Generating Game Narratives with Focalization and Flashbacks

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Abstract

In this paper we describe a system for generating textual narrations of what happened in a simulation-based serious game, focusing on the use of focalization (telling the story from the perspective of one of the characters) and flashbacks to give the player insights into the internal state of non-player characters.

Introduction

To learn from serious games, i.e., games that are aimed not just at entertainment but also education, it is important for players to reflect on what has happened in the game (Cowley, Heikura, and Ravaja 2013). To support reflection, we propose to give players feedback after game play in the form of a written narrative about the events of the game. In this paper we describe the automatic generation of such game narratives, and in particular our use of two narrative devices: *focalization* and *flashbacks*. By focalization we mean telling the story from the viewpoint of one of the characters in the game, and by flashbacks we mean breaking the chronological narration of events to tell of events that happened at a previous time (specifically, in an earlier game session). Both narrative devices can be used to provide the player with insights into the emotions and motivations of non-player characters, and awareness of how these characters perceived the player's actions. We believe such insights are particularly important for serious games that are aimed at social skills training through interaction with virtual characters, which is the type of games we focus on here.

The context of this research is a serious game for training the social skills of police officers. The game scenario we are currently working on is called LOITER; in it, a police officer has to deal with a group of young people hanging around and causing trouble on the street. The police officer must use his or her social skills to persuade the loitering youths to stop bothering passersby. The LOITER game is being implemented in the Awareness Game Environment for Natural Training (AGENT) (Linssen and de Groot 2013). This is a new game environment based on the Virtual Storyteller, a multi-agent system for interactive storytelling (Swartjes 2010; Alofs, Theune, and Swartjes 2011).

In our police training game, we expect that showing the interactions from the youths' perspective and using flashbacks to explain their motivations can provide the police trainees with valuable insights into the internal state of the characters. This approach is in line with the idea of explainable Artificial Intelligence (AI), which aims at building systems that can explain the causes behind what happens in a simulation (Core et al. 2006).

Below, we first discuss related work. Then we give an overview of the narrative generation process, followed by a description of how we implemented focalization and flashbacks. We present our evaluation of the effect of these narrative devices, and end with conclusions and some suggestions for future work.

Related Work

Early work on presenting an interactive story from different character perspectives is that of McIntyre and Bolter (2003). In their augmented reality system, inspired by the movie "Twelve Angry Men", a jury deliberation can be experienced from the perspective of each of the jurors. The other characters look and sound differently depending on which juror's perspective is chosen, and the player can hear the inner thoughts of the selected juror.

Zhu, Otañón, and Lewter (2011) also use focalization to show a story from a specific character's perspective. They change the visualisation of the story world depending on the emotions of the focalizing character, as a way of making the character's inner world visible to the viewer. Their system also includes flashbacks in the form of cut scenes that show the character's memories of past events, explaining the changes in the character's emotional state.

Bae and Young (2008) describe a planning-based approach to the generation of flashbacks (as well as foreshadowing) with the specific goal of evoking surprise in the reader. They start with a sequence of the story's main events in chronological order, and then select which causally linked events to insert as flashbacks. Candidate flashbacks are evaluated on their unexpectedness. If the current sequence is understandable without the flashback, the flashback is considered non-surprising, and the generator selects another one.

Using a similar planning-based approach to story generation, Bae, Cheong, and Young (2011) create focalized stories by leaving out parts of the story plan that cannot be known

to the focalizing character, and replace them with alternatives that are plausible from the character's point of view (but which may not be correct).

Porteous, Cavazza, and Charles (2010) also present an approach to focalization that focuses on story planning. Their systems allows switching between the point of view of different characters during story generation. Different planning operators are used depending on the chosen perspective, leading to changes in the overall plot.

All of the research mentioned above either deals with story planning, or with presentation of the story using audio and video or 3D animation. One of few systems handling focalization and flashbacks in written narratives is Curveship (Montfort 2007; 2011), a framework for generating interactive fiction using different narrative styles. Curveship supports focalization by different actors and telling events in non-chronological order, including the use of flashbacks. Curveship has two main modules: the 'Simulator' and the 'Teller' (Montfort 2011). The Simulator is where the story happens: it maintains the state of the world and determines whether the player's actions succeed. It passes on a representation of the events that have happened to the Teller, which uses them to narrate the story.

