question.

The situation is muddier in the latter case, where the terms such as 'player', 'actor', 'user', 'agent' and 'participant' have been used in the literature (Smed and Hakonen, 2008). Our choice here is *interactor* which emphasizes being an interactive actor in a storyworld created by a designer; wwe use sometimes 'player' when it is more convenient or customary in the context but, generally speaking, 'interactor' can be used more broadly (e.g., when interactive storytelling is used in teaching or guiding). The interactor is the one who foremostly experiences the story as it unravels. They typically play the role of the main character in the story, interacting with the other characters. Consequently, the interactor is a traditional type of an actor in the play as well (without the inter-prefix), and, as such, they take upon a role and are also a character in the storyworld.

Storyworld includes all the characters, props, scenes and events set up by

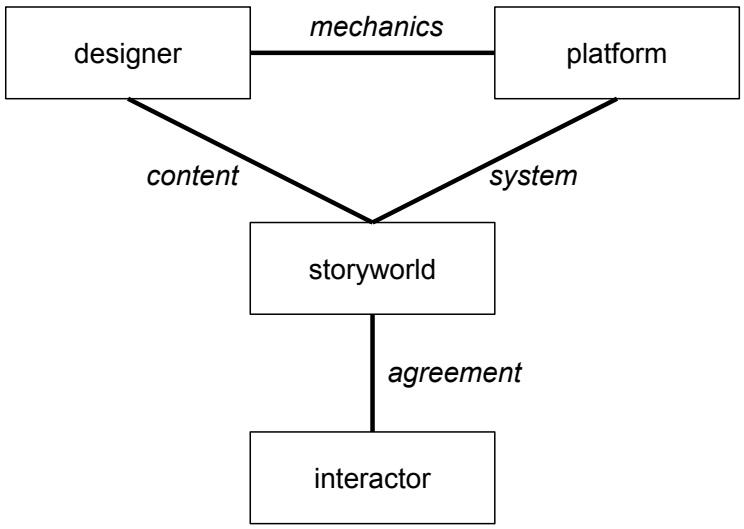

Figure 1.3: Partakers of interactive storytelling.

the designer for the interactor. Props are inanimate objects, which can be used in the storyworld, and events cause changes launched by fulfilling some criteria. Characters combine these two properties: they are both objects and agents of change. Scenes are the surroundings which the props and characters inhabit and where the events and characters can affect.

Although earlier the storyworld tend to be built upon customary software, we would like to discern *platform* as a separate. This follows the trend we have seen in other forms of software applications where the content and the development environment gets separated. For example, nowadays computer games are developed in dedicated platforms such as Unity or Unreal Engine, whereas earlier the development process included also creating the tools and runtime environment as well as the actual content. At moment of writing, we are seeing signs that interactive storytelling as software is maturing to this point of separation.

Figure 1.3 summarizes the four partakers and their interdependencies (Smed et al., 2018).

1.1.2 Narrative, plot and story

The term 'narrative' has different definitions, but we adopt here the naïve view promoted by Adams (2013, p. 25), where *narrative* refers to the unchangeable material presented to the interactor. From this reason, Adams concludes that 'interactive narrative' is an oxymoron and it is better to use

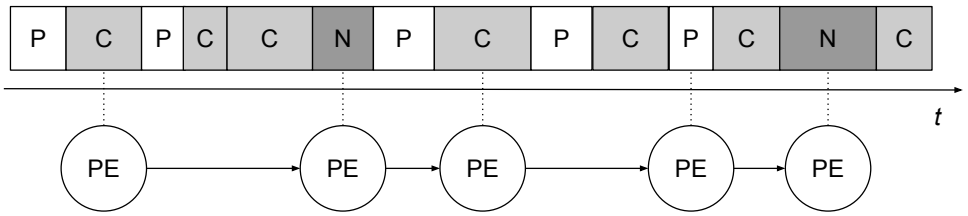

Figure 1.4: Interactor's perception of the sequence of events. P marks a player-generated event, C a computer-generated event, and N a narrative event. Plot events, marked with PE, are the dramatically significant events and their sequence form the plot.

the term 'interactive storytelling'. However, many scholars prefer using 'interactive narrative' arguing that that narrative can change, for example, when the interactor makes choices. These kind of terminological ambiguity is, unfortunately, quite pervasive in this field of study.

An *event* is any (possibly unseen) event that the computer can demonstrate (Adams, 2013, pp. 26–27). A *narrated event* (following the definition above) is immutable and set by the narrative designer. A *computer-generated event* is a result of processing done the underlying platform. A *player-generated event* is a response to the interactor's input. It is worth noting that narrated event are not necessarily needed in a interactive storytelling system. The interactor's perception of the sequence is illustrated in Figure 1.4. Events have three functions in a story: they can set a scene, reveal a character, or be a part of the plot.

If an event is *dramatically significant*, we call it a *plot event*. This means that the event creates or releases the dramatic tension and that it is related (causally or by subject matter) to the other experienced events. Figure 1.4 illustrates how they can correspond narrative events (e.g., cutscenes), computer-generated events (e.g., a runtime decision by the platform to introduce a new character) or player events (e.g., player choosing to save one of the characters from a zombie attack and letting the others die). In traditional storytelling, the usual aim is to reduce the insignificant events, whereas video games – being partly a simulation of the real world – may include them. How do we then discern the significance? As Adams (2013, p. 28) summarizes it subjective and context-dependent on the interactor's sense, which is why we cannot have a universal rule but have to rely on convention and common sense.

The plot is *advancing* when the interactor is experiencing more plot events, and it is *stalled* when this process ceases. If the interactor delib-

erately stalls the plot, we can say that they are *obstructing* the plot.

A *plot line* is the manifestation of the plot. If the plot is defined in advance by the designer, we can call a *predefined plot*. If the story can be different in each play, we can call a *manifold story*.

A story in Adams' naïve view means now all the events that the interactor can experience in the course of playing the work (Adams, 2013, p. 29). For the story to be interesting to the audience, it must have a psychological buy-in by the audience, and the audience must engage in willing suspension of disbelief, which we will address in more in Chapter 5.

1.1.3 Interaction

Interaction can be seen as reciprocal action, where entities' actions influence one another. Crawford (2013, p. 28) defines interaction as "[a] cyclic process between two or more active agents in which each agent alternately listens, thinks, and speaks". Crawford uses this metaphor of a conversation to illustrate the phases through which the entities – whether they are controlled by a human or a computer – must pass in interaction. Adams (2013, pp. 29–31) agrees and sees interactivity as the user's ability to interact with any software. The *interactive range* (or freedom) of a software – such as an interactive storytelling system – is simply the collection of choices made available to the user.

Interactivity should not be confused with *agency*, which means the user's ability to influence on the system. In an interactive storytelling system, this could mean the interactor's ability to influence the plot line. Having a large interactive range (e.g., a vast array of options to choose from) does not imply that the interactor has also a stronger agency unless the options also have a meaningful and perceptible effect on the storyworld. We will return to agency in more detail in Chapter 5.

Crawford (2013, pp. 37–41) lists that three three factors affecting the degree of interactivity in storytelling are speed, depth, and choice. *Speed* refers to that the faster the turnaround is, the better are the possibilities for interaction. For example, instant messaging has a short turnaround whereas mailed letters can take days. Faster turnaround means that the communicating parties can react faster and see the result of their action faster. It creates a state of continuous 'motion' like individual film cells when played fast after one another. *Depth* is about the human-likeness of the interaction (i.e., the deeper, the more human-like). Apart from simple cognitive modalities (e.g., hand-eye coordination or spatial reasoning), social reasoning would be the most important for interactive stories. *Choice* has a two-fold focus. Firstly, it is about the functional significance (i.e., agency) of the choices the interactor

makes (i.e., how well they satisfy the interactor's wants or desires). Secondly, perceived completeness refers to the number of choices with respect to the possibilities the interactor can imagine. This does not mean that the more is always better, but it is relative to the context.

1.2 History of interactive storytelling

Storytelling originally meant telling stories to an audience. Most of the initial stories are based on learning about things that can harm us, both as individuals and groups. Stories can also give explanations and finding a reason for certain phenomenon or behavior, which can give a basis for a religion – or even science. And, naturally, entertainment has always been a big motivator for storytelling.

Storytelling included an interactive part by default, because the storyteller (e.g., bard) would have to adapt the story according to the audience (Murray, 1997). If the audience did not respond favourably to the story, the storyteller would have to change the approach. Even epics such as the *Iliad* and the *Odyssey* started out as bardic tales and – regardless whether they were composed by Homer – went through several centuries and countless generations of bards before they were first written down.

Plato (1925, 275a—277a) expressed a critique on written word, which he asserts to be inferior to a human as a source of information. Apart from being an aid to the memory preventing one from truly knowing, it is non-dynamic and non-personal: you cannot make questions to a written text and it does not adapt to your needs. But the introduction of the printing press the 15th century, made written word preferred medium for distributing stories faster and to a wider audience. New inventions such as film and television meant that the crafted narrative that would be reproduced in the same way – providing all spectator the same presented story (see Figure 1.2a).

Literacy grew slowly and for many oral storytelling remained the main form of entertainment and passing wisdom. In addition to that, murals and allegories in architecture (e.g., religious monuments and environmental art) provided a medium for visual storytelling.

Interactive forms of storytelling, however, did not fade away but remained in the fringes – until the advent of a digital medium has brought them back to the limelight.

1.2.1 Improvisational theatre

Western theatre has its roots in ancient Greece, where the plays were performed according to scripts. Some of those scripts such as Sophocles' *Oedipus Rex* and Aristophanes' *Lysistrata* have survived and are performed this day.

Whereas classical theatre does not allow much improvisation, *commedia dell'arte* ('comedy of craft') started out in the 16th century Italy as a form of improvised performances based on sketches or scenarios. A typical commedia dell'arte performance would include characters from a roster including stereotypical features (some of which later evolved to modern day circus characters).

Modern day improvisational theatre formed in the 1970s from improv theatre scene with likes of 'Too Much Light Makes the Baby Go Blind', followed later by the Frantic Assembly and the Viewpoints movement. Improvisational theatre in an intricate collaboration between the actors and audience. The actor should react believably and in an emotionally engaging way at every point of the performance. Based the character-defining goal or drive, the actor should also create story opportunities that have an emotional impact. The other actors then strengthen or contradict then this and offer new opportunities. The audience can also affect the performance by providing the actors cues on the situation, style, their character's attributes.

Another and more serious strand of improvisational theatre is Forum Theatre, which aims at helping the audience to solve social problem through performances (Boal, 1979). A typical Forum Theatre performance includes a preselected theme where first the actors begin an improvisational situation. At any point, members of the audience can shout and change the story – or even step in the stage to replace one of the actors.

1.2.2 Role-playing games

Although many games include role-playing elements, the role-playing games (RPGs) in their modern form evolved from fantasy wargames in the 1970s. One the most influential RPG is *Dungeons & Dragons* designed by Dave Arneson and Gary Gygax and published first in 1974. The subsequent RPGs are often variants or improvements on the original *Dungeons & Dragons* with more complex or simpler rule sets and themes varying from dystopian futures to everyday real-life.

What is common to RPGs is the promotion of one of the participant into the role of a *game master*. The game master acts partly as a proxy for the original designers and partly as author creating new content for the players. The game master maintains rules and leads the players through the game.

Often this includes using various storytelling devices to keep the players focused on the scenario as well as moving them forward. The game master also controls the non-player characters (NPCs). Consequently, much of the entertainment value of RPGs resides on the shoulder of the game master.

The player of a RPG builds a character and assumes the identity of their character. This means, for example, when a player is making a decision, it is based on what they character might do in that situation and not what they themself might choose personally.

As the first computer RPGs emerged in the early 1980s, the role of the game master was modelled using algorithms. In many cases, these computer-driven game masters only maintained the rules and did not allow much deviation from intended story.

RPGs also jumped from tabletop games to experiences in the physical world, which are called live-action role-playing (LARP). The earliest recorded LARP group started in 1977. LARPs include a predefined setting and backstory. The player creates or receives their character and adopt their behaviour accordingly during the play. As a LARP event can include hundreds of players, last for several days and disperse into large areas, the role of the game master is often limited into making the initial setup. Once the event is on its way, the players will act without any centralized control and the story will emerge from the players' interaction.

1.2.3 Gamebooks

One of the earliest trials in writing a book for alternative reads is Julio Cortzar's *Hopscotch* (originally in Spanish *Rayuela*, 1963; English translation 1966), which can be read following two different sequences of chapters intended by the author, or uniquely by the reader making his or her own sequence.

Gamebooks represent a genre of printed books that are not to read linearly but making jumps based on the reader's selection. One of the most known gamebook series is *Choose Your Own Adventure* series by Bantam Book. Between its launch in 1979 and 1998 they sold over 250 million copies. There three typical mechanisms used in gamebooks:

- Branching plot novels include textual passages followed by branch point where the reader has to decide the next move. Based on the selection the reader is then referred to another page in the book.

- Role-playing game solitaire adventures are based on the rule set of a pre-existing RPG (e.g., *Dungeons & Dragons*). This allows the player

to play alone as the book acts as the game master by maintaining the story and controlling the NPCs.

- Adventure gamebooks use their own RPG system specially customized for the book.

The popularity of gamebooks started to dwindle in the 1990s as the digital media (especially hypertext) allow to implement them more easily.

1.2.4 Hypertext fiction

Hypertext fiction using digital medium were pioneered by Judy Malloy's *Uncle Roger* (1986) and Michael Joyce's *afternoon, a story* (1987). The primary distribution media was CD-ROM, until from the mid-1990s onwards they were made available in WWW. The initial works were aimed at a literary audience, but they started to move towards conceptual art and performance (i.e., hypermedia fiction).

Some of the notable works in hypertext fiction are Stuart Moulthrop's *Victory Garden* (1991), Shelley Jackson's *Patchwork Girl* (1995), Robert Arellano's *Sunshine '69* (1996) and Mark Amerika's *Grammatron* (1997) (Rettberg, 2015).

1.2.5 Webisodics

The earliest instance of an episodic online story is Tracy Reed's *QuantumLink Serial*, which ran on AOL 1988–89 is considered to be the first episodic online story. After each week's chapter, the audience wrote to Reed suggesting how they could be part of the story, and she would select few users and wrote them into the narrative and use their input to change the story.

The term 'webisode' was coined to describe Scott Zakarin's *The Spot*, which used the web as a medium and ran on the site thespot.com 1995–97. It took its inspiration from television series such as *Friends* and *Melrose Place* and had characters (or 'spotmates') who were living in the same house. The spotmates, of whom some were portrayed by the writers and some by hired models, would keep online diary (akin to blogs), respond to emails from the audience, post images and short videos on their life. Audience could become a part of the storyline and give advice to the characters.

Later webisodics used emerging digital media such video streaming services and social media as a part of the storytelling. For example, *lonelygirl15* (2006–08) started on YouTube without initially revealing its fictional nature and evolved into a multi-character series, and *Soup of the Day* (2006) allowed the audience to interact with the main character via MySpace.

1.2.6 Interactive cinema

Cinema provides possibilities to experiment with the limits of the medium. One class of these experiments is bringing the audience input into a part the cinematic experience. Next, we highlight some of the milestones along this way. The reader interested in the history of interactive cinema is referred to Hales (2015).

William Castle's *Mr. Sardonicus* (1961) can be seen as false start on interactive cinema. It included a 'punishment poll', where the members of the audience received a thumb printed on paper. Before the final reel of the film, the audience were prompted to vote whether the main character of the film, Mr. Sardonicus, is pardoned or not. This, however, was only a gimmick because only the punishment film was ever made and shown to the audience.

The first actual example of an interactive movie is Radúz Činčera's *Kino-automat* (1967). It was originally made for Expo'67 in Montreal. The movies begins with a flashforward of the protagonist's apartment in flames. The movies comprises nine spots where the action stops and a moderator ask the audience to choose between two alternative scenes. After the voting, the movie proceeds according to the majority's choice. However, no matter what choices are made, the end result is always the same: the fire.

The laser disc brought new possibilities for creating interactive films. In *The Aspen Movie Map* (1978–81) by MIT Machine Architecture Group, the interactor can explore town of Aspen Colorado via touchscreen interface. MIT Media Lab, founded 1985, had Interactive Cinema (IC) research group lead by Glorianna Davenport, which focused on polylinear storytelling and reconfigurable video. On the commercial side, Vidtex released two interactive laser discs: *Murder, Anyone?* (1982) and *Many Roads to Murder* (1983) (Herman, 2001, Chap. 10). They allowed the viewer to act in the role of a detective solving a murder case. The story was played by real actors. The interactive features of the laser disc allowed the viewer to look at evidence or solve the crime. Each disc featured sixteen different plot lines.

Bob Bejan's *I'm Your Man* (1992) is a short film, projected from laser disc in a specially equipped movie theatre, which has seat-mounted joysticks with three choices. There are six selection points during the film, where story can diverse. The same technology was used in Bejan's film *Ride for Your Life* (1995), where the protagonist engages in a bicycle race to avoid alien invasion – and the audience had to make choices on his behalf every ten seconds. Although these movies were intended to be a showcase for new technology, both the projection system and joysticks turn out to be too costly to gain wider popularity.

The film *Wax or the Discovery of Television Among the Bees* (1991)

was the first movie streamed over the internet in 1993. In 1994, a website called 'Waxweb' based on the movie opened (Blair and Meyer, 1997). The original movie was cut into 80,000 pieces that could be pieced together akin to William S. Burrough's 'cut-up' technique. The visitors could view the sequences in the order based on their choices along the story.

With the advent of DVD, moviemakers were also dabbling with the possibility of creating interactive DVD films. David Wheeler's *Tender Loving Care* (1998) plays a story episode after which the spectators is asked a series of questions to their perception of what they have seen. The same method is used in David Wheeler's *Point of View* (2001). Morten Schjødt's *Switching* (2003) has no interface but is cyclic, jump back and forth in time and place. *Late Fragment* by Daryl Cloran, Anita Doron and Mateo Guez (2007) is a feature length film. The audience can click to change the scene or follow a character seeing the events from different points-of-view. Loops are also possible when the system is waiting for an input from the audience.

Recently, there has trials to utilize less invasive input technologies into an audience such as motion detection and mobile devices. However, they have not (yet) gained much attraction amongst the movie-goers or theatre owners alike.

Although not a truly interactive films, there are some movies that have dabbled with having alternative stories. Krzysztof Kieślowski's *Blind Chance* (*Przypadek*, 1981) has three story lines about a medical student who has lost his call after the death of his father. Whilst running after a train for Warsaw, the outcome of each story depends on how he reacts to obstacles on the way. If he misses a drinking fellow and catches the train, he meets a Communist and joins the party. If he bumps into the drinking fellow but does not stop, he misses the train and hits a railroad guard and is arrested. In the end he joins anti-Communist resistance. In the third story line, he almost hits the drinking fellow, apologies, misses train but does not hit the guard. He then returns back to medical school and stays out of politics altogether. In the end he is going to conference and meets people from the first two stories at the airport. The board the aeroplane, which in the end explodes.

Kieślowski's movie inspired two less complex variants. In Peter Hewitt's *Sliding Doors* (1998) the protagonist misses a train in an underground station in the first story line, whereas in the second she catches the train. In Tom Tykwer's *Run Lola Run* (*Lola rennt*, 1998) the protagonist goes through three alternative story lines depending on how she reacts to a dog in a staircase.

In Harold Ramis' *Groundhog Day* (1993) the protagonist relives the same day over and over. During the process he gets to know the little town and its people, until he finds a way out of the loop into the next day.

Marc Forster's *Stranger Than Fiction* (2006) begins with a premise that

the protagonist starts hearing a voice-over narrating his daily life. As he tries to avoid following the narration, he is forced to follow the story that is being told about him.

1.2.7 Television

On the television, having multiple channels at the disposal has allowed to create interactive stories, where the viewer can choose the viewpoint by changing the channel. Oliver Hirshbiegel's *Mörderische Entscheidung* (1991) is a crime story that was originally presented on two German TV channels ARD and ZDF. Zapping between the channels allowed the viewer to the see events from the perspective of the two main characters. Similar different perspectives approach was used by *Noodles and 08* (1996) shown simultaneously on Swedish channels SVT1 and SVT2. The Danish production *D-dag* (2000) by Søren Kragh-Jacobsen, Kristian Levring, Thomas Vinterberg and Lars von Trier extends the same principle and comprises four different 70 minute movies about bank robbery taking place on the New Year's Eve of the millennium.

Teijo Pellinen's *Akvaario* (2000) broadcast in nightly over four weeks in the Finnish channel YLE1 starred two insomniac neighbours Ari and Eira. The audience could call on and vote from four impulses that would affect how the characters behave. The work had a library of about 5,000 videoclips. Each week had a overall theme that allowed the story to progress: getting to know the characters, characters realizing they are hearing voices from the neighbour, discovery of a hole on the wall, and curiosity turning into a interest. At the final, Eira drops scented note on Ari's mailbox as Ari opens the door, and the characters meet one another for the first time.

Streaming services have recently shown interest in developing interactive television shows. For example, DreamWorks' *Puss in Book: Trapped in an Epic Tale* (2017), *Buddy Thunderstruck* (2017) and *Black Mirror: Bandersnatch* (2018), all released in Netflix, have introduced the genre to a wider audience. Also, Steven Soderbergh's *Mosaic* (2017) was made available first as an interactive app, before it was released as a non-interactive series in HBO.

1.2.8 Games

Apart from RPGs, there are several non-digital games based on storytelling. *Once Upon a Time* by Atlas Games (1994) allows the players to tell fairytale out of cards. In *Dread* by E. Ravachol and N. Barmore (2004), storytelling is connected to the game mechanics of *Jenga* to create suspense. In *Dixit* (2008) by Jean-Louis Roubira, the task of the players is to find cards matching the

story among donated cards. *Fiasco* by J. Morningstar (Bully Pulpit Games, 2009) directs the players to tell crime stories gone horribly wrong (in the spirit of the movie *Fargo*). *Rory's Story Cubes* (2010) by Rory O'Connor challenges the player to tell a story from symbols printed on the sides of dice.

For the remainder of this section, however, we will focus on digital games on various genres.

Interactive fiction

Interactive fiction covers (text) adventure games played in a computer. One can argue that they are an evolved version of gamebooks – albeit gamebooks became popular later – that replaces the book with a computer program.

The first work of interactive fiction is *Adventure* (also known as *ADVENT* or *Colossal Cave*) by Will Crowther released 1975. It inspired many to create their own text adventures, of which the most famous is *Zork* (1977) by Matt Blanc and Dave Lebling, who went on to found the company Infocom. Infocom released several games, sometimes working together with authors like Douglas Adams on a text adventure version of *The Hitchhiker's Guide to the Galaxy*.

Another pair inspired by Adventure were Roberta and Ken Williams, whose Sierra On-Line took advantage of the better graphical capabilities of the home computers in the 1980s and added a graphical user interface to assist textual input. Sierra On-Line's roster of games include titles like *King's Quest*, *Police Quest*, *Space Quest* and the *Leisure Suit Larry* series.

The emphasis on graphics continued with adventure games developed by LucasArts Games (later LucasGames) starting from *Maniac Mansion* in 1987. Their user interface did not include anymore the possibility to input text, but all the player had to select the desired action from a list of verbs and an inventory of objects. The list of verbs reduced from title to title during the 1990s until it included the trio hand (e.g., use, pick up, open), eye (e.g., examine, read) and mouth (e.g., eat, talk). Also, the genre got renamed as point-and-click adventures.

This strive towards graphical representation culminated in *Myst* (1993) by Cyan Worlds. Myst and its follow-ups utilized the encyclopedic affordance provided by CD-ROMs by offering pre-rendered animation and voiceovers. Also, all player interaction was included into the game world without any additional user interface overlay.

During the late 1990s and early 2000s interactive fiction as well as point-and-click adventure vanished from the limelight and remained in the hands of the hobbyists. Point-and-click adventures, however, got commercially re-

surrected when Telltale Games started publishing them on mobile device, with *The Walking Dead* (2012) being their break-though title. *The Walking Dead* is interesting also from the point-of-view of interactive storytelling as it allows the player to have some agency when solving moral dilemmas.

Device 6 (2013) by Simogo hails back to text adventures by making the text and interacting with the text the focus of the game. The puzzles are a combination of visual and textual challenges that the player has to solve.

Visual novels are similar to interactive fiction but they put more emphasis on the story (Uusi-Illikainen, 2016). They emerged in Japan in the 1980s but remained less known in the Western markets until the 2000s, when games like *Phoenix Wright: Ace Attorney* (2001) started to be officially localized to English. Visual novels often include a branching story with multiple endings, offer a limited means of interaction. The main game mechanic is conversations, which includes reading dialogue and descriptive texts and answering them, for instance, via multiple choice questions. In addition, visual novels may include collecting items to be used later in a conversation and movement mechanics similar to point-and-click games.

Digital Games

Laser disc technology were used arcade games such as *Dragon's Lair* (Advanced Microcomputer Systems, 1983) to make the game more story-like by the including animations. In the case of *Dragon's Lair*, however, the game story does not offer much brevity but it is a linear story, where any wrong decision leads directly to a death scene.

The advent of CD-ROM in the 1990s brought about computer games that were sometimes marketed under the title 'interactive cinema'. For example, *Sherlock Holmes: Consulting Detective* (ICOM Simulations 1991), based on a board game, utilizes full motion video. *The Last Express* (1997) by Jordan Mechner is an adventure game that takes place on the Orient Express, days before the start of World War I. It attempts to simulate (speeded-up) real-time events and includes thirty characters. The story is non-linear and the player's actions and failures affect the outcome. In *Blade Runner* (1997) by Westwood Studios the protagonist Ray McCoy, a blade runner, chases replicants in the original movie settings and with voiceovers from the original actors. The game story has thirteen different endings, which depends on player's decisions during the game.

The founder and lead game designer of Quantic Dreams, David Cage has argued strongly for maturation of video games to expand their range of expression and themes. Quantic Dreams' *Fahrenheit*, titled *Indigo Prophecy* in the US, (2005), *Heavy Rain* (2010), *Beyond: Two Souls* (2013) and *Detroid:*

Become Human (2018) have been his answers on how to realize interactive video game storytelling.

In the 2010s, several experimental and avant garde games have tested the limits of storytelling in video games. In *The Stanley Parable* by D. Wreden (2011), the player's avatar Stanley has to explore the empty building after his computer has broken down. The player can freely move around and influence the surroundings within confines of the game world. The story is presented using a voiceover, which suggests where Stanley should go next and comments on his decisions, but the player is completely free to disregard the voiceover.

Dear Esther (2012) by The Chinese Room includes voiceover letter fragments from a woman called Esther. The fragments are distributed randomly on each game instance, which means that the story collected by the player is different during every gameplay. The developers continued the work in *Everybody's Gone to the Rapture* (2015).

In a similar fashion, *Gone Home* by S. Gaynor (Fullbright Company, 2013) focuses on an exploration of a mansion in Portland in 1995 with providing the player any specific goal but piecing together the underlying story by examining at the objects at the house. In *The Vanishing of Ethan Carter* (2014) by The Astronauts, the player can use paranormal abilities to search the game world to find stories that a boy called Ethan Carter has written.

