Event mappings for comparing formal frameworks for narratives

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We present a technique called event mapping that allows to project text representations into event lists, produce an event table, and derive quantitative conclusions to compare the text representations. The main application of the technique is the case where two classes of text representations have been collected in two different settings (e.g., as annotations in two different formal frameworks) and we can compare the two classes with respect to their systematic differences in the event table. We illustrate how the technique works by applying it to data collected in two experiments (one using annotations in Vladimir Propp’s framework, the other using natural language summaries).

**Keywords:** Narrative, Events, Formalization, Comparison of representations and representational formats

\section{1. Introduction}

This article presents a method of comparing formal representations of narrative in different formal frameworks by extracting the represented event structures. The method is entirely general and can be applied to give comparison data for any two formal frameworks that are largely event-based and produce annotations that allow us to extract a text representation from the annotation.\textsuperscript{1} We illustrate the use of our method with empirical data from two experiments.

\textsuperscript{1}The technique could be generalized in order to get rid of the restriction of being event-based as well, by including higher-order concepts; see §5.
In [21, 22], Löwe discusses a general formal approach for comparing formal frameworks for the representations of narrative which will render most existing frameworks incomparable in the formal sense defined in [22, § 5.1, Case 3]. But in order to make qualitative judgments about formal frameworks and their adequacy for certain purposes, we shall need to compare even frameworks that are incomparable in this sense, preferably with a tool that is general and does not depend on the concrete nature of the frameworks.

This paper continues the methodological discussion of [22] with a special emphasis on providing such a general comparison tool based on the represented sequence of events. In §2.2, we discuss the task at hand in the methodological setting of conceptual modelling. In §2.3, we argue that is is adequate to look for the structural narrative core in the sequence of narrated events. We then discuss some of the frameworks from the literature in §2.4 and show that they all focus on the story as a sequence of events allows us to apply a general comparison method to them.

§3 is the heart of this paper: here, we describe an algorithm for constructing an event mapping. Even though we use the word “algorithm”, the method is not fully automatizable and requires a number of modelling choices that depend on the nature of the two frameworks that are being compared as well as the type of questions that the comparison is aiming to answer.

Finally, in §4, we apply the method of event mapping to concrete data from two experiments. The results of this concrete event mapping serve as an illustration of the use of the algorithm and are interesting in their own right.

2. Related Work

To our knowledge, there is hardly any work comparing different formal representations of narrative (cf. [21]). As a consequence, the practical problem that we are dealing with (the comparison of experimental data that is given in two different formats) has not been discussed before. The broader research context is presented in this section, followed by a discussion of some individual formal frameworks for narrative and a discussion of the notion of event.

2.1. Research Context

In this paper, we shall consider narrative as a form of storing and transmitting information and discuss tools to access and compare this information. In practice, narratives are presented to us as informal entities: as natural language text in written or recorded form, possibly with visual components (e.g., if the narrative is given to us as a video). Narrative in this format has many aspects or dimensions, many of which are not directly related to the purpose of storing and transmitting information. If we consider narratives as tools to store and transmit information, we typically reduce them to their story, i.e., what is the case and what happens in the narrative. Story corresponds to Schmid’s second level (“Geschichte”) of narrative constitution [32] and
Bal’s *fabula* level [4]. We do not claim at all that this level is the only interesting level of analysis of narratives or that the other levels play no role in human narrative processing: in [12,11], we have argued that the opposite is the case; however, these other levels are beyond the scope of this paper.

The link between narrative and information has been observed by many authors (often in the form of the crucial role that narrative plays for memory) and goes back to antiquity;² Schank even subsumes almost all of human intelligence in narrative when he says “in the end, all we have […] are stories and methods of finding and using those stories” [31, p. 16]. Thus, a representation of stories in a description language that captures the *structural narrative core* would be a formidable candidate for a measure of narrative information.³

This paper can be seen as part in a sequence of papers [21,22,5,12,11] that aim at developing tools for constructing such a description language and empirically establishing its adequacy.

2.2. Nomenclature

By the word *narrative*, we are referring to the informal object with all of its features such as a social and cultural embedding, a context of reception, etc.; the narrative is typically given to us as *data*, i.e., a text or a video or a combination of text and images. In our paper, we shall only deal with narratives that are given to us as text. We refer to the formal systems used for representing narratives as *formal frameworks*, the individual representations as *structures*. The process of transforming a narrative into a structure is called *formalization*: the process of formalization produces an *annotation*, i.e., an assignment to parts of the data of the narrative to the parts of the structure that is the result of the formalization.⁴

²Cf. [29, p. 1]: “Memory is, then, the precondition of narrative, and when it is disturbed or malfunctioning, narratological coherence and efficiency suffer as well. […] However, the memory-narrative relation is far from unidirectional: just as memory engenders narrative, so is narrative, at times, indispensable for the agility of the faculty of memory.”

²It is interesting to compare Aristotle’s focus on the chronological sequence of events for memory in his *De Memoria* (451b-452a) with our discussion of the sequence of events as constitutive element of narration in § 2.3. For an overview of the development of mnemotechnics from antiquity to the renaissance, cf. [27].

³With a view towards a possible application in narrative information retrieval, Schank elaborates: “What makes us intelligent is our ability to find out what we know when we need to know it. What we actually know is all the stories, experiences, ‘facts,’ little epithets, points of view, and so on, that we have gathered over the years. […] We can compare two stories and attempt to find the similarities and differences, or we alter a story to invent a new one for some purpose. […] In the end, all we have […] are stories and methods of finding and using those stories. Knowledge, then, is experiences and stories, and intelligence is the apt use of experience and the creation and telling of stories.” [31, pp. 15–16]

⁴We point out that the translation of informal objects into something formal is a methodologically difficult task and comes with many philosophical issues; we refer the reader to [9,33].
2.3. The structural narrative core: events

Narrative has many interesting dimensions, not all of which are part of what we call the structural narrative core.\(^5\) For the purposes of this paper, we shall say that the structural narrative core of a narrative consists of its sequence of events narrated.\(^6\)

This is not an arbitrary choice: the most common way to separate narrative texts from non-narrative texts is to say that narrative texts are a description of a sequence of events.\(^7\) Genette discusses the meaning of récit via its relationship to événement:

“Dans un premier sens – qui est aujourd’hui, dans l’usage commun, le plus évident et le plus central –, récit désigne l’énoncé narratif, le discours oral ou écrit qui assume la relation d’un événement ou d’une série d’événements.” \(^[14,\text{p. 13}]\)

Also, in text linguistics (cf., e.g., \(^{15,\text{pp. 238ff}}\)), narrative is used as a label for texts that relate events in temporal order. Hoffmann \(^{16,\text{p. 373}}\) goes even further and highlights agreement that narration generally involves events or action (“Handlungen, Ereignisse oder Geschehen”), and that “Handlungsträger menschliche oder zumindest belebte Wesen sind bzw. […] als solche dargestellt werden”.

Defining event precisely is not trivial, especially in the context of Natural Language Processing (cf., e.g., the TimeML guidelines \(^{30}\)). We follow the general definitions in linguistics and narratology in defining an event to be a change in the state of affairs.\(^8\) If nothing changes, there is no event; following established terminology, we call such non-events states.

We assume that a story consists of several events happening in order. In general, events can be recursively decomposed into smaller sub-events and summarized in larger super-events.\(^9\) We do not claim that there is an objective and unique way of representing the story as a sequence of events;\(^10\) consequently, our high-level description language has to be able to deal with variations in the perception of the story as sequence of events.

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\(^5\) Human test subjects, when prompted for judgments whether stories are similar, seem to focus mostly on superficial features (such as vocabulary, setting, motifs) \(^{12}\). Cf. also the discussion of movie reviews in \(^{11}\).

\(^6\) Cf. the discussion of higher-order concepts in \(^5\).

\(^7\) The relevant OED definition of the word narrative is: “[…] 2. a. An account of a series of events, facts, etc., given in order and with the establishing of connections between them; a narration, a story, an account. […]” \(26,\text{accessed 30 July 2012}\).

\(^8\) For narratological discussions of events, cf., e.g., \(^{18,25}\). We focus on what Hühn \(^{17}\) calls event I and omit the notion of "eventfulness" (cf. \(^{19}\), Hühn’s entry Event and Eventfulness) which is a filter applied to single out events worth telling and relevant for narratological structure.

In the linguistic context, the notion of event from \(^{36,\text{pp. 328–329}}\) subsuming all dynamic aspects of \(^{35}\) (accomplishment, achievement and activity) is largely co-extensive with our notion. For instance, activities such as reading a scientific article or skipping rope are considered as "constant change", and thus as events.

\(^9\) Goethe’s famous characterization of a novella as “eine sich ereignete unerhörte Begebenheit” (from his conversations with Eckermann, 29 January 1827) is the extreme case of subsuming events into a super-event.

\(^10\) There is evidence against such an assumption, cf., e.g., \(^{35,19}\).
For the purposes of this paper, we shall assume that the sequence of events narrated is a good and adequate approximation of the structural narrative core of a narrative. In the following section, we’ll give a more pragmatic argument for our choice: our focus on sequences of events is matched by the important formal frameworks for narratives.

2.4. Concrete formal frameworks

The computational models of narrative community has provided several approaches for formalizing narrative, some of which claim that the formal representations in the framework correspond to an actual cognitive representation of the story in the human mind. Most of the frameworks from this community focus either entirely or primarily on structural properties of the stories, ignoring other narrative dimensions.

