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Propositions for Innovative Forms of Digital Interactive Storytelling Based on Narrative Theories and Practices

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Abstract. This paper takes a look at narrative forms as of yet unexplored in the field of digital interactive storytelling, and proposes methods for how they can be used in engaging ways for the user. Digital Interactive Storytelling, while nearly two decades old as a field of research, has yet to produce a tool capable of producing masses of narratively interesting and engaging pieces for the end user. Although the various prototypes available produce several different story genres, they stem from the same classic narrative form. With this paper, we aim to introduce narrative techniques that have successfully been used in cinema, literature and the gaming world, and show how they can be adapted to DIS. We believe that by presenting these techniques authors can gain a better understanding of how to use existing systems.

1 Introduction

A hybrid between computer games and storytelling, the field of Digital Interactive Storytelling (DIS) aspires to deliver a new reading experience to its audience. By putting the reader in control of one character (at a time) and allowing him to make decisions that not only guide, but generate the plot, DIS aims to ultimately provide a unique story experience with each reading of the story [1, 2, 3, 4]. While early day adventure games such as Leisure Suit Larry in the Land of the Lounge Lizard that came out in 1987 [5] or Infocom's Hitch Hiker's Guide to the Galaxy adventure game [6] are a good example of what a basic DIS piece can look like, mixing story and user interaction, they hardly provide a comprehensive overview, nor do they go far enough into the possibilities of what DIS aims to achieve today. Recent adventure games have a strong cinematographic influence with nicely crafted stories, but leave little choice to the user to influence the story. These games generally use a storyline as a means to advance the actions [7], DIS would like to advance the storyline through actions. Modern adventure games provide players with a setting to perform actions and revert to cut scenes where the player gets presented the new scene which advances the storyline from which he will continue to perform basically the same actions as before. Most DIS systems today present the player with an unfolding story and will systematically present the player with a scene where he can take action from which the storyline will continue to advance.

An overview of approximately 25 DIS system prototypes can be found here [8]. Looking through the various systems it becomes clear that the DIS community has not yet achieved its goal of providing the reader with a high quality story experience while at the same time providing him with a key role in affecting the outcome of said story. Several challenges still obstruct this goal, and these can be divided into two categories; technical feasibility and creative contributions - or authoring as it is referred to within the DIS community [9]. DIS must generate story fragments based on a user's actions and insure that their addition to the current story keeps the latter coherent. Or, as C. Crawford puts it "In Interactive Storytelling, the story engine must be able to generate stories on the fly, based on user feedback, without relying on pre-scripted action or a hardwired series of events" [10]. And this is not easy. Writing a story that will be completed only once it is read is a difficult task for authors. Finding the balance between giving the reader enough control so that he feels he is taking an active part in the story's development, and keeping enough control to produce a coherent story, is one of the main challenges of DIS.

Taking a look at the various types of stories implemented with current DIS prototypes, we find children's fairytales [11, 12, 13], greek tragedies [14, 15], classical literature [16], adventures [17, 18, 19, 20], sitcom [21], soap opera [12], family drama [22], whodunit [2], political fiction [23]. While these works are varied, they all stem from classical and established, literature or drama, narrative forms.

Except for the user's ability to influence the story, the existing DIS pieces don't explore the large palette of expressive means offered by the computer. This is certainly explained by a certain immaturity of the domain, and the technical difficulties regarding the dynamic generation of narrative, that need to be solved first. Many of (if not all) the stories mentioned above were not designed by professional writers, but by the system designers, who naturally started simple. It could thus be argued that one should wait for the domain to gain maturity and for professional authors to get comfortable with the DIS approach, systems and authoring tools. However, this is a typical chicken and egg problem as explained in Spierling and Szilas [9]: artists wait for mature DIS systems, but DIS need artists' guidance to evolve in an appropriate and innovative direction.

In light of the current situation, this paper explores new possibilities of expression that advanced DIS research could offer authors. We are basing our exploration on technology, considering that engines capable of dynamically generating narrative actions according to a user's actions are available. Promising narrative engines such as Mimesis [24], IDtension [17], Gadin [12] or Storytron [23] are already developed and are examples of such technology. Then, taking inspiration from both theoretical work in narratology and practical creative narrative work, we explore what could be achieved in the future. While one could consider that these propositions go far beyond the current technological state of the art, several of the propositions below are already feasible with current technology. Our approach is profoundly interdisciplinary, mixing technology, narrative theories and art.