80 Days (2014) by Inkle draws inspiration from Jules Verne's novel *Around the World in Eighty Days* (with a steampunkish twist), but allows the player to make their own choices selecting the route. Apart from the route selection, the generated story is affected by events and challenges that the player faces during the travel and whilst staying over in the cities.

Sam Barlow's *Her Story* (2015) puts the player in the role of an investigator solving a missing person case using snippets from old interrogation videotapes. By entering search terms the player can find out new videoclips, which reveal more and more on the original story. Other recent mobile games trying out the possibilities of storytelling are *Florence* (2018) and *My Child Lebensborn* (2018).

Chapter 2

Background

In order to follow the concepts and discussion related to the partakers of an interactive digital storytelling (IDS) system we will present in this chapter a selection of research work done in analysing stories in general and interactive stories in particular.

2.1 Analysis of storytelling

This section aims at presenting a review of the relevant theoretical work. Our aim is not provide a comprehensive study for analysing stories, but rather introduce concepts, models and terminology are often referred in the scientific literature on interactive storytelling. One could – quite rightly – point out several omissions such as the works of Johann Wolfgang von Goethe, Roland Barthes, or Claude Lévi-Strauss. Moreover, we focus on Western tradition and not, for example, Far Eastern or African storytelling traditions.

We will proceed in a chronological order, because the later writers are usually expanding, criticizing or refuting the earlier works.

2.1.1 Aristotle's *Poetics*

As with any scientific endeavour, one can always start with the Greek philosopher Aristotle (384–322 BCE), whose writing include also a treatise on drama called *Poetics* (ca. 335 BCE) (Aristotle, 1932). Although its analysis is based on ancient Greek theatre, it formed the basis of Western literary theory. Originally *Poetics* included two parts, but only the first part focusing on tragedy has survived, whereas the second part focusing on comedy is lost.

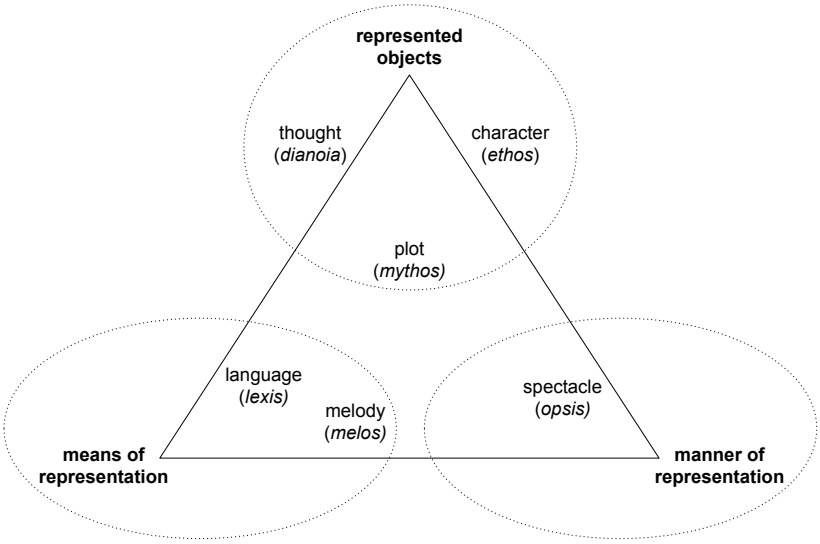

Figure 2.1: The elements of tragedy (Heinonen et al., 2012, p. 88).

Elements of tragedy

Aristotle (1932, 1450b8–12) recognizes six elements of tragedy – plot, character, thought, language, melody and enactment – which he assigns to three classes depending whether the question is about the represented objects, the means of representation or the manner of representation (see Figure 2.1).

- Plot (*mythos*) describes the incidents of the tragedy and their order; it comprehends the whole action being represented. These actions should follow logically from what happened before and from the character's decisions. The plot is, therefore, a coherent and causal construction. Moreover, it should follow the principle of dramatic economy: if any incident is removed or changes its place in the plot, the unity of whole work changes. If it does not, then the incident not an integral part of the whole and could be discarded. Apart from the logical order of incidents, the aesthetic value of the plot depends on its length (i.e., the wealth of material that it is present) while still being condensed into coherent and consistent whole.

- Character (*ethos*) reflects to the the moral choices that the character makes, which get revealed in the character's actions. Apart from traits and dispositions, this is the ethical nature or morality of the character (e.g., vices and virtues).

- Thought (*dianoia*) refers to the character's reasoning or rationality. It

is 'the ability to say what is possible and appropriate' (Aristotle, 1932, 1450b4–5). From this we can infer thought process and background of the character.

- Language (*lexis*) relates to the selection and arrangement of words and the use of language.
- Melody (*melos*) relates to the language, rhythm and melody of speech.
- Spectacle (*opsis*) comprehends the whole appearance (e.g., costumes, props and sceneries).

Narrative forms

Aristotle recognizes two narrative forms: epic and dramatic. In the *epic form*, the events are represented through verbal narration (*diegesis*). The story focuses on the exploits of a solitary hero, and the story can be endlessly expanded. The motivations of the hero remain fairly simple. For example, the *Odyssey* is an epic story, which could be easily expanded with new adventures.

In the *dramatic form*, the events are represented through the imitation of action (*mimesis*). Here, the focus is on the evolving networks of human relations, and the action is mental rather than physical. Moreover, events follow the structure of the dramatic arc (see Figure 2.3).

A third narrative form, not recognized by Aristotle, is the *epistemic form* (Ryan, 2008). In this way, the story resembles detectives stories (emerging in the 19th century), where we have a superposition of two stories: events that took place in the past and an investigation that leads to their discovery. This kind of (mystery) stories are driven by the desire to know.

If look at the narrative forms from the perspective of interactivity, we can see that the epic form – focusing on the accomplishment of a mission – is used in many video games. There are also games using the epistemic form, which put the player in the role of a detective. The story can be author defined or variable, and includes elucidation of the mystery until the solution is found. The dramatic form is the most difficult to implement. It includes goals of characters evolve together with their relations, which requires constant redefinition and simulation of human reasoning.

Dramatic arc

For Aristotle change (*metabasis*), for example, from happiness to misery is an elemental part of any tragedy. It is the difference between the initial

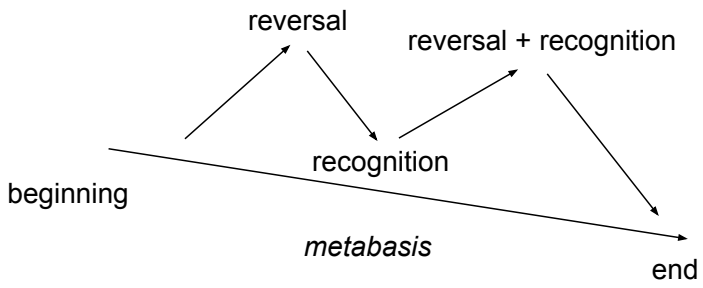

Figure 2.2: Changes in the plot of a tragedy (Heinonen et al., 2012, p. 114).

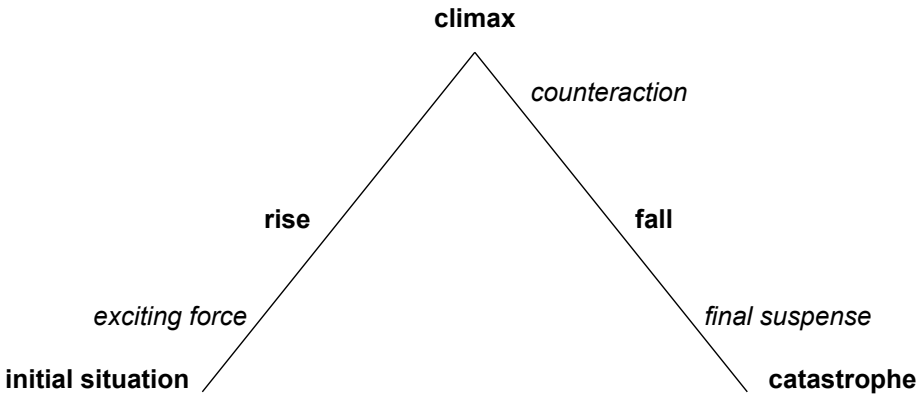

Figure 2.3: Freytag's dramatic arc.

situation and outcome. Within this framework, the plot can change due to recognition (*anagnorisis*) and reversal (*peripeteia*) as illustrated in Figure 2.2. Recognition means a change from not-knowing to knowing, whereas reversal is a turning point in the plot. The general structure involves that the play has a central problem that divides it to two halves: complication and unravelling. The problem causes complications, which then get solved.

Gustav Freytag (1900, pp. 114–140) provides an illustration and elaboration on the dramatic structure (see Figure 2.3). The complication increases after the initial situation has been exposed, often accompanied by an exciting force (or an inciting incident). The rising action increases the complication and drama, until it peaks out in a climax, which is followed counteraction leading to a fall. Before the end there is a final suspense that results in a catastrophe.

The dramatic arc has had a strong influence on the Western theatre. It has been seen as the ideal structure for well-formed plays and, consequently, films – and even video games. The idea of a three-act play has permeated

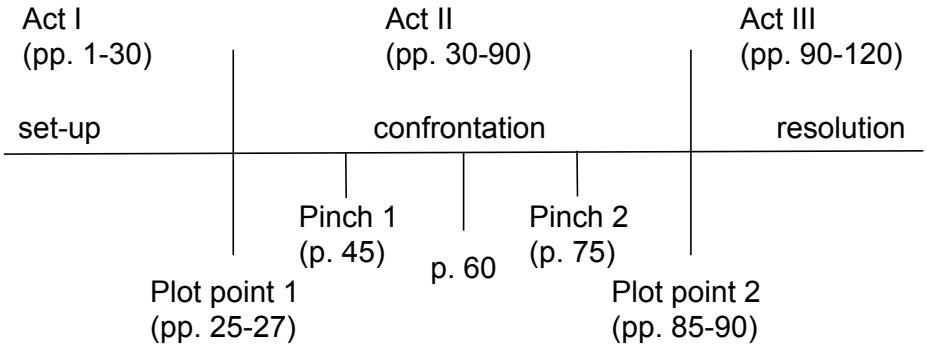

Figure 2.4: An example of a structure of a Hollywood movie script (Field, 1984). A script for a two-hour movie has typically 120 pages (i.e., each page corresponds to one minute of the filmed movie).

even to that extent that the structure of a typical Hollywood movie can pinned down to a structure such as in Figure 2.4.

2.1.2 Vladimir Propp's morphology

After the Russian revolution in the 1920s emerged a new school viewing the structure of stories, called Russian formalism. It had later a major influence, for instance, in France.

Russian formalism divides the story into three layers

- *fabula*: logically and chronologically related series of events caused or experienced by the characters in the storyworld
- *sjužet*: the finished arrangement (i.e., the plot) of the narrated events as they are presented to the reader
- *media/text*: the surface of the story expressed in language signs

Vladimir Propp (1895–1970) was a Russian structuralist, who was influenced by the Russian formalism. His special interest was Russian folktales, which he started to analyse to find a common structure in them. His book *Morphology of the Folktale* on the results of the analysis was published in Russian in 1928, and translated to other languages in the 1950s (Propp, 1968). At the time, the book influenced many folklorists and encouraged the study of morphology paving the way to, for instance, French structuralism.

Table 2.1: A summary of Propp's narrathemes.

α	initial situation	$\uparrow$	departure	$\downarrow$	return
β	absentation	D	the first function	Pr	pursuit, chase
γ	interdiction		of the donor	o	unrecognized
ε	reconnaissance	E	hero's reaction		arrival
ζ	delivery	F	provision or receipt	L	unfounded claims
η	trickery		of a magical agent	M	difficult task
θ	complicity	G	spatial transference between	N	solution
A	villainy		two kingdoms, guidance	Q	recognition
B	mediation, the	H	struggle	Ex	exposure
	connective incident	J	branding, marking	T	transfiguration
C	beginning	I	victory	U	punishment
	counteraction	K	resolution	W	wedding

Narrathemes

The core of Propp's morphology are 31 narrative units or *narrathemes* that occured in the analysed folktales. They are the basic primitives, which tend to occur in the same order in the stories (see Table 2.1).

The narrathemes form spheres dividing the structure of the story into four phases:

1. *Introduction*: Introduces the situation and most of the main characters, and sets the scene for the subsequent adventure.

    - β: A member of a family leaves home and the hero is introduced.
    - γ: An interdiction is addressed to the hero (e.g., 'don't go there' or 'don't do this').
    - δ: The interdiction is violated as the villain enters the tale.
    - ε: The villain makes an attempt at reconnaissance.
    - ζ: The villain gains information about the victim.
    - η: The villain attempts to deceive the victim to take possession of the victim or the victim's belongings.
    - θ: The victim is taken in by deception.

2. *Body of the story*: The main story starts here and extends to the departure of the hero on the main quest.

    - A: The villain causes harm to a family member or the family member lacks something.

- B: The misfortune or the lack is made known (e.g., the hero hears the call for help).
- C: The hero agrees to go.
- ↑: The hero leaves home.

3. *Donor sequence*: The hero goes in search of a method by which the solution may be reached, gaining a magical agent from the donor.

   - D: The hero is tested preparing the way for receiving a magical agent from the donor.
   - E: The hero reacts to the actions of the donor (e.g., faces a test set by the donor).
   - F: The hero acquires the magical agent.
   - G: The hero is directed to the whereabouts of the object of the search (e.g., by a helper).
   - H: The hero and the villain join in a direct combat.
   - J: The hero is branded (e.g., gets wounded or receives a special token).
   - I: The villain is defeated.
   - K: The initial misfortune or lack is resolved (e.g., the spell is broken or a captive is freed).

4. *Hero's return*: The hero returns home, possible facing a final task in order to a receive a hero's welcome.

   - ↓: The hero returns.
   - Pr. The hero is pursued (e.g., ambushed or ridiculed).
   - Rs: The hero is rescued from the pursuit.
   - o: The hero arrives home in an unrecognized form.
   - L: A false hero presents unfounded claims.
   - M: A difficult task proposed to the hero.
   - N: The task is resolved.
   - Q: The hero is recognized (e.g., by a brand or by the possession of a special token).
   - Ex: The false hero or the villain is exposed.

- T: The hero is given a new appearance (e.g., new garments).
- U: The villain is punished.
- W: The hero is rewarded (e.g., gets married or ascends the throne).

As these narrathemes collect the general structure of a story, a particular instance may lack some of them or even a whole phase (e.g., the donor sequence).

Character roles

As we can see, the stories have a set characters, which are defined from the point-of-view of their significance to the course of action (i.e., the character roles are independent from the actual characters). Propp lists the following character roles:

- *Villain* who struggles against the hero (e.g., narrathemes A, H and Pr).
- *Donor* who prepares the hero or gives the hero some magical object (e.g., narrathemes D and F)
- *Helper* who helps the hero in the quest (e.g., narrathemes G, K, Rs, N and T).
- *Princess* (or her father) who gives the task to the hero and is often sought for during the narrative (e.g., narrathemes M, K, Ex, Q, U and W).
- *Dispatcher* who makes the lack known and sends the hero off (e.g., narratheme B).
- *Hero* who departures on a search, meets the donor and returns home (e.g., narrathemes C, ↑, E and W).
- *False hero* who takes credit for the hero's actions (e.g., narrathemes C, ↑, E and L).

A major critique of Propp's morphology is that classifies the character roles based on what they are (e.g., a hero, a donor or a princess) and not what they do. The first semiotic, role-based analysis of the narrative is the actantial model introduced by A.J. Greimas (1917–92) in 1966. Figure 2.5 illustrates the actantial model and the six actants. The protagonist of a story is the subject who is seeking for an object. The sender has dispatched the subject on this task, and the subject should deliver the object to a receiver. The

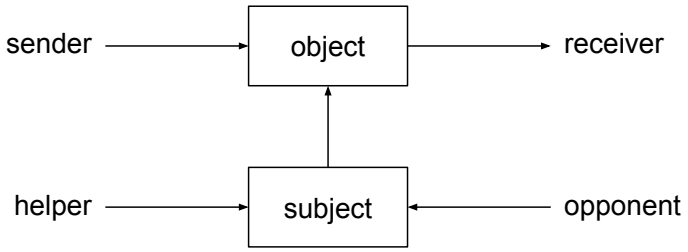

Figure 2.5: The six actants of the actantial model.

subject gets aid from the helper, while the opponent acts as an antagonist to the subject's efforts.

As Propp's work was translated to English in 1958 (and later to French), his morphology gained recognition and began to influence Western narrative analysis. Moreover, the framework laid out by Propp has been very alluring to many computer scientists working on computer-generated stories. It offers an obvious implementation, where the system first recognizes what is the narratheme that suits the current situation and selects then the next narratheme in the sequence and creates new content based on that.

2.1.3 Joseph Campbell and the hero's journey

Joseph Campbell (1904–87) proposed in the book *The Hero with a Thousand Faces*, published originally in 1949, the idea that all mythic narratives are variations of a single great story (Campbell, 2008). This story, or *monomyth*, tells about the journey of an archetypal hero shared by world mythologies. It is a symbolic representation of the passage from childhood to adulthood through departure, initiation and return.

Figure 2.6 illustrates the hero's journey as a cycle of 17 stages from the innocent world of childhood to the freedom to live at the end. The journey has three phases, of which the first one is initiated by a separation from the world of childhood when an adventure calls the hero. The hero initially refuses to embark on the journey, but with the help of a mentor (e.g., a supernatural aid) the hero finally leaves and faces the threshold of the known and unknown world. The hero is unprepared for this world and is caught in a 'belly of a whale' marking the separation from the known world.

The second phase begins with the initiation and descends into the unknown world. This will take the hero through trials (often occurring in threes). The 'meeting with the goddess' leads the hero into temptation, which threatens the progress. Having overcome the temptation the hero is

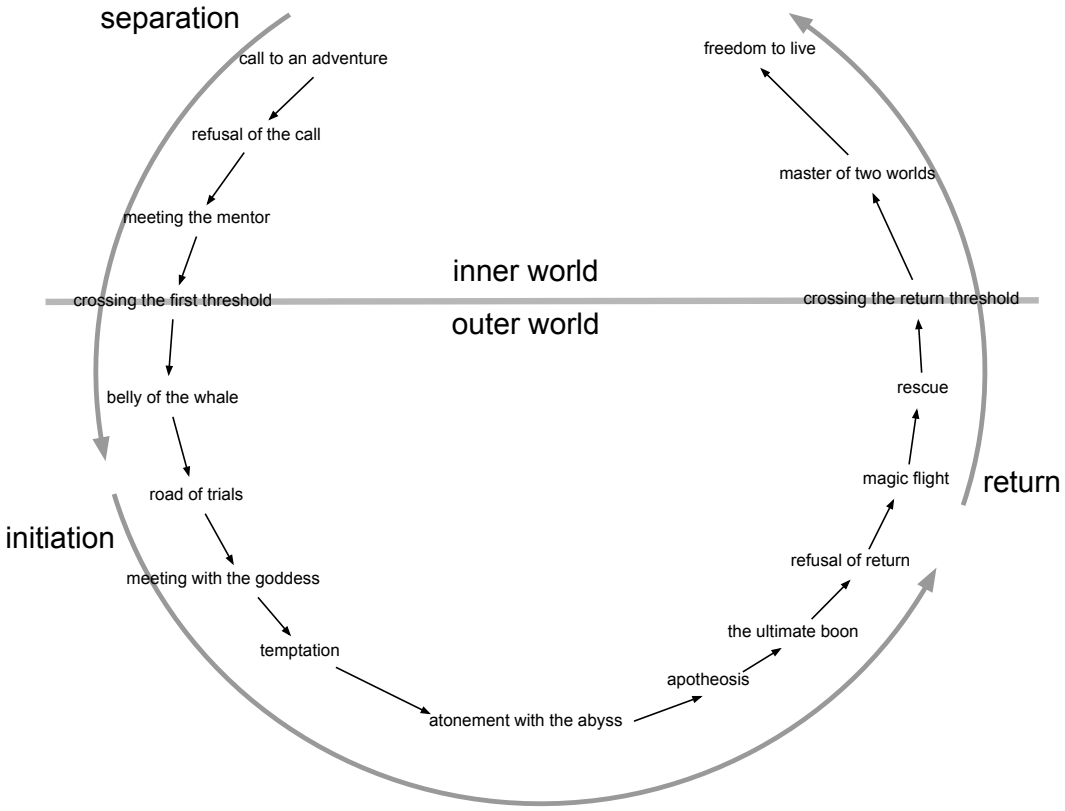

Figure 2.6: The hero's journey in the monomyth.

ready to meet the abyss (e.g., the actual villain) but is initially not yet ready and suffers a defeat leading to the lowest point of the story that could involve some form of symbolic death. This point, however, is a turning point as the hero learns the lesson and survives the abyss. At 'apotheosis', the hero ranked among the 'gods' and receives the ultimate boon to bring back to the inner world. However, the hero refuses the call to return, which concludes the initiation phase.

The third phase begins with a flight as the hero is chased by forces in the outer world towards the inner world. Reflecting the separation phase, an outside help rescues the hero and prompts the way to cross the threshold back to the inner world. As the story is closing to end, the hero has become a master of both inner and outer worlds. This finally grants the hero the freedom to live (and be free from the fear of death) – and the story to end.

Campbell's work has been highly influential in shaping Hollywood movies since the 1970s. For example, George Lucas has elaborated that when he was writing the script for *Star Wars* in the early 1970s, he was surprised to find similarities between the early draft and the monomyth. The monomyth is also a pervasive story structure occurring in many video games.

2.1.4 Kernels and satellites

Based on the work by Roland Barthes, Seymour Chatman (1978, pp. 53–54) separates the narrative content into two groups: kernels and satellites (see Figure 2.7). The term *kernel* refers to the essential content of the story that is repeated when it is experienced anew. Basically, the kernels form the identity of the story: If we change a kernel, we will destroy the narrative logic of the story and would end up having a different story altogether. In comparison, *satellite* refers to content that could be omitted or altered without changing the identity of the story – although we might impoverish it aesthetically. For example, the identity of the story of Cinderella remains the same, whether she has one or two stepsisters or whether her chores include cleaning the house or peeling potatoes; however, the identity of the story would change, if Cinderella's father had died and her mother would have remarried instead.

This model is interesting from the perspective of interactive storytelling, because one can think a kernel as moment where the story could branch to different possible paths. These would be the moments when the interactor has to make important selections and form their own path to become the generated story. The satellites, on the other hand, are more malleable and allow easier interaction.

Espen Aarseth (2012) uses the kernel–satellite framework to differentiate stories and games by allowing the reader or player to have three kinds of

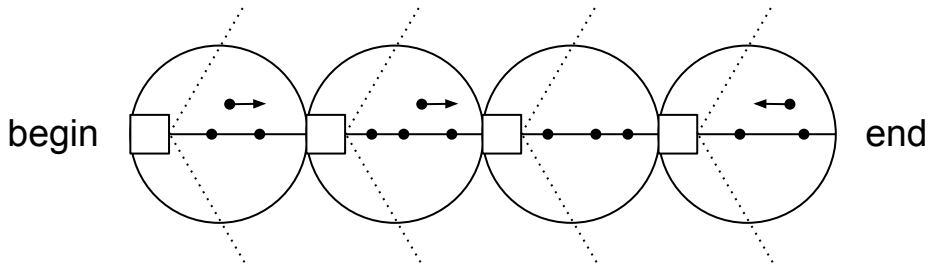

Figure 2.7: Kernels and satellites. Rectangles present kernels and black dots the satellites. The circles illustrate the complete narrative blocks that kernels create. Apart from residing on the narrative path, a satellite can be an anticipator satellite of later kernels or a retrospective satellite of earlier kerners (marked with an arrow). The solid line marks the followed narrative path and the dotted line possible (but not followed) paths.

influence: no, limited or full (see Table 2.2):

- If the interactor cannot affect the kernels nor the satellites, agency is shallow and the story will reduce into a linear story (e.g., a novel or a film) that will take the same course in all instances.
- If the interactor can influence the satellites, we have a structure typical to linear games (e.g., *Half-Life*).
- If the interactor has the liberty to choose the kernels from a set of alternatives but has no influence on the satellites, we have a non-linear story (e.g., hyperfiction).
- If the interactor can choose the kernels from a set of alternatives and can influence the satellites, we have deep agency, for example, in the form a quest game (e.g., *Star Wars: Knights of the Old Republic*).
- If the interactor can influence both the kernels and the satellites, we have a pure game (e.g., chess).

With respect to Figure 1.1 we could now fill in the gap between conventional stories and simulation by placing the labels from Table 2.2 into the spectrum.

2.2 Research on interactive storytelling

Interactive storytelling, in the sense that we will use in this book, began in 1986 when Brenda Laurel published her doctoral dissertation entitled *Toward*

Table 2.2: Using kernels and satellites to differentiate stories and games Aarseth (2012).

Kernel influence	**Satellite influence**	
	Not possible	*Possible*
No influence	Linear story	Linear game
Choose from alternatives	Non-linear story	Quest game
Full influence	N/A	Pure game

the Design of a Computer-based Interactive Fantasy System (Laurel, 1986). She had worked in Atari in its heyday in the early 1980s, and then later in Activision, LucasArts Games and Apple. Her research work stemmed from the idea that computers, especially their user interfaces, would be best seen as a stage governed by the rules of theatre. Her book *Computers as Theatre* (Laurel, 1991, 2014) reflects this idea and Laurel states: 'When we look toward what is known about the nature of interaction, why not turn to those who manage it best – to those from the world of drama, of the stage, of the theatre?' (Laurel, 1991, p. xii).

Laurel's work inspired the first research work, the Oz Project (1989–2002), in Carnegie Mellon University lead by Joseph Bates (Oz Project, 2002). Initially, the research included studies simulating computer system by the use of human actors and directors. Later on the work continued with the systems like *Edge of Intention* and *Lyotard*. The interactive drama *Façade* by Michael Mateas and Andrew Stern (see Section 3.2.3) can be seen as the culmination of this line of research work.

At the same time with Brenda Laurel in Atari worked game designer Chris Crawford, who wrote the first book on computer game design (Crawford, 1984) and found the Computer Game Developer Conference. Game Developer Conference (GDC) – as it is called today – is the largest and most influential yearly event in the game developer community. However, its humble beginning was Crawford's living room which housed the first conference in 1988 with 27 attenders (including Brenda Laurel). In 1992, Crawford gave a keynote talk in the conference entitled 'The Dragon Speech' (YouTube, 2014). In his talk, Crawford wanted to deepen the emotional impact of computer games, to tell stories that touch human beings, to make art. Being a game developer pioneer he was saying goodbye to conventional games and welcomed a new task which he likened to pursuing a dragon. The years after that Crawford focused on creating interactive storytelling system called *Erasmatron* and later *Storytron* and *Siboot* (see Section 3.2.2) as well publishing a book entitled *On Interactive Storytelling* (Crawford, 2005, 2013).

At the same time, another game designer was also tackling the problem interactive storytelling. In 1995, Ernest Adams gave a lecture in GDC titled 'The Challenge of the Interactive Movie', where he lined out the some of challenges facing the realization of interactive storytelling. He continued writing and refining his views, which were collected first in his doctoral dissertation (Adams, 2013).

Just as Brenda Laurel approaches computers from the perspective of theatre, Janet Murray looks them from the perspective of literature. Her book *Hamlet on the Holodeck: The Future of Narrative in Cyberspace* (Murray, 1997, 2017) focuses on the question whether the digital media can provide a basis for an expressive form. Her book and her subsequent work offered a new terminology for interactive digital media in general, and interactive storytelling in particular.