To achieve focalization, Curveship makes a distinction between the 'actual world' and the 'concepts' of the world as perceived and believed by each actor. Using this technique, Curveship can either tell the story from the point of an all-knowing narrator, or from the point of view of one of the actors, using the appropriate world concept. Curveship can also generate flashbacks by inserting anachronisms into chronological sequences of events. To select flashbacks for insertion, Montfort uses heuristics such as "Select the most salient event from the first time the focalizer encountered this character" (Montfort 2007, p.90).

Finally, Gervás (2013) uses focalization as a way to select content for a narrative, using the events of a chess game as an example. First, the game is focalized for each chess piece, creating a 'fiber': a sequence of events that this piece took part in or could perceive. Then, to create a narrative out of individual fibers, the system uses an evolutionary algorithm to select a set of fibers according to criteria such as overlap, coverage, density, and cohesion.

Of the above systems, our work is most closely related to Curveship. Like Montfort, we make a strict distinction between simulation (generating the sequence of game or story events) and narration (expressing these events in natural language), with focalization and flashbacks taking place at the level of narration. Unlike Montfort, we do not work with different world concepts for focalization, and our heuristic for selecting flashbacks is aimed at selecting past events that explain a character's current emotional state.

The Narrator: From Fabula to Text

As the basis for our work we use the Narrator, the natural language generation module of the Virtual Storyteller (Swartjes 2010; Theune, Slabbers, and Hielkema 2007a; 2007b). We modified the Narrator to support focalization and flashbacks, updated its design, and coupled it to the AGENT framework. The input for the Narrator is a formal representation of the events that happened in the story or game world. We call this the *fabula*, using the narratological term for the sequence of events of a story as they 'really' happened. The Narrator converts the fabula into a narrative in natural language. In narratological terms this would be called the *sjuzhet*: a specific retelling and arrangement of the events in the fabula. Below we briefly describe both the fabula and the process of narration.

Fabula

The fabula is a formal representation of the events in the story (or game) in the form of a causal network (Swartjes and Theune 2006). Our fabula model is an adapted version of the story comprehension model of Trabasso, van den Broek, and Suh (1989). Whereas their model includes a separate causal network for each character in the story, representing their subjective viewpoint, our fabula network only stores one 'objective reality' of all events. Telling the story from the point of view of one of the characters is the responsibility of the Narrator, as discussed below.

The fabula model defines causal relationships between six types of elements:

Goal (G). The drive for a character to act.

Action (A). A world change caused by a character.

Event (E). A world change not caused by a character.

Outcome (O). Goal success or failure as perceived by the character.

Perception (P). A character noticing an action or event.

Internal Element (*IE*). Anything that happens within a character. The main examples are emotions and beliefs.

Following Trabasso et al. (1989), the fabula elements are connected by one of four types of causal relations: Physical Causality, Psychological Causality, Motivation and Enablement; see Swartjes and Theune (2006) for details.

Fabula graphs are automatically created during interactive storytelling with the Virtual Storyteller or AGENT by recording what happens in the simulation and why. For example, when a character agent adopts goals and selects actions, these are added as Goal and Action nodes to the fabula network. Each Action that is part of a character's plan gets a Motivation link to the Goal for which the plan was made. Events and Actions physically cause Perceptions by the characters, and Perceptions in their turn psychologically cause Internal Elements, e.g., beliefs.

Because development of the LOITER game is still in its initial stages, the fabula graphs it produces are currently very limited. Therefore, we used manually created fabulas for the research presented in this paper.

A strongly simplified example of a fabula is shown on the left in Figure 1. It represents a very short and simple story: one character insults another character, which makes the second character angry (Psychological Causality), and motivates him to retaliate by kicking the first character. Figure 2 shows the data representation of the first node and edge

Figure 1: A very small fabula (left) and the corresponding document plan (right).
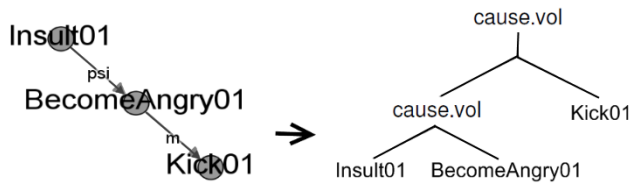
```
<node id="Insult01">
  <data key="EventType">action</data>
  <data key="Type">insult</data>
  <data key="Agens">policeofficer</data>
  <data key="Patiens">bystander1</data>
  <data key="Time">1</data>
</node>

<edge id="Psi01" source="Insult01" target="BecomeAngry01">
  <data key="RelType">psi-causes</data>
</edge>
```

Figure 2: XML representation of the first node and edge of the example fabula.

of the example fabula. It is specified in GraphML, a standardized format for graphs.[1] It shows the type of the fabula element, the time, the characters involved in it, and its connections to other elements.