To limit the field of exploration of this paper, we have defined a set of constraints on how the user can interact with the DIS artefact:

- The only means for the user to act upon the fictional world is via a character's actions. This excludes letting the user act as in a god-game style, such as adding a prop in the stage, but does however include other out of character actions at the discourse level, as long as the story is untouched. (Here we refer to the classical distinction between story and discourse in narrative theories [25].)
- There is only one user.
- The interacting device does not play a role in the exploration of expressive possibilities, that is the classical keyboard and mouse interface will be sufficient for interacting with these future works. Of course, many innovations can be investigated regarding interaction devices combined with our propositions, but we leave these aside for future work.

2   Multiple Actualisations

In classical narrative, a text (understood in its generic meaning) triggers a multitude of possible worlds, which are constantly created by the reader, according to "clues" provided by the author [26]. These worlds correspond to alternatives that the reader imagines while reading. But only one of these worlds is finally actualised to create the story. While the story can vary a bit according to each reader and depending on the degree of openness of a work [27], each reader reconstructs a single story.

Things are different in less classical forms in which several alternative routes, representing alternative worlds from a narratological point of view, are included in the same work. Various movies have explored this form, for example: *It's a Wonderful Life* (F. Capra), *Smoking / No Smoking* (A. Resnais), *Lola Rennt* (T. Tykwer), *Sliding Doors* (P. Howitt). In these movies, two or more alternative worlds are actualised.

With current DIS systems, although the user may be given choices at several points within the story (choice points), only one route is finally explored. If the user replays, he can explore another route, but each reading is distinct, and previous readings are not accessible during the current reading.

How can the possibility of multiple actualisations be better exploited in DIS? As the user interacts via a character (see the first scope limitation defined in the introduction), the only way to create alternative worlds is through a character's choice points. Thus, this opens the possibility that when interacting with a story via a choice point, the user can, not only actualize one of his choices, but also explore other alternative routes.

Before going further in this investigation, it is convenient to represent these routes as a tree: the root node is the start of the story, each node represents a choice point, a bifurcation corresponds to the creation of an alternative route and world from an existing one, the leaves represent the world in the state the user left it, and finally a storyline or route is a full trajectory from the root node to a leaf (see Figure 1).
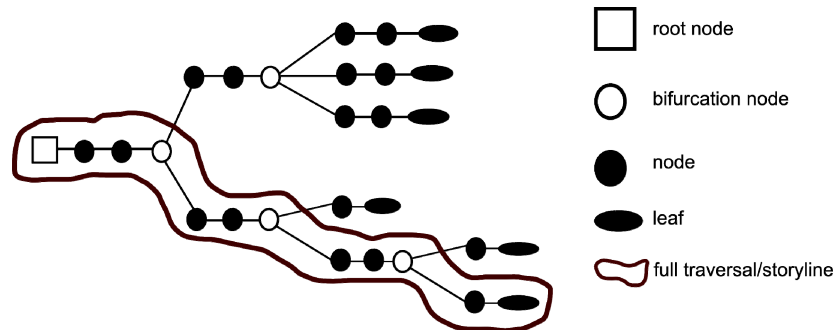
Fig. 1. Multiple Actualisations

Although this tree representation evokes the concept of a hypertext, it is radically different. In a hypertext, the tree is built by the author, in multiple actualisation based DIS, the tree would be dynamically generated by the user. In fact, a main property of DIS is that the largest explorable tree is gigantic.

We can then further refine this potential form, according to three criteria.

The bifurcation point chooser: Who decides where the bifurcation points are, the user or the computer? Four cases can be distinguished:

- **Free choice:** Any user interaction point can be a bifurcation point, leaving the user the possibility to create as many alternative worlds desired.
- **Computer-constrained:** The computer filters the user interaction points to keep only a part of them, among which the user is free to choose.
- **Computer-proposed:** According to the current state of the story, the computer proposes several bifurcations points that the user is free to accept or not. Typically, the computer is able to calculate causal dependencies between events and it proposes to "replay the past to modify the present".
- **Computer-imposed:** The computer decides which bifurcation points must be explored by the user.

The moment of bifurcation point choice: When the user decides that a bifurcation point is worth exploring.

- When played: after encountering a certain choice point, the user decides that this moment in the story should create two possible worlds to be played. Then, in most cases (but see part 6) the user will explore one of them, leaving the alternative world for later (in playing time).
- Retrospectively: the user, when at a leaf of the story, decides/selects one or more bifurcation points, and either explores one of them (the most natural case) or continues with the current storyline route.

The navigation between alternative worlds: how does the user stop exploring the current world and go back to a previous (in playing time) alternative world?

- **Totally free:** the user can go towards any bifurcation point, either continuing an already started storyline at its leaf or directly starting another branch from an existing bifurcation point to create a new alternative world.
- **To any leaf:** The user can continue any already started storyline at its leaf.
- **At a subset of leaves:** The computer restricts which leaves can be continued.
- **At the previous leaf:** To simplify the user's representation of storyline imbrications, the user can only go back to the storyline he came from.