Narrative Intelligence Reading Group started in MIT MediaLab in the autumn semester 1990 by graduate students Marc Davis and Michael Travers (Davis and Travers, 1999). Their idea was to bring together students from AI and literary theory to introduce work done in their respective fields and to find relevant research questions and a shared vocabulary for narrative intelligence (NI). The reading group comprising about twenty people met regularly until 1997, after which it continued as a mailing list.

In 1999, a conference on narrative intelligence was organized as a part of AAAI fall symposium series, with Michael Mateas and Phoebe Sengers acting as the program co-chairs Mateas and Sengers (2003). Interestingly, after this point the term 'narrative intelligence' vanishes and is replaced by a variety of terms such as 'narrative technologies', 'interactive digital storytelling' and 'interactive narrative'. Also, after this point the European researchers started have a more prominent role in the research on interactive storytelling.

The narratology vs. ludology debate waged fiercely for a few years in the early 2000s. The ludologists proposed a formal analysis of digital games and rejected the narrative (Juul, 1999, 2001). They argue that the notions derived from narrative theories are not effective to analyse games. Simply put, games cannot convey narratives. After a while, ludology's position became more flexible. For example, Juul (2005) allows that digital games are 'half-real': they have a real part (i.e., rules and formal aspects) and a fictional part, which helps the player to understand the rules and interpret them. Finally, Murray (2005) states that the battle is over.

Research on IDS was active during the 2000s and the decade saw several doctoral theses, for example by Mateas (2002), Osborn (2002), Riedl (2004), Fairclough (2004), and Louchart (2007). The academic research on interactive storytelling focused on three conference series. The biannual International Conference on Virtual Storytelling (ICVS) series was organized four

times between 2001–07 (Balet et al., 2001, 2003; Subsol, 2005; Cavazza and Donikian, 2007). The Technologies for Interactive Digital Storytelling and Entertainment (TIDSE) conference series was organized three times between 2003–06 (Göbel et al., 2003, 2004, 2006). In 2008, these two conferences formed a joint conference series called International Conference on Interactive Digital Storytelling (ICIDS) which has been organized annually (Spierling and Szilas, 2008; Iurgel et al., 2009; Aylett et al., 2010; Si et al., 2011; Oyarzun et al., 2012; Koenitz et al., 2013b; Mitchell et al., 2014; Schoenau-Fog et al., 2015; Nack and Gordon, 2016; Nunes et al., 2017; Rouse et al., 2018).

2.2.1 Brenda Laurel and interactive drama

Much of Brenda Laurel's work is based on her idea in the invisibility of the computer. Accordingly, designing an interface is the real problem, and the aim is at creating a representational world that leaves the feeling of the interface behind.

At the heart of her work is, however, a neo-Aristotelian theory of interactive drama (see Figure 2.8). The following levels match the ones we saw earlier in Section 2.1.1, but Laurel uses different translations for some of them:

- *Action* (plot) comprises the whole action of the system. It is based on the interactor's collaboration with system, and, consequently, the action may vary in each instance of the story.
- *Character* collects all the traits and dispositions of the interactor and computer-controlled characters alike.
- *Thought* represents the inferred internal processes of both interactor and computer-controlled characters.
- *Language* focuses on the semiotics of all verbal and non-verbal (e.g., visual) phenomena.
- *Pattern* (melody) comprises the perceived, aesthetically-pleasing patterns from the sensory phenomena.
- *Enactment* (spectacle) focuses on sensory dimensions of the presented story (e.g., auditory, visual and tactile).

The levels are connected to one another via two causal chains: each level in Figure 2.8 is a formal cause for the level below it and a material cause for

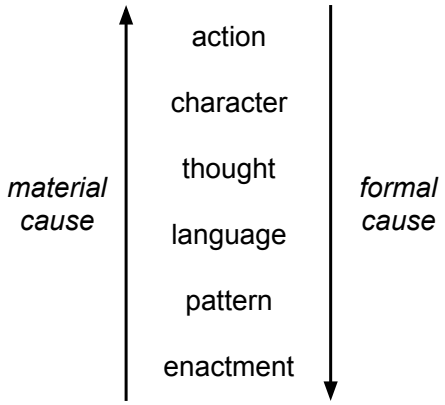

Figure 2.8: Neo-Aristotelian theory of interactive drama.

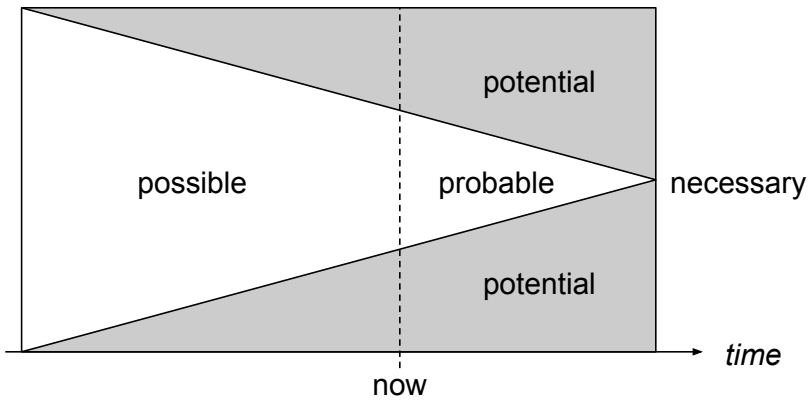

Figure 2.9: The flying wedge of possibilities.

the level above it. For a further discussion on the neo-Aristotelian theory, see Mateas (2002, pp. 25–27).

Laurel illustrates the effect of choices with the *flying wedge of possibilities* (see Figure 2.9), When the story progresses, there are fewer possibilities that can be probable consequences to the history of events. This means that there is more potential action that could have happened. Also, introducing new potential 'late in the game' can explode the structure of the action. The conclusion becomes more obvious over the course of the story, until only one necessary outcome is left, and which point the story has come to its logical conclusion.

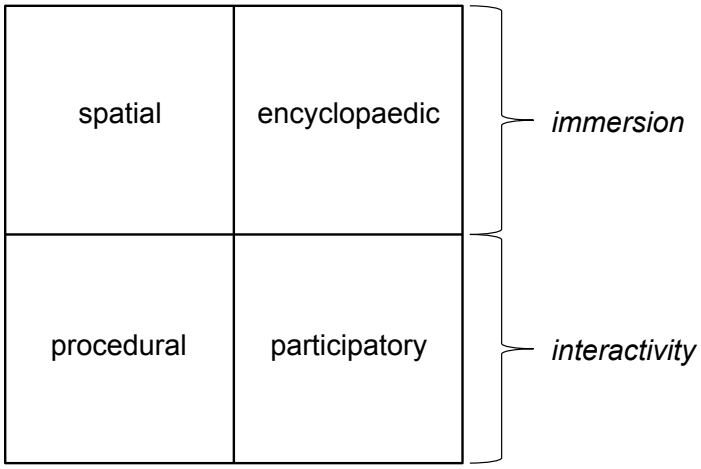

Figure 2.10: The four affordances of digital media. Immersion emerges from the spatial and encyclopedic affordances and interactivity from procedural and participatory affordances.

2.2.2 Janet Murray and the cyberbard

A digital medium provides the user with affordances, which are opportunities for action made available by an interface. According to Murray (1997, pp. 71–90) and Murray (2012, pp. 51–80) a digital medium has four affordances:

- Encyclopaedic affordance: Digital medium can store a vast amount of (possibly semantically segmented) information in various formats.
- Spatial affordance: Digital medium can represent a navigable space.
- Procedural affordance: Digital medium allows us to specify conditional, executable instructions.
- Participatory affordance: Digital medium allows us to manipulate the content and processing.

These affordances make the digital medium a vehicle for literary creation: the procedural and participatory affordances make it interactive, and the encyclopaedic and spatial affordances make it immersive (see Figure 2.10).

Murray (1997, pp. 97–182) defines three aesthetics (or phenomenal strategies) of the digital medium: immersion, agency and transformation. We will study each of these closer in Section 5.2

Murray (1997, pp. 185–213) anticipates the coming of the *cyberbard*, which would exploit the properties of digital media and create procedurally multiform stories open to collaborative participation. Murray further

claims that even densely plotted works like the *Iliad* and the *Odyssey* were collective efforts of a highly formulaic oral storytelling system. This bardic system is conservative, focusing on the underlying patterns where a particular performance can be created.

Ryan (2008) collects lessons from Murray's vision of the holodeck as an ideal and proposes the following goals to pursue:

1. natural interface (e.g., involving language and the human body)
2. integration of user actions within the story (i.e., the user moves the story forward)
3. frequent interaction (i.e., the user is not a spectator but can decide whenever)
4. dynamic creation of the story (i.e., the plot is created as much as possible in real time)
5. ability to create narrative immersion (i.e., engagement of the imagination in the mental construction and contemplation of a storyworld)

According to Ryan goals 1–4 bring IDS close to life, and goal 5 transcends it into art. Although Murray uses the holodeck as a motif, Koenitz (2018) summarizes that the essence of Murray's work is not the vision of the holodeck itself but the affordance and aesthetic qualities.

2.2.3 Narrative paradox and other research challenges

As we saw in Section 1.1, interactivity is the key difference between games and other forms of media, and game technology provides a new medium of expression where an essential part of experiencing the story happens through a direct participation with the story generation process. In order the interactor to have agency in the storyworld, they must be able to make meaningful choices affecting the story's direction. This requires that the platform conveys information on the possibility of a choice to the interactor. Moreover, the interaction must, at the time of making the choice, have an idea on the possible consequences of that decision. Finally, to have agency, the ramifications of the choice in the story must be seen immediately and – to maximize the effect – they should also show an effect at the end.

The requirement of narrative agency – or freedom of choice – contradicts with the idea of a story being authored. Consequently, the core question at the heart of interactive storytelling is the *narrative paradox*, which happens

when the 'pre-authored plot structure conflicts with the freedom of action and interaction characteristics of the medium of real-time interactive graphical environment' (Aylett and Louchart, 2007), which creates tension between the interactor's freedom and well-formed stories (Adams, 2013). This can be seen from two ways (Louchart and Aylett, 2005):

- the plot contraints the interactors's freedom, and
- interactive freedom affects the unfolding of the story.

Simply put, the more freedom the interactor has, the less control author has, and vice versa. Especially, this can lead to the problem of internal consistency (Adams, 2013) where the interactor can act inconsistently with respect to the author's intentions (e.g., plot, character, or storyworld). The player can refuse to follow the intended story and do something else instead. For example, imagine a game based on the film *Star Wars: A New Hope*. Now, the player controlling the character of Luke Skywalker could refuse to leave Tatooine preferring to lead a life of a farmer. How could the author persuade the player to follow the intended story and leave the planet with Obi-Wan Kenobi and the droids?

The storyworld and its set-up limit the freedom of the interactor. For example, in *Façade* the storyworld comprises a soirée of three people and the theme is about a breaking relationship of the two computer-controlled characters. If the player refuses to follow this set-up and decides, for instance, to act like a zombie (i.e., to march in and only utter 'Brains, brains!') or to act like he has been shot and is bleeding (i.e., to plead the characters to tie the wounds and to call an ambulance), the story is not progressing at all.

One possible answer is to increase the limits of the freedom of choice and forcing the player into a certain direction – either by hinting or even by coercion. This resembles the situation in the film *Stranger Than Fiction*, where the main character is hearing a voiceover of his life. At some point, he decides not to follow it and instead goes back to his apartment only to discover how hints (e.g., mail, news programme, commercials) turn into coercion (wall being bulldozed down) forcing him eventually to follow the voiceover's story (this same conceit is also used in the game *The Stanley Parable*).

There are different proposals how to solve the narrative paradox. One possibility is to take a high-level approach that posits that the player enters into a contract with the author meaning that the player will obey the constraints of the storyworld (Adams, 2013). The same happens in games in general: the game designer is the one setting up the moral of the game world

(i.e., which actions are 'good' and which 'bad'). For example, a pacifist stance is not 'good' in the moral system of a first-person shooter game, because it makes impossible proceed in the game. More on this in Chapter 5.

A design-oriented solution to the narrative paradox has two opposite approaches (Smed, 2014). Author-centric approach puts the author's control in the first place. This leads having a part of the software, a drama manager, which acts as a proxy for the author and tries to manipulate the game world and its entities so that the interactor follows the intended route lined out by the author. Naturally, this can lead to a situation called 'railroading' where the interactor – regardless of their skills and abilities – is at the mercy of the game story.

Conversely, the character-centric approach sees the author as a Newtonian god, setting up the game world and its entities and leaving them alone to interact once the game starts. This so-called emergent narrative depends highly on the underlying simulations, especially the computer-controlled characters, but gives no guarantee whether a story comes up from this process. Naturally, this can be enhanced by re-introducing the drama manager as a behind-the-scenes partaker, which the characters can consult for making dramatically compelling decisions, leading to a hybrid approach. We return these solution attempts in Section 3.1.

Next, we will go through some specific problems present in interactive digital storytelling.

Platform

Perlin (2005) poses the fundamental questions what is an IDS system and how do we make such a thing. Over the years, there has been a plethora of IDS systems, mainly because everybody has wanted to develop one of their own – which usually is not compliant to any other system. This lack of interoperability has lead to a situation, where the researchers are burdened with solving problems – and often the same implementational issues – that are peripheral to their original goals. For this reason, there is clearly a need for a specification for an open architecture IDS systems (Koenitz, 2014).

The interface provided by the platform should be expressive and provide a multi-modal representation of the character's actions in a real-time 3D environment (Szilas, 2007; Stern, 2008). It has to be closely connected the storyworld's content generation so that the designer is able to use the platform to its full potential. In addition to providing the interactor with content, the interface faces the question of interpreting the interactor's actions appropriately (Szilas, 2007).

Obsolescence is an ever-growing problem of all kinds of digital media.

For example, a significant part of the early work done on IDS systems is lost. Koenitz (2014) emphasizes the need sustainability, which is the need for preserving operational records of the software for the future.

We will look more into the platform and examine existing applications in Chapter 3.

Designer

As we saw earlier in Section 1.1, the role of the author is tipped over in interactive storytelling, which is why we prefer calling them a designer instead. This also means that authorability must take new forms maintaining that the artist should still be able to express themself (Szilas, 2007). As Bringsjord (2001) points out, the artistic expression includes defining the theme – such as betrayal, yearing, love, or revenge – of the storyworld. Also Koenitz (2014) wants to put more focus on the author, because nowadays the engineers (i.e., the ones developing the platform) are often also the authors. To make a comparison with other media, movie camera engineers are rarely directors or book-printers authors. There is a need to focus on the creative process of creating IDS experiences (cf. Murray's cyberbard).

A touchstone for an interactive storytelling application is, whether the story remains dramatically compelling (Bringsjord, 2001). Creating an interesting story from the interactor's choices means that the designer must maintain a temporal management of actions (Szilas, 2007). Moreover, this generation must happen in real-time and possibly from predefined building blocks (Stern, 2008)

We will return to this in more detail in Chapter 4 on the designer.

Interactor

Adams (2013) points out the problem of amnesia, where the human interactor does initially not know much anything about their character in the storyworld. Therefore, the story has to account this, for example, by letting the interactor's character suffer amnesia and finding about themself and the storyworld at the same pace as the human interactor. Otherwise, the interactor can be exposed to extra dialogue that would not normally be believable. The same problem affects also video games, especially if the game is story-driven and the player should emphasize with the avatar.

Another problem the interactor is facing is agency. Agency is the primary feature offered to the interactors, and the interactor has to be able to affect the plot directly (Stern, 2008). Perlin (2005) puts forth a list of questions

regarding agency: how do we interact, what would change, and what would stay the same.

Koenitz (2014) summarizes that user experience is a crucial goal for research. How do we create exciting and fulfilling narrative experiences? And how do we reach the wide audience?

We will see more on this in Chapter 5 when we look at the interactors.

Storyworld

Bringsjord (2001) emphasizes the importance of the computer-controlled characters in interactive storytelling. Firstly, the characters should be strong and autonomous in order to pull the story forward. Secondly, the characters should be personalized so that they have reasonable reactions and beliefs.

We will return to this in more detail in Chapter 6.

Terminology

Interactive storytelling is a young field and is still lacking proper terms (Stern, 2008), which was already observed in early 1990s by the Narrative Intelligence Reading Group (Davis and Travers, 1999). Research has approached interactive storytelling from two fronts: from computer science as a technical problem to solve, and from humanities as a process for discovering new expressive forms (Koenitz et al., 2013a). This has lead to a problematic situation, where competing concepts require an extensive knowledge and understanding of each term and familiarity with their etymological development. For this reason, (Koenitz, 2014) emphasizes the need for a new narratology, because there is a clash of research fields. Narratology assumes fixed objects of study (e.g., printed books or final cuts of movies), whereas interactive storytelling systems are usually dynamic. Furthermore, narratology uses fuzzy terms and the terminology does not help in communicating concepts amongst interdisciplinary scholars. For example, it is not easy to discern the meaning of terms such as ‘text’, ‘story’, and ‘discourse’. Hence, there is a need for commonly understood terms.

Chapter 3

Platform

Typically software matures so that parts that were originally developed in-house later on are developed by third-parties and before they become off-the-shelf tools or components. Initially, these tools are crude and expensive but with time and competition they get more sophisticated and cheaper.

3D engines used in video games provide a good example of this progress: In the 1990s, it was customary that every game developer created their own 3D engines. This took both effort and skill limiting the scope and amount of 3D game titles. Late 1990s and early 2000s emerged few 3D engines such as Unreal Engine by id Software and CryEngine by Crytek that began to get used in other games and by other game companies. However, these engines typically required a sound knowledge of 3D programming in order to be used and – more debilitatingly – obtaining a licence required that the developer paid fees up $100,000 and had a history of developing AAA games. With the advent of paradigm-challenging 3D engines such as Unity 3D (as it was originally called) by Unity Technologies expanded and democratized the group of potential developers by offering the product for free for academic and non-commercial purposes and changing the monetization method. This expanded the user base and helped to make the game engines even more easier to use so that nowadays creating 3D video games is easy even if the developers do not have a specific skills in graphics programming.

As a technology, interactive storytelling is not yet at this point of maturity. Rather, we are seeing limited and tentative systems created in-house for specific needs. Despite this reality, let us begin with the platform and differentiate it from those – designers – who are using the platform to create storyworlds. To make this difference clear, we will use the term *developer* to refer to those creating the platform for interactive storytelling. The relationship between the designer and developer can be close: when the platform is being developed in-house, it tends to get modified according to the feedback

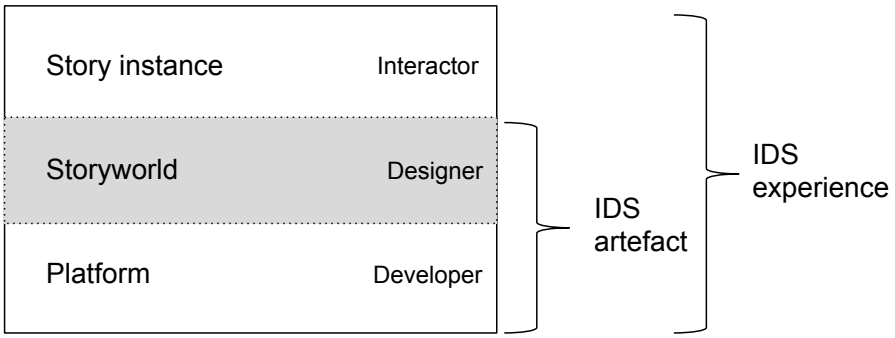

Figure 3.1: The boundaries of between the interactor, designer, and developer (Spierling and Szilas, 2009). The IDS artefact is presented to the interactor, who in turn will have their own IDS experience.

from the designers as well as the interactors. However, separating the roles is vital and, clearly, there is a dependency where the designer is using the platform created by the developer.

Figure 3.1 illustrates the boundaries and emphasizes that the developer and the designer need not be the same. The developer's responsibility is the runtime engine that enables the performance of the characters' autonomous or semi-autonomous behaviour and other mechanics, whereas the designer's storyworld constitutes the actual 'content' using the platform-provided mechanics.

Discerning the roles or the designer and developer plays a crucial role. Sometimes an artist has to create their own tools for creating the work. When telling stories by writing books or painting images, we can expect that the artist masters the tools and mechanisms involved. Obviously, most writers and painters do not make their own ink and paper or colours and canvas. If you consider this production as a part of the storytelling process, the people responsible for these tasks could be considered as 'developers' in the same sense as in Figure 3.1. In digital media, it is more typical that the artist purchases a computer to be used as a tool (like they would purchase ink and paper) but there a special scribe called 'the programmer' who masters the techniques for transferring the artist's vision into a digital artefact.

The platform can allow the also interactor to affect the underlying mechanics. Video games often support the creation of *modifications* (or 'mods') made by the player community. This places the members of the community in the role of the developers. In other words, the platform does not only include people from the company who publishes the game, but also from those who traditionally are considered as the audience. These modifications

can extend the functionality or mechanics, which can even transform original system into something that the original developers had not intended.

The mods can also involve the mechanisms that the designer use to put the story into the game. Thus, through mods, the community of interactors (the fandom) can become designers for storyworlds and expand them beyond the original. These community created storyworlds can even be the basis for the business idea like in the platforms *Episode* and the now-defunct *Versu* (see Section 3.2.4).

The *software architecture* of the platform follows the established model–view–controller (MVC) pattern (Smed and Hakonen, 2017, pp. 4–5). The model part is coordinating the internal state instance and upholds the (physical or dramatic) rules that form the core structures. The view part creates a representation of the model for external use by rendering it to output devices and internal use via synthetic view used by the computer-controlled character. The controller part comprises the control logic which is dynamic part updating the model based on internal input from the character and external input from the interactor received from the input device through a driver software.

Figure 3.2 collects the main components of the MVC pattern. Interestingly, the MVC pattern is line with the concept of expressive processing by Wardrip-Fruin (2009, pp. 8–13), which considers how to craft and situate interesting processes so that they produce meaningful audience experience. The terms used by Wardrip-Fruin correspond so that data means the model, process the controller, and surface the view.

We can notice that the human interactor participates in a human-in-the-loop data flow by perceiving information from the output devices and generating actions to the input devices. Similarly, the computer-controlled characters have their own perception of the storyworld, which they then use as a basis for their decision-making process (see Section 6.1).

3.1 Solving the narrative paradox

The platform developer's first task is to select a strategy on how to handle the narrative paradox introduced in Section 2.2.3. Here, the we can choose from two opposite approaches: the author-centric and the character-centric (Bailey, 1999; Mateas and Sengers, 1999). The *author-centric approach* (also known as explicit authoring, top-down or plot-centric approach) models the creative process of a human author. The system includes a proxy of the designer, the drama manager, which controls the events and characters of the storyworld. The *character-centric approach* (also known as emergent

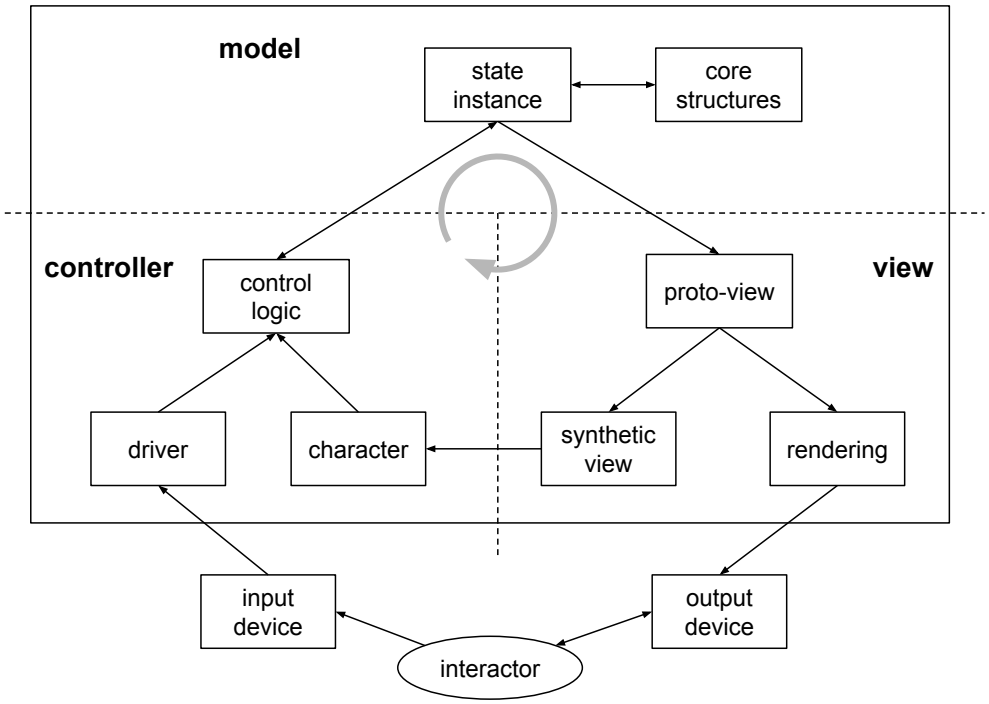

Figure 3.2: The model–view–controller architectural pattern for an interactive storytelling platform.

narrative, bottom-up or implicit creation) focuses on autonomous characters and modelling the mental factors that affect how the characters act. The story emerges from the characters' decisions and interaction.

To compare the two approaches Riedl (2004, pp. 12–14) proposes two measures for balancing the plot and character (Riedl and Young, 2010):

- Plot coherence: The perception that the main events of a story are causally relevant to the outcome of the story so that there is a logical causal progressing of the plot (cf. Aristotle's concept of the plot in Section 2.1.1).

- Character believability: The perception that the events of a story are reasonably motivated by the beliefs, desires and goals of the characters (i.e., they should not have a negative impact on the interactor's suspension of disbelief; cf. Aristotle's concept of the character).

Clearly, author-centric approach allows us to have a strong plot coherence as a result of the drama manager's influence. The downside is, however, that the character believability weakens when the actions of the characters seem to be compelled to follow the designer's will (Aylett et al., 2011). The problem is then finding subtlety so that the influence does not feel too forced upon the user. In implementation, the main concern is that a platform must observe the reactions of the interactor as well as the situation in the storyworld to recognize what pattern fits the current situation: Is the story getting boring and should there be a surprising twist in the plot, or has there been too much action and the user would like to have a moment of peace to rest and regroup? Since we aim at telling a story to the human users, we must ensure that the world around them remains purposeful.

Conversely, character-centric approach has (and requires) a strong character believability. This means that the plot coherence is weaker, because the story emerges bottom up based on the characters. Although the idea of emergent narrative of the character-centric approach seems to solve the narrative paradox, it is unlikely that it is enough for implementing a satisfying platform (Aylett et al., 2011). Realistic actions are not necessarily dramatically interesting, if the characters have no dramatic intelligence. Therefore, the argument is that the author's presence is necessary, because without the author's artistic control we would end up having the chaos and drudgery of everyday life.