Narration

The fabula forms the input for the Narrator component of the Virtual Storyteller, which generates a natural language text in a number of steps. We only give a very brief overview here; for more details see Theune et al. (2007a; 2007b).

The first step is the creation of a document plan: a binary branching tree structure containing the story elements from the fabula as leaves, chronologically ordered and connected by rhetorical relations (Mann and Thompson 1987). We only use a limited number of rhetorical relations that can be directly mapped to the information in the fabula. We insert background information about the characters into the document plan where appropriate; currently this is restricted to information about the names of the characters. The document plan corresponding to our example fabula is shown on the right in Figure 1.[2]

Next, the leaves in the document plan are converted to abstract sentence structures called Dependency Trees, which specify the hierarchical structure of a sentence but not the ordering of the words in the sentence. For each type of fabula element, a template is available specifying how its arguments should appear in the corresponding Dependency Tree. The Narrator uses a lexicon to map concepts such as entities and actions to words (in Dutch). For most concepts multiple

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[1]http://graphml.graphdrawing.org/

[2]For more complex fabulas, creating a good document plan is not trivial. Our fabula conversion rules do not always lead to a fluent text, but fixing this was outside the scope of our research.

words are available, so word choice can be varied. The lexicalization step also involves the selection of discourse markers (e.g., *because, then, therefore*) to express the rhetorical relations between the sentences.

To achieve fluent output texts that are more than lists of simple sentences, the Narrator combines Dependency Trees to form complex sentences (aggregation) and deletes recurring elements in complex sentences (ellipsis). If and how two Dependency Trees can be combined depends on the discourse marker expressing their rhetorical relation. See Theune, Hielkema, and Hendriks (2006) for more details about aggregation and ellipsis in the Narrator.

Referring expressions are generated for each entity. This involves choosing suitable descriptions, names or pronouns. The goal is to achieve fluent and varied texts which are not ambiguous; i.e., pronouns must only be used if it is clear which entity they refer to. Finally, the surface form generator decides the final order of the words in each sentence, inflects the words and adds punctuation.

When adapting the original Narrator for use with AGENT, we improved the Narrator's user interface, made the system more modular and domain-independent, and changed the input format to XML. The narration process was kept largely the same, besides the addition of focalization and flashbacks as described below. For more details on the new version of the Narrator, see Hoek (2014).

Feedback with Focalization and Flashbacks

In this section we describe how we extended the Narrator to produce focalization and flashbacks.

Focalization

Focalization refers to the point of view from which a story is told. The term was coined by Genette and Lewin (1983). Genette defined three types of focalization: zero, internal and external focalization. In narratives that have zero focalization, the perspective is that of an all-knowing narrator. This is how the Narrator originally functioned: the story was told using all available information, without using the perspective of a specific character. Internal focalization means the story is told by a character in the story, while external focalization means it is told by someone outside the story (who is not all knowing). Here, we focus on internal focalization.

Like Gervás (2013), we approach focalization as an information filter: a focalized narrative only contains events that the focalizing character could either perceive or participated in. The focalization algorithm is simple: it removes all fabula nodes that do not involve the focalizing character in the role of either *agens* (who carries out the action), *patiens* (who undergoes the action) or *target* (recipient). Fabula edges that belong to a removed node are also removed, to prevent the graph from having edges that lead nowhere. Note that in the fabula, perceptions are explicitly represented as story elements with the perceiving character as the *agens*, so events that were observed by the focalized character are retained by the algorithm even if the character did not take part in them.

As an example, take the automatically generated narratives in Figures 3 and 4 (shown in translation from the original Dutch). The narrative in Figure 3 has zero focalization.

A tall bystander called Richard was in a main street.
A tough loitering youth called Barry was also in the main street.
A police officer called Adrie was also in the main street.
Barry was angry, so he yelled at Richard.
Adrie heard the loitering youth yell at the bystander.
The police officer therefore waved at him.
Adrie talked to Barry, after he had made calming gestures.
The loitering youth was calmed down.
Adrie saw that the loitering youth was calmed down, so he was happy.

Figure 3: Automatically generated narrative with zero focalization. (Translated from Dutch.)