When combined, these different criteria can produce many different subforms of multiple actualisations. All these forms enable navigation at the discourse level on top of navigation at the story level, managed by the narrative engine.

Let us provide a few examples of combinations of the above criteria:

- Free choice of the bifurcation point, retrospective bifurcation, going back to another alternative world at the previous leaf: The user plays his story and can decide at any moment to stop the current storyline to explore another branch from any previously played storyline. At any moment, he can also stop the current storyline to go back to the previous storyline's leaf he quit to join the current storyline.
- Computer-proposed bifurcation point, retrospectively chosen, going back to another alternative world at a subset of leaves: During his interaction in a storyline, the user is prompted by the computer: "apparently, your choice to [...] three months ago had serious consequences. Do you want to replay this previous scene?". If the user clicks "no", he simply continues the current story, but if he clicks "yes", he replays the past decision point and chooses another option. He then explores the consequences of this choice. When the equivalent situation to the previous leaf is played, the computer prompts the user: "which story would you like to explore further?". The user can then either continue the first storyline, or the second one.
- Free choice of the bifurcation point, chosen when played, going back to another alternative world at any leaf: While playing the story, the user has the possibility to mark some of his decision points. Later, he can choose which among the marked decision points will constitute a bifurcation point, from which another storyline will be explored. He can quit the current storyline to continue any other previously started storyline.

Technically, since the worlds do not interact with each other, there is no specific challenge requiring advanced AI for implementing these forms. The main difficulty is to keep a memory of the different narrative states.

These forms rely on a Graphical User Interface (GUI) that enable the choice of bifurcation point (if not computer-imposed) and the navigation to and from these bifurcation points. The tree representation already mentioned above is certainly to be reused in this GUI. The user would visualize the globality of his multiple storyline current exploration and navigate through it. This GUI, and the concept of navigation through alternative worlds is clearly a breach in the search of immersion. By quitting a world to re-enter another one, the user is in a more distant, position regarding the

fictional world. This contrasts with the "Hamlet on the Holodeck" [28] point of view on DIS but promotes a more reflexive and critical approach regarding the story.

Finally, it should be stressed that such multiple actualisation forms are not so far from certain existing functionalities in digital media. In particular, the saving mechanism in video games is, implicitly at least, a form of multiple storyline exploration. By saving a game, the player stores a specific game's state (choice of the bifurcation point when played) that he will be able to explore later. Note that there exists a multitude of variants of the saving mechanisms in video games: automatic save points (the game is automatically saved when a given stage is reached), in-game (diegetic) save points (the possibility of saving is represented in the fictional world by a specific artefact), manually vs. automatically labelled saved games, constrained or unconstrained number of saved games, etc. However, the saving mechanism in games is primarily a tool allowing both to enable to play a game in several sessions and to manage the reaching of the game's success in the most efficient manner (that is without having to replay a large part of the game) [29]. The saving mechanisms in video games are rarely used as a narrative device. An interesting exception is the game *The Last Express* [30], in which the user can go back in time in the current storyline via a rewinding clock metaphor, to explore another branch (but the previous leaf becomes no longer accessible). Four such clocks are available in the game, constituting four saved games.

3   Embedded Stories

In classical narrative, an embedded story is a fiction in a fiction. Within a first fictional world, the embedding world, a boundary is crossed and the reader/audience is transported into another world, the embedded world [31]. Typically, a character tells a story to another character. An exemplary form of embedded stories is the *1001 Arabian Nights*, in which Sheherazade is constantly embedding new stories within the current story as a narrative strategy to extend the narration. Embedded stories are a common device, both in literature and drama. According to Todorov, the embedded narrative is a "narrative within a narrative". The embedding narrative provides the contextual theme for the embedded narrative [32]. In movies, there are several examples of "film/play in a film" which also constitute embedded stories: for example *La Nuit Américaine* (F. Truffaut) or *Deathtrap* (S. Lumet).

Embedded stories applied to DIS would consist in letting the user act in both the embedding and the embedded worlds. A Non Playing Character (NPC) would "tell" an embedded story in a participative way, since the user would play one character in the embedded story. Depending on what crosses the boundary between the two worlds, several cases can be distinguished.

- **Separate worlds:** The embedding and embedded worlds are totally separate. The user goes into the embedded worlds and what happens in that world does not have any influence on the embedding world that he comes back to later. The two stories can only be thematically linked.