In the following, we discuss a number of formal frameworks for narratives that have been proposed and discussed in the literature and show that these are largely event-based and that we can distill events in the sense defined above from the representation, and that thus an event-based comparison method should yield reasonable results.

The first and most celebrated formal attempt is Propp’s famous system for classifying Russian folktales [28]. In the following, we shall describe Propp’s system [27, 28], Lehnert’s Plot Units [20], and the doxastic preference framework of [23, 24].

These frameworks are vastly different and incomparable in the formal sense of [22]. And yet, they all have in common that the most fundamental building blocks of the formal representations are the events of the narrative. In the following, we give brief descriptions of the frameworks.

Propp’s Morphology. Working with a corpus of 100 Russian folktales from the collection of Narodnye Russkie Skazki by Alexander Afanas’ev (a selection is presented in English in [1]), Vladimir Propp developed a formal system that could describe the structure of each folktale by short annotation strings consisting of symbols representing what Propp calls functions.

Propp identified seven dramatis personae representing roles the characters may play within the tales. They are: the hero (H), the villain (V), the princess (P), the princess’s father (PF), the dispatcher (Di), the donor (Do), the (magical) helper (MH) and the false hero (FH) [28, § 3]. Not every dramatis persona occurs in each story, not every character represents a dramatis persona, and some dramatis personae can be represented by the same character.

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11Cf. [20, pp. 293–294]: “When a person reads a narrative story, an internal representation of that story is constructed in memory. … [V]ast amounts of information within the memory representation are selectively ignored, in order to produce a distilled version of the original narrative.”

12In [22 § 5.2], we show that the concept of “expectation of agents” is not expressible in the plot unit framework but in the doxastic preference framework, and vice versa for the concept of “causality”.

13One of these, the Princess/Princess’s Father, can be split into two with a slightly difficult delineation. Here, we are using the resulting list of eight dramatis personae.
The actions of the *dramatis personae* are described by a set of thirty-one functions defined in [28, § 3] by means of examples. These functions are marked by symbols in the order of their occurrence in the folktale; the first seven functions, marked with lowercase Greek letters, are called *preliminary functions*: \(\beta\) Absentation; \(\gamma\) Interdiction; \(\delta\) Violation, \(\epsilon\) Reconnaissance, \(\zeta\) Delivery, \(\eta\) Trickery, \(\theta\) Complicity. The preliminary functions are not fully developed in [28] and are not included in Propp's own annotation strings. The main functions are: A Villainy, a Lack, B Mediation, C Beginning counteraction, ↑ Departure, D First function of the Donor, E Hero's reaction, F Provision or receipt of magical agent, G Spatial transference between two kingdoms, H Struggle, J Branding, I Victory, K Liquidation, ↓ Return, Pr Pursuit, Rs Rescue, o Unrecognized Arrival, L Unfounded Claims, M Difficult Task, N Solution, Q Recognition, Ex Exposure, T Transfiguration, U Punishment, W* Wedding. These functions are illustrated by non-exhaustive [28, p. 25] examples, which also illustrate the abstraction of the function system, e.g., that despite the label, the function Wedding can also refer to a monetary reward (p. 64, example w⁰). Functions occur in strict sequential order, i.e., they have to occur in the folktale in the order they are given in the list above. In the full Proppian system, there are, however, few specific ways to break strict sequentiality [28, § IX.A]: The most important one is that some folktales contain a series of individual tale units, called moves. Examples are trebling, the triple repetition of moves within the tale, and moves in which a magical agent is obtained in the first move but only used in the second move of the tale.

Most of the Proppian functions represent events in the sense of §2.3. The only one that does not necessarily (but still often) represent an event in the story is the function Lack. However, large spans of the text (and hence: a good part of the events) may go unlabelled in Propp's system, and will then be omitted from the structure.¹⁴

**Plot units.** In the plot units framework, we represent a narrative as a grid of events. Each agent in the narrative is represented by a column in the grid; all events occurring in that column are events affecting that particular agent. There are three types of events: mental events, and positive and negative events; here, “positive” (“negative”) means “positively (negatively) affecting the agent corresponding to the column where the event is listed”. Events in the same column can be linked by causal links of which there are four types: motivation, actualization, termination and equivalence. Events in different columns can be linked by interactive links. There are a number of rules as to which links are allowed (cf. [20] for details.) A list of basic constituents in the form of plot unit structures can then be used to generate more elaborate narratives.

The plot unit structures can now be represented graphically as labelled graphs where +, − and M represent the three types of events (positive, negative and mental, respectively), and m, a, t, and e label the causal links as “motivation”, “actualization”, “termination”, and “equivalence”, respectively. In Figure 1 we give an example of a plot unit structure with two agents: we read it from top to bottom, thinking of time

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¹⁴Cf. [7] for examples. This fact was also observed by the authors of [5] as a quantitative outcome of their second experiment, but is not mentioned explicitly in the published paper; cf. also [10].
flowing downwards; the second agent (right column) has a mental state representing the desire to perform an action of mutual benefit to both agents; this action in turn motivates the first agent (left column) to reciprocate in kind.

The notion of event used here is not identical with the notion of event from §2.3: This formalism only captures such events that have a mental/emotional impact on the agents. Events represented in the narration (such as “the birds are singing”) would only be included if the song affects the agents’ emotional or mental state; Lehnert herself notes that she is only concerned with “gross distinctions between ‘positive’ events, ‘negative’ events, and mental events of null or neutral emotionality” [20, p. 294]. In this regard, the selection mechanism for events can be seen as an elaboration of the concept of eventfulness (cf. footnote 8).

**Doxastic preference framework.** The doxastic preference framework [23, 24] considers narratives as game-theoretic (perfect information) decision trees where each node of the tree represents either a decision of one of the agents or an event. The terminal nodes of the tree are the possible outcomes of the narrative, and the agents of the story have a preference concerning those outcomes, represented by a linear order of the set of outcomes.

All nodes of the doxastic preference framework fall under our notion of event from §2.3, even though, in the terminology of the framework, there are two types of nodes (action nodes and event nodes), classified according to whether the change of the state of affairs is caused by a conscious subject or not. The focus of the framework on counterfactual reasoning requires to include a number of fictitious events that never take place in the story.

In addition, we have layers of belief about these preferences: at the first level of these layers, agent X has a belief about what he or she thinks is the preference relation of agent Y for each point in time (i.e., a node of the decision tree). At the next level, we have the belief about what agent X thinks what agent Y believes are the preferences of agent Z for each point in time.

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15If one wants to be pedantic, it could even be difficult to deal with clearly relevant events such as the death of one of the agents, as this is strictly speaking not a change of the agent’s emotional state.
Figure 2: An example of a doxastic preference structure.

Formally, this is represented as follows. For each sequence of agents $\vec{P} = (P_0, \ldots, P_n)$ of agents, every agent $X$, and every node $v$ of the decision tree, we write

$$S(v, \vec{P})(X)$$

for “the belief of $P_0$ about the belief of $P_1$ about ... about the belief of $P_n$ about the preference of $X$ at decision node $v$”. If $\vec{P} = \emptyset$, then $S(v, \emptyset)(X)$ stands for the true preference of agent $X$ at node $v$. We represent preferences as a sequence of terminal nodes, i.e., $(t_1, t_2, t_0)$ stands for “$t_1$ is preferred over $t_2$ and $t_2$ is preferred over $t_0$”. If $v$ is a non-terminal node and $t$ is a terminal node, we write $(v, t)$ to mean “all terminal nodes succeeding $v$ are preferred over $t$”, and similarly for $(t, v)$. Figure 2 gives an example of a typical doxastic preference structure representing a narrative. Details can be found in [23, 24].

3. Event mapping

In this section, we shall describe the technique of event mapping that allows us to compare representations in different formats based on which parts of the structural narrative core they represent. The input for the event mapping is a finite list of text representations of the same narrative.

In the case of a formal framework, the process of formalization produces an annotation of the narrative data. This annotation is an assignment of parts of the text data to parts of the structure that represents the narrative. In this case, we consider the part of the text data that is linked via the annotation to some part of the formal representation as a text representation of the narrative.

Event mapping produces, based on the given list of text representations, a list of events that we shall call the event table in which the rows correspond to all events represented in at least one of the representations from the list and the columns correspond to representations from our list. The entries in the table indicate whether the event corresponding to the row is represented in the representation corresponding to the column. We should stress that the result of event mapping is highly dependent on
the finite list of representations it is produced from: starting with a different list of representations might greatly affect the resulting event table.\footnote{For instance, if a given list of representations produces an event table $M$, and you add one additional representation to the list producing an event table $M'$, you cannot assume that $M'$ differs from $M$ by just having one extra column (corresponding to the extra list item). Instead, the process of determining the structure of the rows may be affected by the additional list item, resulting in a rather different event table. The procedure should, however, yield the same result for the same input independently of the order in which the input is processed. As our algorithm depends on human judgments about event relationships (super- and sub-eventhood), we can only phrase this as a theorem under an additional assumption that these human judgments always result in the same structure. We exemplify this in §3.2.}

\textbf{Caveat.} The algorithm as it is presented here relies on human judgments and can therefore not be implemented as a computer programme at the moment, as the knowledge resources that would be necessary are not available yet.\footnote{A consequence of this is that we do not separate linguistic processing from formalisation. If the algorithm were implemented in a computer program, it would take as input a representation in which linguistic disambiguation and coreference resolution have already been applied.}

\section{Description of the Algorithm.}

We shall now give a description of the algorithm that produces the event mapping from a given list of text representations $R_1, ..., R_n$, possibly stemming from different formal frameworks. The algorithm is not deterministic, but involves a number of modelling choices which we shall highlight in the description. In §3.2 we will discuss a simple example story and exemplify the steps of the algorithm.