A tall bystander called Richard was in a main street.
I was also in the main street.
A police officer called Adrie was also in the main street.
I was angry, so I yelled at Richard.
After Adrie waved at me, he made calming gestures.
He talked to me, so I was calmed down.

Figure 4: The story from Figure 3 with focalization by Barry.

To tell the same story from the perspective of Barry, the loitering adolescent, the Narrator filtered the input fabula by removing Adrie's perceptions and emotions, and then proceeded as normal. This resulted in the narrative of Figure 4. Here, we opted to tell the story from a first person perspective, but the Narrator can also use second or third person for focalized stories. Stories with zero focalization are always told in the third person.

Note that the focalized narrative in Figure 4 is not just the zero focalized narrative from Figure 3 with some sentences removed from it. Because story elements were removed at the level of the fabula, this resulted in a different document plan, and as a consequence, some of the sentences were aggregated differently in the focalized narrative.

Flashbacks

Flashbacks are a form of anachrony: a difference between the order in which events are told in the narrative and the order in which they occurred (Prince 2003). Prince defines a flashback (or analepsis) as an anachrony that goes back to the past, compared to the current story time; that is, the telling of one or more events that happened before the current story time.

In the LOITER game, a trainee will be able to interact with the same non-player characters in multiple sessions. This simulates current police practice, where police officers strive to build a relationship with local youngsters through brief interactions over an extended period of time. Sometimes, the reason for an AI character to behave in a certain way can be found in the events of a previous session. In this case, the characters have a "backstory" that influences how they currently react (cf. Rank and Petta 2012). We modified the Narrator so that it can tell this backstory in the form of flashbacks. Specifically, we use flashbacks to link the emotions of characters in the cur-

```
for node in backgroundGraph
    if node.type == "state" // If the node is an emotion
        for edge in incomingEdges(node)
            if edge.type == "psi-causes" // Check for its causes
                newCause = getSourcenode(edge)
                currentCause = emotionCauses.get(node)
                // Store cause if it's the only or most recent one so far
                if (currentCause==null ∨
                        currentCause.time ≤ newCause.time)
                    emotionCauses.put(node, newCause)

for node in graph
    if node.type == "state"
        causeNeeded = true
        for edge in incomingEdges(node)
            if edge.type == "psi-causes" // If a cause is present
                causeNeeded = false // a flashback is not needed
        if causeNeeded
            cause = emotionCauses.get(node)
            cause.isFlashback = true // Mark cause as flashback
            addNode(cause) // Add cause to fabula
            addEdge(new edge ("psi-causes", cause, node))
```

Figure 5: Algorithm for finding the cause of an emotion in an old fabula and adding it as a flashback to the current one.

rent story to the causes of these emotions in the backstory. This is similar to Zhu et al.'s use of flashbacks to explain emotions (Zhu, Otañón, and Lewter 2011). Like the flashbacks by Zhu et al., and unlike those of Montfort (2007; 2011) and Bae and Young (2008), our flashbacks are *external*, meaning that the events of the flashbacks happened outside the current story, rather than *internal*, where the events happened within the current story but are told in non-chronological order (Guy and Champagnat 2012).[3]

The idea is as follows: if a certain character has an emotion that is not caused by an event in the current story, it must have been caused by something in the past. By looking at the fabulas of all previous game sessions, we can find the latest event that caused a certain emotion for a character. This cause can then be added to the current story.

Figure 5 shows the flashback algorithm. The first part involves finding the causes of emotions in a fabula graph from a previous session, and storing the most recent one. The second part takes the current fabula graph and checks to see if there are any emotions without a cause. If so, it looks at the stored causes and adds a cause node if one is applicable to the current node (i.e., for this particular combination of character and emotion). The added node is marked as a flashback. During surface realization, flashbacks are narrated in the perfect tense and preceded by the word *earlier*.

As an example, Figure 6 shows the focalized narrative from Figure 4, with a flashback added to explain Barry's anger. Note that this story contains a pronominalisation error: since the story is focalized from Barry's perspective, the

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[3]The Narrator sometimes does tell story-internal events anachronously: certain discourse markers may cause the order of two aggregated sentences to be switched. An example from Figure 3 is *Adrie talked to Barry, after he had made calming gestures*. We do not regard these cases as flashbacks, however.

> A tall bystander called Richard was in a main street.
> I was also in the main street.
> A police officer called Adrie was also in the main street.
> Earlier, Richard had scratched Barry's moped, so I was angry and yelled at him.
> After Adrie waved at me, he made calming gestures.
> He talked to me, so I was calmed down.