This leads to idea that the approaches can be combined to a *hybrid model*, where a character proposes a set of possible actions to a drama manager, which selects the dramatically best alternative (Weallans et al., 2012). Here,

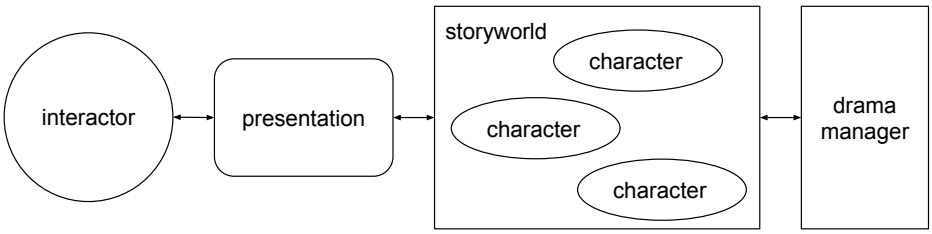

Figure 3.3: The structure of the Oz Project's interactive drama engine.

the drama manager is no longer pushing the characters to follow its lead but supports their decision-making.

3.1.1 Author-centric approach

The first school to emerge in the late 1980s and early 1990s was the author-centric school (Laurel, 1991; Bates, 1992). It likens IDS to theatre, where the author sets up the storyworld and a computer-controlled drama manager directs its characters. The drama manager modifies how the computer-controlled characters react and tries to lead the story towards a direction that the author has intended (see Figure 3.3).

A concrete example of an author-centric system is the early test scenario described by Kelso et al. (1993): Having no computer implementation at their disposal, Bates' research group devised a situation where a human test subject gets on the stage with a group human actors. The actors have headphones for receiving instructions from an off-stage human drama manager, and these instructions affect how the actors play. The drama manager observes the reactions of the test subject and modifies the situation accordingly. In the later experiments, the human actors and drama manager are replaced with computer programs. One of the early, staged Oz experiments took place in a bus station with three actors: clerk, a blind passenger and a punk (Wardrip-Fruin, 2009, pp. 317–326). Interactor's task in this scenario is to buy a bus ticket to a relative's funeral. Whilst waiting in the queue, the punk begins a knifepoint robbery. As the situation unfolds, the clerk gives the interactor a gun. The human interactors' reactions varied much, some took quickly the initiative and acted out their role, while for some the experience was too much and the test had to be interrupted. Nevertheless, the interactors were all highly engaged in the drama. For the outside observers, the experience was lagging because engaging pacing for the interactor was different from traditional media experience (cf. watching an uncommented and unedited gameplay video). Still, the design philosophy of interactive

drama was successful and lead to subsequent computer implementations.

A computer-controlled drama manager acts as a proxy for the designer. Analogously, it tries to change the situation so that the user is going to the direction of the intended story. This resembles the set-up of the movie *Stranger Than Fiction*, where the protagonist realizes that his life is happening in a fictional novel, and when he refuses to obey the voiceover, the world tries to force him to follow the intended story.

Crawford (2013, pp. 214–218), Crawford (2005, pp. 205–208) lists examples on how the drama manager can influence the storyworld. The most common one is *environmental manipulation*, where the interactor is guided to take a certain route or prevented from getting out of limits of the story or doubling back to already discovered content. It is the easiest one to realize as it involves manipulating some elements already present in the scene. One example is the lock–key structure, where the interactor first faces a lock which prompts them to search for a key and, once it has been found, return back to the lock to proceed.

If the platform allows the drama manager to affect the characters, they can be used to guide the interactor. This can be realized crudely as *goal interjection*, which means – quite literally – that the character's goals in the scene are adjusted so that they lead the interactor to the intended direction. If the drama manager's intention is to lead the interactor to a pizzeria, where the story continues, the character playing the interactor's friend could have a new goal of getting to the pizzeria. As these interjected goals might come out of sudden and look unmotivated, it can easily break the believability of the character, since it can look almost possessed or remotely controlled by some outside force.

A subtler way to use characters is *shifting personality* which, in turn, adjust their goals. This is less discernible as it seems to stem more naturally from the characters' traits and needs. For example, instead of injecting the goal to go to a restaurant, the character's personality could changed to prefer Italian food and once the character gets hungry, it naturally proposes the interactor to visit a nearby pizzeria.

The development of the story can be triggered by *plot points*, which are predefined conditions related to the interactor's exploration, interactor's decision or advancement, or passage of (real) time (Adams, 2013, pp. 42–44). These conditions can form complex network, where changes in the characters' or interactor's attributes cause plot points to trigger. One special case of plot points is the 'ticking clock of doom', which adds a time limit that can pressure the interactor to continue to intended direction instead of wandering around. Although this might look a crude method, this can be realized so that the interactor does not realize the manipulation.

The crudest way for the drama manager to influence the interactor is *dropping the fourth wall*, where the suspension of disbelief is knowingly disrupted to instruct the interactor. For example, *Portal 2* and *Leisure Suit Larry Goes Looking for Love (in Several Wrong Places)* both break the fourth wall with the limitations of the user interface. In the onboarding phase of *Portal 2*, the non-player character Wheatley asks the player to say something. As there is no command available for the player to say anything, they typically try out every button they can while looking for the correct command. This is possibly intended to encourage the player to discover different controls. Eventually the player will press the jump-key, and Wheatley condescends to that as a sufficient response, stating: 'or jump... that's good too...' In *Leisure Suit Larry*, the player as Larry takes part in Dating Game, where Miss X is asking Larry and two other male contestants questions to determine with whom to go to a date. Whilst the other two contestants give highly poetic answers, the player is limited to entering short text strings, which makes it as impossible for the player to write as eloquent answers as the competitors. No matter what, Miss X eventually chooses one of the other two contestants, but due to a mistake, she ends up getting Larry instead.

3.1.2 Character-centric approach

The character-centric school appeared in the late 1990s and gained more influence in the 2000s (Aylett, 1999; Spierling, 2007). Aylett (1999) poses the question 'how far the user of [an interactive story] can freely participate in a narrative rather than acting as a spectator' and answers that by allowing the characters in the storyworld to be autonomic we can achieve emergence which would solve the problem. Consequently, the key question is to model the mental factors that affect on how the characters act. As there is no drama manager, the author's influence is limited in creating and setting up the storyworld. After that, the storyworld runs without the author's influence, and the story – hopefully – emerges, bottom up, from the interaction between the characters and the interactor.

Reality television can be seen as an analogue to this kind of emergent narrative as a source for a story (Louchart and Aylett, 2005). In a reality television show, the participants are motivated by, for example, money or fame, and they are subjected to entertain the spectators. The spectators get entertainment but lack influence on the narrative. The programme production team makes pre-production selections by choosing and defining the main protagonists and by designing the world environment to foster emotions. Moreover, they have performance time control by issuing tasks or eliminations and, ultimately, by compiling a broadcast to the spectators.

Relying solely on an emergence, however, does not guarantee that the interactor experiences interesting or dramatically-compelling stories. On the contrary, it is tends to lead to (more or less) a simulation of everyday life. For this reason, character-centric approach evokes many challenges for the design (Ryan et al., 2015). Modular content requires that there is a way to express the underlying system state to the interactor. Compositional representational strategies are needed to define how the content is actually deployed. A bigger challenge, however, is story recognition, which is needed to discern stories in the simulation. Finally, story support is needed to answer what do with a recognized story-like sequence.

The seeming dead-end of 'pure' emergent narrative lead to improvements and refinements. *Double appraisal* aims at solving problems of emergent narrative so that the actions generated by the character are believable but still the system generates high drama, where each step is loaded with emotional impact with no quiet or pensive moments (Weallans et al., 2012). The idea is that the character generates a set of possible actions to perform. After that, the emotional impact of each action in the set of other agents is simulated and the action with the biggest emotional impact is selected. The weakness of double appraisal is that it does not consider which emotion are being impacted. The dynamic of the story requires also quieter moments and build-ups instead being a constant emotional rollercoaster. Moreover, the most dramatic action should happen only at climaxes – not all the time.

3.1.3 Hybrid approaches

The problems encountered by both author-centric and character-centric approaches have brought forth a hybrid model combining them. The idea is that the characters are autonomous but they can communicate with one another outside of the storyworld. These two modes of the character are called in-character (IC) and out-of-character (OOC). They are used, for example, in live action role-playing where the participants can act IC (i.e., within the role they are playing) or drop to OOC when they are being themselves. Also, in improvisational theatre the actors can convey OOC information using indirect communication (Swartjes and Vromen, 2007; Swartjes et al., 2008). For example, the actor can say 'Hello, son!' cuing the other actor of their roles as a mother and son.

The idea of *late commitment* is that OOC decisions are used to allow the characters to fill in the storyworld with what the story need. These could include added props, deepened characters, defined relationships or backstories of the characters filled during the simulation. Late commitment is explicit OOC communication using framing operators. This includes goal man-

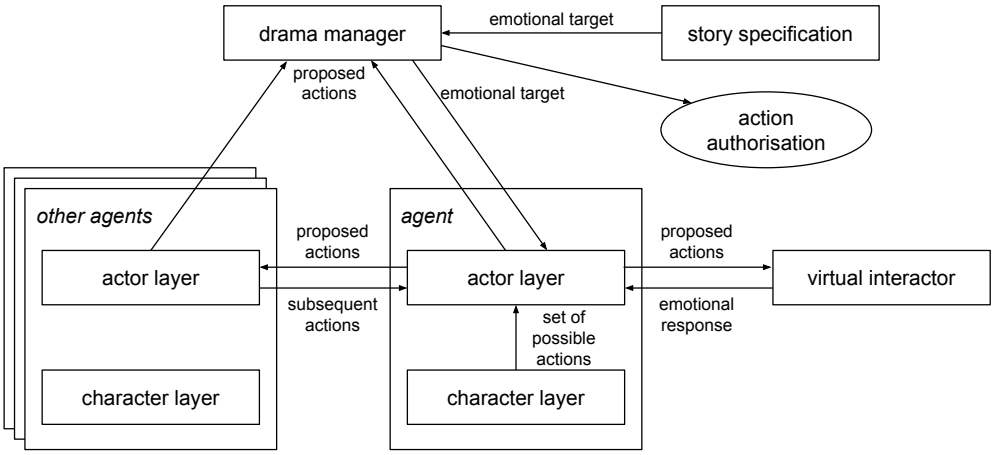

Figure 3.4: Distributed drama management (Weallans et al., 2012).

agement (i.e., creating goals from OOC if no other goals exist) and action selection (i.e., characters can create OOC plans for their goals).

Weallans et al. (2012) present a more advanced hybrid approach called *distributed drama management*, where the characters act on an IC level and reflect on their actions on an OOC level (see Figure 3.4). A character proposes a set of possible actions to a drama manager, which selects dramatically the best alternative. Here, the drama manager is no longer pushing the characters to follow its lead but supports their decision-making through OOC communication. When using a distributed drama manager, each character should be aware of its role as a character in a story with respect to the human interactor (Louchart et al., 2015). The character must reason about the actions possible for it (i.e., its role) and the impact that the chosen narrative action will have on other characters. The internal representation of interactor's character creates feedback. The decisions are based on characterization and the emotional trajectory.

In the distributed drama management, the character layer simulates the character. The actor layer mediates possible action in terms of dramatic appropriateness. The virtual interactor represents the human interactor's beliefs, desires and emotional state. It is used to estimate what is the emotional impact of proposed actions. Drama manager receives the proposed actions and authorises the one that fits the best. Story specification is a document by the narrative designer, which describes the story at a high-level of abstraction. This can be a sequence episodes akin to Propp's functions, where each episode sets an emotional target for the virtual interactor.

The hybrid character should also have a function, where drama manager

could query for a chain of actions, and ask, whether the character would go through it, or what would it take for the character to go through it. If a story requires a character to make a certain critical mistake in a given situation, the drama manager could cast a suitable character for that particular role. In the movie *Dirty Harry*, the bad guy needs to be such that he could not keep a precise count whether Harry has already fired six shots, otherwise the story would not work. Similarly, comedies are often based on characters, who have strong mannerisms for reacting in a particular way in certain situations. If these behavioral patterns on a character are remarkable, the story will be foreseeable but funny. If they are more subtle, they may help to build up suspension and interesting delicate plots with relatability to the characters.

3.2 Implementations

In this section, we will give an overview an existing IDS systems. We will include laboratory systems and demonstrations as well as commercial systems and open-source platforms. The games mentioned already in Section 1.2.8 are not included here.

3.2.1 Pioneering storytelling systems

The first storytelling system were mainly not interactive – or the interaction happened by tweaking the parameters for each batch run. Instead, they focused on generating stories within clearly defined limits (e.g., genre).

Tale-Spin by James Meehan (1976) is based on Aesop's fables such as 'The Tortoise and the Hare', 'The Goose That Laid the Golden Eggs' and 'The Boy Who Cried Wolf'. It aims at modelling the behaviour of the characters, which, in turn, creates the story. *Tale-Spin* allows no interaction but each story is generated top-down on one run.

An example output (with added capitalization) from *Tale-Spin* given by Meehan (1977) runs as follows:

> Once upon a time George Ant lived near a patch of ground. There was a nest in an ash tree. Wilma Bird lived in the nest. There was some water in a river. Wilma knew that the water was in the river. One day Wilma was very thirsty. Wilma wanted to get near some water. Wilma flew from her nest across a meadow through a valley to the river. Wilma drank the water. Wilma wasn't thirsty any more.
>
> George was very thirsty. George wanted to get near some water. George walked from his patch of ground across the meadow through the valley to a river bank. George fell into the water. George wanted

> to get near the valley. George couldn't get near the valley. George wanted to get near the meadow. George couldn't get near the meadow. Wilma wanted to get near George. Wilma grabbed George with her claw. Wilma took George from the river through the valley to the meadow. George was devoted to Wilma. George owed everything to Wilma. Wilma let go of George. George fell to the meadow. The end.

As we can see, the system tends to overgenerate a narrative because the model has no intrinsic sense of what makes a story (Bailey, 1999). Also, the subsystem creating the presented text is lacking finesse.

Universe by Michael Lebowitz (1984, 1985) aims at generating stories that resemble television melodramas. Like soap operas, these stories can be endless. *Universe* is not based on simulating human cognitive processes but emphasises story and character structures. It also allows a limited combining and sequencing of hand-authored data.

Minstrel by Scott Turner (1985) is inspired by Arthurian knight tales. The underlying mechanics is based on Propp's narrathemes (see Section 2.1.2) but it also models the goals of a simulated author. *Minstrel* sees story generation as a common sense reasoning problem. This, however, makes it a brittle system that tends to undergenerate the stories, because the model has a limited sense of what makes a story (Bailey, 1999)

Brutus by Selmer Bringsjord and David Ferrucci (1989) generates stories of betrayal (Bringsjord and Ferrucci, 1999). It uses a logical formulation as model and solves it with logic programming. The downside of this approach is that it offers little or no variation for the generated stories.

3.2.2 Hunt for the dragon

Chris Crawford started developing ideas for an interactive storytelling system in the early 1990s. These are collected in his website Erasmatazz (Crawford, 2019a) and formed the basis of the Erasmatron system. This system, however, never materialized but the material Crawford originally published in Erasmatazz ended up in his book *On Interactive Storytelling* (Crawford, 2005).

Crawford tried to next to develop a commercial interactive storytelling platform called *Storytron*, which was released in 2006. It included a tool for authoring stories, a storyworld library and a run-time engine for interacting with the storyworlds. *Storytron* did not catch on and was discontinued in 2011. Apart from the financial crisis of 2008–2009, which made it difficult to find investors, Crawford confessed that the system turned out to be too complex to understand and to use (Crawford, 2011b). Crawford (2011a)

lists the lessons learned from the failure of *Storytron* to keep the technology simple:

- all actors (i.e., characters and interactor) have to be protagonists
- large base of fixed system verbs (i.e., things that the actors could do)
- author can only manipulate nouns (i.e., actors, props, and stages)
- the range of storyworlds is limited
- no scripting
- no attribute creation (i.e., the designer's choices are limited by the platform)

Crawford is currently developing a simplified version of *Storytron* called *Siboot*. After a failed Kickstarter campaign in 2015, *Siboot* has been developed as an open source project (Crawford, 2019b).

3.2.3 The moonshot: *Façade*

Even today *Façade* by Andrew Stern and Michael Mateas, released 2005, is still, in many respects, a prime example what interactive storytelling could be about (Mateas, 2002; Mateas and Stern, 2004). It was also a culmination of the work started on the Oz project and author-centric drama management. The setup is that the player takes the role of a close friend of Trip and Grace, a couple whose relationship is in trouble. The events take place at Trip's and Grace's home where the player is invited to have a cocktail. The player sees the 3D environment from the first-person perspective and can move around and interact with the objects in the apartment. Interaction with Trip and Grace includes a set of gestures (e.g., hug, smile and kiss) and typing in utterances in English.

The complete play is divided into three sections. The first one is a zero-sum affinity game, which tries to get the player to agree with either Trip or Grace. In the second section, the character realization is increased through a therapy game. Finally, the third section lead to a dramatic conclusion.

The system structure is based on discretizing the time into beats. A beat is the smallest unit of a value change (i.e., an action–reaction pair). The story comprises dozen carefully scripted interactive narrative scenelets, and techniques are to steer the story towards the relatively linear set pieces.

To allow maximum range of meaningful interaction, *Façade* uses a *broad-and-shallow approach* inherited from the Oz project. The system is broad in

Table 3.1: The discourse acts of *Façade* (Mateas and Stern, 2004).

agree/disagree	ally/oppose character	advice
positive/negative exclamation	don't understand	refer to
express of emotion	apologise	ask to share intimate thoughts
unsure or indecisive	praise/criticize	say goodbye
thank	flirt	miscellaneous discourse act
greet	pacify	can't understand
explain		

the sense that all necessary features have an implementation, and shallow in the sense that some features could have been performed better. In practice, this means that characters can act believably, but not necessary intelligently, in a wide range of situations. One example of this is how the textual utterances from the player are handled by surface-text processing. In the first phace, the surface text (i.e., the player's input) is mapped into one of 19 possible discourse acts (see Table 3.1). The relevant discourse act is then mapped into character responses.

3.2.4 Experimental systems

We introduce shortly some of the experimental system and their key features in alphabetical order.

The *Advanced Stories Authoring and Presentation System (ASAPS)* (Advanced Stories Group, 2019) is used for teaching how to author interactive stories and studying the authoring process (Koenitz and Chen, 2012). It uses a bottom-up approach, where the author has accesses to building blocks and combines them into an interactive story. Like *Façade*, it uses beats (14 types) which can be static (e.g., title screen), flexible (e.g., conversation, navigation, inventory) and procedural (e.g., counters, global variables, items, timers). The results from using *ASAPS* in teaching interactive narratives concluded that the typical narrative genres selected by the students were

- adventure
- detective story/mystery
- role playing game
- alternate history
- amnesia/escape room
- situational challenge
- character development

- complex topic/multiperspective

CrossTalk is designed to be used as an exhibition guide (CrossTalk, 2019; Klesen et al., 2003). The basic idea is an interaction triangle with three screens. The first screen is meant for virtual exhibition hostess, which engages in a conversation with changeable virtual exhibition visitors who inhabit the second screen. The third screen is a touch screen for the interactor's choices.

FearNot! aims at teaching school children how to handle cases of bullying (e.g., as the one being bullied or as a bystander witnessing bullying) (Aylett et al., 2007). The underlying FAtiMA (Fearnot Affective Mind Architecture) system is an agent architecture driven by cognitive appraisal, where the characters focus on both problem solving and assessing other characters' emotions.

Makebelieve is a virtual guide system, which uses Jess/CLIPS reasoning system, OpenMind common sense data, and Unreal Tournament engine (Ibanez et al., 2003). The storyworld comprises a pool of story elements, each which has data related to the content of the event (e.g., name, type, location, date and caused effects). Based on the interactor's input, the system selects a suitable story element (possibly adding some causally related elements). The data is then translated according to the guide's attitude and extended with common sense data. Based on that the system generated a storyboard for the output to the interactor.

Nothing for Dinner released in November 2015 (Medilab Theme, 2019), is based on the Interactive Drama Engine (IDA) (Szilas, 2007). Its purpose is to train how to support stroke patient's family and loved-ones. Player takes the role of a teenager, whose family member is suffering from a stroke, and observes the consequences of the actions.

Prom Week released in 2012, focuses on the interactions of high school students (Expressive Intelligence Studio, 2019). It has a dynamic storyspace, and characters with 5,000 social interactions (e.g., who likes who and how much and direction of relationships).

Scenejo is a platform for experiencing emerging dialogues or conversations between a number of virtual and human actors (Scenejo, 2019). It connects computer-controlled character and the interactor in a conversational loop that is controlled by 'dramatic advisor'. For example, the interactor could act as moderator in a debate between two characters. For each turn, the dramatic interactor receives utterances from the characters and interactor and selects one to be played and reacted by everyone in the next turn.

Virtual Storyteller is a multi-agent framework with plot generation (Virtual Storyteller, 2019; Theune et al., 2004; Swartjes and Theune, 2006). It places a special focus on natural language generation and the presentation

by an embodied agent.

There have been many others systems presented which have had a shorter lifetime or lower impact, including *SAGA* (Machado et al., 2004), *OPIATE* (Fairclough, 2004), *VIBES* (Sanchez et al., 2004), *PaSSAGE* (Thue et al., 2007), *ISRST* (Nakasone et al., 2009) and *LogTell-R* (Karlsson and Furtado, 2014).

3.2.5 Other systems

To conclude our review we list some commercial or open project systems for creating interactive stories:

- Twine is an open-source tool for telling interactive stories (Twine, 2019).
- Versu is a platform for creating and distributing interactive stories such as *Blood and Laurels* (Versu, 2019).
- Episode is a platform for creating and distribution digital stories (Episode Interactive, 2019).
- Ink is an authoring system developed by Inkle Studios and used in, for example, in their game *80 Days* (Inkle Studios, 2019).
- Ren'Py is an engine for creating visual novels (Ren'Py, 2019).

Chapter 4

Designer

In conventional storytelling such as books and movies, the author's role is decisive in creating the presented story to the spectators (see Figure 1.2). Here, we have usually a single author – the writer or the director – composing a story to an audience, and the only interaction in storytelling happens before the story set down to its published form. For the audience, the presented story is always the same but everyone makes their own experienced story out of it. In reality, the case is typically more complex and interactive than that. Books are processed by writers who receive feedback from editors and advance readers before the book is published. Movies are conducted by the directors in a complex process involving actors, cameramen and many others – and the director might not even get the last word but the film can go through a recut based on the reactions from test audiences. Nevertheless, on a higher level of abstraction, these teams can be considered collectively as the author.

In interactive storytelling, the role of the author and whole authoring process is redefined so much that we henceforth use the term *designer* instead (Adams, 2013, p. 8–9). In game industry, a game designer is responsible for the vision and idea of the whole game working together with the rest of the game development team from the conception to the release of the game. In larger projects, the team can involve several designer each specializing in their own field such as level design or audio design. A recent addition to the group of game designers is a *narrative designer*, who focuses on bringing in and integrating the story so that it seamlessly fits into the game design and complies with the game mechanics and art style (Heussner et al., 2015). This requires a special set of skills, and many writers coming from more traditional media might find it difficult to give up authorial control and to adapt to work within the confines of the game system and as a part of a multidisciplinary development team. Furthermore, the narrative designer commonly directs

the graphics and audio team in creating the right environment, character design aesthetics and all other visual elements that would highlight the story content for more immersive gaming experience. A main requirement for the narrative design is second person insight, which is the ability to think in terms how the expression will be perceived by the audience (Crawford, 2005).

In the literature the term 'author' is, however, widely used, but we have tried here to harmonize the terminology to the term 'designer' as much as possible. For example, we use the term 'design process' instead 'authoring' when we talking about the designer's tasks related to implementing, assessing and refining the storyworld.

4.1 Storyworld types

What sets the design of an interactive storyworld apart from traditional storytelling is the interactor's influence on the story being told. This creates a friction that the design has to solve. There are different approaches how to handle this depending on how much control is given to the interactor. The designer can employ different narrative types for guiding the interactor to make impact on the story progression, which are illustrated in Figure 4.1 (which is actually Figure 1.1 revisited). As the narrative paradox indicates, the designer's control over the story and interactor's freedom exclude one another: the higher the designer's control, the less freedom the interactor has, and, conversely, high freedom of choice means reduced control for the designer. At one extreme, we have the case where there is no freedom, which constitutes a reduction back to traditional linear storytelling (e.g., cinema, literature). At the other extreme, we have no authorial control of the narrative and the game is reduced to just a simulation.

Between the extremes we have three different approaches – linear, branching and open – to incorporate narrative into games (Heussner et al., 2015; Zeman, 2017) and (Adams, 2013, pp. 37–42).

4.1.1 Linear storyworlds

In video games, the most widely used is a linear narrative, where the story progresses linearly (e.g., through cutscenes between the levels or environmental changes) but the player has freedom in the gameplay (see Figure 4.2). This means that every player will every time encounter the same story in the same order. Although the interactor, therefore, lacks agency, the story can be woven into the level design such a way that the interactor's actions seem to have an influence in the story as well. For example, the killing of

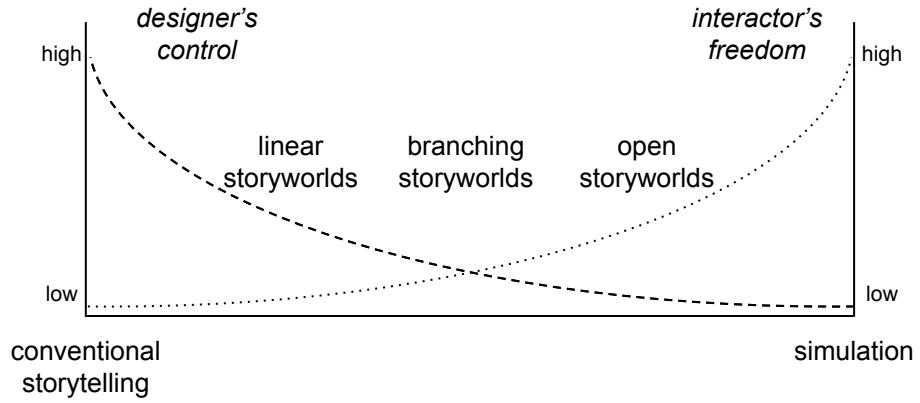

Figure 4.1: The spectrum of storyworld types.

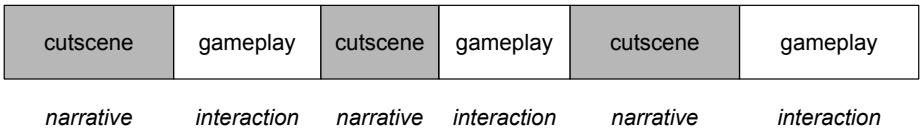

Figure 4.2: Typical linear narrative in a video game.

a level boss can be followed by a cutscene, where the allies of the boss get involved in the conflict. Although the killing of the boss was necessary for the player to proceed in the gameplay, now it seems to have repercussions in the story as well. This pseudo-agency provides the players with a feeling that they can affect also the story (see Section 5.1.1).