Let us fix our terminology first: we first construct an event list for every representation; these lists are then aligned and structured during a merging process that produces the rows of a table. The columns of the table will then contain the occurrence information for each of the representations. The event table then constrains the evaluation phase (§3.3) for the representations, which can be understood as mapping events from these representations to each other. We refer to both the whole process and its result as event mapping.

\textbf{Granularity.} Before we start, we must choose a granularity level, defining the level of resolution of the comparison. Possible options would be the level of granularity of the original narrative, the level of granularity of one of the frameworks or the common refinement of the two frameworks to be compared.

\textbf{Step 1. Initialization.} Each representation $R_i$ in our list ($i \leq n$) is translated into an event list $L_i$. After this step, the differences between the frameworks that produced the individual representations $R_1, ..., R_n$ have been removed and the created event lists are comparable. Therefore, obviously, the initialization step requires the largest amount of human judgment in determining whether an event occurs in the
An example for the initialization step: text mapping. For a simple text representation, a list of all occurring events is created from the text by following the linguistic structure of the text as described below. In this example, the choice of sentence predicates in the text representation will indicate what is presented as an event.

To identify events and overall the elements to include, we count a sentence or fragment of a sentence as an event description if it describes a change of the state of affairs. So, for instance, “Shortly after that, the seven brothers are orphaned” is an event description, whereas “Seven orphans…” is not.

Event descriptions can regroup non-contiguous events (e.g., “Every year, Joan published an article.”). For the initialization step, we treat such descriptions as if they were a single event and insert them into the event list at the point where they are mentioned in the text. In the merging step described below, these may be decomposed into constituents.

The decision to base the identification on the grammatical structure of the natural language text is one of the modelling decisions that we were referring to earlier. In addition to the events, we decided to include non-events if they were expressed as a full clause, and also references in sentences to states resulting from events in the story description of the original narrative. Again, this was a modelling decision, and one might have considered to include also state references of the type “the seven orphans” as a reference to the event of the children’s losing their parents. We decided against this as this would have inflated the number of elements in the mapping beyond measure.

Step 2. List merging. After Step 1, we now have an event list $L_i$ for each of the text representations $R_i$ (we call these the individual event lists) and merge them recursively into one event list (called the merged event list). We start with $M_1 := L_1$ and assume that we have already merged lists $L_1, ..., L_i$ to a merged list $M_i$ and describe how to merge list $L_{i+1}$ with $M_i$ to produce the new merged list $M_{i+1}$. For each event $e$ occurring in $L_{i+1}$, we proceed as follows:

1. If $e$ occurs in $M_i$, then we just keep it in $M_{i+1}$.

2. If $e$ does not occur in $M_i$ and no event occurring in $M_i$ is a sub-event or super-event of $e$, we simply add $e$ to $M_{i+1}$.

3. Assume that $e$ does not occur in $M_i$, but $M_i$ contains a related event $e’$. Related means that $e’$ is a sub-event of $e$ or a super-event of $e$, or that $e’$ implicates or implies $e$ or any of its super- or sub-events. In this case, we have a number of options:
   a) add a hierarchical structure to $M_{i+1}$, which indicates that we unfold $e$ into sub-events $e_1, e_2, e_3, \ldots$, or subsume $e$ with other events into one super-event.
We use the following notation for this:

\[ e(e_1, e_2, e_3) \]

b) sub-events occurring *non-contiguously* in the text are regrouped and reordered into a *(super-)sequence of sub-events*. Assume that one of the lists under scrutiny contains (in temporal order) the events \( e_1, e_2, e_3, e_4 \), while the other contains event descriptions \( e^*_1, e^*_3 \) and \( e^*_2, e^*_4 \), which comprise \( e_1 \) and \( e_3 \) and \( e_2 \) and \( e_4 \), respectively. We want to add this information to our list. As pointed out above, we want to retain the original temporal order; hence we have to use some notation to indicate reordering groups. We use the following notation for this:

\[ e_1, e_2, e_3, e_4, e^*_1, e^*_3, e^*_2, e^*_4 \]

Note that \( e^*_1, e^*_3 \) and \( e^*_2, e^*_4 \) are not real events, but rather labels for the text fragments that represent the events \( e_1 \) and \( e_3 \) or \( e_2 \) and \( e_4 \), respectively. Therefore, it does not matter where in the sequence we place them.

For instance, a merged structure after unfolding and reordering might look as follows:

\[ e_1(e_2, e_3), e_4(e_5, e_6), e^*_2, e^*_3 \]

In both cases, the decision to introduce additional structure is a modelling decision. This decision should be made in such a way that the representation stays as close to the original text as possible. In borderline cases, the modeller should avoid introducing additional structure in order to facilitate comparison.

After \( n \) merging steps, we have produced the merged list \( M_n \) which is the final product of **Step 2**.

As mentioned, a major source of difficulty is the fact that both the original narrative and the natural language text representations could lack direct references to events and instead only have implicit, implied or implicated events (cf. the examples in the next section). The modeller has to justify the modelling decisions by comparing the resulting merged event table with the original narrative.

**Step 3. Occurrence Tabulation.** **Step 2** produced the merged list \( M_n \) which represents the rows of our event table; now, we are populating the table by entering the data of which of the text representations in our list mentions each given event. We could either mark this on a binary basis (“occurs” vs. “doesn’t occur”), or add some additional information about the form of occurrence. In our applications, we distinguished three levels of occurrence:

- *explicit occurrence*, the “normal” and obvious case (including strict implication and decomposition),
- *implicature* or some other kind of *inferrability*,
- *state references*.
3.2. Illustration of the Algorithm

We now illustrate the basic application of the algorithm and the modelling decisions in two examples.

Hierarchical Structure. The first example illustrates merging with super- and sub-events. It uses the following four simple stories.\textsuperscript{18} In the presentation, we already segment the full clauses, to facilitate reference in the event table. The text representations $R_1$, $R_2$, $R_3$, and $R_4$ are given in [1], [2], [3], and [4] below, respectively.

(1)  
  a. The king and the queen died,  
  b. and were buried.  

(2)  
  a. The king died,  
  b. and then the queen died of grief.  
  c. Then a great state funeral was held.  

(3)  
  a. After the queen died,  
  b. a great state funeral was held.  

(4)  
  a. After the state funeral had taken place,  
  b. the prince got invested.  

We generate the following event lists. In doing so, we notice that the subclauses [1-b], [2-c], [3-b], and [4-a] refer to the same event, which we designate by “burial b”. The merging process will give us the opportunity to double-check this decision.

\begin{itemize}
  \item \textbf{L}_1  
    \begin{itemize}
      \item a. deaths of king and queen (d)  
      \item b. burial (b)
    \end{itemize}
  
  \item \textbf{L}_2  
    \begin{itemize}
      \item a. death of king (k)  
      \item b. death of queen (q)  
      \item c. burial (b)
    \end{itemize}
  
  \item \textbf{L}_3  
    \begin{itemize}
      \item a. death of queen (q)
    \end{itemize}
  
  \item \textbf{L}_4  
    \begin{itemize}
      \item a. burial (b)  
      \item b. investiture (i)
    \end{itemize}
\end{itemize}

Note that in producing these lists (Step 1), we already made a number of modelling decisions, e.g., by dropping the state reference “of grief” from $R_2$ which is not represented in $L_2$.

We now merge the lists $L_1$, $L_2$, $L_3$, and $L_4$ according to our recursive algorithm. We start with $M_1 := L_1$. With our human judgment, we observe that $d$ (“deaths of king and queen”) is a super-event of both $k$ (“death of king”) and $q$ (“death of queen”), and so the algorithm requires us to unfold $d$ into $k$ and $q$. During the merging process, we also check the identification of the events made in the initialization step (e.g., in this

\textsuperscript{18}These stories were inspired by Forster’s classical examples \cite{forster}.
case whether “[the king and the queen] were buried” and “a great state funeral was held” refer to the same event). Issues that can arise during this check are discussed in §4.5. We obtain

$$M_2 = d(k,q), b.$$  

In the next step, we are merging $L_3$ into $M_2$, but all events occurring in $L_3$ are already in $M_2$, so we obtain $M_3 := M_2$. Finally, we are merging $L_4$ into $M_3$ and observe that $i$ (“investiture”) has to be added since it did not occur in $M_3$. As the final merged list, we obtain

$$M_4 = d(k,q), b, i.$$  

The final event table now uses $M_4$ as the rows and tabulates the occurrences of events in $R_1$, $R_2$, $R_3$, and $R_4$ in its four columns (Table 1).

We invite the reader to check that the order of the four text representations does not matter for the final event table: every permutation of the four text representations would have resulted in Table 1.\(^{19}\)

### Regrouping

Our second example concerns regrouping repetitive sequences. Consider the examples in (5) and (6). We notice that the events recounted in (6) are those regrouped in (5).

(5) Every year, Joan published an article.

