

# A Model of Interpretation of Embedded Stories

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## Abstract

Stories told by a character within a story are known as embedded stories. They occur frequently in narrative and they constitute an important challenge to models of narrative interpretation. Computational procedures for interpreting a story need to account for these embedded stories in terms of how to represent them and how to process them in the context of the story acting as frame for them. The present paper proposes a simplified computational model capable of representing discourses for embedded stories and interpret them onto a representation that captures their recursive structure. Then it tests this model over examples of stories from different domains and draws some conclusions on what embedding implies in terms of interpretation of narrative.

## 1 Introduction

Narratives often feature characters that tell a story. This is sometimes used as a framing device, with a brief scene setting the context for a much larger story that is the real body of the narrative, and sometimes used to introduce smaller contributions to a larger narrative, with small stories inserted into a larger one as brief asides. This phenomenon has received a lot of attention in narratology [HJR10], where the stories inserted into other stories are known as *embedded stories* and the different stories so connected are known as different *narrative levels*. However, the large majority of recent efforts at formalising narrative in computational terms skim over this problem.

The problem is important because it differs significantly from other approaches to text and/or narrative. An important difference is that the relation between a framing story and the story embedded in it may fall outside the set of relations that normally hold between the elements in a discourse (each story may have different characters, different setting, different time) and outside the set of relations that hold within a story (they may also have different plot lines, the embedded story often being self-contained). The embedding may also be recursive, with stories nested within stories like a set of Russian dolls. Existing formalizations of text analysis or narrative representation tend to focus on relations between elements within a single discourse or a single story. This has consequences at two different levels. First, existing formalisms are insufficient to model embedded stories. Second, the relations between embedded stories and their framing stories constitute an open question yet to be modelled formally.

The present paper explores this gap in existing work and proposes a basic computational model that allows a simplified representation of the basic characteristics of discourses for embedded narratives and defines an interpretation procedure that identifies the different narrative levels involved. This is yet far from solving the problem but it is a step in a positive direction.

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In: R. Campos, A. Jorge, A. Jatowt, S. Bhatia, M. Finlayson (eds.): Proceedings of the Text2Story'21 Workshop, Online, 1-April-2021, published at <http://ceur-ws.org>

## 2 Previous Work

The concept of “embedding” in narrative is defined [HJR10] as: “literary device of the ‘story within the story’, the structure by which a character in a narrative text becomes the narrator of a second narrative text framed by the first one”. A fundamental concept for understanding narrative is the concept of a narrative level, as introduced by Genette [GLC83]. Genette’s model for the analysis of narrative levels is centred around the concept of *diegesis*, an act of telling. When a story is told, the narrator and their audience stand at the *extradiegetic* level with respect to the story – outside the story being told. If a character within the story tells a second story, this creates a second narrative level, considered *intradiegetic* – inside the telling – with respect to the enclosing main story. The same situation can be replicated if further stories are told within the second story. So each level of telling is considered a *narrative level* or *diegetic level*, characterising the way in which the narrating act and the narratee are situated in relation to the narrated story [Pie14].

Another important concept introduced by Genette is *narrative distance*, which represents how close the narrator is to the story he is telling, in terms of how he represents it in his discourse. Four types of discourse are considered, presented here by diminishing distance: from a narrated version – in which a character’s words and actions are narrated like any other event – to reported speech – in which the character’s words are cited literally by the narrator – with two intermediate stages of transposed speech – in which the words and actions of the character are reported indirectly.