4.1.2 Branching storyworlds

Ideally, each choice would lead to a new and different situation meaning that the interactor could try out all possible scenarios like in the film *Groundhog Day*. However, this full branching leads to a combinatorial explosion (see Figure 4.3), where the shear amount of narrative alternatives becomes infeasible to handle. In practice, these kinds of branching narratives use pinch points, where the divergent paths join reducing the number of alternatives (see Figure 4.4). An early and non-digital example of this approach is the *Create Your Own Adventure* book series, where the reader has to choose at the end of a chapter how the story continues and then skip to the indicated page to continue reading. A classical example of a game using branching narrative is *Indiana Jones and the Fate of Atlantis*, where the story early on branches to three alternative paths – team, wits or fists – and later on a

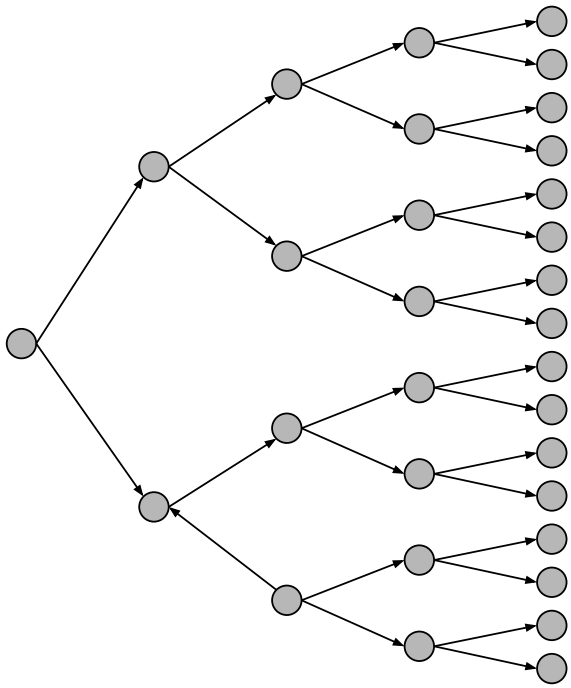

Figure 4.3: A full branching narrative of degree 2.

pinch point brings all three paths back together.

In branching narratives, a key question is the *critical path*, which connects the start to the end of the narrative. Maintaining the critical path is an important task for the designer so that the story progresses no matter what the interactor chooses. To enlarge the storyworld the designer can add short linear narratives that are separate from the critical path and optional to the interactor. They can be individual quests or tasks that the interactor can take, which can expand the overall fabula of the game.

4.1.3 Open storyworlds

Open narratives present the biggest challenge to the designer. Here, there is no imposed sequence for the events but each interactor can take their unique path – or, alternatively, a drama manager (see Section 3.3.1) is used to limit and guide the interactor. These kinds of sandbox games can include preconditions for the narrative elements, which provide some structure. For example, the game *Her Story* has a complete but deconstructed underlying story, which can be experienced in any order by entering keywords to the game's internal search engine. However, the player are most likely to search

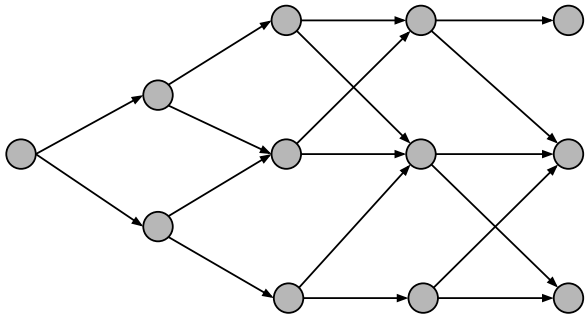

Figure 4.4: A branching narrative with pinch points.

terms related to events happened recently, hence creating a loose structure into the open narrative.

Another possibility to create a structure into the openness is to scatter the story throughout the levels (i.e., each level has its own set of open stories). Also, some story elements can threaded so that they form short linear sequences (see Figure 4.5). These (possibly optional) threads can include missions, quests, jobs or rescues taken inside of a larger context.

4.2 Design process and tools

Creating a storyworld means delivering content for somebody else's experience, which means that the designer defines actions (which the interactor can choose from), states and events (Spierling, 2009; Spierling and Szilas, 2009). In a larger context (e.g., in a video game), the key design goal is the overall importance of the story (e.g., theme) and how it acts as a part of the whole experience (Adams, 2013, pp. 140–168). Naturally, credibility (i.e., believability) and coherence (e.g., making sure that we are not violating gameworld, character nor plot) are important for the degree of well-formedness of the generated story. Other challenges for the design process include (Aylett et al., 2011; Spierling, 2009; Spierling and Szilas, 2009):

- Due to the medium's immaturity the tools often show the underlying software solutions and the line between storyworld and the story engine can be blurry. For example, the content might depend on the run-time system architecture (see Chapter 3).

- As the amount of required content increases the more complex the storyworld gets. This implies that designing might not be a single person's task but should support multiple designers. Some of them

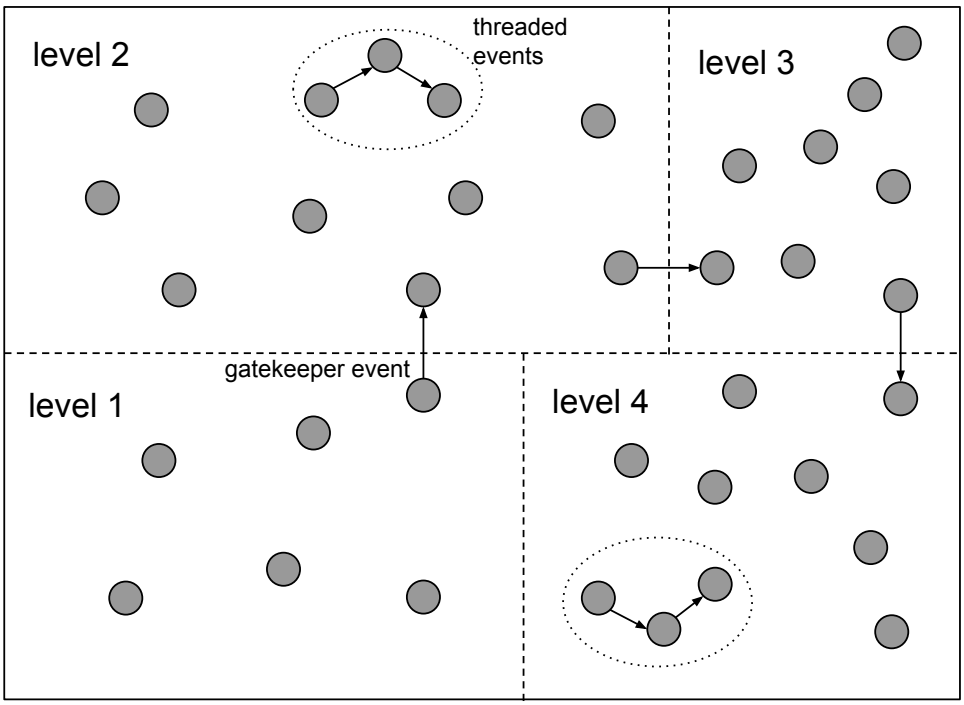

Figure 4.5: An open storyworld with levels and threads. A gatekeeper event opens the access to the next level and the associated events in the storyworld.

can be responsible for the visual content, others for creating the audio world (e.g., music, sound effects, voice-overs), or for simple text (e.g., in-game letters or emails between characters, background lore), or for putting the disparate pieces of authored texts together into cutscenes and in-game cinematics. The design is often a collective effort.

- The usability of an IDS system requires that the story-related structures are presented at a suitable abstraction level for the designer. Narrowly formatted and constrained mechanisms limit the designer's possibilities to reduce human affairs into logical models. On the other hand, to support the designer to utilize the potential of a story engine requires inspiring examples and prototypes as a study material.

In the following, we look at the design process first from the perspective of making a concept for the storyworld. After that, we look at the iterative process that the designer has to go through. Finally, we consider ways of evaluating the 'quality' of the designed storyworld.

4.2.1 Concepting the storyworld

The conception of a storyworld resembles how, for example, self-driving cars are being realized today. The traditional view was that the computer program should be designed to act as a substitute for the driver (i.e., an emulation of the human process). The modern view – which actually allows the driverless cars we see today – does not focus on the human-driver but on what is the *functionality* required to accomplish the task and how to *realize* it procedurally. Hence, we can model the whole roadwork (an 'inhuman' task) and the routing through the model while observing the differences between this model and the real world. Storyworld design requires a similar kind of mind-switch: one should not think oneself as the author telling a story, because the interactors will make their own paths. Rather the designer should model the whole range of possible stories – the storyworld.

One to see imagine the storyworld is a landscape of possible stories (Louchart et al., 2008) illustrated in Figure 4.6. Here, one can think the landscape as an own axis 'dramatic tension' over the possible states where the interactor can be. Interactor's decisions move them to another neighbouring state. Moving up a mountain in this landscape means that the dramatic tension increases, until it has reached its dramatic necessity at the peak on the top (cf. Laurel's flying wedge or Aristotle's dramatic arch). The valleys are places that offer potential mountains for the interactor to climb.

One could extend this model by thinking the states as atomic narrative elements. For an argument's sake, let us call these narrative elements 'naxels'

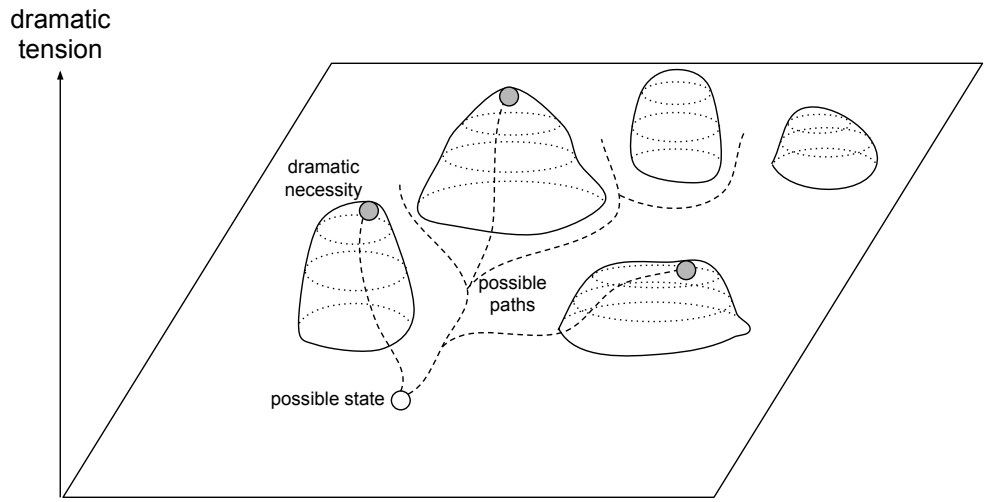

Figure 4.6: Landscape of possible stories. Mountains represent highening of the dramatic tension with a dramatic necessity at the top. The valley offers potential mountains where the selected path can lead the interactor.

as they resemble the idea of pixels (picture elements) on screen or voxels (volume element) in 3D modelling. The question now is about setting the resolution for the naxels: a small resolution can be enough within a certain application. For example, in *Façade* the smallest atomic element – or naxel – is a beat, a pair of action–reaction.

The neighbourhood of a naxel can be defined using pre-condition and post-condition, or other models (such as actact model, see Section 2.1.2). These bound the naxels together to form a 'landscape' for the storyworld (see Figure 4.7).

The design process is about modelling a dramatic abstraction of reality (Louchart et al., 2008). This mean that we have to model how the characters behave (which is different from how people behave in reality). To achieve this the designer has to reduce complexity without making too much generalizations. One way to do this is set clear boundaries to the storyworld thus keeping it small and manageable (e.g., *Façade* has very clear and well-defined boundaries). The biggest challenge is, however, not to think too much in the terms of plot. Louchart et al. (2008) list three concerns for the design of the storyworld.

- The existing boundaries of storyworld has to be justified. This mean spatial (or physical limits), contextual (e.g., theme like bullying in *FearNot*) and interactional (i.e., what the interactor can do) bound-

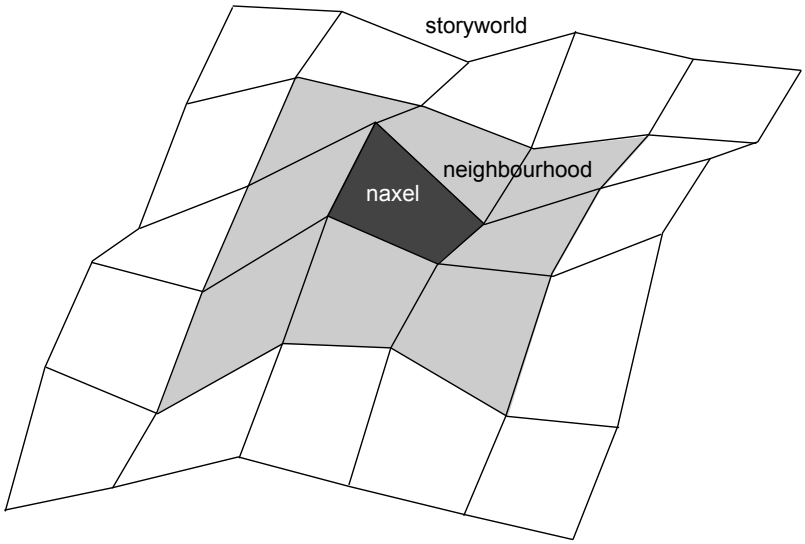

Figure 4.7: Storyworld comprising narrative elements (naxels). The neighbourhood of a naxel is the set of naxels where the story can move based on the interactor's choice.

aries.

- The design should offer a critical mass for emergence. This can be boiled down to the idea of density, which means how the authored content serves to create different paths (i.e., how well the contents covers the storyworld). It is important to notice that any added content creates new possibilities, which leads to wider boundaries and reduced density. Within the boundaries the content should cover the storyspace.

- The designer should be aware of possible dead ends, where the density is much too low (i.e., there is a lack of content). Consequently, storyworld design is a continuing process involving finding dead ends and resolving them by adding new content.

Character design

At the core of the design process lies the narrative paradox (see Section 2.2.3), because the designer cannot expect the interactor to make the right decision at the right moment or in the right place (Louchart and Aylett, 2005). For this reason, the designer's role is also to write interesting characters and rely on their ability to interact with one another (the interactor can be considered to be an autonomous actor as well, which is why the designer must

Table 4.1: Dilemmas and their pay-offs (Barber and Kudenko, 2007).

Dilemma	Pay-off to self	Pay-off to friend	Pay-off to foe
betrayal	best	worst	worst
sacrifice	worst	best	–
greater good	best	–	best
take down	worst	–	worst
favour	none	best	worst

be attentive to the interactor's inner state). Here, the designer has to decide the degree of specificity (unspecified, partially, richly, interactor-specified) and the relationship to the interactor (enacted, tool, guided) (Adams, 2013, pp. 140–168).

Murray (2011) lists principles of character design to maximize the meaningful variation of the value system (e.g., chastity in a love story or courage in a war epic). Most importantly, the number of main characters should be limited and they should have clear relationships to one another within the dramatic situation. The individual character definitions should be along the spectrum based on the value system central to the story. In this regard, the designer should pay attention to the parallel characters are needed to draw clear contrasts (e.g., rivals, friends, enemies). If characters act as foils for one another, their similarities as well as their differences must be emphasized throughout the story.

Plot composition

When devising the plot, the designer has to think the form of the story (e.g., Aristotelian drama or soap opera), its type (e.g., branching or open), the beginning(s), the ending(s) and the theme. The plot advancement mechanism can be based on the passage of time, avatar movement, overcoming challenges, or interactor choices and other interactions (Adams, 2013, pp. 140–168).

Barber and Kudenko (2007) describe how to create (possible infinitely) long stories using dilemmas (or clichs in a soap opera) as decision points. Here, we need a knowledge base containing storyworld (i.e., characters and locations), story actions, and dilemmas. The dilemmas are listed in Table 4.1 including their pay-offs to the character itself and the character's friend and foe.

Plot design can be approach also by describing event relations in plan-based plot composition (Ciarlini et al., 2010; Karlsson and Furtado, 2014). The basis are the four relationships between narrative events (i.e., four-fold

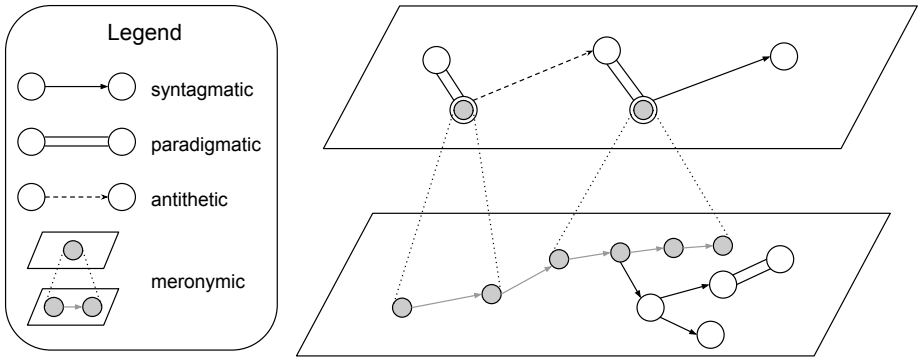

Figure 4.8: Relationships between narrative events (Karlsson and Furtado, 2014).

perspective of plot composition):

- Syntagmatic: The occurence of first event leaves world in a state where second event is coherent (i.e., weak form of causality). The corresponding trope is metonymy, which is a substitute for reduction, where we are substituting effects for a cause.

- Paradigmatic: There are alternative ways to accomplish a similar action. The corresponding trope is metaphor, which is a substitute for perspective, where C_1 and C_2 are similar or analogous events and replace a more general event C.

- Antithetic: An unexpected turn (e.g., manipulation by an outside agency) leads to that the beliefs of one or more characters about actual facts have changed. The corresponding trope is irony, which is a substitute by dissimilarity of disjunction (i.e., under- and overstatement) reflecting the opposite.

- Meronymic: Lower-level events are decomposed. The corresponding trope is synecdoche, which is a substitute for representation, where event C_1 denotes event C_2, if C_1 is a part of C_2.

Figure 4.8 illustrates how these relationship can be used when forming the overall structure of an interactive plot. Paradigmatic moves create coherent sequence of events, whereas the others allow variation in the plot. Syntagmatic and antithetic moves present (possibly unexpected) alternative choices. Meronymic moves go down to details by summarizing detailed event sequences and decomposing events into finer-grain actions.

Adapting material from other media

Adaptation for interactive stories means creating a translation between the media (Spierling and Hoffmann, 2010). This adaptation can take different forms:

- Scissors adaptation: direct cut-and-paste (e.g., staging a play by Shakespeare)
- Distilled adaptation: the adapted version uses only a part of the original material (e.g., Peter Jackson's *Lord of the Rings* movie trilogy is a distilled adaptation of J.R.R. Tolkien's book trilogy)
- Expanded adaptation: the adapted version adds material not present in the original work (e.g., Peter Jackson's *The Hobbit* movie trilogy incorporates events also from other works by J.R.R. Tolkien)
- Straight adaptation: one-to-one conversion (e.g., Rober Rodriguez' and Frank Miller's movie *Sin City* is a one-to-one adaptation of Frank Miller's graphic novel)
- Wild adaptation: converting beyond apparent resiliency (e.g., Francis Coppola's movie *Apocalypse. Now* is a wild adaptation of Joseph Conrad's novel *The Heart of Darkness*)

In interactive storytelling, the typical form are expanded and wild. This means formalizing the story into an abstract form, which is then followed by making a creative interpretation and adaptation.

Adaptation is also needed when integrating interactivity with an existing narrative. For realizing this, Jenkins (2004) presents four models:

- Evocative: encountering references to prior stories in other media (e.g., a theme park or a game based on the *Star Wars* expanded universe)
- Enacted: acting out a specific role in an existing narrative universe (e.g., taking the role of Luke Skywalker in the *Star Wars* arcade game)
- Embedded: spatially distributed, narrative-infused encounters (e.g., *Myst*)
- Emergent: constructing personal stories from encountered events (e.g., *Eve Online*)

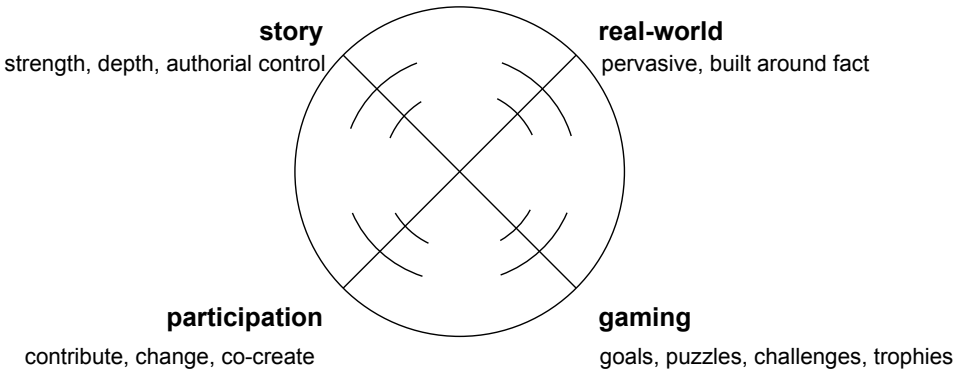

Figure 4.9: Transmedia radar diagram (Pratten, 2011, p. 52).

Transmedia design

Transmedia storytelling uses different media as platforms for telling a story. Pratten (2011) divides the approaches to transmedia storytelling to franchise transmedia and portmanteau transmedia. *Franchise transmedia* is the classical approach, where different stories of the same storyworld spread across different media platforms. For example, the *Star Wars*, *Transformers* and *Masters of the Universe* universes extend to movies, comics, toys, animations, tv-series and games to mention few. Each of these instances are, however, their own stories that take place in the larger storyworld. *Portmanteau transmedia* instead expands one single story across different media platforms. Alternate reality games (ARGs) are a good example of this kind of transmedia, where the scenes take place on various platforms, from the internet to real world.

The transmedia experience relies on four dimensions (see Figure 4.9). Story emphasizes the importance of narrative. Real-world reflects the extent to which the story-experience pervades real locations and times as well as real people and events. Participation is about the ability of the audience to chance or contribute the story-experience (i.e., agency). Gaming shows that the audience has a goal, which they can approach through challenges (e.g., puzzles) and game mechanics (e.g., trophies, levels or leaderboards).

In transmedia design, the designer has think much more about the interactor's experience. It is not enough just to recognize who the interactors are, but what technology they have available and how much time do they have. Pacing also plays a bigger role, when the story can use different platforms (e.g., not to put too much content at the same time through many channels). Ultimately, the designer has to be able to justify what is the benefit of using

different platforms.

4.2.2 Iterative design process

The designer's creative process is highly iterative. In this respect, it resembles more software programming than traditional story authoring. It includes 'debugging' which means altering and adapting the story content to match the designer's intent as well as co-creation where the designer embraces the possible emerging stories and lets them change their original design intent (Swartjes and Theune, 2009). We can even say that it is a process of dissociated authoring, where designer cannot associate all possible outcomes (Suttie et al., 2013).

The design has a static and dynamic parts (Swartjes and Theune, 2009): In content design, the designer chooses which instances of story elements are in the domain and which actions and goals may occur. In process design, the designer focuses on how the elements connect causally and when do the elements occur.

Iterative design process means constantly choosing between debugging and co-creation as illustrated in Figure 4.10 (Swartjes and Theune, 2009). In the first stage, the designer comes up with ideas how to extend the storyworld. This can be a result of pure inspiration but, more often than not, a reaction to the flaws found earlier. In the second stage, the ideas are turned into new content and processes, which are added to the storyworld. Also, it is important to constrain the domain as this new content could open new possibilities that are not yet handled. In the third stage, the changes are simulated (e.g., by running them through the IDS system) to feel out the storyworld and to detect any surprising behaviour. After this, the designer returns back to the first stage.

Looking at the design process more broadly, we can divide it into three stages as illustrated in Figure 4.11 (Suttie et al., 2013). In the concepting (or pre-design) phase, the designer sets up the overall parameters of the storyworld (e.g., theme and boundaries). The second phase is the actual design phase, where the designer iteratively adds elements to the storyworld and get quick simulated feedback on their effect. Within this iteration, the designer can engage in another iteration by adding a character, action or goal into the storyworld, which also validated promptly. The feedback can have different types such as system, structural (e.g., charts), experiential (from the interactors). Having multiple simulation runs with a virtual interactor, the designer is provided with feedback so that they can steer towards the pre-design goals. Finally, the third stage handles the evaluation of a complete scenario.

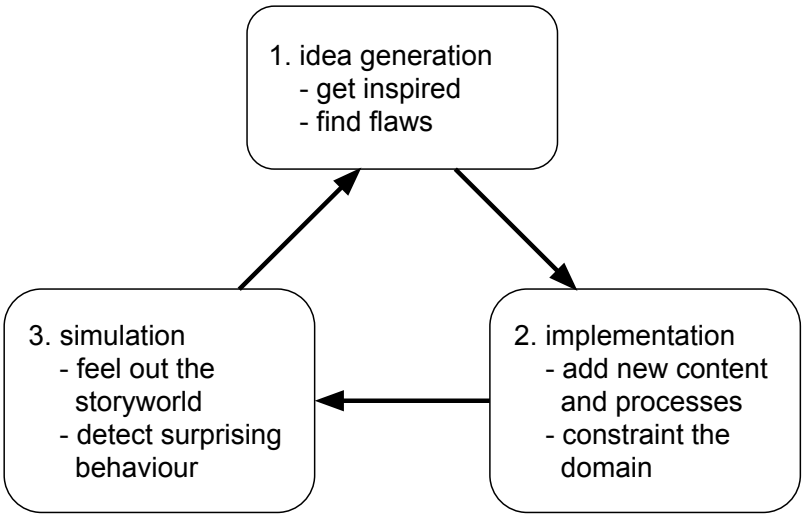

Figure 4.10: Iterative design process (Swartjes and Theune, 2009).

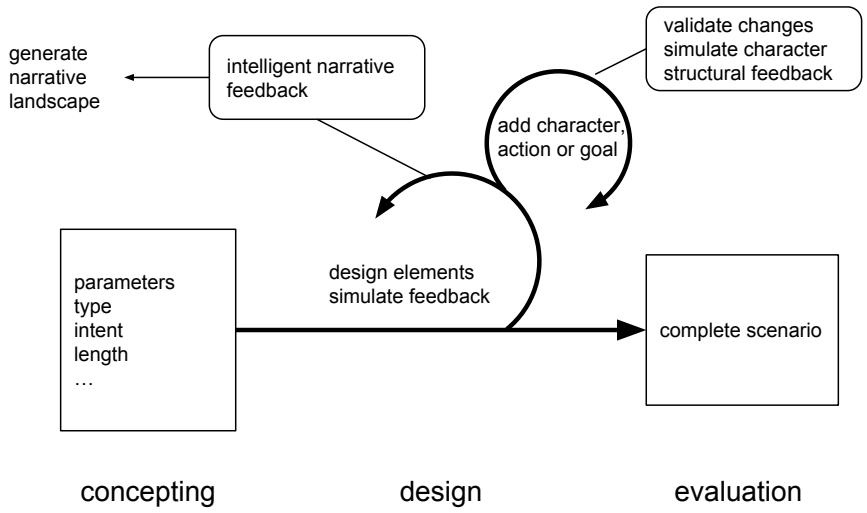

Figure 4.11: Broader view to the design process (Suttie et al., 2013).