Fig. 2. Separate Worlds: Embedding and embedded worlds that are only thematically linked

Knowledge connected worlds: Some knowledge crosses the boundary between the two worlds. Typically, the embedded stories would serves as a metaphor to inform about something that is relevant in the embedding world. For example, a NPC, instead of convincing the user via a dialogue based argumentation, would let the user play a relevant embedded story, announced in a sentence such as "Imagine yourself in this situation" and the boundary would be crossed.
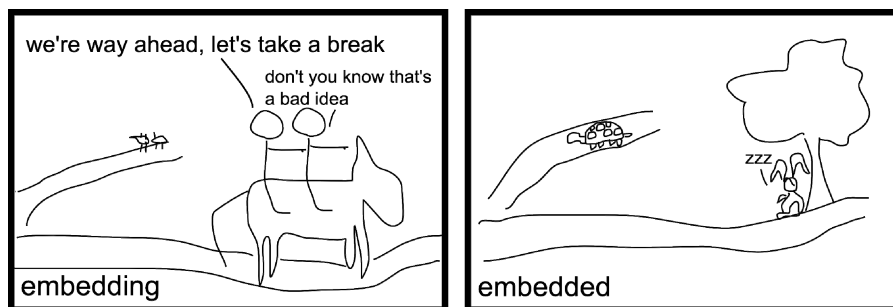

Fig. 3. Knowledge Connected Worlds: The embedded world serves as a metaphor to inform about something relevant in the embedding world

- **Materially connected worlds:** The embedding and embedded worlds recognise a change; the absence of the user or introduction of a new object. For example, as is nicely illustrated in the movie *The Purple Rose of Cairo* (W. Allen), when the character leaves the film in the movie theatre to enter the audience's world, the rest of the cast in the movie becomes stuck because they cannot finish the movie. With materially connected worlds, the character physically travels from one world to the other, not just the user's point of control. We can further distinguish between three kinds of material connections:
  - **Absence:** A minima, the character is missing in one world, which might have some consequences, as illustrated in the above example of *The Purple Rose of Cairo*.

- **Object transfer:** The user's character can cross the boundary with objects. If the two stories are happening in different periods in history, this can create humoristic anachronisms, as is often seen in time travel movies.
- **NPC transfer:** In this case, a NPC can cross the boundary, either on its own initiative or being invited by the user to do so. This situation is technically harder to implement, since one needs to model not only the reaction of the "travelling" NPC to the other world but also the reactions of other NPCs to the "stranger" character.
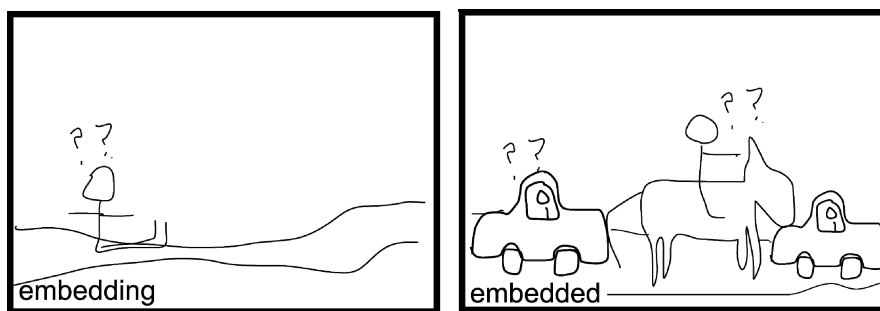

Fig. 4. Materially Connected Worlds: There is a recognised change in both the embedding and embedded world

Furthermore, the navigation to/from an embedded world can:
- occur at the user's initiative
- be proposed by the computer, typically a NPC
- be imposed by the computer

Finally, we would like to discuss two more complex cases of interactive embedded worlds.

Strange loops: As described by Marie-Laure Ryan [31], in some rare cases, within the embedded world one finds elements from the embedding world itself. An example of this is the movie *Stranger than Fiction* (M. Forster), where the main character happens to be the character of a book being written by another character in the same world. In DIS, it would mean that while moving from world A to world B, then again from world B to world C, one would strangely be back in world A. It is hard to predict how this would be perceived by the user, but such a form would certainly be worth exploring by an author.

NPC's role playing: In all previous cases of interactive embedded stories, only the user could play two characters in two different worlds. Going back to the example of the "movie in the movie" (e.g. *La Nuit Américaine*), one could imagine a situation where the user meets a NPC, and they both decide to go to an embedded world where they would each respectively play a new character. When the user meets the NPC's new character, it can actually be considered a double encounter since he has knowledge of the NPC's original role. When the user goes back to the embedding

world, both "actors" can refer to the embedded experience during their conversations. Because the process of embedding is recursive (A can play character B who can play character C, etc.), one could imagine triple encounters, quadruple encounters, etc.

These last two examples show that the possibility of interactive embedded stories are very rich, and that we are far from having exhausted the possibilities of artistic explorations for these new kinds of forms.