In terms of computational modeling, embedded stories have received scarce attention. The relation between an embedded story and the discourse it appears in is not included among the relations in the original *Rhetorical Structure Theory* [MT88] nor in later revisions [TM06]. Even narrative specific solutions such as *Storytelling RST* [NI06] focus on modeling the relations internal to a given story to the detriment of relations between a story and the context in which it is told. Neither *Discourse Representation Theory* [KR93] nor *Segmented Discourse Representation Theory* [LA07] include embedded stories either among the set of features of discourse that they model. Levison et al [LLTD13] describe means for representing the text for a story as *topoi* – understood as schemas for a story – in terms of the semantic representation of natural language, but they never consider how such elements might operate as arguments of further functions representing a discourse – which would correspond to having them appear as embedded stories. The closest I have found to a computational representation of embedded stories is the EpisTeller system [Ger16], which describes an elementary computational model of a society of agents driven by a need for information, where the ability to represent and communicate reality as a sequential stream of symbols is explored as a model of social cognition. In this model, cognitive agents construct sequential discourses that encode a fragment of their personal experience, and other agents interpret such discourses to enrich their own stored knowledge about the world around them. Such a model might explicitly represent embedded stories whenever an agent tells about an experience where some other agent provided it with a story. But this situation is never addressed explicitly in the paper.

## 3 Modelling Embedded Story Interpretation

From a computational point of view, there are several challenges involved in addressing the handling of stories with more than one narrative level:

1. To identify from the discourse of a story when an embedded story is present.
2. To have a representation of the story that allows for explicit distinction of different narrative levels (a simple story is represented at a single narrative level, a multi-level narrative explicitly represents each level as a distinct element).
3. To provide means for handling transitions from one narrative level to another during interpretation.

The present paper proposes a first approximation to the problem by defining a simple language for describing stories and an interpretation procedure for instances of stories so described such that:

- Stories are represented in a simple notation based on predicate-argument structure (challenge 0).
- The language includes notational devices to mark the start and end of embedded stories (challenge 1).
- Data structures are proposed to represent more than one narrative level (challenge 2).
- An interpretation procedure for the handling of embedding is defined relying on these definitions (challenge 3).

### 3.1 Identifying Embedded Stories from Text

Embedded stories are sometimes very clearly flagged and delimited in the text of the encompassing narratives. *The Thousand and One Nights* [BBB04], a classic case of Frame Story, is a single framing story – that of Sharazad and King Shahryar – full of insertions of shorter stories. In this example, each tale is clearly indicated by an element in the discourse of the main story: either an indicative dialogue between the narrating character and the characters acting as audience<sup>1</sup> or explicit indication that a story is starting.<sup>2</sup> Each individual tale is also marked typographically with a header in large font that indicates the title of the tale. This example also shows how the nesting can involve more than two levels: the first tale that Sharazad tells, The Tale of the Merchant and the Ifrit, itself includes three inserts – The Tale of the First Sheikh, The Tale of the Second Sheikh and The Tale of the Third Sheikh.

In other cases, the transition from the framing story to the embedded story is not marked so explicitly. *The Heart of Darkness* [Con90], another case of Frame Story, is a novel describing a trip up an African river, but the whole description of the trip is framed by scenes of Marlow, the protagonist of the actual story, narrating the experience to two other sea captains while waiting for the tide at anchor in the Thames. Here the indications in the discourse of the framing story are much more subtle, requiring the reader to infer from the context that a story is to be told<sup>3</sup>. The next statement by Marlow is indeed the start of the story, but the only indication of its nature is the fact that it is also in quotes, as Marlow’s previous contribution to the dialogue of the framing scene. The rest needs to be inferred from the previous indications provided. The embedded story follows from there for most of the novel. When the embedded story finishes, a final paragraph retakes the framing story.<sup>4</sup>

These brief examples show that the challenge of identifying from a text when embedded stories start and end involves complex issues of semantic and pragmatic interpretation that are beyond the scope of the present paper. The paper will therefore focus on the remaining three challenges.

### 3.2 Basic Representation of Discourse for Stories

We consider a representation of the discourse for a story as a list of statements – each a predicate with arguments – describing the sequence of events or facts for the story. Within such a representation of discourse, an embedded story will be represented as a combination of the following elements:

- a statement to act as start of story marker (with a name for the story to act as its unique id) (`start_story <story-name>`)
- a sequence of statements for that story (just like those for the frame story)
- a statement to convey the telling of the embedded story within the frame story (`tell_story <narrator> <narratee> <story-name>`) which also acts as an end of story marker