(6) a. In 1995, Joan published *The Event – a review*. […]  
    b. Joan published *John Smith – an underestimated writer* in 1996. […]  
    c. In 1997, Joan barely managed to finish her annual article.

We obtain the following initial Lists:

$L_5$

- annual publication ($a^*$)

$L_6$

- a. article 1995 ($a_{1995}$)

\(^{19}\)We take this to be evidence for the claim we made in footnote 16.
Table 2: Event table for (5) and (6)

<table>
<thead>
<tr>
<th>Event</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a^*{a_{1995}, a_{1996}, a_{1997}})</td>
<td>(5)</td>
<td></td>
</tr>
<tr>
<td>(a_{1995})</td>
<td></td>
<td>(6-a)</td>
</tr>
<tr>
<td>(a_{1996})</td>
<td></td>
<td>(6-b)</td>
</tr>
<tr>
<td>(a_{1997})</td>
<td></td>
<td>(6-c)</td>
</tr>
</tbody>
</table>

b. article 1996 (\(a_{1996}\))
c. article 1997 (\(a_{1997}\))

By merging \(L_5\) and \(L_6\), we obtain

\[M_6 = a^*\{a_{1995}, a_{1996}, a_{1997}\}, a_{1995}, a_{1996}, a_{1997}\].

The final event table is shown in table 2.

These examples illustrate the procedure, but an in-depth discussion of finer parts of the algorithm requires real data. We shall therefore resume the discussion in §4.5 with data from the experiment described in §4.3.

### 3.3. Evaluation

After we produced the event table, we can now use it for evaluation and comparison. For a quantitative analysis, we should typically want to derive numerical data from the table by counting occurrences, overlaps and other features. A number of decisions have to be made concerning the counting process.

The following are examples of different counting practices for super-events:

1. We count a super-event only if it occurs.
2. We count a super-event if it or any of its sub-events occur.
3. We count a super-event if it occurs or all relevant sub-events occur (and human judgment is necessary to define what “relevant” means in a given concrete case).

For our example mapping given in §3.2, this would mean that using counting method 1., deaths of king and queen only occurs in \(R_1\); using counting method 2., it occurs in \(R_1, R_2,\) and \(R_3\); and using counting method 3. (assuming that both sub-events are relevant), it occurs in \(R_1\) and \(R_2\).

Similarly for folded events, the following are examples of counting practices:

1. We count \(e_i\) as occurring, only if \(e_i\) itself occurs.
2. We count \(e_i\) as occurring if either \(e_i\) itself or some folded event \(e^*\{\ldots, e_i, \ldots\}\) referring to \(e_i\) occurs.
To see the difference between these two counting methods, consider the event table given in Table 2. In the first case, σ_{1996} would be counted as occurring in (6), while in the second case it would be counted as also occurring in (5).

Finally, we can give different weights to events depending on their type or whether they are mentioned implicitly or explicitly. For example, we could assume that in (4), the deaths of king and queen is implied or implicated by the mention of the funeral, and we could decide that this implicature is relatively weak (weight \( \frac{1}{2} \)) compared to an explicit mention as in the other stories (weight 1).

Evidently, these choices will be motivated by an underlying conceptualization of events, and they have a strong influence on the resulting number with which we measure similarity.

4. Empirical Study: Propp vs. Summaries

In this section, we present an application of the event mapping described in §3 to data obtained in two experiments, labelled Propp and Summaries. The first experiment asked the test subjects to provide annotations in the Proppian framework (cf. §2.4), the second one asked test subjects to provide natural language summaries of the same narratives. As mentioned before, the Proppian annotations are assignments of passages in the text data to Proppian functions, and we can see the selection of the annotated text (i.e., the text that the test subject considered to be corresponding to a Proppian function) as a text representation.

Assuming that the natural language summaries are a good candidate for what is naturally included in the structural narrative core, this comparison allows us to make judgments about which parts of Propp’s system are natural (or, to be more modest, which parts of Propp’s system are considered relevant enough by untrained human subjects to be included in a summary).

A full quantitative analysis of the two experiments was not possible due to the small numbers of test subjects involved (each of them had six test subjects). Instead, we considered whether events and functions occurred reliably reusing a notion of stability used in [5] defined in terms of “a majority of test subjects”:

We say that a event (or a Proppian function) occurs stably in one of the two experiments if at least four of the six test subjects list it. A given Proppian function can be assigned to different text passages (and even different events) by different annotators: we call a stable function strongly stable if there is a text overlap in the assigned text passages of at least four of the six annotators and weakly stable if this is not the case.

4.1. Data Labels

We refer to the two experiments by the labels Propp and Summaries. These experiments are described in detail in §§4.2 and 4.3. In the next paragraph, we give a short overview of the narratives used for the sake of understanding the examples.
The empirical data were all generated using the same narratives as material. We used the folktales *The Seven Semyons*, 147, *Shabarsha*, 151, and *Ivan the Bear’s Son*, 152 from Afanas’ev’s corpus *Narodnye Russkie Skazki* as also Propp had worked with them; in the following, we refer to these folktales as *Semyons*, *Shabarsha*, and *Ivanko*.20

**Data and Labels.** In the summary experiment, test subjects were instructed to write summaries of the narratives. All references to data from experiment **Summaries** are labelled as follows:

\[\langle\text{narrative}\rangle,\langle\text{test subject}\rangle,\langle\text{sentence}\rangle\].

These labels can be used to find the data in Appendix 3, the narratives are abbreviated as *Iv(anko)*, *Se(myons)* and *Sh(abarsha)*. Some sentences were split into sentence parts, marked by a dot:

(7) \(<\text{Iv}_{1,2.1}> = \text{Ivanko summary of the first test subject, second sentence, first part.}\)

In the experiment **Propp**, test subjects assigned Proppian function labels (cf. §2.4) to concrete passages of text. These assignments are labelled as follows

\[\langle\text{function}\rangle,\langle\text{sentence}\rangle\) (\langle\text{test subject}\rangle,\langle\text{narrative}\rangle)\]

as given in the following example:

(8) \(\text{A:<1,2}> I:<2,12> L:<3,4,2> P:<3,6> Q:<3,10> S:<8,5>–<8,6> T:<8,8,1> U:<8,10>\)

(subject 1, *Ivanko*)

### 4.2. Experiment **Propp**

The experiment **Propp** is described in detail in [5, § 2.3] where it is called **Propp II**:

Six test subjects, all students of the *Universiteit van Amsterdam*, and all with native or near-native competence of English, read the three folktales *Ivanko*, *Semyons*, and *Shabarsha* and produced a list of the Proppian functions occurring in the folktale,21 and marked text passages corresponding to each of the functions that occurred.

In the following, we give the experimental results obtained in [5]: Table 3 gives the annotation string produced by the test subjects. In *Ivanko*, *β*, *I* and *↓* were strongly

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20We used the translations of Gutermann [1] for *Semyons* and *Ivanko*, and the translation of Cook [2] for *Shabarsha*.

In *Semyons*, seven orphans meet the Tsar and pledge to work hard in their professions. The seventh becomes a thief and, with the help of his brothers and their respective talents, journeys to capture Elena the fair as a bride for the Tsar. In *Ivanko*, Ivanko is born of a peasant woman and her kidnapper, a bear. After returning to human society, he causes some damage and is sent to a lake in which devils dwell. Through a series of tricks, Ivanko gains all of the devils' gold and the services of a little devil for a year. In *Shabarsha*, the protagonist Shabarsha takes a day off to earn some money for himself and his boss. He goes to a lake to catch fish, meets a little devil and threatens to evict all of the devils from the lake if they don't pay rent. Through a series of tricks he acquires all of their wealth.

21For Propp’s formal system, cf. 2.4, *Propp’s Morphology*
stable and ↑ and H were weakly stable (of which ↑, H, I and ↓ are annotated by Propp); in Shabarsha, a and ↑ were strongly stable and H and I were weakly stable (of which ↑, H, and I were annotated by Propp); in Semyons, a, B, G, and W were strongly stable and ↑ and K were weakly stable. Note that in both Ivanko and Shabarsha, there is a strongly stable function not annotated by Propp (B and a, respectively).

4.3. Experiment Summaries

A summary of a text is an account “containing ... the chief points or the ... substance of the matter” (OED 1989, summary, adj.), i.e., a “distilled version of the original” [20] p. 294]. What the chief points or the substance of the matter are depends on the task and the context, and thus writing summaries is not a natural but an acquired skill. This skill features prominently in reading and writing education and is used frequently in everyday communication about narratives, even though there is no unique definition of what constitutes a good summary. Summaries are also a text type that has been extensively studied as a measure of adequacy of story understanding systems [3]. In this study, we assumed that our test subjects have the general ability to construct adequate summaries. We were not concerned with the quality of the summaries of our test subjects.

As an example for quality measures, consider the Writing Framework for the 2011 National Assessment of Educational Progress of the National Assessment Governing Board of the U.S. Department of Education (pp. 10–11). Cf. also the discussion of the differences in “holistic encoding” (holistische Kodierung) of texts between Germany and the United States in [6] pp. 38–39].
**Experimental setup.** The experiment was conducted with six students of the Universität Hamburg; they all had native or near-native competence of German. The text data were German translations of the Russian folktales used in the experiment Propp.