4   Modal Worlds

In Section 2, we discussed the notion of possible worlds as various, alternative, future worlds imagined by the audience while experiencing the narrative. Frequently within a story, one of these worlds is explicitly mentioned by a character, according to different modalities. For example, when a character says "if you do that then..." or "if I had not done that, ..." or "I wish this could happen and...", it corresponds to specific narrative acts studied in narratology. In particular, we refer to T. Todorov [32, 33], who distinguishes four modes that can be attached to an action or state:

- Motivation-based modes
  - **Obligative:** What must be true in a society: "You have to respect the law: tell them the truth"
  - **Optative:** What characters desire: "I want that... "
- Hypothetical modes
  - **Conditional:** if something becomes true the character will do something: "If you give me a rose, I will kiss you"
  - **Predictive:** What could happen if something were true: "If it rained, people in this country would be happy"

To each of these four worlds corresponds a type of possible world that when explored with DIS techniques opens new narrative forms. Before giving examples of such narrative forms, let us extend the four previous modes with the work of M.L. Ryan [31], who adds the following worlds:

- **K-worlds, worlds of knowledge:** The knowledge a character has of the fictional world is in itself a possible world. Of course, if this knowledge is true, this K-world is not particularly interesting because the possible world and the fictional world are the same. But if it is wrong, then the beliefs of a character can constitute a separate and relevant possible world to explore. Example: "We know that the world is flat: if you walk in that direction, then there is nothing".
- **Pretend worlds:** In this case, the possible world presented by a character is deliberately wrong. This is very common in narrative, two excellent examples are the movies *The Usual Suspects* (B. Singer), where a large part of the movie happens to be a pretend world or *Big Fish* (T. Burton) where most of what is recounted is embellished to the point where the audience is brought to believe it is pretend.
- **F-Universes, mind's created worlds:** The possible world is simply imagined by the character. This case includes dreams, hallucinations, fantasies and fictional stories. Example: "I dreamed that...". This case resembles the case of embedded

stories, with the difference that the worlds "creator" might not be aware of the fact that this is a different world.

Applied to DIS, the idea consists in letting the user act in a possible world created during a given dialogue. We denote the Initiating Dialogue Act the precise dialogue line which triggers the possible world. It can be considered a generalization of the embedded worlds case discussed in Section 3, where the relation between the embedding world and the embedded world can vary in nature. Let us shortly review what kind of narrative forms this could take, depending on the above narratological discussion:

- **Obligative interactive world:** The user would enter in the NPC's "obligative logic" to live what it means, in this context, to respect what must be respected. This case has something special in that the user's possibility of acting would be constrained: each time he would select a non correct action, he would be reminded that it is not the way to proceed and the action would be blocked. This interactivity management might seem odd and contrary to the principle of DIS, however, it can provide a powerful expressive means. For example, the game Real Lives [33] uses a similar mechanism: it puts the user in the life of a person in the developing world and explicitly shows impossible choices to express the idea that some actions cannot be taken. It is contrary to the basic ergonomic principle of control but still provides a narrative effect.
- **Optative interactive world:** In this case, the user would enter an alternative world, bifurcating from the current situation. However, this alternative world that would not follow the natural property of the fictional world but it would be biased by what the uttering character wishes. If the wish is a NPC's one, then a branch would be explored by the user, as described in Section 2 regarding multiple actualisation, with the difference of status: this new branch must be tagged as a character's wish, rather than as a mere fictional possibility. It might be the case that one storyline evolves according to that wish, but it could also be the case that all storylines that the user would explore according to the multiple actualisation system described in Section 2 will never conform to the wished storyline.

Note that if we wanted to have the user interact with his own wished world, a situation that is similar to the concept of an awake dream in real life, then the user would need to be given direct access to the rules governing the fictional world. This would violate our initial scope (user's intervention is restricted to character-based intervention)

- **Conditional and predictive worlds:** We group these two modes, since the latter is in fact a generalization of the former [32]. This case is already covered by Section 2: case where the bifurcation is proposed by a NPC in a dialogue and the navigation back to the original storyline necessarily gets to the initial dialog.
- **Knowledge world and pretend world:** It is a variation of the embedded story case, but the embedded world is 1) introduced by a NPC in a dialogue 2) similar to the embedding world, with specific knowledge differences (a mistake or a lie).
- **Mind's created worlds:** See embedded worlds (See Section 3).