This notation allows the explicit representation of the content of embedded stories within the sequence of the discourse for the story. An example of the discourse sequence used as input for the interpretation of a story rendered is presented in the left hand column of Table 1. This solution for encoding the input discourse may sometimes result in a reiteration of events already told as part of the frame story, but it also allows for representing situations in which the embedded story differs from that told in the frame story, or to include different stories.<sup>5</sup>

### 3.3 Representation of the Interpretation of a Multi-Level Story

The interpretation of a story with a single narrative level is represented as sequence of statements that describe events that follow a chronological order (corresponding to those given in the single narrative level in the discourse

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<sup>1</sup>“So he said to her: ‘Take care that the fate of the ass with the bull and the husbandman befall not you also. Listen!’” [The Fable of the Ass, the Bull and the Husbandman], “The Jinni answered: ‘Assuredly, O venerable sheikh. If you tell me the story and I find it indeed extraordinary, I will grant you mercy for a third of this blood!’” [The Tale of the First Sheikh]

<sup>2</sup>“And Shahrazad, this first night, began the following tale:” [The Tale of the Merchant and the Ifrit], “So the second sheikh began:” [The Tale of the Second Sheikh]

<sup>3</sup>“But Marlow was not typical (if his propensity to spin yarns be excepted) . . .”, “but it was only after a long silence, when he said, in a hesitating voice, ‘I suppose you fellows remember I did once turn fresh-water sailor for a bit,’ that we knew we were fated, before the ebb began to run, to hear about one of Marlow’s inconclusive experiences.”

<sup>4</sup>“Marlow ceased, and sat apart, indistinct and silent, in the pose of a meditating Buddha. Nobody moved for a time. . . .”

<sup>5</sup>Discourse and interpretation are shown alligned for clarity, but no gap appears in the actual representation of the discourse when used as input.

Table 1: Example of input discourse sequence and structured interpretation for tale 155, showing how the embedded story is explicitly declared in the discourse sequence used as input for the interpretation process and how the embedded story is explicitly separated as a structure. In the discourse, the inline declaration of the embedded story, and the statement that introduces the embedded story have been boxed for clarity.

Discourse	Interpretation	
	Narrative level 0	Narrative level 1
.	.	.
.	.	.
start_story princess'_torment kidnap dragon princess2 torment_at_night dragon princess		
tell_story X brother2 princess'_torment	tell_story X brother2	<b>princess'_torment</b> kidnap dragon princess2 torment_at_night dragon princess2
decides_to_react brother2	decides_to_react brother2	
.	.	.
.	.	.

of the story). The interpretation of a story with a single level does not differ from the representation of the input discourse.

The representation of the interpretation of a story that includes more than one narrative level needs to account for the possibility of having several levels of stories, and for complex relations of nesting between them. We therefore define a narrative interpretation as a complex structure that holds:

- a representation for the initial level of narrative (as a sequence of statements)
- representations of any additional embedded narrative levels (each one a narrative interpretation itself, to allow for recursive nesting, and indexed with the name of the story)

For ease of understanding a story represented in this way is visualised as shown in Table 1. Each narrative level is represented in its own column, with embedded stories appearing to one column to the right of the corresponding frame story. When the embedded story ends, the representation of the sequence returns to the column on the left where the frame story is being developed. The structure may be recursive, if embedded stories are nested.

### 3.4 Interpretation Procedure

The solution proposed in this paper models the interpretation of embedded stories as a stack-based mechanism for handling the changing contexts of interpretation:

- The process starts with an empty stack for the initial narrative level.
- On detecting the start of an embedded story (`start_story <story-name>`):
  - the interpretation of the frame story to that point is pushed to the stack, and
  - a new empty interpretation is created for the embedded story.
- The discourse for the embedded story is processed against this specific representation for its interpretation.
- When end of the embedded story is reached (`tell_story statement <narrator> <narratee> <story-name>`):
  - the accumulated interpretation for the embedded story is stored in a table for embedded sub-stories, indexed by the name of the sub-story (`<story-name>`), and
  - the interpretation for the frame story acting as context is popped from the stack and established as context for the rest of the frame story
  - add the `tell_story statement <narrator> <narratee> <story-name>` statement to the interpretation of the frame story, indicating how the embedded story fits into the frame story