Test subjects were given a sheet of instructions which was not only provided in written form, but also read aloud by a native speaker of German. The instructions highlighted that the story should be recognizable from the summary and that it should not give comments on style or order of events. No example of a summary was given, and similarly no precise algorithm was given how to determine the important facts to mention in the summary, nor even to focus on events. Test subjects were instructed to use “simple sentences”; and examples of simple sentences were provided containing at most one level of subordination or coordination (cf. Appendix A for the part of the instructions given to the test subjects that describe summaries).

Test subjects were then given 2½ hours to read the folktales and write the summaries, and were given a modest financial compensation.

**Results.** The complete summaries in the original German without any corrections can be found in Appendix B. In the following, we give an overview of the recurring features of the summaries:

In Semyons, test subjects agree least about which details to include in their summary. However, all agree to mention some events before the theft, in particular meeting the Tsar, presenting their plans what trade to learn and the test cases (four test subjects each). All agree in naming Theft and Reward, and all except one mention the Wedding of Tsar and Princess. The fact that a trick was performed is only mentioned by four.

In Ivanko and Shabarsha, test subjects agree on the central events: All mention some event leading up to the competition between the hero and the little devil (Ivanko’s blunders and assignment to go to the lake; Shabarsha’s fishing plans or presence at the lake). The competitions are always mentioned, so is receiving the gold. The trickery is only mentioned by four (one test subject fails to mention trickery in all three tales). The final trick to obtain the gold is completely omitted in Ivanko summaries but mentioned by four for Shabarsha.

The narratives Semyons and Shabarsha ended with a narrator’s commentary (which was quite surreal in the case of Shabarsha). Only very few test subjects mention these commentaries in their summaries.

**4.4. The Event Tables based on the experimental data.**

For each of the three narratives, we followed the description of the algorithm in §3, applied to the six summaries. We chose the granularity of the Summaries as the level of comparison.  

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23The original text data was also a natural language text (albeit with much more detail than the summaries), and one could have considered including it as one of the text representations in the list. We did not do this in our construction of event tables: the rather different level of granularity of the
the summaries unless necessary for merging event lists, even if they occur in a more fine-grained version in the original narrative. After doing the event mapping with the six summaries, we enriched the table by including the data from the Propp experiment: in two cases, we had to add events because they were annotated by test subjects in the Propp experiment.\textsuperscript{24} We tested the reproducibility of our event mapping by having it repeated independently: the differences were relatively small.\textsuperscript{25} Figures 3, 4 and 5 show the event mappings for Ivanko, Semyons and Shabarsha, respectively. Columns S1 to S6 correspond to the six test subjects in the Summaries experiment and columns P1 to P6 correspond to the six test subjects in Propp.

4.5. Merging Redux

In this subsection, we use examples from the experiments to illustrate finer points of event mapping. This section resumes the discussion of the decisions involved in executing the algorithm from §3.2, using the construction of the event mapping for the data from the experiment Summaries as an example.

Data which is suitable for the application of the algorithm cannot be generated easily in abstracto, so that the data used here should be taken as an example of data to which the algorithm can be applied. The algorithm is by no means restricted to them.

\textsuperscript{24}Cf. §4.5.2, “To Unfold or Not to Unfold? The Devil in the Details” for a discussion of the interesting case; the less interesting case concerned the reaction of the stolen princess’s father in the Semyons, which were omitted in all of the summaries and hence had to be introduced in the merging process.

\textsuperscript{25}Main differences were a lack of alignment of the introduction of sub-events and super-events, esp. where the super-events were not instantiated. This means that all counts that do not count sub-events for super-events are unaffected.
Figure 3: Synoptic annotations of *Ivanko* from *Summaries* and *Propp* (cf. Table 4 for explanation of labels).
<table>
<thead>
<tr>
<th>Event</th>
<th>SubEvents</th>
<th>TS1</th>
<th>TS2</th>
<th>TS3</th>
<th>TS4</th>
<th>TS5</th>
<th>TS 6</th>
<th>PII 1</th>
<th>PII 2</th>
<th>PII 3</th>
<th>PII 4</th>
<th>PII 5</th>
<th>PII 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>§</td>
<td>(Childless)</td>
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<td>Prayer</td>
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<td>§</td>
<td>Birth</td>
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<td></td>
<td>(Name)</td>
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<td>(1.1)</td>
<td>(1)</td>
<td>2.1</td>
<td>2.2</td>
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<tr>
<td>BG:</td>
<td>Live in Tzar's</td>
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<tr>
<td>Kingdom</td>
<td>Orphaned</td>
<td>1.1</td>
<td>(1)</td>
<td>(1.1)</td>
<td>3.1</td>
<td>[β]</td>
<td>[β]</td>
<td>[β]</td>
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<td>3.2</td>
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<tr>
<td>§</td>
<td>(Tzar wants kids)</td>
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<td>2.1⁺</td>
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<td></td>
<td>Meet the Tzar</td>
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<td>(1)</td>
<td>(1.2)</td>
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<td>(Admiration Tzar)</td>
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<td>1:3</td>
<td>D:1.5⁺</td>
<td>2</td>
<td>1:4</td>
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<tr>
<td>Ask for</td>
<td>Edu Plans</td>
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<tr>
<td>Edu Plans</td>
<td>Others</td>
<td>5.2</td>
<td>3.1</td>
<td>2.1</td>
<td>6.1</td>
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<td>3.2</td>
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<td>6.2</td>
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<td>Pillar &amp; Ship</td>
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<td>4.1</td>
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<td>*Enamoured</td>
<td>w/Elena</td>
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<td>*Decision</td>
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<td>/ Assignment</td>
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<td>7=A</td>
<td>6=A</td>
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<td>9</td>
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<td>[G]</td>
<td>[G]</td>
<td>[t]</td>
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Figure 4: Synoptic annotations of *Semyons* from *Summaries* and *Propp* (cf. Table 4 for explanation of labels).
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additional detail: near-loss of cudgel 6

Intervention Grandfather 7 6 [I] [U] [K]

Demand for Gold (by Shabarsha)? 1

Gold Received 9a 9b 7a 7b

Filling Cap 6b 9 (X) [W] [U]

Last Chest/Finish (B) (11) [W] [K]

Gold Trick# 9b 8 7a 10

*(Rich)* 10a 9 6 5a 12† [N] [W] [W]

*(Mead bitter)* 10b 8b

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Figure 5: Synoptic annotations of *Shabarsha* from **Summaries** and **Propp** (cf. Table 4 for explanation of labels).
4.5.1. Constructing Super-Events and Unfolding.

If different text representations contain different levels of granularity of a given event, the modeller will need to make decisions about the sub-event structure in the event list. In general, containment relations between events are not trivial, and involve issues of implication, implicatures and unclear event boundaries.

Example for different granularity: Fishing plan. We introduced (sometimes anonymous) super-events in case that we felt that a certain event was mentioned *pars pro toto*, or that events form a unit in the original narrative. For instance, we used the label *fishing plan* to refer to the event “Shabarsha decides to go fishing with the intention to earn money to support his master”. This event essentially coincides in the narrative with “Shabarsha goes to the pond” and the fishing plan motivates the latter event. One summary omits the fishing plan and only lists the latter event. We decided to consider these two events as two sub-events of an unlabelled super-event in our event mapping.

4.5.2. Regrouping Repetitive Sequences: challenges and tasks.

Repetitive sub-events are often combined in the summaries: in *Shabarsha*, there are four competitions, each consisting of a challenge, a trick and the success); in *Ivanko*, both the mistakes made and the competitions with the devil occur in several forms. As discussed above, reordering super-events are not really events, but they are treated as such in the summaries. As we decided to follow the textual structure relatively closely, we retain this structure, and later add a significant amount of structure information. Without this structure information, a comparison to the *Propp* data would not have been not possible.

An example of such a regrouping is the following:

(9) a. <Iv5,8.1> Vom Großvater beauftragt <Iv5,8.2> geht der Teufel mehrere Wettkämpfe mit dem Sohn ein.
   b. <Iv5,9> Der Sohn überlistet den Teufel jedes mal.

To Unfold or Not to Unfold? The Devil in the Details. In the *Propp* experiment, one test subject consistently marked challenge passages and passages corresponding to the devil’s turn in *Ivanko* (but not in *Shabarsha*), and we would like to represent this in our comparison. However, consider the following Summary data:

(10) a. <Iv1,6.1> Dort fordert Ivanko von einem Teufel eine Pacht <Iv1,6.2> und dieser ihn zu Wettkämpfen heraus.
   b. <Iv2,9.1> Da der Teufel jede Wette verliert, <Iv2,9.2> gibt er anschließend klein bei.
   c. <Iv3,9.1> Dort trifft er einen Teufel, <Iv3,9.2> von dem er einen Hut mit Gold und ihn selber ein Jahr als Knecht gewinnt.
We notice that in (10-a), we can infer that there were several competitions (“Wett-
kämpfe”), but in (10-b) the test subject confuses Wettkampf (competition) with Wette (bet). Strictly speaking, the word Wette does not allow us to infer that each of the contestants has a turn. In (10-c), we cannot infer that competitions take place at all. Counting all of our summaries, we get two inferrable, one questionable (10-b) and three non-inferrable cases for Ivanko. For Shabarsha, the devil’s turn is always inferrable in Summary data (if you read “Wette” as “Wettkampf”, again); however, here we do not need to unfold the devil’s turn events because there is no similar annotation in the Propp data which necessitates this unfolding.