Finally, we found that a hypothetical mode, missing in the narratological work we referred to, should be added: the past conditional mode, to follow a grammatical metaphor, or the retrospective extension of K-Worlds, to follow M.-L. Ryan's classification. It consists in assertions such as "If I had done this...". This mode is related to the multi-actualised world forms discussed in Section 2. Let the parent world be the world where the dialogue takes place and the child world the world that is referred to during this dialogue. Two sub cases are worth considering:

- The child world is played before the parent world, and the initiating dialog act is performed by the user: The user plays a first storyline, then, according to the mechanism discussed in Section 2, he goes back to another alternative storyline. At some point in this second storyline, during a dialogue, the user can refer to the previous storyline, and utter: "If I had done this, then ...". Such a sentence would be generated from the GUI used for the navigation through the different alternative worlds.
- The child world is played after the parent world, and the initiating dialog act is performed by a NPC: The user is prompted by a NPC, with a dialogue line such as: "let's suppose you had...". Then the user would play an alternative branch and go back later in the initial dialogue. It is a similar situation than one of the cases discussed in Section 2, except that the navigation occurs via a dialogue, which increases the feeling of immersion. Furthermore, another case is also possible, if the choice point used as a bifurcation point is not a user choice point but a NPC or a happening: "let's suppose he had...", "let's suppose it had not rained that day".

This exploration of novel interactive forms based on possible world interaction in dialogues gives us a multitude of possibilities for DIS that we have certainly only partially covered in this section.

5   Ellipsis

An ellipsis is a frequently used narrative device in literature [26] and film [35] to condense time or to create space for free imagination. By omitting a portion of a sequence, it becomes up to the audience to fill in the narrative gaps. This can simply be used to shorten the telling of an action like standing up, walking through the room, opening the door and going out. The reader of a story or the viewer of the film understands the action by simply showing the standing up and the coming out of the door. A second function of an ellipsis is to create a metaphorical parallel between two different instants in a story. A great example is given by Stanley Kubrick in his film *2001* where he uses an ellipsis to create a metaphorical relationship between the first tool used in the history of humans (a bone) and the latest in the near future (a space station).

Ellipses are rarely used in DIS and even less so in games, simply because they do not fit with the idea of real-time interaction. While real-time interaction is absolutely necessary for action-based games, it is less true for adventure games and interactive narratives. In this section, we want to explore how ellipses could be used in DIS. We won't discuss scripted ellipses imposed by the computer (for example between levels or scenes in a video game) but rather ellipses triggered by the current situation and the

user. Such triggering by the user is an action at the discourse level, contrary to the action taken as a character.

Let us define the concepts of the ellipse-start time as the time in the story when the first scene stops, the ellipse-stop time as the time in the story when the second scene begins just after the ellipsis and the ellipsed period, the time section between the ellipse-start time and the ellipse-stop time (by definition not seen by the user). Three cases are worth being distinguished:

- **The ellipsed period contains no narrative action:** the ellipsis is just a way to speed up the narrative and eliminate "empty" bits, like for example movement in a room. (Of course, these bits are only empty from the narrative progression point of view.)
- **The ellipsed period contains NPC actions only:** the system calculates some actions that are played by the NPCs. The user will (or will not) discover these actions after the ellipsis. Such an ellipsis is similar to the kind of ellipses found in movies.
- **The ellipsed period contains player character's actions:** this implies that the user let's his character act autonomously during the ellipsed period. This is a loss of control from the user towards his character, who becomes semi-autonomous [36]. How will the user's character behave? Either automatically or according to the user's instruction. Metaphorically, the character goes into an "auto-pilot" mode. This evokes the movie *Click* (F. Coraci), in which a character discovers a remote control able to skip some of the boring bits of his life... but soon, the remote control decides what to skip and goes out of control.

The key issue in the proposed ellipses management is the balance of control between the user and the computer. Among the three types of ellipsis mentioned above, the type chosen can be defined within the form of the narrative. But also, it could be possible to give the user the choice to define what type of ellipsis he wants at a given moment; he can decide if his character and other NPCs can act in the ellipsed period or not.

In the case where semi-autonomy of the user's character is not allowed, the ellipse-stop time is calculated by the computer, according to the current situation (we assume here, to keep things simpler, that this discourse-based interaction does not modify the story level; action will not magically stop or slow down because there is an ellipsis going on).

Computer-decided ellipses have a great potential but need to be implemented with subtlety. The ellipsis should not be felt as a loss of control ("Okay, whatever I do, I get the same end scene anyway!"), but instead as a device creating narrative tension ("Well, how did all this finally end?").