Table 4.2: Quantitative metrics for narrative conflict (n.b. $E - f_1 - f_2 \neq \varnothing$ and $utility(c, \varnothing)$ indicates c's utility before a conflict).

c_1, c_2	characters
f_1, f_2	sequence of actions intended to be carried out by a character
E	set of actions which actually occur in the story
$\pi(f)$	how likely a sequence of actions f is to succeed
$utility(c, f)$	how satisfied c is with the state of the world after f

Based on the earlier discussion, we can now lay down the properties for a tool for design (Medler and Magerko, 2006; Suttie et al., 2013). Primarily, the tool should be general so that it could be re-used across environments and story contexts. The design process should be independent of the story-world representation and runtime implementation. To support the decoupling of the real-time experience from the authored story content and agent behaviour, the tool should offer debugging. The overall usability of the tool should support the ease of learning and reduces the errors by making tasks easy to remember and the whole design process more intuitive.

With respect to the storyworld, the tool should make easy to understand the environment definitions and have a broad scope so that it supports stories written for different environments that differ in narrative structure, mechanics and user interaction. Also, pacing and timing are important so that the designer can create timelines that bring captivating effects to the stories. The tool should help to structure the storyworld and bring dramatic consideration. Finally, the tool should cover a wide range of design functions (e.g., character behavior, story representation, definitions, dialogue scripts).

4.2.3 Evaluating interactive stories

Interactive stories can be evaluated by using post-experience questionnaires, in-game questionnaires, interviews (free or semi-structured), or computer traces (logs) extracted from playing sessions (Szilas and Ilea, 2014). For example, Kyrki (2015) and Kyrki et al. (2017) discuss how to measure morality, loyalty and conflict in an interactive story system.

Ideally, we could do the evaluation automatically using different metrics, which is the idea behind conflict dimensions (Ware et al., 2012). They can be discrete, directly observable values such as participants, subject and duration (see Table 4.2), or continuous, qualitative values such as balance, directness, intensity and resolution.

Balance is the relative likelihood of each side in the conflict to succeed (regardless of the actual outcome) within the range $[0, 1]$:

$$c_1 = \frac{\pi(f_1)}{\pi(f_1) + \pi(f_2)}$$

Directness means how close (familial, emotional, interpersonal) characters are to one another (regardless of the actual outcome) within the range $[0, 1]$:

$$directness(c_1) = \sum_{i=1}^{n} \frac{closeness_i(c_1, c_2)}{n}$$

Intensity means the difference between how high the character's utility is if it prevails and how low it will be if it fails (failing mean that other character prevails; favours high risk in high reward situations):

$$intensity(c_1) = |utility(c_1, f_1) - utility(c_1, f_2)|$$

Resolution is the change in utility that character experiences after the conflict ends within the range $[-1, 1]$:

$$resolution(c_1) = utility(c_1, E) - utility(c_1, \varnothing)$$

Szilas and Ilea (2014) present the following metrics for evaluating an interactive story:

- total length of a session: discrete (number of actions), continuous (time)
- diversity: intra-diversity (i.e., within one session), global diversity
- renewal rate: the ratio between intra- and global diversities
- choice range: how much choice the user has?
- degree of freedom: discrete choice frequency, real-time choice frequency
- variability: are new choices being provided to the user?

These require a certain level of granularity, a discrete framework. Furthermore, this does not preclude parallelism and overlapping between action. Regarding the choice range, a large is desired but not always necessary. If the discrete choice frequency is 0, it means no player action, whereas 1 means no system action. The real-time choice frequenze is 1 Hz (i.e., 1 action per second).

4.3 Further considerations for the designer

In this section, we present two consideration for the designer of interactive storyworlds. First, we discuss focalization (or finding how the designer and interactor can interact in a story). Second, we look at the message that the designer wants convey to the interactor.

4.3.1 Focalization

Generally, all stories have characters of some sort, and the stories consist mostly of their relations and interactions between them. In classical narratology, the most important questions regarding the characters in the story directly relate to the communicational content of what is being told: who is the teller and who is it being told to. Gérard Genette (1980, p. 189) uses the term 'focalization', often confused with the more common 'point of view', to discuss the various ways the author and the characters in the text interact with the reader.

Typically stories are focalized in a very specific way: Genette speaks of 'zero', 'internal' and 'external' focalization (Genette, 1980, p. 189–190). In zero focalization, a form of 'omniscient' narration, the narrator knows more than the characters know, and thus so do the readers. In 'internal' focalization, the narrator and the character are one and the same, and everything the narrator/character knows the reader knows. Finally, 'external' focalization allows for a situation where the character knows more than the narrator: the narrator may only objectively describe the character's actions and external appearance, but not their internal world. There is of course no reason not to mix these within the same narrative, nor any reason to remain within a single character for the whole duration. Focalization in games follows roughly similar patterns, although, unlike other forms of narrative media, 'character' is not always equally central. For example, simulation or sports games may well be populated by multiple actors, even named and voiced actors, but to call them characters might be giving them too much credit, as their internal worlds are often entirely irrelevant to the game being played or the story being told; they are 'externally' focalized in the sense that their appearance and actions are described, but there is no assumption that were one to suddenly inhabit (internal focalization) their minds, there would actually be anything in there, so to speak.

There are, however, plenty of video games which offer variations on both internal and zero focalization, as well as 'proper' external focalization (where one can safely assume a character has a story that we are simply not privy to). First or third person games, for example, might feature internal dialogue

or commentary on the environment that is only uttered out loud because the player needs to have access to the character's thoughts – such as in *Outlast 2* or *BioShock Infinite.* But first person games can also be externally focalized, as in the first *BioShock* or *Half-Life*, where we have no access to the internal world of the protagonist we are inhabiting. Zero focalized games often feature narrators, such as in *Bastion*, that freely inform the player what the characters are thinking, or otherwise feature in their user interface elements that let the player know what the character is feeling, as in, for example, *The Sims* or *RimWorld* that have detailed statistic on the emotional state of the multiple characters the player can control.

The most common form of character focalization in games is, however, inherited from film (i.e., the external). Much like in cinema, we can only assume what the actors are thinking or feeling, based on their animations or dialogue lines – and this includes the so-called 'player' character (if there is one).

Finally, we cannot omit the importance of the platform developer's decisions, which set the 'natural laws' to the storyworld. The most important of them is the choice of narrative approach – author-centric, character-centric or hybrid – which crucially affects how the story is generated in the system and how the storyworld can be constructed.

4.3.2 Story as message

Following Jakobson (1960), the 'story' in IDS would be the 'message', in other words, what lies between the designer and the interactor or what the designer is attempting to present to the interactor through the storyworld and its characters. In IDS, the story is a two-fold concept. First, there is the designer's idea of the story. The designer and the platform developer create the storyworld to deliver an experience for the interactor. They put in the theme and, depending on the type of story they wish to tell, might put in everything from a singular path with rigid story points that must be followed in a specific order, to a sprawling possibility space filled with individual, hand-crafted or generated 'storylets' (to borrow a term from the *StoryNexus* storytelling system by Failbetter Games) that can be experienced in any order, to anything in-between. Second, individual stories begin to diverge and arise from this Platonic ideal of a story as a result of the interactor's experiences. The extent to which these individual stories are permitted to diverge from the intended experience depends on the intent of the platform developer and the designer; although divergent experiences can also be manufactured by industrious interactors entirely outside the realm of the 'intended', for example, speedrunners will purposefully break games

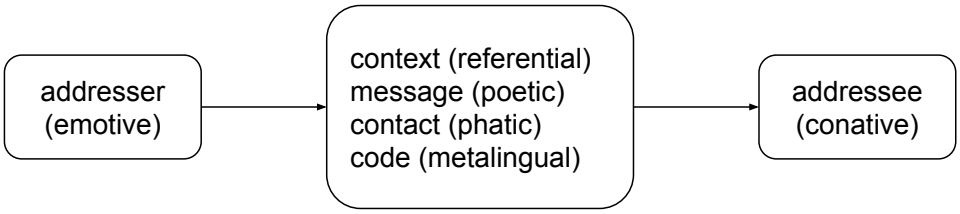

Figure 4.12: Addresser–message–addressee scheme with emotive, conative, referential, poetic, phatic, and multilingual functions (Jakobson, 1960).

in order to finish them quickly and thus often entirely subvert the intended narrative by skipping over whole sections or glitching through levels. Following in the footsteps of Jakobson, we find that the role of the 'message' (i.e., the story) in an IDS can vary considerably. Jakobson described six different functions of communication, which describe the reasons and intention of why we communicate, each with a focus on a different part of the addresser–message–addressee scheme (see Figure 4.12).

Most of these functions have to do with everyday verbal communication, but are also surprisingly easy to apply to the role and purpose of 'story' in an interactive experience. The emotive function (Jakobson, 1960, p. 354) refers to communication for the sake of (on the behalf of the sender) expressing some particular emotion, such as anger or interest, and is usually non-verbal or interjective (e.g., 'Tut tut!' to express disappointment): story-wise, this might be the game telling the interactor they have done something correctly or wrong, the game reacting in some way to the player's actions. The conative function (Jakobson, 1960, p. 355) on the other hand focuses on the receiver, the addressee, and is best expressed in the imperative: communication occurs in order to give the receiver some form of instruction; for example, consider tutorials in many games, which are often clothed in some form of 'story'. The referential function (Jakobson, 1960, p. 355) has to do with context: where is the communication taking place. Particularly in games low on other story content, this is one of the prevailing places where story is imparted, as the referential function would be how we can tell that this game takes place in, say, a candy kingdom à la *Candy Crush*. There are also phatic and metalingual functions: phatic functions are simply used to make sure the channel of communication is functioning, or then to prolong communication without offering any new information – this might be like a character in the game asking you if you are still playing, or the player starting to whistle at random during a prolonged idle period. The metalingual (or glossing) function (Jakobson, 1960, p. 356) is used to discuss the code (i.e., the language) itself,

typically by asking someone to repeat something they said, or making sure they are following: within IDS this might manifest through a tutorial prompt or an advisor character commenting on some aspect of the game trying to make sure they are following along. The final function of language is the poetic function (Jakobson, 1960, p. 356), which is communication focused on the message itself. This, naturally, is how the most interesting stories are told, and is the purvey of all forms of narrative media.

IDS is, out of all forms of narrative art, unique in that many games make do with the simpler functions of communication when they tell their story; they may simply employ 'story' in order to communicate a tutorial or to give the interactor a referential frame within which they can perform various actions that are, otherwise, entirely divorced from any kind of deeper storytelling structures (matching three candies of the same type together...). For example, many simple games will have a theme (referential), a few characters that offer encouragement at success and failure (emotive) and advice when new gameplay elements are introduced (conative), as well as now and again prodding the player when they are idle or when too long a pause in the action occurs (phatic), without offering in any way a cohesive or intentional story as we typically think of it (the poetic function).

Chapter 5

Interactor

The interactor in IDS has a counterpart in conventional storytelling settings such as the reader of written stories or the audience of concerts and theatrical plays. However, instead of being a passive recipient of the story, the interactor is required to participate actively in the creation of the experience. This means making decisions that affect on how the story unfolds. Given such rights, the interactor is also bestowed responsibilities.

As Ernest Adams (2013, p. 111) describes, how the interactor undertakes an agreement to comply to the story, since – presumably – there is a reason why the designer is leading the interactor through the story (Perlin, 2005). In this *designer–interactor contract*, the designer offers the interactor a (more or less defined) role to play and a set of actions that can be performed (i.e., the interactive range, where more freedom means more possibilities for the interactor to depart from their intended role). Correspondingly, the interactor promises to play the offered role wholeheartedly and in character. The contract agrees on mutual obligations but does not include any penalty for a failure to perform – a breach of contract simply ends the agreement.

Currently, we can see many examples from mainstream games where the design of the gaming experience aims at forcing the interactor to change the course of the game or, at least, to give an illusion of freedom in creating own story. Yet, if the interactor inclines to proceed in the game as the designer may have intended (e.g., prefers a linear story), the designer provides tools with which game can be played without making much of individual alterations to the storyworld. Alternatively, the designer can give branching story-choices which, at the end, lead to the same ending or a finite set of alternative endings (see Section 4.1).

Although the interactor normally controls one character at one place, it would be possible to conceive system where interactor could control many characters or be able to see various places at the same time in the story

(Szilas, 1999). Also, Adams (2013, pp. 10–11) observes that avatar-based interaction is more common, whereas multipresent interaction (e.g., *Prom Week*) is rare and does not have any expectations yet.

5.1 Experiencing an interactive story

The *willing suspension of disbelief*, a term coined by Samuel Coleridge in 1817, states that a story should follow its internal logic but touch the human realm (Sampson, 1920, pp. 52–58). This is the same principle why it is easy to believe but difficult to adjust the view later on when more facts arrive. Coleridge's statement has, however, faced criticism: J.R.R. Tolkien (1964) in his essay 'On fairy-stories' finds it inadequate and Janet Murray (1997, p. 110) also criticizes the term and wants to replace it with 'active creation of belief', because the audience know the story is fictional and – despite of this – the audience wants to believe the story is real.

In all experiences of being told a story, one enters a magical circle – akin to the model of the play experience by Huizinga (1955) – and subscribes into believing what is told in the story. The storyteller is responsible for providing a believable story, and the responsibility of the audience to suspend their disbelief, which human beings have a natural disposition to do. Like credit, we choose to accept what is being told and withhold our disbelief, but there is a limit to this credit, and if the logic of the story strays too far, we cease from believing. In all cases of storytelling, the audience has some responsibility over enjoying the story. If a person takes the stance of not being entertained by a performance, there is not much that can be done. This applies increasingly much, when audience interaction is included.

Next, we will look in detail three key phases in the interactive story experience. First, onboarding happens whenever the interactor begins to get familiarized with the storyworld (and perhaps also the platform). Second, maintaining the interactor's interest during the journey in the storyworld needs special attention from the designer. Third, as with conventional stories, interactive stories also allow – and even invite – the interactor to re-experience the storyworld by starting the process all over.

5.1.1 Onboarding – from amnesia to awareness

In conventional storytelling, one could philosophise that learning the language and learning to read, would be the onboarding phases. However, a more reasonable measure would be learning to identify fictitious narratives

from factual ones and learning to understand the deeper meanings and allegories embedded in stories.

In interactive storytelling, the designer enjoys the privilege that they get to line out the design of the storyworld, whereas the interactor does not have this benefit. Instead, the interactor has to be first introduced what is the storyworld and the character they are supposed to portray. Simply put, the interactor initially does not know anything about their character, its surrounding, background, personality nor intentions, which leads to the *problem of amnesia*, outlined by Adams (2013, pp. 48–51). A traditional solution in video games is that in the beginning the player either has an amnesia or finds themself in an unfamiliar environment (e.g., facing a mystery or heroic quest). According to Adams, the reason for the problem of amnesia is the mixing of the roles of an actor (who is expected to be familiar with the role and the stage), audience (who can be totally ignorant) and player (knows the rules but little else).

Additional challenges are posed by the user interface design (see Section 5.3), because the interactor also has to learn what their character can do and how make it do what the they want. Onboarding is the phase that has teach all these things to the interactor.

5.1.2 Supporting the journey

In many action adventure stories the protagonist needs a mechanism to disable an opponent without severely damaging them, least of all killing. One can observe this especially in superhero action stories. *The Marvel Super Heroes* role-playing game has a game mechanism of 'karma', which the player can expend to gain advantage in critical dice rolls, and which they gain from heroic actions (Grubb and Winter, 1984). Particularly the rules state that if the player character kills someone or lets someone die, the group loses all of their karma points. The rules even talk about the character of Wolverine being a gamble for the X-Men team in the comic book stories, as he does kill people, thus expanding the team's karma, but he is valuable enough as a team member to be kept regardless of this. The whole team, however, does strongly discourage Wolverine from killing, even sometimes opposing him and protecting the opponent against Wolverine's killing intent.

A standard method, for non-lethal disabling, has become 'knocking out'. Most people are aware that boxers, for example, suffer permanent brain damage and altered cognitive capabilities, for getting knocked out in matches. Yet, most all fictive stories consider getting knocked out as a temporary setback, out of which a person recuperates after a day of headache, if even that.

In the *Assassin's Creed* game series the player assassinates people. When NPCs notice dead bodies, they react with somewhat realistic shock and raise alarm. However, what is not realistic, is that if a minute of time passes with the player managing to stay hidden from everyone, the NPCs give up their shock and alarm and start going about their business as usual. The bodies remain where they were, and nobody pays attention to them anymore, as everyone already knows they are there. Only appearance of new bodies raises the alarm again. This, of course, is not realistic human behaviour in any circumstances, but it is convenient for the game mechanics and has a solid credit for the typical player's suspension of disbelief. The player knows it is just a game – the rules of the magic circle.

From fairytales we are also familiar with how the protagonist is rewarded with marriage and half of the kingdom. This part is never elaborated any further than that, even though such arrangement would be quite complex in practise, even for a dictator. Even more familiar from fairytales, is how the protagonists live 'happily ever after' the story. A story should have a proper beginning – 'once upon a time there was...' – and a proper ending, and 'they lived happily ever after' very conveniently ties up all the loose ends of the story.

To experience the story the interactor has be to be connected to the storyworld. The story takes place in the storyworld, and has to be conveyed to the interactor through some channel. With IDS we can think of this as a case of the classic brain-in-a-vat setup. An interactor is not truly in the storyworld – not truly in the magic circle – but rather in their own brain that is being fed by some mean the experiences from there. There are several ways this can be done (cf. focalization in Section 4.3.1)

- Multipresence is the most distant presence the interactor can have to the story. They are actually not a part of the storyworld at all, but they can observe it and influence it, in a more or less a god-like manner. Examples of this are games like *SimCity*, *RimWorld*, *RTS* and *X-Com*.

- Third person views to the storyworld in all of its variety provide a seamless spectrum from multipresence to first person. In early video games, such as *Pong* and *Space Invaders*, one can argue whether the player is multipresent in the storyworld, but only able to control one object in there, or if the controlled object (the turret in *Space Invaders*, and the bat in *Pong*) is the interactor's third person avatar. Examples of this are *Tomb Raider*, *Zelda* and *Horizon Zero Dawn*.

- Towards the first person presence there are games such as *Skyrim*, where the player can choose whether the avatar is viewed from the

behind in a third person view, or if the storyworld is perceived through the player character's eyes in a first person view. Examples of this are *Doom*, *No Man's Sky* and *Elite*.

- In virtual reality the interactor is as fully inside the storyworld as possible.
- In augmented reality, the storyworld is actually entering the real world.
- The extreme of augmented reality is pervasive games, where the game world is present in several parts of the reality. The game may send the interactors e-mails, phone calls, and even physical objects through different real world services or other interactors involved in the same game.

5.1.3 Re-experiencing an interactive story

One criteria of an engaging story is the extent to which the interactor feels connected to it: how difficult it is to put the book down or how tempting it is to play 'one more turn'. As with all forms of entertainment, immersion is often the key (see Section 5.2.2). The interactors can have different motivations for re-experiencing interactive stories (Mitchell, 2010):

Making sense of things: new fragments to be reconciled into the overall understanding of the story

- Finding out more: there is more to the story than can be seen on the surface
- Trying out 'what-if' scenarios: different choices can lead to different outcomes
- Seeing things from a different perspective: radical revision of player's model of the storyworld, character's personality and motivation, and causal connections
- Looking for a deeper meaning: process of looking for an interpretation of the text
- Reflecting on the techniques used: appreciating or critiquing the ways in which the text achieves its effects
- Figuring out how the system works: what is the underlying role system

5.2 Aesthetic categories

Janet Murray (1997) classified the aesthetics of interactive media into three categories: agency, immersion and transformation. Next, we will go through them.

5.2.1 Agency

For an IDS system to be genuinely interactive, the interactor's choices should affect the direction of the unfolding story. This agency is a key concept in IDS aesthetics (Knoller, 2010, 2012), and it is facilitated by the platform developer and provided for by the designer. The platform developer creates the interface through which the interactor can make choices, and the the designer defines what choices the plot allows and how they can affect it. The real depth of agency is relative to the level of influence in the story being generated.

It worth noting than apart from the interactive story, agency can be can manifest itself also in other ways. For example, mechanical agency which is based on the controls available to the interactor. Game mechanics such as problem solving or puzzle may provide gameplay agency in a game even without a story. Combining different types of agency can enhance the interactor's experience.

There are three major trends in the conceptualization of agency summarized by Ahearn (2001) and Harrell and Zhu (2009):

- Agency as free will: interactor is allowed explore the storyworld at will
- Agency as resistance: oppositional agency (e.g., female skins to *Quake* or protest movement in *Second Life*)
- Absence of agency: no room for agency (e.g., Ian Bogost's *Airport Insecurity* and *Disaffected!*)

Although free will has been a predominant approach in IDS research, lately there have been more examples on the latter two. When agency is seen as free will, it can be defined as 'the satisfying power to take meaningful action and see the results of our decisions and choices' (Murray, 1997, p. 126). It is the distinctive experience that an interactor has in an IDS system, which emphasizes the importance of the interactor's intentional actions guiding the story along the paths set by the author. In this sense, agency represents the interactor's ability to interact with and affect the storyworld. With this in mind, having a freedom of choice – choosing a certain path or viewpoint in

which story will progress – can be considered as a minimum requirement for true IDS. Murray (2004) goes to state that agency can be achieved even if the interactor does not have direct control over the direction of the story, which is the case of story-driven games such *Half-Life* and *System Shock 2*. Even in this case, the interactor keeps a sense of importance and relevance and can be viewed as a catalyst driving the story forward. Murray invests in the notion of the author or designer as a *privileged* role, distinct from the creative roles available to interactors. Laurel (2004) challenges this view and that agency require the ability to change the direction of story.

Tanenbaum and Tanenbaum (2010) also challenge the idea of agency-as-free-will and define agency as a 'commitment to meaning', which shifts the attention away from the outcome of an action to the *intention of an action*. Here, 'commitment' is understood, as in speech act theory, as an utterance categorized in terms of its illocutionary point. Each kind of a point entailing different commitments or attempting to achieve different goals. For instance, a commissive speech act commits the speaker to a future action, whereas an assertive speech act commits the speaker to the truth of the statement. It is, therefore, critical to establish trust and communication between the interactors. Designers and performers are in a type of a conversation with each other, mediated by the game. The meaning allows us to shift the emphasis on interactive action from outcome towards the intent underlying the choice. Meaningful choices mean that the illocutionary commitments entailed by the utterance/action are *real*. As Phoebe Sengers (1998) puts it, it is more important to do the thing right than do the right thing. The communication of meaningful commitments requires that the player needs to trust that the game is correctly interpreting her expressed meanings via the often limited communication channels. Also, games need to 'train' players to perform meaningfully.

Theoretical and perceived agency

We can discern two types of agency: theoretical and perceived (Thue et al., 2010). In *theoretical agency*, we look at the interactor's objective ability to act and change the outcome of event within the story. In *perceived agency*, we focus on the interactor's subjective perception of their ability to enact such changes in a story.

While theoretical agency is commonly regarded as an ideal for interactive storytelling, perceived agency is the one that we should focus on (Itkonen, 2015; Itkonen et al., 2017). For instance, although choices are given, the interactor can unaware of making choices or pass them without noticing them. Here, theoretical agency exists but bad design leads to that the interactor

is not consciously making the choice. Thue et al. (2010) recognize that perceived agency depends on

- Foreseeability for the outcome of an action
- Ability for accomplishing such an outcome
- Desirability of the outcome
- Connection the interactor perceives between the action and the outcome

The connection can be temporal (i.e., stronger with more desirable observed outcomes) or predictive (i.e., stronger with interactor-predicted outcomes).

Bruni and Baceviciute (2013) state that every system embraces a goal, which leads to an intrinsic communication cycle between the system (and its designer) and its interactors. Without communication the expectations for the agency cannot be managed; if the interactor cannot be understood by the system, the system misinterprets the interactor's intentions, and, conversely, if communication back from the system is lacking, the interactor cannot understand the cues from the system. For example, in *Dishonored* it is hinted that more kills lead to a darker ending, but there is no further information how the player can make a conscious choice about that.

Local and global agency

Mateas and Stern (2005) point out the difference between local agency and global agency. *Local agency* concerns meaningful actions that have immediate observable effect (e.g., mechanical agency). *Global agency* concerns actions that have repercussions observable only later in the story (e.g., the interactor can look back at the end of the story and see connection between his or earlier actions and the outcome). The difference is the lifetime of the consequences of an action. Global agency can be difficult to observe, which can be aided like in *Witcher* which shows a cutscene of the choice that led to the consequence at hand. An example of local agency it *Knights of the Old Republic*, where the interactor is awarded dark or light points immediately after a certain action. These point, however, have no effect on the ending of the story – the only long term effect happen through the game mechanics (e.g., rewards and punishments).

Invisible agency

A special type of agency is invisible agency recognized in *Silent Hill 2* by Sengün (2013). Here the interactor's subconscious actions can have agency. In *Silent Hill 2*, the game tries to make a psychological mapping of the interactors by tracking their obscure actions (i.e., when they are not aware making choices). Example of such actions are looking at the picture of interactor's character's dead wife, listening closely on the dialogue, or following closely the intended path whilst being escorted through a town. These actions are recorded to make a prediction on how the interactor feels about the other characters. The story unfolds then based on these quasi-subconscious actions. Interestingly, the interactor may not have recognized their agency at all. An obvious problem in this is that the interactor is not aware making commitment because the meaning of an action is not directly communicated. For example, what happen if there is an outside interruption and interactor forgets pause the game. The fact that the screen is centralized to an object in a game for an extended period here, does not mean that the player is actually looking at it. Another example of invisible agency is *Fable 2* where the interactor's character can choose the type of food to eat. However, different foods have an effect on the interactor's qualities leading to different reactions from the other characters.

Can the interactor process all the information that will determine the outcome of choice? In an extreme case, a storyworld with high realism (like in the *Dark Souls* series) means the interactors can cause things to happen that they did not want to happen as they have no information on the possible repercussions. On the other hand, plot twists and unexpected turns are amongst the normal dramatical arsenal in storytelling, although they hinder the communication. Clearly, there has to be a balance between these two.

Limited agency and no agency

Let us come back to the idea of unrestricted agency, where the interactor has more or less absolute freedom – which, obviously, clashes with Murray's definition emphasizing meaningfulness. According to (Tanenbaum and Tanenbaum, 2008, 2010) this true or unrestricted agency has been idealized in the IDS community. Itkonen (2015) questions unrestricted agency as an obscure idea, because the context always dictates the interactor's agency, and breaking this context renders interaction nonsensical and meaningless. This close to the idea of 'limited agency', which is highly contextually limited (Tanenbaum, 2011). Here, the interactor is provided freedom to choose between *contextually* important options. Tanenbaum points out that too

many choices and too much freedom leads to uninteresting and unimportant choices. Also, the technological limitation create also their own context: it is different to play an RPG video game than RPG tabletop game with real humans and an ever-adapting dungeon master.

Lastly, we have to mention a rare class of games that have no (or hardly any) agency over the story. For example, *Dear Esther* offers no challenges and no puzzles. The interactor has agency in navigating through the island but has no effect on the unfolding of the story and outcome because the placement of the story fragments is done randomly for each game instance.

One should note, however, that the agency experienced by the interactor is not necessarily in relation to the real depth of agency. The interactor may be given a deep sense of agency without giving them any real agency at all – similarly to the Eliza effect where a system appears to be more complex than it is (see Section 3.2). Conversely, the interactor may feel like their actions have no influence to the game whatsoever, even if the story mechanics in the background are thoroughly affected by each action the interactor takes. Noah Wardrip-Fruin (2009) calls this case, where a system fails to represent its internal richness, the Tale-Spin effect. He also describes the ideal situation, the SimCity effect, where a system enables the interactor to build an understanding of its (complex) internal structure.