4.5.3. Decomposing a Trick: Success.

We give an example of an event that occurs in all summaries, but could be seen as an artifact of our method. We labelled this event as success. In Ivanko and Shabarsha, success refers to the protagonist’s victories over the devil(s), in Semyons, it refers to the success in getting Elena. This event is expressed in quite different forms in the various summaries, but in each summary it is at least implicated. We decided to count it as a separate event in order to compare it with the Propp annotations (where the Proppian function I (Victory) triggered the annotation). Consider the following examples:

(11) a. <Sh1,5> Schabarscha ist dem Teufel überlegen und gewinnt jede vorgeschla-
gene Wette.
    b. <Sh6,7> Bei jeder Aufgabe trickst Schabarscha den Seeteufel aus.

In the first example, only the challenges and the victory are mentioned, but in the second, the trick is focused, and austricksen entails success of the trick. Therefore the challenge episodes are segmented into three sub-events: challenge, trick, and success. Yet success is also mentioned explicitly in similar cases (cf. next paragraph, (12)), so that the separation as an event in its own right is justifiable.

4.5.4. Implicit and Implicated Events

In the Semyons, the following is the description of the return of the brothers: “[…] and soon [the ship] came to the shores of the Semyons native land. The tsar was overjoyed; he had not even dreamed of ever receiving Elena the Fair in his own house.” Note that in the original text, there is no explicit mention of the fact that Elena is actually delivered to the Tsar, but since the task was to steal Elena and the Tsar was “overjoyed”, it is implicated that Elena has been delivered. In contrast, this event is explicitly present in some of the summaries:

(12) a. <Se1,5> Seine Brüder helfen ihm und bringen sie zum Zaren.
    b. <Se3,7.2> und schaffen es sie zum Zar zu bringen.
    c. <Se4,7.2> schenken sie dem Zaren.
We decided to separate the state \{Tsar’s Pleasure\} from the event Gift to Tsar: they are ontologically different, but belong to a common super-event and occur simultaneously.

**Implicature / Inference and Event Conflation.** When measuring what information of the original narrative (in terms of events) is contained in the summaries, we find that certain events are only implicated; consider the following examples:

(13) a. \(<\text{Se2,3}>\) Der Zar bewundert den Fleiß der Kinder und will ihr Vater werden.
   
   b. \(<\text{Se1,3}>\) Später sollen sie, unter Anführung des Diebes-Simeon, die Prinzessin Helene stehlen.

Example \([13-a]\) does not explicitly say that the Tsar indeed adopts the children, but is close to the original narrative where the Tsar utters the sentence “I will be your father.” This utterance only expresses a wish or commitment, not its fulfillment, but (uttered by the Tsar) can be seen as a performative formula that also executes the action. The successful adoption is later presupposed in the narrative by showing that the Tsar listens to the children’s plans and dismisses them “having bound the Semyons as apprentices”.

In \([13-b]\), the obligation to steal is reported, but we understand this to also report the event of Permission/Assignment to steal the princess. As there is no negation of the fact, this also implicates that they accept the assignment and are going to (try to) steal Elena, which is reported in the next sentence. In our application, there was nothing to be gained by adding these additional implicated events, and so we decided to understand Permission/Assignment to include the acceptance. This differs from the Tsar’s order to execute the first Semyon, which is later cancelled by the Permission/Assignment to steal Elena.

**Implicature, Non-Occurring Events and TimeML.** As we are concerned with processing events in texts, one might consider an annotation language like TimeML [30] to be close to our goals. Yet the two approaches are quite different: our event mapping follows the text quite closely, but does not link the lists directly to the original text, thus alleviating some of the difficulties of annotation. In particular, our method differs from TimeML annotations in the treatment of events that are reported or are assigned a modality or aspectual information, because our event lists only contain events that are real (within the story).

We need not treat what TimeML calls REPORTING_VERBS or INTENTIONAL STATES, since we only check whether descriptions perform, presuppose or conversationally (and hence defeasibly) implicate the reported or intended action. In our approach, we would just add reported events to the event list in the order they happened (not in the order they were told); however, our three narratives did not have examples of this. We have examples of intentions stated but not carried out, e.g., the execution of the seventh Semyon which we didn’t add to the event list as a modeller’s decision.
4.6. Application of the method of Event mapping to the two experiments

To show that the event-based comparison can deliver interesting results, we focus on some qualitative examples of differences in the following: storylines omitted from function assignment, stable events, some (strongly) stable functions from the Propp data that are not present in the summaries, and an example of a stable passage which we find in all Propp annotations but in no summary.

**Framework Difference: Density.** Summary descriptions tend to be very dense, making use of certain implicatures (cf. the examples in §4.5). Since the Propp annotations refer to actual passages of the original text, this type of density cannot occur here. Rather, a reverse effect to density occurs in the Propp annotations: test subjects have a tendency to mark relatively long stretches of text as pertaining to one Proppian function. We have many assignments of text to Proppian functions that mark several lines of text; three of these assignments annotate text that adds up to more than 25 lines, thus considerably more text than the summaries, but still only a small fragment of the entire text of the folktale. These long text passages correspond to several events, thus creating a mismatch between the functions and the listed events. This is interesting because it means that a function cannot always be subsumed under one event, even though Propp’s system would suggest that this is intended.26

**Focus on the main storyline.** In both frameworks, test subjects tend to agree to concentrate on the main storyline: Both Ivanko and the Semyons have a prelude storyline that leads up to the central story line of the competition with the devil (Ivanko) and the theft of the princess (Semyons). Such a prelude does not fit Propp’s system as used in our experiment. Consequently, we find very few annotations in the part of the text corresponding to the prelude storylines.27 As mentioned, Shabarsha and Semyons also have a final narrator’s commentary; this is listed by only one summary and no Proppian annotation for the Semyons and by three summaries and three Proppian annotations for Shabarsha.

The missing representations of the prelude and the coda are an example of framework bias for the Propp annotations, but the fact that the summaries reproduce the Propp results in not representing these parts of the narrative can be seen as an argument that this particular framework bias is natural.

**Similia contrariis annotantur.** We observe that in the Propp annotations, similar events are sometimes assigned to different Proppian functions. E.g., in Shabarsha, we

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26Cf. the following quote: “Function is understood as an act of a character, defined from the point of view of its significance for the course of action.” ([28] p. 21), original emphasis)

27Exceptions to this are annotations of the functions Absentation or Lack to the preludes. The correctness of these with respect to Propp’s system is questionable, as the prelude storyline (at least in the case of Ivanko) does not involve the dramatis personae.
consider the four challenges (Wrestling, Running, Whistling, and Throwing) and their sub-events Challenge, Trick, and Success as largely parallel. However, in some of the annotations, the Proppian functions H, I, M, and N are assigned parts of the text corresponding to these events.

### Stable Events

As mentioned in §3.3, there are several counting methods that we could have used. In the following, we used the minimal and the maximal counting method. The minimal count ignores states and state references and does not count sub-events; the maximal count includes all sub-events, states and state references. The minimal and maximal counts of stable events are given in Table 5.

There is only a very small overlap in the stable events between the two experiments. In the minimal count, the following are the events that are stable in both the Propp and the Summaries data: Shabarsha goes to the pond (one common stable event); the Semyons get the assignment to bring Helena and are rewarded in the end (two common stable events); and Ivanko is assigned the task to go to the lake, and challenged to do a horse-carrying contest which he wins (three common stable events).

<table>
<thead>
<tr>
<th>Story</th>
<th>Summary</th>
<th>Propp</th>
<th>Common</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semyons</td>
<td>10 / 17</td>
<td>5 / 7</td>
<td>2 / 3</td>
</tr>
<tr>
<td>Shabarsha</td>
<td>17 / 24</td>
<td>5 / 9</td>
<td>1 / 5</td>
</tr>
<tr>
<td>Ivanko</td>
<td>16 / 24</td>
<td>9 / 12</td>
<td>3 / 6</td>
</tr>
</tbody>
</table>

Table 5: Stable events for the three stories; giving the minimal count (counting only events) / maximal count (counting all sub-events, states, state references)

Stable functions as a framework bias. In Semyons, four Propp annotators agree that the Tsar’s love for Elena constitutes a Lack (strongly stable function), while none of the summaries mentions this condition. Similarly so for the Lack that affects Shabarsha’s master right at the beginning of the story, which is, however, not mentioned in any summary. We interpret this as a framework bias: the function Lack plays an important role in the Proppian framework (since it acts as a motivation for other functions), and so Proppian annotators are likely to include it in their representation. The fact that this is not explicitly mentioned in the summaries indicates that it is a genuine framework bias that does not have a direct natural correspondence.

5. Conclusion and future work

We presented the method of Event Mapping and applied it to a concrete case to illustrate the procedure. In the application, our aim was to find out whether a formal framework tends to annotate the events deemed relevant by untrained readers, and

\[28\] Figures for any other counting variant can easily be produced by the reader using the event tables in Figures 3, 4, and 5.
our method of event mapping produced an adequate and useful comparison tool. The comparison allowed us to identify phenomena that are due to a bias in the framework, as well as judgments whether some instances of such framework biases are natural (in the sense discussed in §4). A similar comparison could be done with other event-based frameworks, comparing them to each other or to natural language summaries.