Figure 6: The story from Figure 4 with a flashback explaining Barry's emotion.

Narrator should have selected a first person pronoun when referring to Barry's moped (i.e., *my moped*).

Evaluation

We carried out an online evaluation experiment to test (among other things) whether focalization in the generated narratives helped readers to identify with the focalized character. Our hypothesis was that readers would identify more with a character when focalization was enabled for that character, compared to zero focalization or focalization by another character. We also tested whether flashbacks increased readers' self-reported understanding of the story.

For the experiment we generated variations of three different stories involving a police officer, a loitering youth, and a bystander. As input we used fabulas that were created manually, not derived from actual play sessions. Each story was narrated with zero focalization, focalized from the perspective of the police officer, and focalized from the perspective of the loitering youth. We also created versions with and without flashbacks, when applicable.[4] This resulted in 3×5 = 15 narratives, including those from Figures 3, 4 and 6.

The Narrator sometimes makes language errors, for example concerning word order and the choice of referring expressions (as we saw in Figure 6). To keep such known errors from distracting the participants, we edited the narratives to correct them.

Each of the 28 participants in the experiment read one version of each of the three stories. For each narrative, they indicated to what extent they identified with the loitering youth and to what extent with the police officer by rating their agreement with the following statements (shown here only for the loitering youth character):

- I identified with the loitering youth

- I had the impression that I was really experiencing the story of the loitering youth

- I understood the loitering youth's way of acting, thinking or feeling

- I imagined how I would act if I found myself in the place of the loitering youth

The statements were based on the work of Igartua (2010).

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[4] The flashbacks are based on the emotion of a certain character. If the story is narrated from the perspective of another character, the emotion, and thus the flashback, is not told.

Focalization	Adrie	Barry	zero
Identification with Adrie	2.88	2.40	2.71
Identification with Barry	1.90	2.49	2.40

Table 1: Average identification with characters (scale 1-5).

Flashback	enabled	not applicable	disabled
Understanding	3.46	3.23	2.96

Table 2: Average subjective story understanding (scale 1-5).

In addition, to measure how well participants thought they understood the text, we asked them to rate their agreement with the statement *I understand what was described in this story* on a 5-point scale.

The average identification ratings for the different focalizations are shown in Table 1. Enabling focalization for a specific character did not result in a significantly higher identification with that character when compared to telling the stories with zero focalization, i.e., from the perspective of an all-knowing narrator. However, the readers identified more with a character when the story was focalized by that character than when the story was focalized by another character. This difference was significant, for both characters (p < 0.05 using a single-sided paired t-test).

Table 2 shows the participants' average ratings of their understanding of the story. With flashbacks enabled, understanding was rated higher than when flashbacks were disabled, but the difference is not significant. When flashbacks were not applicable, because they did not involve the focalized character, self-reported understanding was halfway between the stories with enabled and disabled flashbacks.

Conclusions and Future Work

We have described our work on the automatic generation of written narratives about the events in a serious game aimed at social skills training for police officers. We created a new version of an existing narrative generation system, the Narrator, updating it for the new serious game domain. To increase the impact of the generated narratives on learning, we added the possibility of narrating the story from the perspective of a certain character (focalization), and narrating events from the past (flashbacks). Both were designed to give the reader more insight in the emotions and motivations of the non-player characters.

Evaluation showed that identification with the characters is influenced by focalization. Focalization has a negative effect on identification with a non-focalized character. This makes sense, as focalization by one character actively removes information about other characters. No significant difference in identification with a character was found between stories focalized by that character and stories with an all-knowing narrator. Finally, we found that flashbacks led to higher ratings for self-reported understanding of the story, but this effect was not significant.

It could be that focalization and flashbacks did not have much impact because the stories used in the evaluation were

short and simple, and therefore relatively easy to understand. It is possible that longer and more realistic stories, based on the actual output of the serious game, will benefit more from the use of these narrative devices. To verify this we need to carry out new evaluations when our serious game is finished. We also need a more advanced method to measure actual (rather than self-reported) story understanding, for example using the QUEST question answering model (Graesser, Lang, and Roberts 1991).

Other avenues for further work include the generation of longer flashbacks, and adapting linguistic style to the emotions and other personal traits of the focalizing character; see e.g., Li, Thakkar, Wang, and Riedl (2014).

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