The operation of the model can be described over the example shown in Table 1. Tale 155 analysed by Propp involves two brothers departing from home and separating at a road marker. One brother goes on to a foreign land, where he marries a princess and obtains magical water of life. The discourse shown in Table 1

represents the next item in the overall tale, where someone tells the second brother about a second princess being kidnapped by a dragon. This constitutes an instance of an embedded story. The representation of the input presents the story of the kidnapping first, and then a statement to the effect that this story is told to the second brother. On identifying the `start_story` marker, the system places the interpretation of the story of the two brothers to that point in the stack, and creates a new empty interpretation for the story of the second princess. It then parses the two statements that describe this story (second princess is kidnapped by a dragon and then tormented nightly) and adds them to the interpretation of the embedded story. On identifying the `tell_story` marker, the system stores the interpretation of the story of the kidnapping of the second princess, retrieves the unfinished interpretation of the story of the two brothers and sets it as context for subsequent interpretation, adds the statement of the story being told to that interpretation, and proceeds to parse the next statement in the discourse (in this case, a decision by the second brother to attempt a rescue of the second princess). This illustrates the operation of the model for an embedded story.

Instances of `tell_story statement <narrator> <narratee> <story-name>` statements may re-occur elsewhere in the story once an interpretation for the `<story-name>` has been added to the representation. This allows the representation of cases where the same sub-story is told more than once – possibly by different narrators or to different audiences – in the context of the frame story. Examples of this may be observed in the example presented in Table 3 below.

The use of a stack is required in order to address the recursive nature of embedded stories. An embedded story occurs in the context of a framing story. When the embedded story is parsed, the context of the framing story is no longer relevant – because the embedded story establishes its own context of interpretation – but the context of the framing story needs to be recovered when the embedded story has been parsed and the parse of the framing story is to continue. For multi-level embeddings – as in the example cited above for the Arabian Nights – the LIFO retrieval strategy guarantees the correct context for the continuation parse in each case.

## 4 Examples

The proposed representation of embedded stories is tested over examples of narrative from two different domains: representations of Russian folk tales and representations of the plot of a 18th century opera.

### 4.1 Russian Folk Tales

Vladimir Propp [Pro28] studied a subset of the corpus of Russian folk tales and proposed a formal description of certain regularities he identified in their structure. The descriptions used for the examples below rely on the summaries of the plots of the tales given in Appendices II and III of Propp’s book. Two elements in Propp’s account address the phenomenon of embedded stories: the connective incident and the false hero sequence.

The connective incident acts as a connection between the villainy triggering the story and the hero, usually taking the form of some character telling the hero the story of the villainy – as in the example shown in Table 1 above.

The false hero sequence involves another character attempting to steal the hero’s laurels – by telling a false story – only to be exposed before the end – often by someone else telling the true story. An instance of this type is shown in Table 2.

This corresponds to a later incident in the story of the two brothers described previously, taking place at the court of the tsar, father to the second princess. The second brother has achieved his purpose of rescuing the second princess, getting wounded in the process. However, a water carrier sent by the tsar to recover the princess’ bones returns with her and claims to have defeated the dragon. This involves him telling a false story of his confrontation with the dragon, which constitutes an instance of an embedded story. Having parsed this false story, and stored it in the table for embedded story, the system returns to parse the arrival at the court of the second brother. When the princess recognises him as her saviour, the real story becomes known. This is represented in the input discourse as an embedded story. In more elaborate renderings of the story, the same result may arise as a result of inference, but the correct interpretation of the situation requires that the real story become known as a correct replacement of the false story told previously. This presents a significant challenge for solutions attempting to arrive at the interpretation from direct analysis of the text, because the real story is unlikely to appear explicitly again at this point of the discourse. The problem in this case becomes one of identifying a reference to a story already told – possibly as a subset of the whole story being told. Such situations will be considered in future versions of the model.