In order to use the technique of event mapping for more general narratives, a number of modifications would be necessary:

**More flexible chronology.** The table structure does not allow for breaking the chronological order (with the exception of event merging) or simultaneous events. A generalization of the technique in this direction will help us to treat more complex narratives.

**Higher-order concepts.** Our current technique focusses solely on the events themselves and not on the relations between events (e.g., that one event is the motivation for another one). In more complex narratives, the inclusion of these higher-order concepts would be necessary.

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### References

Aleksandr Afanas’ev. Folkloristic commentary by Roman Jakobson.


[17] Peter Hühn. Event and eventfulness. In Hühn et al. [18].


A. Original instructions given to the test subjects for the experiment *Summaries*

Sie sollen in diesem Experiment Zusammenfassungen von Geschichten erstellen, und zwar in möglichst einfachen Sätzen. Die Zusammenfassung sollte etwa 8–12 Sätze lang sein. Was wir unter einer *Zusammenfassung* und unter *einfachen Sätzen* verstehen, ist im Folgenden erläutert.

**Was ist eine Zusammenfassung?** Eine Zusammenfassung im Sinne dieses Experiments ist ein Text, der die wesentlichen Aspekte der Geschichte wiedergibt. Jemand, der Ihre Zusammenfassung liest, sollte die Geschichte wiedererkennen können, wenn er/sie sie bereits kennt oder später einmal liest. Üblicherweise sind Zusammenfassungen chronologisch aufgebaut, auch wenn Sie in begründeten Fällen von dieser Ordnung abweichen können.

Die Zusammenfassung sollte auch deutlich kürzer als das Original sein; Sie sollen also keine Nacherzählung verfassen. Das bedeutet, dass natürlich nicht alle Details der Geschichte vorkommen können, auch unter Umständen nicht alle wichtigen Personen. Die Zusammenfassung muss auch nicht besonders unterhaltsam oder witzig sein.

Die Zusammenfassung sollte keine stilistischen Kommentare, Kommentare über den Verlauf des Textes oder Wertungen enthalten. Die folgenden durchgestrichenen Texte würden also nicht in eine Zusammenfassung gehören:

(a) Der Text ist schwer verständlich.
(b) Dann wird es ganz sprunghaft: Der Prinz heiratet die Prinzessin.
(c) Es folgt im dritten Absatz eine Beschreibung der Landschaft.
(d) Die Stelle, wo der Prinz die Prinzessin küssst, gefällt mir besonders gut.

Schließlich sollte die Zusammenfassung im Wesentlichen im Präsens (Gegenwart) verfasst sein.

**Was sind einfache Sätze?** Einfache Sätze im Sinne dieses Experiments sind solche Sätze, die: keine komplizierten grammatischen Strukturen enthalten, unter anderem wenige Nebensätze, und typischerweise aus weniger als 14 Wörtern bestehen. Beispiele für einfache Sätze wären die folgenden:

(a) Drei Schwestern treten in ein Kloster ein.
(b) Er kauft ein schwarzes Pferd und durchquert die Wüste.
(c) Der Prinz heiratet die Prinzessin.
(d) Der Drache verwandelt sich in eine goldene Ziege.
(e) Der Magd wird es untersagt, die goldene Feder aufzuheben.
(f) Das Ei, in dem die Liebe der Zarentochter steckt, wird gestohlen.
(g) Die Kinder vertauschen heimlich ihre Kleider mit denen der Hexentöchter.
(h) Die Prinzessin zwingt die drei Streitenden, einen Wettlauf zu machen.
(i) Der Krieger bezwingt den Bewohner einer Waldhütte, der daraufhin flieht.
(j) Die Zauberin fliegt dem Offizier nach.
(k) Der Zwerg zerbricht den Becher, weil er ärgerlich ist.

B. Data of the experiment Summaries

In the following, we reproduce the text data produced by the test subjects without any corrections.

B.1. Ivanko

B.1.1. Subject 1

<İv1,1> In einem Dorf leben ein reicher Bauer und seine Frau.
<İv1,2.1> Die Frau gerät in eine Bärenhöhle
<İv1,2.2> und gebärt einen Bärling.
<İv1,3> Die Frau kehrt mit ihrem Bärlings-Sohn zurück ins Dorf.
<İv1,4.1> Dort soll Ivanko Bärling mithelfen,
<İv1,4.2> doch macht er allerlei dumme Fehler.
<İv1,5> Der reiche Bauer will ihn loswerden und schickt ihn zu einem See voller Teufel.
<İv1,6.1> Dort fordert Ivanko von einem Teufel eine Pacht
<İv1,6.2> und dieser ihn zu Wettkämpfen heraus.
<İv1,7> Ivanko überlistet den Teufel bei einem Wettlauf, sodass der Teufel verliert.
<İv1,8.1> Ivanko überlistet ihn auch beim Krückstockwerfen,
<İv1,8.2> obwohl der Teufel eigentlich besser ist.
<İv1,9> Beim Pferd-tragen reitet Ivanko das Pferd, obwohl der Teufel das Pferd trägt, und gewinnt.
<İv1,10.1> Dann lässt er sich ganz viel Gold geben
<İv1,10.2> und bringt es zu seinem Vater.

B.1.2. Subject 2

<İv2,1> Ivanko Bärling ist halb Mensch und halb Bär.
<İv2,2> Ivankos Stiefvater ist verzweifelt angesichts des Verhaltens von Ivanko.
<İv2,3.1> Ivanko tut zwar das, was man ihm aufträgt,
Iv2,3.2> doch er nimmt den Stiefvater stehts wörtlich.
Iv2,4.1> Der Stiefvater verliert auf diese Weise seine Schafe
Iv2,4.2> und wird bestohlen.
Iv2,5.1> Um Ivanko loszuwerden,
Iv2,5.2> schickt sein Stiefvater ihn an den See.
Iv2,6.1> Im See leben viele Teufel
Iv2,6.2> und der Stiefvater hofft, sie ziehen Ivanko zu sich.
Iv2,7.1> Am See begegnet Ivanko einem Teufel
Iv2,7.2> und fordert ihn auf, Geld für den See zu zahlen.
Iv2,8> Der Teufel fordert Ivanko daraufhin zu einer Reihe von Wetten auf.
Iv2,9.1> Da der Teufel jede Wette verliert,
Iv2,9.2> gibt er anschließend klein bei.
Iv2,10> Ivanko erhält vom Teufel eine Wagenladung voll Gold.
Iv2,11> Außerdem verpflichtet er den Teufel als Knecht für seinen Stiefvater.

B.1.3. Subject 3
Iv3,1.1> In der Geschichte “Ivanko der Sohn des Bären”, geht es um eine Frau,
Iv3,1.2> die von einem Bären in einer Höhle gefangen hielt
Iv3,1.3> und ihm ein Bärling,
Iv3,1.3.1> welcher halb Mann und halb Bär ist,
Iv3,1.3> gebar.
Iv3,2> Sie nennt ihn Ivanko.
Iv3,3.1> Die Mutter und der Bär ziehen in ein Dorf,
Iv3,3.2> in welchem sie ihren Mann wiedertrifft.
Iv3,4.1> Der Mann erteilt dem Bärling einen Auftrag,
Iv3,4.2> er soll ein Schaf schlachten nämlich jenes ihn zuerst ansieht.
Iv3,5> Da ihn alle ansahen schlachtet er alle.
Iv3,6.1> Der Vater ist verärgert
Iv3,6.2> und sagt ihm, dass er das Fleisch in die Hütte bringen soll
Iv3,6.3> und das Tor bewachen soll.
Iv3,7.1> Der Bärling bewacht das Tor,
Iv3,7.2> jedoch nicht das Fleisch,
Iv3,7.3> sodass es gestohlen wird.
Iv3,8> Der Vater schickt ihn zum See.
Iv3,9.1> Dort trifft er einen Teufel,
Iv3,9.2> von dem er einen Hut mit Gold und ihn selber ein Jahr als Knecht gewinnt.

B.1.4. Subject 4
Iv4,1.1> Die Frau eines Bauern trifft eines Tages im Wald auf einen Bären,
Iv4,1.2> der mit ihr ein Kind zeugte.
Iv4,2.1> Eines Tages kehrt die Frau und das Mensch-Bär-Wesen namens Ivanko zurück zum Bauern,
Iv4,2.2> der beide glücklich aufnimmt.
Iv4,3.1> Der Bauer erteilt Ivanko Aufgaben,
Iv4,3.2> welche dieser wörtlich aufnimmt
Iv4,3.3> und sie so, zum Erschrecken des Bauern, bewältigt.
Iv4,3.4> Dieser entscheidet Ivanko zum Fluss zu schicken,
Iv4,3.5> wo er durch einen Teufel umgebracht werden soll.
Iv4,5.1> Ivanko trifft am Fluss angekommen auf einen Teufel,
Iv4,5.2> der ihm drei Aufgaben zu lösen erteilt.
Iv4,6> Diese drei Aufgaben löst Ivanko, indem er drei mal den Teufel austrickst.
Iv4,7> Als Belohnung gewinnt Ivanko eine Menge Gold und den Teufel als Sklaven.
Iv4,8> Den Gewinn schenkt er dem Bauern.