6   Parallelism

Parallel narrative structures often refer to cases where a story has more than one causal chain of events. Stories that deal with parallel structures are not confined to having these unfold in the same time space and can just as easily mix past and present as is done in the film *Julie and Julia* (N. Ephron) or mix contemporary story lines like

in Armstead Maupin's *Tales of the City* series of books or K. Kwapis' film *He's Just Not That Into You*. However, we will consider parallelism relevant for DIS in the cases when the multiple causal chains that make up a complete story can be experienced simultaneously at various points throughout the narrative, regardless if they occur at the same time story wise. Additionally, the parallelism we are interested in, is used only when the actions that unfold are disjoint and not split just for reasons of geography (i.e. watching a telephone conversation between two people with each half of the screen displaying the character's apartment). Simultaneous visioning of different scenes can be done using a split screen and can be seen in examples such as *Timecode* (M. Figgis), *24* (J. Surnow and R. Cochran) or the internet fiction *HBO Imagine* [37] (see Figure 5b). Usually, the use of simultaneous viewing is temporary, since for comprehension it is difficult to focus on several scenes at the same time, especially if there is dialogue because divided attention and the cocktail-party effect comes into play [38, 39]. In a split screen scenario, the screen is divided to show multiple action settings unfolding at the same time. For example in *24*, the viewer sees 4 scenes unfolding until the focus settles on one. This gives the viewer a sense of what is going on with the other characters in the drama while watching what unfolds for only one. The switch screen is when several scenes unfold simultaneously but only a subset of those can be seen and the user can control which ones are visible. This is demonstrated in the scene cubes The Affair and The Art Heist in *HBO Imagine* (see Figure 5) where the viewer selects the scenes to watch in any order.

Fig. 5. 2 scene cubes demonstrating simultaneous actions allowing the viewer to see the same scene from four points of view by spinning the cube

When considering simultaneity of causal chains, it is important to note that this is not limited to a visual modality as in the examples mentioned above. Simultaneous viewing can be done with text as well. For example, the children's book *Milo and the Magical Stones* [40] contains pages which are horizontally cut, the top pages representing the happy version of the story, while the bottom pages represent the unhappy version (see Figure 6). The format clearly encourages a parallel reading of two alternative stories.
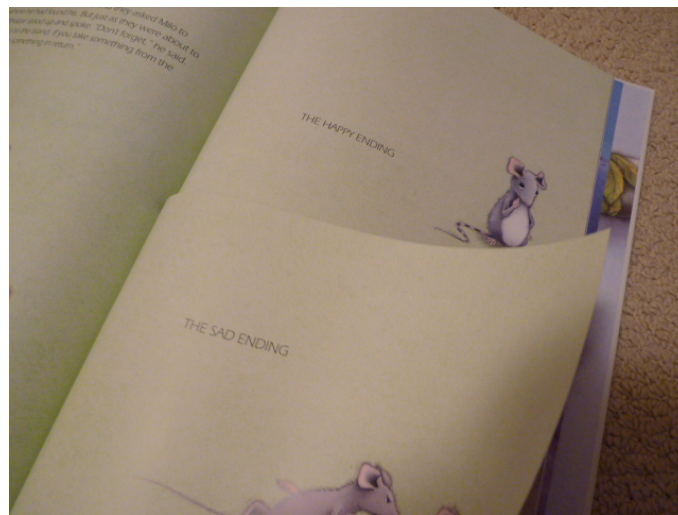

Fig. 6. A paper implementation making use of a parallel storyline with simultaneous viewing

Parallelism and multiple views can be exploited in DIS whenever it appears relevant for an author to give two or more perspectives at the same time. Parallelism is most interesting when coupled with other narrative methods mentioned in the previous sections. In what follows, we will analyse the coupling of multiple views with multiple actualisations, but the reader is free to extrapolate how it could also be applied to embedded stories and modal worlds.

Multiple views on multiple actualisation means that the user sees two (or more) actualised worlds unfolding in two (or more) parts of the screen; the screen would effectively be split in as many parts as there are actualised worlds. Three cases can be distinguished, depending on the user activity during these phases.

- Passive user: Suppose the user chooses to create an alternative storyline from a bifurcation point whose one branch has already been actualised (see Fig. 1). The user is then presented both the previously played storyline(s) and the current one that is currently being following, until the next choice point, where the multiple viewing stops. This provides a transition between paths.

- Active user on one storyline: This cases starts like the passive user case, but when a new choice is provided to the user, the previously played alternative storyline continues. This case is harder to handle for the user, as the alternative views might disrupt the interaction. Note also that this case is technically challenging, as it requires some form of synchronisation between the storylines. In particular, if the type of interaction freezes the world, the alternative storylines might need to be stopped as well, to maintain synchronisation.
- Active user on two storylines (we restrict the case of two storylines, for the sake of simplicity): In this case, the user is able to start two alternative storylines at the same time. In a bifurcation node, the user chooses not one but two choices and two parallel views start. When an interaction is required in one of the parallel actualisations, the other actualisation continues, or, if needed, waits for synchronisation reasons. When two interactions are required at the same time, it is of course not possible to interact on both views at the same time. In this case, the time must be frozen on both storylines, and the user must choose the actions successively, before the parallel stories can restart.