Illusion of agency

Figueiredo and Paiva (2010) discuss about providing an *illusion* of agency. This mean accommodating of disallowing interactor's action on certain points and changing the expected outcome to more suitable for the story's needs. Naturally, this can lead to unexpected or illogical outcomes. Itkonen (2015) continues on how to make the interactor to expect the result the designer want to achieve. The key is communication, because even if the actions fails, the interactor will retain their sense of agency when the storytelling platform acknowledges and explains why they failed. Fendt et al. (2012) use *L.A. Noire* as an example of textual feedback even in the case the action has been futile and has no effect on the story.

Tanenbaum and Tanenbaum (2010) discuss about creating an illusion of agency by having quick time events (QTEs), which provide the illusion of agency but actually limit choices. Here, the interactor has a small time window to react something happening in the storyworld. This could bring out better the interactor's real intent instead of over-thinking and over-analysing. The result of this approach limit, at best, to local agency. For example, the *Mass Effect* series uses QTEs in dialogues. QTEs can even bring out unintentional effect as in *Heavy Rain*, where chasing a character through a

marketplace is realized using QTEs in a quick sequence. The idea is to create the suspense of a chase where the interactor has to fight the way through different obstacles. However, none of the QTE obstacles have any effect on the outcome of the scene, and interactor can fumble on everyone of them creating rather a comical than suspenseful mood.

5.2.2 Immersion

We humans structure our experiences in the form of a narrative (Aylett and Louchart, 2007). If somebody would ask you to recount your day or life, you would most likely tell it in the form of story. This ability seems to be built in the way our autobiographical memory holds stories about the self. And this why we get so immersed in stories. Marie-Laure Ryan (2001, p. 103) calls effective immersion 'recentering'. This means transporting the reader (interactor in our terminology) into the fictional world and making that fictional world the new center of understanding for the interactor: a successful recentering allows for the suspension of disbelief, a vital aspect of immersion.

As stated by Ermi and Mäyrä (2005), immersion in games has three dimensions: sensory-based immersion, imaginative immersion, and challenge-based immersion (see Figure 5.1). This model suits all types of IDS. The sensory-based immersion entails the aesthetics of the system. This is provided by the audiovisual content provided by the author as well as the IDS system's high fidelity and timing provided by the developer. The imaginative immersion entails the attractiveness of the story, which is mainly provided for by the author, who designs the story content. Through the affordance of interactivity, this dimension is even more affected by the system built by the developer that is responsible of keeping the audience's interest. The challenge-based immersion entails the experience of agency. A game that is difficult but still surpassable and has an intuitive control scheme, has a quality of keeping the interactor's attention.

Bizzocchi (2007) recognizes two types of immersion: The first one, willing suspension of disbelief (see Section 5.1) and the willing surrender to the pleasure of the story, whereas the second one is immersion of the *flow* (Csikszentmihalyi, 1990). The first kind we encounter more in 'passive' storytelling like cinema, and the latter in interactive forms such as games. People who experience flow experience a sense of agency, where they feel their actions have an impact on the world (see Figure 5.2). The flow theory tries to explain why people fully immersed are when they are applying skills they are good at. Flow is a state of concentration or complete absorption with the activity at hand and the situation. It is also an optimal state of intrinsic motivation.

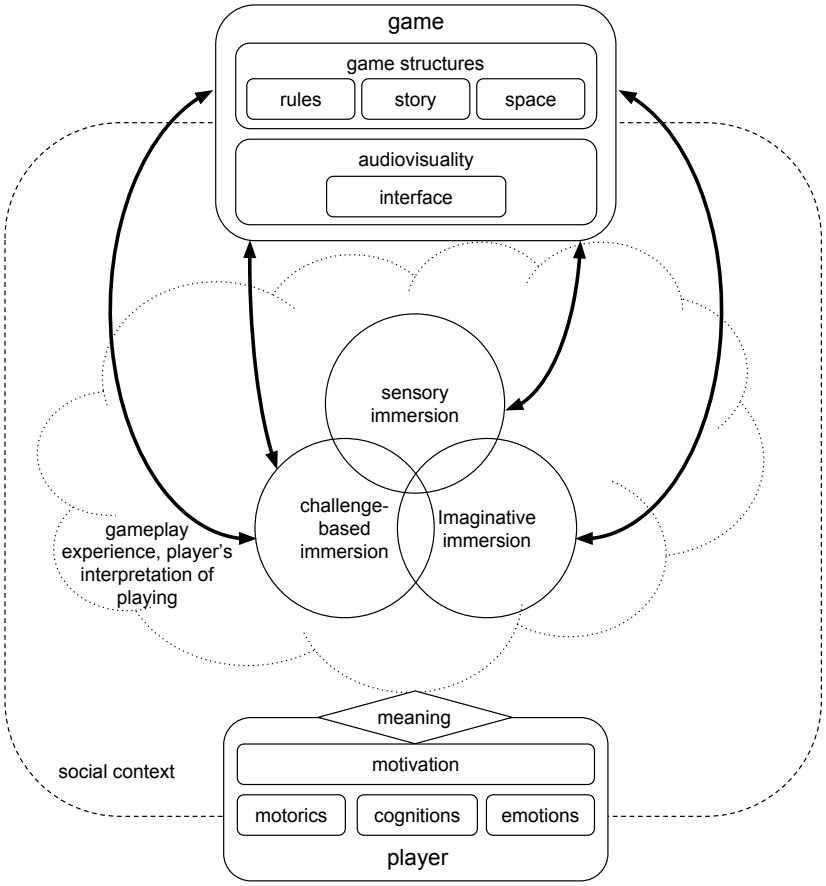

Figure 5.1: A model of immersion by Ermi and Mäyrä (2005).

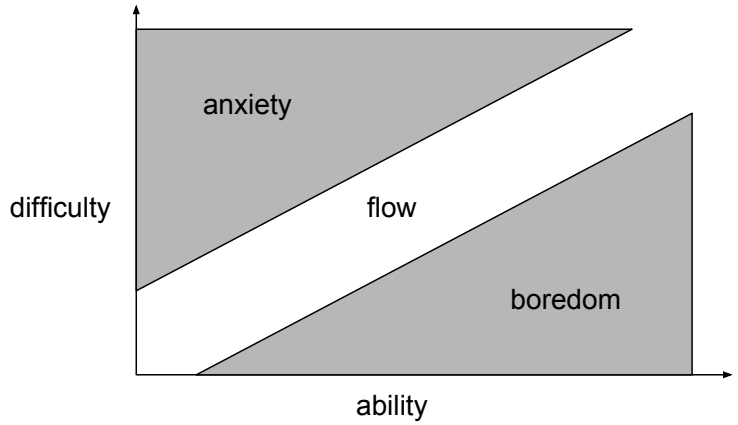

Figure 5.2: Flow experience is a balance between the difficulty of the task and one's ability to handle the task. If the task gets too difficult with respect to the ability, the experience turns into anxiety. If the task gets too easy with respect to the ability, the experience turns into boredom.

5.2.3 Transformation

If agency originates from interactivity and immersion from the willing suspension of disbelief, then transformation stems from identification. Computers are capable of creating and simulating environments for a roleplay, which allows the interactor to transform their identity and 'shape-shift' into a new role.

As Mateas (2004) observes transformation is difficult to pinpoint as it can mean three different things:

- Masquerade: the interactor can change to someone else for the duration of the experience
- Variety: the interactor can exhaustively experience a multitude of variations.
- Personal transformation: the interactor takes a journey of personal transformation

5.3 Interface

Adams (2014) divides a game into three fundamental components as illustrated in Figure 5.3: the player who plays the game, the user interface (UI) that presents the game to the player, and core mechanics (or platform) that

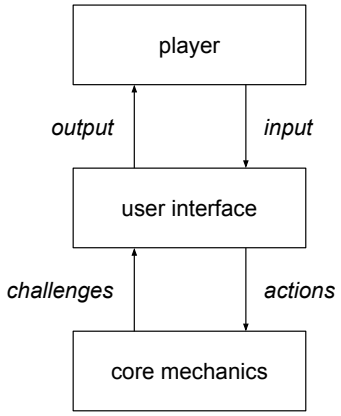

Figure 5.3: The basic design parts of a game.

implements the rules and the game AI. The core mechanics generate challenges that the user interface converts to output for the player. Conversely, the player's input is conveyed through the user interface and converted to actions for the core mechanics. Another way to see this is to recall the affordances (see Section 2.2.2), which are opportunities for action made available by an interface calling the interactor to give input.

At any moment the UI has to provide the interactor information on what they need to know. These include questions (Adams, 2014, pp. 259–260):

- Where am I?
- What am I doing?
- What challenges am I facing?
- Did my choice of action succeed or fail?
- Do I have what is needed to play successfully?
- Am I in danger of losing the game?
- Am I progressing towards victory?
- What should I do next?
- How did I do?

The interface should show only those internal values that the interactor needs to know. Also, it is not necessary to display data the interactor can already

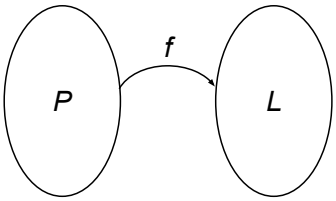

Figure 5.4: Interface mapping function.

see by looking at the game world. Preferably the information should be in symbolic or otherwise graphical form – although using numbers or text is the clearest alternative. Besides what is shown at the screen, audio can supply information by using pitch, volume or beat frequency.

We are discuss next presenting choices in the interface and narrativising the interface. We shall return to representation in Section 6.3.

5.3.1 Presenting choices

Having meaningful choices requires that the interactor's desires and choices provided by the interface meet (Schell, 2015, p. 211):

- if choices > desires, then the player is overwhelmed
- if choices < desires, then the player is frustrated
- if choices = desires, then the player has a feeling of freedom and fulfilment

This can be seen as a *choice problem*, which asks how to choose from a large amount of possible actions Szilas (2004). Let us assume we have interface mapping function f that maps the set of physically possible actions P (i.e., the perceived affordances) to a set of logically (in the story) possible actions L (i.e., the real affordances) – see Figure 5.4. The functions fall into two types (see Figure 5.5): full (non-surjective, non-injective or bijective) or partial (free).

The designer's task is the anticipation of an action and to plan the interactor's inferences. The most important factor is stability so that P and L should remain stable. Surprise counters this stability. For example, if a new possibility is added to interface, it should remain in the selection thereafter (and not to be a gimmick just for one moment). Also, new possibilities should be added in a slow pace so that the interactor does not get overwhelmed.

The interaction takes time and there are three strategies how to cope with this. First, we can freeze or fill in the time, which means that the

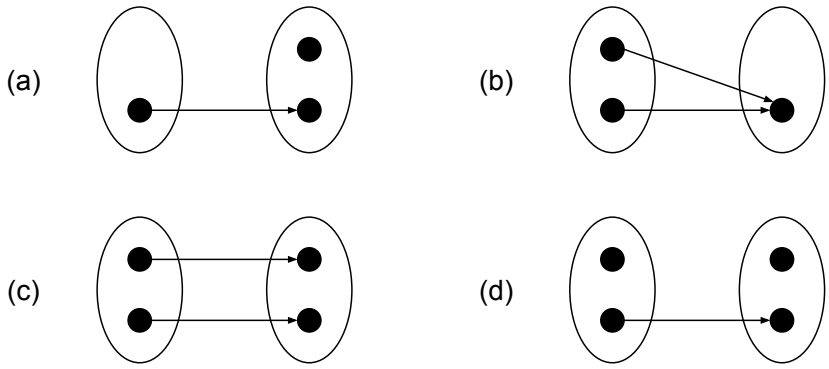

Figure 5.5: Interface mapping functions types: (a) non-surjective or filtering interface, (b) non-injective or redundant interface, (c) bijective or direct interface and (d) free interface.

system either waits for interactor's input or creates insignificant action while user is inputting. Second, we can allow semi-autonomy where the character fills in the time while the user is inputting. Third, we can invoke ellipsis, which means that the system freezes time when interactor is inputting and continues then from a later time (e.g., if the interactor decides to leave a house, we meet them next in the garden outside the house).

5.3.2 Narrativising the interface

Bizzocchi et al. (2011) present four approaches to design a narrativised interface. In the 'look and feel' of the interface, interface elements – apart from providing the interactor with affordances – also performs narrative work. This can be realized in *interface aesthetic*, where the interface can be modified to reinforce the narrative themes. This is a move towards more diegetically integrated interfaces (e.g., *Black & White*). In *narrativised game metrics*, the interface provides feedback to the interactor about the state of the gameplay and performance in the storyworld. It can also reinforce the narrative dimensions of the game.

The interface can be designed from the narrative perspective, where we are considering the impact of the perspective on the narrative experience of a game. Here, the interactor's non-story-related choices (e.g., game mechanics) also support their narrative pleasures. This allows a deeper identification with the character and a more comprehensive sense of the storyworld.

In *behavioural mimicking*, the interaction tries to mimic those of real life actions. This can mean control realism (i.e., how accurately the controls simulate) or feedback realism (i.e., how realistic is the feedback). In *behavioural*

metaphor, the interface can suggest a connection to real-world behaviour.

Finally, interfaces can do 'bridging' or use mixed reality. This means that the 'magic circle' of the game is explicitly made porous (e.g., ARGs and Tamagotchi).

5.4 Interactor types

The role of the interactor raises many questions (Ryan, 2008). First, interactors probably do not want to be tragic or comic characters but rather heroes in their stories. Second, many users do not even want to be interactors but marginally involved observers or confidantes. In this role the user is a peripheral character (see focalization, Section 4.3.1) affecting the world and observing the outcome (i.e., agent and spectator).

There has not been any work on categorizing the interactor types in interactive storytelling. The closest example is the classification by Robin Laws (2002, pp. 4–6), who recognizes the following player types in RPGs:

- Power gamer: wants to continuously develop their character with new abilities and equipment
- Butt-kicker: focuses on fighting to prove their superiority
- Tactician: prefers complex and realistic problems that require thinking ahead
- Specialist: always sticks with their favourite character type
- Method actor: identifies strongly with their character and want to test their personal traits
- Storyteller: interested in the role-playing side and co-creating the story
- Casual gamer: hangs in the background and does not want learn all the rules nor engage in detailed planning

If we look at video games, we can see two broad classes of player type analysis. Top-down models approach the situation by defining first (orthogonal) classifications and recognizing then player types on how they sit on these categories. In contrast, bottom-up models start from the data and try cluster it to recognize and label player types with common features.

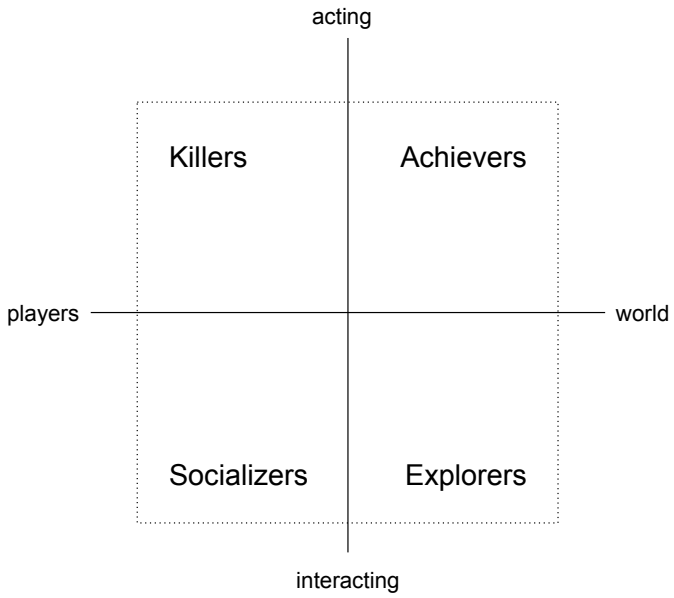

Figure 5.6: Bartle's four player types.

5.4.1 Top-down analysis

Based on his observations on multi-user dungeons (MUDs) Richard (Bartle, 1996) presents a taxonomy of different player types. He places the player among two axis: where their activities are mainly directed to (*players–world*) and in what kinds of activity are they mainly engaging (*acting–interacting*). This allows the player to be divided into four groups according to their activities (see Figure 5.6):

- Killers: People who use the game to dominate to other people.
- Achievers: People who set themselves game-related goals that they then try achieve.
- Explorers: People who try find out what is in the game world and map it for others.
- Socialisers: People who want to converse and interact with the other players.

The player's motivations should be understood as a mix of these, and the type of play for a single player can change during gameplay. For example, in the early game the player can act more like an explorer, whereas towards the end he can turn out to play more like a killer.

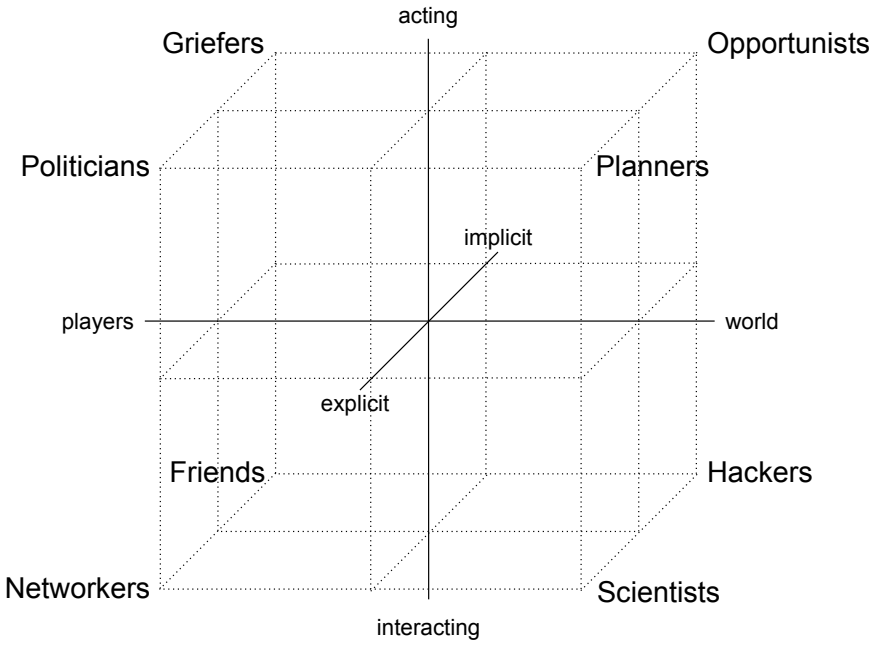

Figure 5.7: Bartle's eight player types.

Bartle (2005) extends the model to include eight player types by introducing a new axis, which classifies the players whether their behaviour is spontaneous or premeditated (*implicit–explicit*). The extended models has now eight player types (illustrated in Figure 5.7):

- Griefers (implicit killers) in games attack other players to get a big, bad reputation
- Opportunists (implicit achievers) in games take every opportunity they see without bothering to tackle obstacles or spending lots of time with any single feature.
- Hackers (implicit explorers) seek to discover new phenomena and experiment to reveal meaning
- Friends (implicit socializers) enjoy a familiar company of other players they know well
- Politicians (explicit killers) aim for a big, good reputation in games
- Planners (explicit achievers) would act the same in RGs as in games – set themselves goals and persistently pursue their way towards them.

- Scientists (explicit explorers) in games experiment with the game mechanics to find out and explain how they work.
- Networkers (explicit socializers) in games seek for interesting and worthwhile people to interact and want to get to know their fellow players.

Bartle acknowledges that players are likely to advance through certain typical development paths within the game. For example, a player can start out as a griefer, developing into a scientist, then a planner and, finally, a friend as they grow more and more familiar with the game.

5.4.2 Bottom-up analysis

Another approach for modelling players is to take data from the players and analyse any commonalities that might exist among them. Vahlo (2018, pp. 61–75) presents the results and analysis from a large survey of over conducted with 12–70 year-old respondents. The survey provided a list of 33 core gameplay activities and the respondents were asked to rate the activities according to how much they like or dislike them. An analysis of the results showed that the 33 activities can grouped, according to their similarity in the respondents' preferences, into five factors:

- Assault (e.g., attacking, defending, fleeing for your life, sneaking, hacking, conquering)
- Care (e.g., decorating rooms, flirting, gardening, hanging out with friends, taking care of pets)
- Coordinate (e.g., jumping from a platform to another, matching tiles together, performing lifelike sports, performing music)
- Journey (e.g., creating your own character, developing skills, exploring, searching for a hidden treasure)
- Manage (e.g., building a city, commanding units, gathering resources, guiding a population, trading items)

Next, the results the respondents' results were clustered according to how much their share preferences of the aforementioned five factors. Based on this the respondents could be clustered into seven player types: mercenary, companion, commander, adventurer, explorer, daredevil and patterner. Table 5.1 collects for each player type their strongest likes and dislikes, their proportion amongst the respondents, gender division, average age and average play times per week and per session.

Table 5.1: Player type data (Vahlo, 2018, p. 71).

Type	Likes	Dislikes	Proportion (%)	Women (%)	Age	Plays weekly (h)	Plays per session (min)
Mercenary	Assault	Care	19.5	24	31.6	17.1	72
Companion	Care	Assault	8.0	72	40.8	10.7	47
Commander	Manage	Care	18.8	27	37.8	13.6	56
Adventurer	Journey	Manage, Care	10.4	45	31.5	15.1	77
Explorer	Journey, Coordinate	Assault, Care	15.8	78	42.3	10.5	42
Daredevil	Assault, Coordinate	Journey, Care	14.5	31	39.6	10.8	44
Patterner	Coordinate	Care	13.1	71	45.3	10.0	33

Chapter 6

Storyworld

The storyworld is an artefact provided by the designer running on a platform for the interactor to experience. It has various elements with different levels of autonomy: *Characters* are computer-controlled entities that are represented as avatars and cohabit the storyworld with the interactor. Interactors and characters can use *props* to act and to interact in the storyworld. The developments in a story instance can occur also due to *events* that are usually set by the designer and triggered by the interactor. The storyworld also comprises of various *scenes* where the story takes place.

6.1 Characters

Broadly speaking, the characters in a story can be aesthetic (i.e., serve the plot), illustrative (i.e., symbolise ideas or themes) or mimetic (i.e., simulate human beings) (Weallans et al., 2012). However, the characters themselves are aware only in their mimetic components, whereas the illustrative and aesthetic components exist outside of the fictional world and only the interactor and the designer are aware of them.

Character's initial state is set by the designer but this state changes due to interaction with the other characters and the interactor. A character can be almost completely autonomous, when it acts as a simulation, or it could be semi-autonomous in the sense that it is harnessed to carry on the story plan.

A typical problem for the characters is that they can jump from behaviour to behaviour, never settling long enough to be comprehended. Sengers (2002) labels this phenomenon as schizophrenia, because the character's behaviour has been designed by solving subproblems individually but they do not form a cohesive and holistic overall behaviour. Moreover, the character's task is

to take actions that will *communicate* (which are not necessary those that are 'correct').

Features of character believability include (Mateas, 2002; Fairclough and Cunningham, 2002; Szilas, 2007; Gomes et al., 2013):

- Awareness of the surrounding world
- Unique and specific personality
- Emotional expressiveness
- Coherent and understandable behaviour (also relating to the past behaviour)
- Rational short- and long-term goals
- Growth and change with time and experiences
- Forming and fostering social relationships

It is important to notice that expressiveness of a character is independent from visual realism. The origins of expressive behaviour are the character itself and the human creator (Szilas, 2007). Even simple characters can be animated so that they seem to have life.

6.1.1 Listen, think, speak

Let us consider the character's interaction as a cyclic process of listening, thinking and speaking (Crawford, 2013, p. 28). We can broaden this perspective so that listening refers to the character's perception of the world. Likewise, thinking is the decision-making process that is coloured by the character's personality and associated with and stored to the character's memory. Finally, speaking refers to the character realizing its decision by acting in the storyworld. The aim of all these is to make the character to act as human-like as possible whilst preventing the underlying software implementation to get too complex.

The model–view–controller model illustrated in Figure 3.2 includes a synthetic view that is prepared from the proto-view and is intended to be the perception of a character. It can filter out elements based on physical (e.g., fog-of-war) or character's perceptional (e.g., blindness) limitations. If we want to have a fully human perception, the filtering should have several layers possibly including a simulation of physical sensors and cognitive processes (Sanchez et al., 2004). Usually this means introducing errors to

the character's perception leading to false beliefs (Carvalho et al., 2017; ten Brinke et al., 2014). Unlike many other application areas, having error-prone computer-controlled characters is likely to be a desired feature in interactive storytelling platforms. Decisions based on faulty or erroneous perceptions can lead to interesting and surprising – but still believable – outcomes.

The received perceptions are stored in the character's memory. Human memory is typically divided into two broad classes: *short-term* (or working) *memory* (STM) and *long-term memory* (LTM) (Norman, 2013, pp. 92–97). STM holds the most recent experiences or currently thought-about material. It allows to retain information automatically and to retrieve it fast, but the amount of retained information is limited to 5–7 items. Although STM is invaluable for everyday tasks, it is fragile, for example, to distractions. LTM is the memory of the past. Retaining and retrieving information takes time and effort. Sleep seems to play a role in strengthening the memory of the day's experiences. In LTM, details are reconstructed and interpreted each time we recover the memories, which means that they are subject to distortions and changes. Also, the organisation of LTM can cause extra difficulties (e.g., 'tip of the tongue' experience). Apart from STM and LTM, there is also *prospective memory* (or a memory for the future), which allows us to remember to do some activity at a future time and to have the ability to imagine future scenarios.

LTM holds the *autobiographical memory*, which stores the personal history of an entity including places and moments as well as subjective feelings and goals. They form the human experience is which based on stories on past experiences so that new experiences are interpreted in the terms of old stories. Also, the content of the stories depends on whether and how they are told, which is the basis of individual's remembered self. Turning to characters, a computational autobiographical memory requires (Brom et al., 2007; Ho and Dautenhahn, 2008):

- Accuracy: how to retrieve relevant information and to measure how trustworthy it is
- Scalability: how to accommodate a large number of episodes (e.g., forgetting over time)
- Efficiency: how to optimise the storage (e.g., omitting and combining details) and recall

Dautenhahn (1998) recognizes different types of storytelling agents, which can be seen as types of autobiographical memory for the characters:

- Type 0: The character is always telling the same story.
- Type I: The character has a variety of stories, from which it chooses one randomly and repeats it exactly (i.e., it has no conversational context).
- Type II: The character selects a story that fits the context best and repeats it exactly but does not listen.
- Type III: The character is able to interpret the meaning and content of the story and to find a similar story to adapt to the current situation (i.e., it tells and listens to stories).
- Type IV: The character is an autobiographical agent (i.e., it has a personality).

Forgetting is an important part of a memory as it helps to reduce the resources needed to maintain the memories. This can be realized by dropping out the least important memories, reducing the details of older memories, or by combining similar memories into one memory.

Let us look at two examples for an implementation of a memory in an interactive storytelling system. In *VIBES* (Sanchez et al., 2004), the memory stores information (i.e., percept objects) acquired about the world, the character's representation of the world, and the knowledge the character has acquired. It also records consecutive internal states of the character (e.g., wants, emotions). In *SAGE* (Machado et al., 2004), the narrative memory stores a temporal sequence of episodes and cause-and-effect links between individual episodes. An episode comprises a crisis, a climax and a resolution.