Table 2: Extract from the interpretation for tale 155, showing the occurrence of embedded stories related to the false hero sequence.

fight brother2 dragon wounded brother2 wins brother2 releases brother2 princess : :	
order tsar water_carrier to_bring water_carrier princess' bones tells_a_story water_carrier	<b>water_carrier's_false_claim</b> fight water_carrier dragon releases water_carrier princess
: :	
arrives brother2 palace recognises princess2 brother2 exposed water_carrier	<b>(brother2_real_deed)</b> (fight brother2 dragon) (wounded brother2) (wins brother2) (releases brother2 princess)
punished water_carrier	

It is interesting to note that the two examples described involve stories being told with different purposes. In the case of the tale of the kidnapping of the princess – an instance of Propp’s connective incident – the story may be told in support for a request for help, and it is understood in the context of the tale as the justification for the hero to act. In the case of the two alternative versions of the rescue – instances of elements from Propp’s false hero sequence – the story told by the false hero is deceitful and told to create a false impression of a given character, and the story told to expose him is intended to reveal the truth and to support a required judgment.

## 4.2 Metastasio Plots

A very different set of narratives that has been the target of specific formalisation efforts is the set of 18th century operas based on librettos by Metastasio, which is the focus of the Didone project.<sup>6</sup> In this case the narratives in question are much longer in nature, and they have a more complex structure. Although the analysis of the plots is ongoing work, the results to this point show that there is a very high incidence of embedded stories. To illustrate this point, Table 3 shows the encoding of the interpretation of the initial fragment of the plot of the opera *Artaserse* (Rome, 1730)<sup>7</sup> by Metastasio – covering most of the first act –, according to the formalism presented above.

It is interesting to see that embedded stories are used systematically by Metastasio to keep all scenes of violence off the stage. The seven embedded stories covered in the analysed fragment all correspond to murders, while no murders appear elsewhere in the corresponding frame story. Another important point is that these embedded stories basically drive the plot of the story – which does include a number of subplots in terms of romantic relationships between various characters but essentially turns around who killed king Serse, and who else gets killed in the aftermath.

In terms of the goals of the characters telling the seven embedded stories, two of are eyewitness reports of things that happened (**murder\_Serse\_Artabano** and **execute\_Dario\_Artabano**), one is the outlining of a plan (**plan\_Artabano**), one is a deceitful story which gets propagated (**murder\_Serse\_Dario**) and two are hypotheses on who the murderer was (**murder\_Serse\_other** and **murder\_Serse\_Arbace**).

Another point worth noting is that the deceitful story (**murder\_Serse\_Dario**) is told more than once. As in the case of the real story of the rescue of the princess in the previous example, this would in more elaborate systems involve a task of identifying a reference to a story already known.

## 5 Discussion

From the examples described above it seems that the interpretation of stories embedded in larger narratives needs to consider: what is the actual content of the embedded story – which operates much as the interpretation of a simple story –, how the embedded story meshes with the frame story – who tells the story to whom –, and

<sup>6</sup><https://didone.eu/>

<sup>7</sup><http://www.progettometastasio.it/testi/ARTASERS—P1>

Table 3: Initial fragment of plot for Artaserse by Metastasio, with substories indicated separately.