It is also possible to view two storylines that correspond to different times in the story. This mechanism is potentially interesting for choosing a bifurcation point in retrospect. During the experience, the user is simultaneously shown the current action he is involved in and a previous action of the same storyline that is relevant given the current situation. He can mark a bifurcating node from it or even start exploring the alternative storyline.

Different sub-cases can be further distinguished depending on how and when the user is proposed parallel scenes. The user can be offered the choice to see the multiple views and select between them at will, or only during specific moments:

- **User decides:** The user selects when he wants to be presented with simultaneous scenes from which to choose one to follow.
- **Computer proposed:** The computer offers the user the choice to select a new scene.
- **Computer imposed:** The user must select one of several simultaneous scenes at moments decided by the computer.

7   Point of Action

We've looked at situations where several causal chains construct the whole narrative. Here, we will consider the case where the same causal chain of actions seen through various perspectives provides a different narrative experience. For example, the film *A la folie, pas du tout* (L. Colombani) uses two perspectives on the same chain of events to tell two very different stories. Similarly, the films *Rashômon* (A. Kurosawa) or *Courage Under Fire* (E. Zwick) recount the same scenario from several perspectives, recounting a slightly different story each time. The interactive drama, *Three Angry Men* [41] allows a user to experience the same scene from the point of view of three very

different characters, thus giving the scene a different interpretation from each perspective.

In DIS systems, the user not only reads or watches the story; he interacts with a given fictional world. So if the user chooses a point of view in the fictional world he chooses not only the viewpoint but also the starting point of his interaction, we call this the *point of action*. Each point of action will then have a different impact on the user's choices and decisions and consequently create a different story.

Applying the model of changing the point of view on DIS gives two types of possible points of action:

- Changing the point of action by changing the character: a DIS system would give the user the possibility to change the point of view on the fictional world by changing the character. This opens the opportunity for the user to choose the point of action with respect to the identity of the selected character. By switching between characters he becomes a kind of story-master with multiple identities. The system then has to be more open and less prescriptive. This option exists in the video game Farenheit [42], an adventure game where the user is offered the possibility to change the character he is playing with. Note however that these changes are scripted, in the sense that the user cannot influence the course of the story by freely changing the point of action.

- Changing the point of action by "taking a mask": A second type of changing the point of view is given, if the user has the possibility to test a character "under cover", that means if he can be masked or if he can play a second character by keeping its identity of the first character. This kind of exchanging identities has been explored in literature and film for example in "Face/Off" (J. Woo, 1997) where a FBI agent and a terrorist assume the physical appearance of one another. A second example is "Freaky Friday" (M. Waters, 2003 - The novel of the same name by Mary Rodgers) where a mother and daughter experience each other's lives by exchanging bodies, but not identities. They can see the life and the world through their respective realities. For DIS this experience would add a second level of role-playing: the user plays the role of a character and his character plays the role of another character of the fictional world. This concept intersects with the NPC's Role-playing case discussed in Section 3, with the difference that the role-playing happens in the same fictional world.

A further question is who decides at which point to change the point of action. Similar to the question about the bifurcation point chooser we can distinguish four cases:

- **Free choice:** the user chooses at the beginning or during the story construction to change his point of action by selecting the type of point of action (in character or mask exchange) and the selected character.
- **Computer constrained:** the system can constrain the user to choose a specific point of action. This constraint can be related to other setting definitions like time, space, number of characters, etc.
- **Computer proposed:** the system can propose a certain number of point of actions without any constraint or preference. But the propositions can be related to user choices or bifurcation points for example.
- **Computer imposed:** in this case the computer decides which point of action must be accomplished at which moment.

Points of action make narratives multidimensional. A given fictional world can be seen in different ways, it can be influenced in different ways and it can be constructed in different ways starting from different points of action.

8 Conclusion

The exploration of several distinct narrative devices; multiple actualisations, embedded stories, modal worlds, ellipsis, parallel worlds and points of action, exposes innovative narrative forms for DIS that can open new horizons for both researchers and creative authors.

The narrative forms presented here represent the mere tip of the iceberg of possibilities to be explored within the field of DIS, especially when one considers the endless mixing, matching and imbrications that could be done. While we realise that the technical feasibility is still a hurdle, we postulate that an equivalent hurdle facing the field is its tendency to follow traditional linear narrative forms. As well, as we mentioned in the introduction, systems do exist today with the technical capacity to produce stories using some of the narrative forms presented in this article. What systems are lacking are authors [9] who can use them to produce interesting stories. With the various narrative forms presented in this article, we hope to provide insight into the possibilities DIS can become.

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