6.1.2 Modelling personality

To model the character's personality we can resort to existing psychological models of human personalities. One of the most known is the OCEAN model, which is also called the 'big five' model or five-factor model (Digman, 1990). It is a taxonomy for personality traits divided to five factors: openness, conscientiousness, extraversion, agreeableness and neuroticism. Table 6.1 collects the features associated in each of these traits.

Crawford (2013, pp. 200–202) presents a simplified personality model based on the traits of the OCEAN model. The character's personality is defined by three variables along the axes:

- nice–nasty (i.e., the basic goodness of the character)
- honest–false (i.e., the character's integrity)

Table 6.1: The traits and associated features in the OCEAN model.

Trait	*Associated features when the trait is...*			
	high	extremely high	low	extremely low
Openness	curious, creative, looking for novelty and variety	unpredictable, unfocused, risk-taker	pragmatic	close-minded
Conscientiousness	organised, disciplined, dependable	stubborn, focused	flexible, spontaneous	sloppy, unreliable
Extraversion	gregarious, sociable, loquacious, energetic	domineering, attention-seeker	reserved, reflective	aloof, self-absorbed
Agreeableness	sympathetic, compassionate, co-operative, trusting, helpful	naïve, submissive	competitive, challenging	untrustworthy
Neuroticism	anxious, excitable, vulnerable, reactive	insecure, emotionally unstable	stable, calm	uninspiring

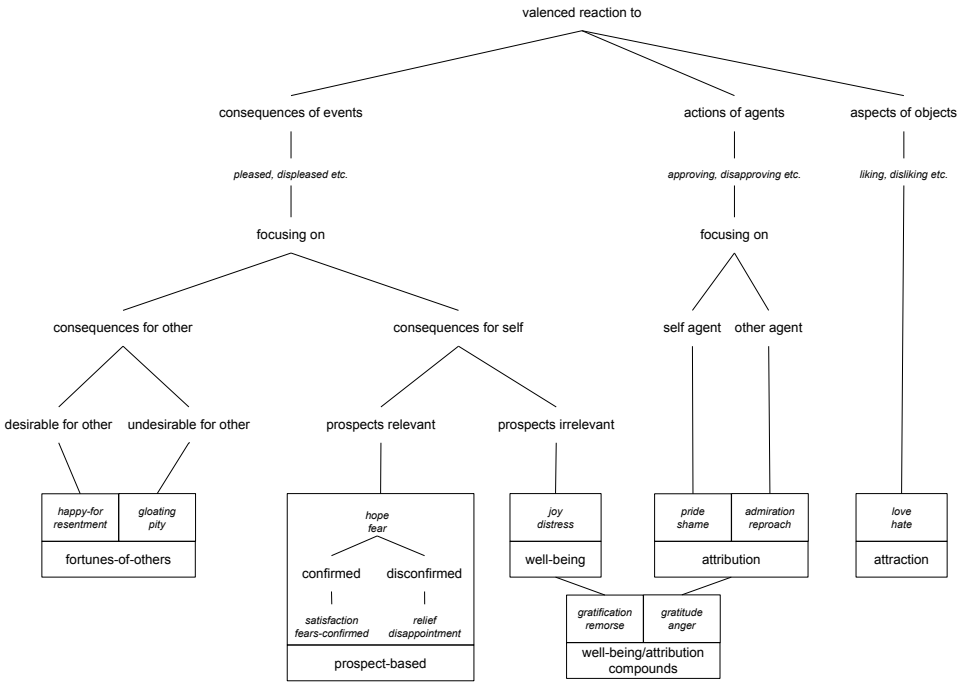

Figure 6.1: Global structure of emotions types in the OCC model (Ortony et al., 1988, p. 19).

Table 6.2: Event-appraisal theory (Theune et al., 2004).

Directed to the character itself	Directed to other character
hope–fear	admiration–reproach
joy–distress	hope–fear
pride–shame	love–hate

- wilful–pliant (i.e., the character's assertiveness)

Another widely used model of emotion is the Ortony–Clore–Collins or OCC model (Ortony et al., 1988). As illustrated in Figure 6.1 is asserts that emotions depend on events, agents or objects leading to 22 emotion types.

Such an extensive categorization can be simplified as *Virtual Storyteller* does by using event-appraisal theory (Theune et al., 2004). Table 6.2 presents the two emotional categories of the event-appraisal theory: emotions directed to the character itself and emotions directed to other character. Each of the six emotional state can be positive or negative and have an intensity within a given scale.

6.2 Props, scenes and events

Fictional universe in constrained only by what is revealed to the audience. *Chekhov's gun* is a narrative principle stating that everything presented in the story should be significant. This principle is related to the Russian short-story writer and playwright Anton Chekhov, who wants the author to remove everything that has no relevance to the story to that extent that if there is a rifle hanging on the wall in the first chapter, it has to go off later in the story (otherwise, it should not have been mentioned in the first place). For example, point-and-click games adhere tightly to Chekhov's gun by highlighting only the active items on a scene. This allows the player to know that during the course of the story, something will be done with these items.

Chekhov's gun can also be reverted as a *red herring*. In this case, the item is shown to the audience leading them to assume that it will used when the plot suggests it, but the surprise element is that the item is not used but the situation is solved by other means.

In the case of interactive storytelling, it is more accurate to extend the concept into *Schrödinger's gun* (Robertson and Young, 2014). It combines the quantum physical concept of Schrödinger's cat (i.e., unobserved aspects of the world exist in multiple simultaneous states) with Chekhov's gun. The rationale here is that *only if* the rifle on the wall is observed by the interactor, it must go off at some later point; otherwise, it will remain in a 'superposition' as a possibility that was not realized by observation. For instance, in *Final Fantasy XII* the player never takes all the possible NPCs to the team at the same time. Often, as the game is played through, not all NPCs are even met once, although they exist in the potential of the story.

In an interactive story many props are mutable. They can be augmented by 'crafting', sold away, discarded or even destroyed. Several games have separate categories for different kinds of props. There are *resources* that can be gathered, bought, sold, and used for crafting. There are items that can be used. There are *quest items* that cannot be affected, except for their plot device intentions. This is to protect the structure of the story, although in some games it is possible for the player to run themself into a dead end, if they destroy a key item for advancing the plot.

Murray (1997) emphasizes that immersion in a digital world can be enhanced by virtual objects behaving in an expected and realistic way, especially in reaction to the interactor's actions. By interacting with objects in a fictional world these objects can become imbued with life and realism. In this way interaction can enhance the feeling of immersion, bringing the world to life around the interactor – creating a positive feedback-loop of immersion.

6.3 Representation

In order to be understood, the story must be concretized into a representation. This representation can be anything that conveys the experience of the story to the interactor and, at the same time, serves as a means for the designer to express the story and vary it to reflect the interactor's reactions. With a traditional medium the representation is typically fixed: paintings are visual, music is auditory, theatre plays are watched in theatres. With interactive storytelling, not only the representation may be multimodal but it can also be interactive. The interactor may be able to choose not to have audio input at all but, for example, rather to have the speech and other auditory cues through subtitles. A game can allow the player to move around in the physical world with the game device to control the game, or instead the player may choose to control the game with a joystick and simulate the motion in the physical world.

In the case of visual representations, visual storytelling possibly has the most significant effect on human reception. Seeing and reacting on an image has much more success in provoking senses and being memorized longer than any other verbal or written information. In this matter, Erwin Panofsky (2003, pp. 306–310) states that the steps of understanding correspond to the forms of knowledge which presuppose historical experience.

Early semiotic work is known as connoisseurship, which is related to the interpretation of signs of authenticity and authorship. The designer holds the origin of the work of art and aims to characterize the existence, circulation and discourses within a storyworld. The designer definitely beholds the attendance of certain events within the created world, along with changes, distortions and their various modifications. Lead by the designer's thought with conscious or unconscious desires, the contradictions can resolve in relations to the others creating a specific meaning which is the interactors' to find.

In visual representations, parts of the field are open for submitting the order of values in the context of the represented objects with potential signs. The changing nature of image–sign relationship is essential subject in the view of Meyer Schapiro (1969). One could say that semiotic approaches and theorems about each aspect of visual representation (an artwork, a sentence, a word, a letter) are the matters in discussion of interactive storytelling in the digital era (Merleau-Ponty, 1964, p. 58).

Unlike verbal, the written text is under continuous transformational process of perception since each generation has own viewpoints and attitudes towards collected written material. That brings changes and movements in elements and makes differences in interrelations of the characteristics, which

belong to the same elements of the visual representations. Artwork stands for the subject, behind the work stands the sender whose expression stays within the spectators. Observer's interpretation forms the basis of the common meaning generated by the interaction between visual and verbal discourse. We can see clearly this approach in postructuralism where the study of interpretation aims to the balance of taking a look at the past as the act of construction. According to Gadamer (2004), the true power of visual representation is in its ability to shape the observer's understanding from what appearance suggests – observer can receive several different stories, or even several different aspects of the same story, by observing one visual allegory. The power of visual representation is in its ability to adjust the consciousness of the observer in which processes the idea of an artwork is crucial aspect of the concept which its appearance suggests.

The role of art has always been a double to the real world, being compared and evaluated to how real does it feel, or, in other words, how faithful it is to our senses of what real represents to an individual. Like any other form of art, narrative design and visual representations of the either fictional or historical elements, can be examined by using post-modern art theories. IDS systems (as well as digital games in general) provide a new medium of expression where the interactor does not regard them as entertaining platforms but digital environments for gaining new experiences.

Although narrative design is often thought as textual, it can also include visual or aural elements – or even omit the textual narrative and focus on other forms of conveying the story. Let us look and compare how some games present a complex narrative design to an interactor using different forms of storytelling. A common feature to these games is they have a deep narrative design with a main protagonist that reflects to the interactors' preferences in a gameplay – the interactor can decide the course of the narrative from aggressive/achievement-driven to more adventurous/story-driven experience.

To provide an open world experience with a feel of free exploration in *Horizon Zero Dawn*, the narrative designer and the game designer have used a variety of traditional methods of literary and rhetorical allegory in revealing the story. Conversely, in games such as *ABZÜ* or *Journey*, the creators have focused fully on the visual storytelling methods with an almost complete absence of textual content in the game. In such an approach, semiotics theory (Schapiro, 1969) and iconography (Panofsky, 2003) have an essential role in creating the interactive narrative experience for the players, where even the symbolism of a colour or the type of light and the texture in a scene can provide necessary information for the interactor to progress in the game. Naturally, this makes high demands on the graphics team, since their task is to translate the narrative design into a visual narrative by using all possible

tools from semiotics, psychology and symbolism theories. Moreover, this visual translation of the story-driven experience needs to be easily understood via a seemingly simple user interface design and clear indicators in the game environment that guide the player in the story progression.

The game *Life is Strange* is based on more traditional storytelling methods, where the player makes clear choices from a given branching narrative. The story progresses as an episodic interactive narrative, which is also common in visual novels and interactive fiction. In these games, narrative designers focus on specific segments of the story that give a full loop and a sense of conclusion by the end of the game, and, at the same time, the story has enough of open-endedness that it can continue in another episode as a sequel, or even completely new game-titles that refer to the previously given narrative experience. Still, the follow-up game can usually be played and experienced without having played the previous game in the series, which is the case in adventure games such as *Zelda*, *Tomb Raider* or *Assassin's Creed*. The storyline binds all the games – and the big narrative construction that represents the game world and all its content – under one title. The introduction and tutorial parts of a game serve as an 'onboarding' to the given narrative framework for the players not already familiar the preceding games in the series

Chapter 7

Conclusion

In the previous chapters we have covered the history and relevant background on interactive storytelling as well as introduced and explicated concepts related to the four components – platform, designer, interactor and storyworld. To conclude we present models that try to provide an overall summary on interactive storytelling. This is followed by a discussion on possible changes that interactive storytelling might see in the near future.

7.1 Models for interactive storytelling

The following three models aim at covering the range of interactive storytelling. The PC3 model and the specific theory of interactive digital narrative are analytical tools whereas Adams' template for requirement specifications aims at being of practical use in the design process.

7.1.1 PC3 model

Magerko (2014) introduces a model for analysing different kind of interactive narratives. Its components include the processes employed, the content used and its structure, the system of control used in the system, and the social context in which the system is intended to be used. This PC3 (process, content, control, context) model can be used when analysing different kind of interactive narratives such as theatre, games and IDS systems.

- *Process* refers to the behind-the-scenes processes that enable the experience to occur. They are domain independent means (e.g., the drama manager) of moving the story along.

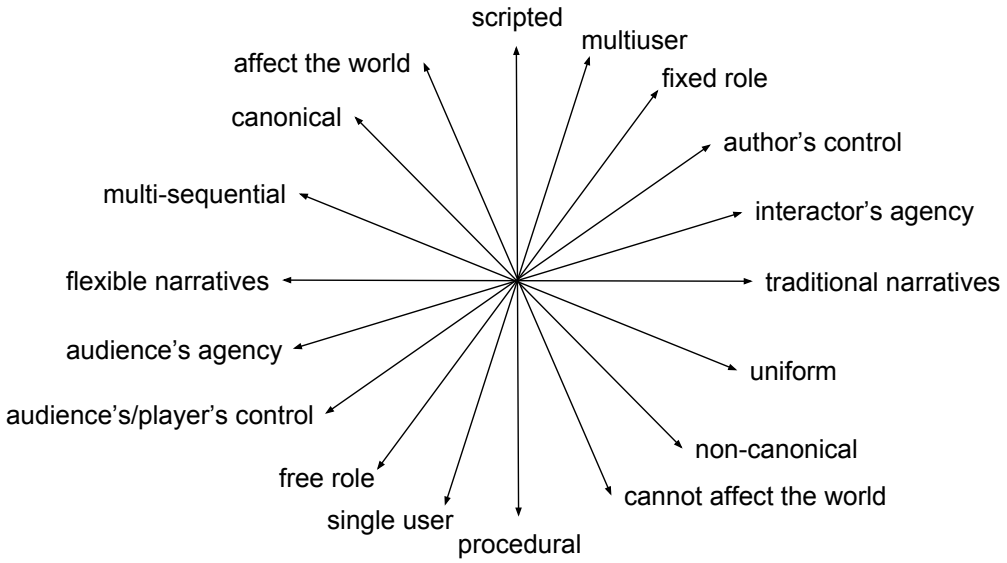

Figure 7.1: Semantic differentials in the ludonarrative field (Koenitz et al., 2015b).

- *Content* forms the surface of an interactive experience, which is a combination of story elements and story structure manipulated by the narrative process.
- *Control* is the gatekeeper of the story content. Here we have a spectrum of story control from centralized to decentralized power structure.
- *Context* refers to the social elements of the system use and the intended purpose of the system.

7.1.2 Specific theory of interactive digital narrative

Koenitz et al. (2015b) present a chart of the ludonarrative field with semantic differentials as couples of significative opposing terms illustrated in Figure 7.1. Moreover, they propose that narrative artefacts could be located within a three-dimensional diagram, where the three axes are narrative complexity, dramatic agency and agency.

Koenitz et al. (2013a) and Koenitz (2015) propose a specific theory of interactive digital narrative illustrated in Figure 7.2. A *protostory* refers to the concrete contents of IDS system as a space of potential narratives. In comprises environment definitions, assets and settings (e.g., user interface). The fourth component is narrative design, which is a structure within the

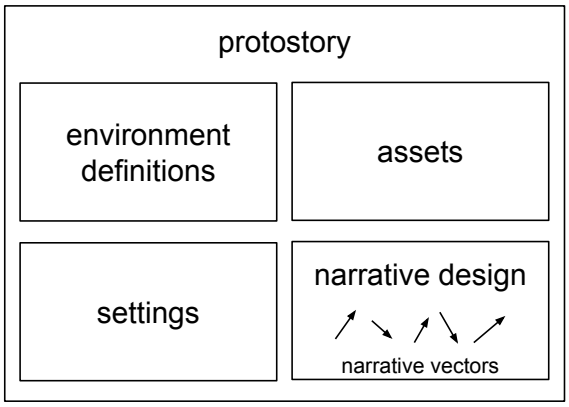

Figure 7.2: Protostory and its components (Koenitz, 2015).

protostory (e.g., plot) describing flexible presentation of a narrative. This can be defined using narrative vectors providing a specific direction (e.g., plot points).

7.1.3 Adams' template for requirements specifications

Ernest Adams (2013, pp. 148–168) presents a template to writing requirements specifications for interactive storytelling. Although it is not intended for the actual design process, it aims at assisting the designer to define the type of experience they want to have. The key design goals for the story's role in the experience are

- Emotional goals for the story
- Function of the story in the experience
- Degree of well-formedness
- Overall importance of the story
- Avatar design

The other considerations include defining the player actions, the interactive range and agency as well outlining the plot and the plot line that the player experiences.

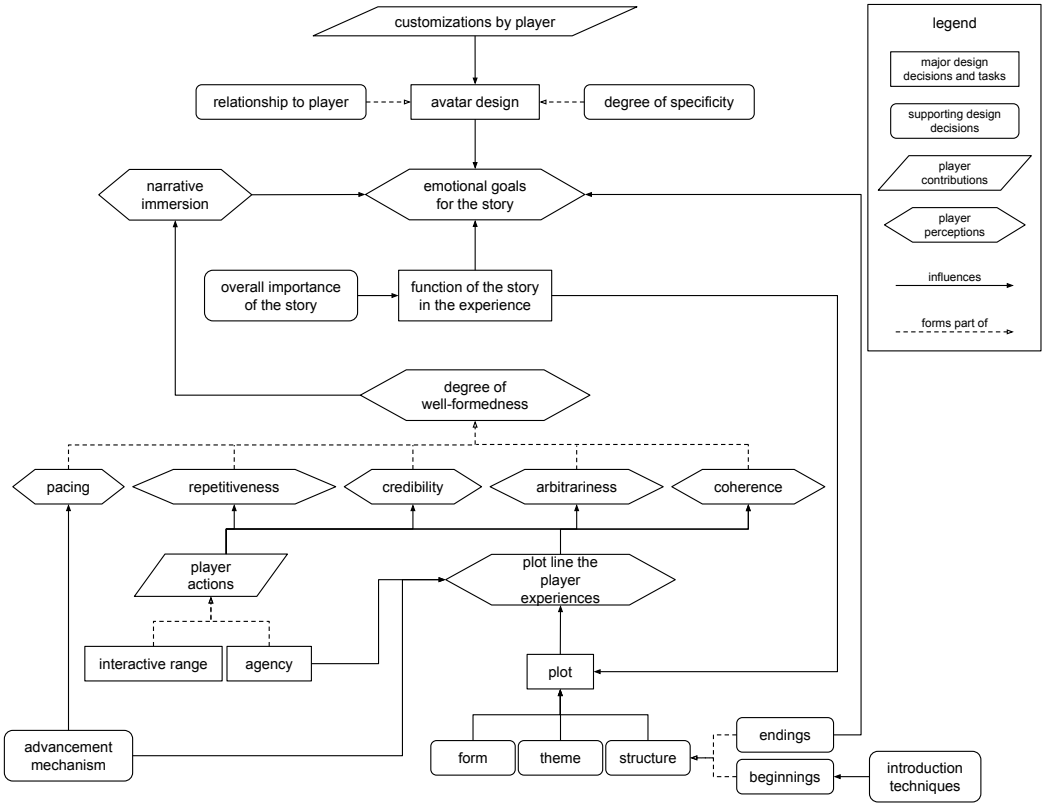

Figure 7.3: Model for defining an interactive storytelling experience (Adams, 2013, p. 154).

7.2 On the horizon

To round up let us review some emerging trends that could affect interactive storytelling in the near future.

7.2.1 Multiple interactors

IDS systems are intentionally designed for single interactors. If we allow multiple interactors in an IDS system, we must also prepare for conflicts in the design. In distributed databases, the conflict is about maintaining consistency so that all users have the same view to the shared data. In multiplayer online games, the conflict is about maintaining both consistency and responsiveness so that all players have a prompt access to relatively reliable game data (Smed and Hakonen, 2017, pp. 256–258). An IDS system with multiple interactors takes the conflict to a new level, because we have to create interwoven stories that are, at the same time, consistent, responsive and compelling. A compelling storyworld requires that the events are dramatically interesting to all the interactors.

There are three questions that multi-interactor IDS systems have to address. The first and crucial challenge is how can we ensure that all interactors will stay in the focus of the story. This *too-many-heroes problem* asks how can we tell a story that would be compelling to multiple main characters (Smed, 2014). Adams (2013, pp. 11–12) postulates that this could work in only epic stories with a massive amount of interactors, of which none is central. Most massive multiplayer online games, however, ignore this problem and offer the same story for all players. For example, *World of Warcraft* allows everyone to take turns in killing the Lich King and saving the world. However, if we want to solve this problem, every character cannot be a hero but someone also has to do the mundane work – even if we are in a storyworld. At the heart of this problem is that each human-controlled character (i.e., hero) needs a group of computer-controlled characters (i.e., extras) to support them. Therefore, one solution is that each new interactor brings along also new supporting characters. Another approach is to limit artificially the number of interactors in the storyworld so that we can provide each of them with a meaningful story.

The second challenge is about *persistence*: if the storyworld is persistent, how do we handle interactors entering and exiting at any time? Multiplayer online games have to solve the same problem, but in an IDS system we have to consider also the on-going stories and the presence of interactors. For example, let us think about what happens when an interactor logs out. One possibility is that the interactor's character just vanishes from the story-

world, which is inconvenient and not believable unless it is included in the storyworld's internal logic. Second possibility is that the interactor's character becomes a computer-controlled character until the interactor logs back in. The problem is now how to guarantee that something extraordinary does not happen to the character in the meanwhile. When the interactor is not present, the character cannot be subjected to big plot twists. Naturally, we can present a recap of the events that have taken place during the interactor's absence upon returning. Third possibility is that the interactor gives tactical (or even strategic) level instructions to the character to follow during the absence (e.g., 'try to befriend this other character', 'stay home and do not answer the phone', or 'be happy and active') (Smed and Hakonen, 2017, p. 284). However, many interactors might find this kind of a loss of control, even if it is only temporary, intrusive and confusing.

The third challenge is *cheating* in a storyworld and its implications. Apart from technical cheating such as hacking the software, this is a about what belongs to the agreement the interactors are committed to. Cheating means achieving the goal by breaking the rules, but what are the goal and rules in a storyworld? Cheating that takes place inside the storyworld is just a part of the story, since every action within the storyworld – no matter how civil or rude – are part of the experience and should be valid. This kind of cheating can be called managed or explicitly possible. However, cheating that is not comprehended as a part of the interactors' agreement may ruin the experience, depending on if the cheat becomes accepted as a way to broaden the conflict aspect of the storyworld. That is, the agreement may evolve, with a mutual approval.

7.2.2 Technological prospects

Technological advances tend to have a rippling effect on the way that software is designed. It can open new possibilities or change the way how the existing ones are being used. In interactive storytelling, this could mean new ways to design the storyworld using transmedia (see Section 4.2.1) or it could lead to new ways to interact with the platform. Nevertheless, one could argue that each technological advancement is taking us closer to Murray's vision of the holodeck (see Section 2.2.2).

Voice recognition

Amongst the many technologies for interaction, voice recognition seems to offer the most interesting possibilities for interactive storytelling. There are

already first examples of applications taking *Choose Your Own Adventure* gamebooks and converting them to audiobooks with speech control.

Broadly speaking, voice recognition provides the interactor with new ways to affect the storyworld. It is a more natural way to have conversation with a character as it removes encumbrance of giving input by typing in utterances or selecting icons – regardless whether the underlying model resembles the broad-and-shallow discussed in Section 3.2.3. Recalling Aristotle's narrative forms (see Section 2.1.1), the networks of social relationships is the key for the dramatic form, and – as in real life – these networks are created and maintained by discussing with the fellow characters.

Locating

Location-based interactive storytelling is essential in many non-entertainment applications such museum or exhibition guides, which connect elementally to a physical location. Here, the challenge for the design is superimposing the storyworld over the real world. The prime examples of location-based games such as *Ingress* or *Pokémon Go* have solved this by having a simple story that does not rely on the real-world topology. In *Ingress*, the two factions, the Enlightened and the Resistance, are having battle over the control over Exotic Matter (XM), which is connected to how much they control the sources of XM superimposed over the real world. The narrative stems then from the actions happening in the real world like history or news being written after the fact.

Let us consider how the paths in the real world could correspond to the storyworld by considering the example illustrated in Figure 7.4. A museum visitor can go to places (connected to story events) in any order but moving from A to D they have to go past B and C. It is unlikely that they will do this blindfolded but B and C will seep through and influence the experience. Also, the physical one-way barrier (e.g, turnstile) between E and F closes the possibility to return places A–E. The problematic is similar to what we have encountered earlier in open storyworld (see Section 4.1.3) with the exception that here the design of the world cannot be altered to fit the story.

Extended reality

Augmented reality (AR) and virtual reality (VR) gears have become considerably cheaper and user-friendly in the past few years, which is why they are expected to be ever more commonplace. Extended reality – which covers both AR and VR – will bring a new dimension to representation and immersion, but it will not change the aesthetics categories discussed in Section 5.2,

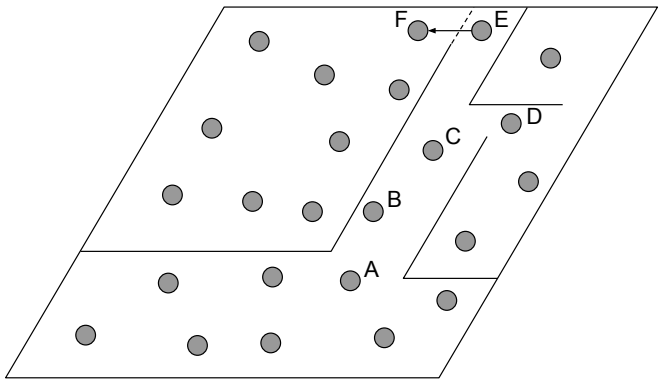

Figure 7.4: Storyworld events superimposed over the real world.

nor is it likely to bring new structural innovations. However, with improved representation and deeper immersion we would be getting a step closer to the Holodeck.

Machine learning

Machine learning – and especially deep neural networks (DNN) – are, at the time of writing, proposed as an all-around method for solving problems that are beyond the grasp of classical computer science. It seems a tempting approach for many problems, because one does not have to solve the problem but just make the DNN learn how to do it. All that is needed is an ample amount of material for learning and an evaluation function to measure how well the DNN is solving the given problem instance. We do have vast amounts of digitally encoded stories, free as the Gutenberg Project as well as proprietary. What would be easier, one could ask, than to just feed in all that data into a DNN and let it learn how to generate stories in similar fashion than how AlphaGo learned to play Go better than any human being. Would this be a recipe for creating a digital storyteller who could adapt to any whims of the audience?

Only time will tell whether this scenario will take place and be a turning point for the research on interactive storytelling. Maybe this will be realized (first) in a small scale, for example, in the control of characters, whose behaviour gets more human-like. Nevertheless, telling and understanding stories is such a fundamental part of the human condition that having an adapting, reactive and creative digital storyteller would prefigure the coming of true digital beings.

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