parent Artabano Arbace parent Serse Mandane loves Mandane Arbace loves Arbace Mandane guardian Serse Mandane different_class Mandane Arbace opposed_to_plan Serse punished Arbace banished Arbace location garden arrives Arbace garden sad Arbace sad Mandane leave Mandane arrives Artabano garden	
tells_a_story Artabano Arbace	<b>murder_Serse_Artabano</b> kills Artabano Serse
offers_exchange Artabano sword Arbace agrees_to_exchange Arbace in_despair Arbace leave Arbace aspires Artabano Arbace_king	
tells_a_story Artabano audience	<b>plan_Artabano</b> kills Artabano Serse kills Artabano Dario kills Artabano Artaserse acceeds_to_throne Arbace
goal Arbace_king arrives Artaserse garden	
tells_a_story Artabano Artaserse	<b>murder_Serse_Dario</b> kills Dario Serse
order Artaserse Artabano to_kill Artabano Dario confident Artabano sad Artaserse leave Arbace arrives Megabise garden parent Artabano Semira arrives Semira garden loves Semira Artaserse loves Artaserse Semira leave Artaserse	
tells_a_story Megabise Semira	<b>murder_Serse_Dario</b> (see above)
in_despair Semira confident Megabise aspires Megabise Semira's_love loves Megabise Semira goal Semira's_love sad Semira sundered Semira Artaserse leave Semira location palace arrives Mandane palace sad Mandane arrives Artaserse palace sad Artaserse arrives Artabano palace	
tells_a_story Artabano Artaserse	<b>execute_Dario_Artabano</b> kills Artabano Dario
sad Mandane confident Artabano sad Artaserse arrives Semira palace	
tells_a_story Semira Artaserse	<b>murder_Serse_other</b> kills other Serse
tells_a_story Mandane audience	<b>murder_Serse_Arbace</b> kills Arbace Serse
in_despair Mandane order Artaserse guards to_bring guards Arbace arrives Megabise palace	
tells_a_story Megabise Artaserse	<b>murder_Serse_Arbace</b> (see above)
arrives guards palace captive Arbace arrives Arbace palace : : :	

what is the goal pursued by the telling of the embedded story – which establishes the actual narrative impact of the embedded story upon the frame story. The possible implications of the proposed solutions on the impact of information across interpreted narrative levels may be discussed in future work.

The proposed model of embedded stories is limited in several ways. First, in that it assumes that embedded stories are always told as a single span of discourse, so it fails to account for cases in which the embedded narrative is split into several spans interleaved with the frame story. That seems to be the case for the story in *The Heart of Darkness* mentioned above. A refinement of the model covering these situations will be considered in further work. Second, in that it assumes that stories – whether framing or embedded – are told in chronological order, which may fail to cover cases of anachrony – such as the film *Dunkirk*.<sup>8</sup> The handling of anachrony is an important problem for the interpretation of narrative but lies beyond the scope of this paper, being also a problem for stories without embedding. If a solution for anachrony is available, the interaction with embedded stories may be pursued in further work.

The examples shown may lead to confusion, as the embedded stories tend to refer to portions of the discourse of the framing story. This is not necessarily the general case – the examples mentioned for the *Arabian Nights* correspond to embedded stories with no connection to the frame story – but it raises a number of interesting questions concerning the interaction across narrative levels. These questions need to be addressed in further work.

As the encoding of the examples employed is based on synopses of the respective plots rather than on their full text, issues such as narrative distance [GLC83] – namely whether the embedded story is rendered as reported or transcribed speech, as a summary, or even left implicit – are obscured in the present approach. Such issues would need to be considered.

## 6 Conclusions

The interpretation of embedded stories is an open problem that needs substantial amounts of further work. The proposed model provides an elementary computational frame that captures the nested structure of narrative levels involved in embedded stories, fitted with a stack mechanism that adequately models the required changes in context. The storage of individual stories identified as embedded in a framing stories is handled by an indexed table, which allows these stories to be referred in simple `tell_story` statements within the discourse of the corresponding framing story.

The concept of a story within a story is slightly more extended than the concept of story told by a character within a story. Stories important to a framing story often appear in the framing discourse as references to the sub-story, requiring inference to identify the sub-story in question. Although the interpretation of both of them is similar in terms of content, the actual form in which they appear in text may differ significantly.

The model is intended as a first approximation to the problem. Extensions operating on textual discourse and more elaborate representations of content will be undertaken as future work. This will require not only a mechanism to bridge from the sentences in the text to statements like the ones used in the conceptual description, but also a solution for inferring when the transitions between narrative levels happen. In most texts these transitions are only indicated by pragmatic cues.

## Acknowledgements

This paper has been partially supported by the CANTOR project (PID2019-108927RB-I00) funded by the Spanish Ministry of Science and Innovation and the the Didone Project funded by the European Research Council (ERC) under the European Union’s Horizon 2020 research and innovation programme, Grant agreement No. 788986.

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<sup>8</sup>*Dunkirk*, Dir: Christopher Nolan, 2017.



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