B.1.5. Subject 5
Iv5,1> Die Frau eines Bauerns verirrt sich in eine Höhle.
Iv5,2> Dort behält ein Bär sie bei sich und sie gebärt einen Sohn.
Iv5,3> Nachdem beide aus der Höhle flohen, gehen sie zum Bauern.
Iv5,4> Die vom Bauern aufgetragenen Aufgaben erledigt der Sohn falsch.
Iv5,5.1> Um ihn loszuwerden,
Iv5,5.2> schickt der Bauer ihn zum See.
Iv5,6.1> Dort solle er Stricke aus Sand drehen,
Iv5,6.2> wobei ihm ein Teufel begegnet.
Iv5,7> Nachdem er dem Teufel droht, dass er ihnen schaden wird, wird dieser ängstlich.
Iv5,8.1> Vom Großvater beauftragt
Iv5,8.2> geht der Teufel mehrere Wettkämpfe mit dem Sohn ein.
Iv5,9> Der Sohn überlistet den Teufel jedes mal.
Iv5,10.1> Somit zahlt der Teufel dem Sohn Pacht,
Iv5,10.2> damit sie im See bleiben dürfen.
Iv5,11> Den Teufel als Knecht und das erbeutete Geld bringt der dem Bauern.

B.1.6. Subject 6
Iv6,1.1> Die Frau des Bauern verirrte sich im Wald
Iv6,1.2> und wurde vom Bären in seine Höhle gezogen.
Iv6,2.1> Dort gebahr sie ihm ein Sohn:
Iv6,2.2> Ein Mann bis zur Hüfte und ein Bär unter der Hüfte.
Iv6,3.1> Eines Tages rannten die beiden Weg
Iv6,3.2> und kamen ins Dorf zum Bauern zurück.
Iv6,4> Der Bauer nahm Ivanko den Bärensohn auf.
Iv6,5> Ivanko machte die Aufgaben des Bauern nach dem Wortlaut, nicht aber nach dem Sinn.
Iv6,6> So verlor der Bauer alle seine Schafe.
Iv6,7.1> Der Bauer wollte Ivanko loswerden
und schickte ihn zum See mit Seeteufeln.
Ivanko trickste den kleinen Seeteufel aus.
Die Seeteufel haben Ivanko die Pacht gezahlt.
Der kleine Seeteufel musste 1 Jahr lang als Knecht Ivanko dienen.
So ging Ivanko zurück zum Bauern mit einem Wagen voller Gold
und einem Seeteufel als Knecht.

B.2. Shabarsha

B.2.1. Subject 1

Der Knecht Schabarscha will für seinen Herrn etwas Geld verdienen.
Er geht zu einem Teich um zu angeln,
doch darin wohnen Teufel.
Schabarscha fordert Gold und droht, die Teufel herauszuangeln.
Doch der Teufel will erst einen Ringkampf ausfechten.
Schabarscha lässt ihn zuerst gegen einen Bären, seinen vermeintlichen "Bruder", kämpfen,
woraufhin der Teufel aufgibt.
Beim Wettlauf überlistet Schabarscha den Teufel wieder
und dieser verliert.
Beim Wettpfeifen wird der Teufel, eigentlich der Bessere,
wieder überlistet.
Als Letztes besiegt Schabarscha den Teufel beim Wettwerfen,
wieder durch eine List.
Daraufhin geben die Teufel ihm all ihr Gold,
weil Schabarscha seinen kaputten Hut auf ein Loch stellt.
Seitdem lebt der Knecht wie ein König,
doch sein Met und Bier sollen trübe sein.

B.2.2. Subject 2

Der Knecht Schabarscha versucht für seinen Herrn etwas Geld zu verdienen.
Um Fische zu fangen und danach zu verkaufen,
setzt sich Schabarscha an den See.
Aus dem See springt ein kleiner Teufel
und fragt Schabarscha nach seinem Tun.
Um nicht von Schabarscha gefischt zu werden,
schlägt er ihm mehrere Wetten vor.
Schabarscha ist dem Teufel überlegen und gewinnt jede vorgeschlagene Wette.

Der Teufel verwetet fast die Keule seines Großvaters.

Da befehlt der Großvater dem Treiben ein Ende zu setzen.

Schabarscha erhält alle Geldreserven des Teufels Großvaters.

Seit dem hat Schabarscha keine Geldsorgen mehr und lebt in Saus und Braus.

B.2.3. Subject 3

In der Geschichte “Schabarscha”, geht es um einen Knecht, Schabarscha, der seinem Herrn helfen will und an Geld kommen will.

Schabarscha geht zum Teich, um Fische zu fangen.

Er angelt einen Teufel.

Der Teufel will das er das Wasser in Ruhe lässt und die Teufel im Wasser am Leben lässt.

Sie führen mehrere Wettkämpfe aus.

Schabarscha gewinnt und somit sollte er einen Hut voll Gold und Silber erhalten.

Der Teufel holt sein gesamtes Gold und füllt es in den Hut.

Schabarscha schneidet ein Loch in den Hut, damit er nicht voll wird.

B.2.4. Subject 4

Schabarscha ist ein Knecht eines Herrn, der ihm eines Tages einen Tag frei gibt, weil Schabarscha es sich so gewünscht hat.

An diesem Tag nimmt er sich vor Fische zu fangen und diese zu verkaufen.

Am See angekommen trifft er auf einen Teufel, welchem er droht, dass er alle anderen Teufel aus dem See ziehen will.

Der Teufel aber will sich zuerst mit ihm in verschiedenen Duellen messen.

Schabarscha schafft es durch Tricks den Teufel zu überlisten und fordert darauf hin viel Gold.

Mit diesem Gold lebt Schabarscha bis heute glücklich und zufrieden.

B.2.5. Subject 5

Schabarscha setzt sich an den See und dreht eine Angelschnur.

Ein Teufel fragt warum er dies tut, er sagt um Teufel zu angeln.

B.2.6. Subject 6


B.3. The Seven Semyons

B.3.1. Subject 1

Dieser ist hocherfreut, heiratet Helene und macht die Simeons reich.
Doch die Reichtümer scheinen nicht für die Ewigkeit zu sein, und nicht zu befriedigen.

**B.3.2. Subject 2**
Die sieben Simeons sind allesamt Waisenjungen.
In der Erntezeit arbeiten sie auf dem Feld.
Der Zar bewundert den Fleiß der Kinder und will ihr Vater werden.
Die Simeons bauen einen Pfeiler und ein Schiff.
Den Zar erfreut es,
dass seine Ziehsöhne ihm Nützliches tun wollen.
Einer der Simeons beschließt Dieb zu werden
und wird dafür vom Zar gerügt.
Er bekommt vom Zar die Möglichkeit, die weit entfernt lebende Prinzessin Helena zu stehlen.
Durch eine List wird Helena auf das Schiff der Simeons gelockt.
Im Reich des Zaren angekommen befreit er die Simeons aus Dank von Pacht.
Der Zar heiratet Helena und gibt ein großes Fest.

**B.3.3. Subject 3**
In der Geschichte “Die sieben Simeons”, geht es um sieben Waisen,
welche von einem Zar aufgenommen werden sollen.
Der Zar will Kinder haben
und trifft auf die Simeons
und fragt nach deren Handwerk.
Alle wollen einem Handwerk nachgehen,
außer einer, der Dieb werden möchte.
Der Zar ist erbost darüber und will ihn hinrichten.
Der Zar nimmt die anderen Simeons auf.
Als der Zar den Dieb erhängen will, trifft er mit ihm ein Abkommen, die Prinzessin Helena zu ihm zu bringen.
Die Simeons reisen zu der Prinzessin
und schaffen es sie zum Zar zu bringen.
Der Zar ist glücklich und belohnt die Simeons.
Der Zar heiratet die Prinzessin.

**B.3.4. Subject 4**
Die sieben Simeon Brüder leben im Königreich des Zaren,
der sie in jungen Kindesalter befragte, was sie werden wollen.
Sechs nannten zur Freude des Zaren geschätzte Berufe,
nur der jüngste wollte Dieb werden.

Bestürzt sagt ihm der Zarr, dass er ihn hängen wird, wenn dies geschehen soll.

Viele Jahre später führen wollen die sieben Brüder dem Zarren ihre ge-
lernten Berufe vorführen,

wobei einer der Brüder,

der einen ähnlichen Beruf wie ein Späher ausführt, den Zaren von der
Prinzessin Helene erzählt,

welche in einem anderen Königreich lebt.

Als der jüngste Bruder den Zaren seine Künste vorführen will,

will der Zarr ihn hängen lassen.

Doch der jüngste bietet den Zarren an, Helene für ihn zu stehlen,

was der Zarr nicht verneinen kann.

Also stehlen die sieben Brüder Helene mit einem Trick aus dem benach-
barten Königreich und

schenken sie dem Zaren

und dürfen so mit einigen Vorzügen alle weiterleben.

B.3.5. Subject 5

Sieben Waisen namens Simeon entdeckt der Zar hart arbeitend auf dem
Feld.

Er holt sie zu sich und lässt sie ihr Wunschhandwerk erlernen.

Einer will Dieb werden

und rettet sich vor dem Tode durch den Zar.

Hierzu bietet er dem Zar an, eine schöne Prinzessin zu stehlen.

Mit den Fähigkeiten seiner Brüder gelingt ihm dies.

Der Zar heiratet die Prinzessin

und die Simeons werden belohnt.

B.3.6. Subject 6

Ein alter Bauer ist kinderlos und fragt Gott nach einem Sohn.

Seine Frau gebärt ihm sieben Söhne,

die Simeon genannt werden.

Kurz darauf verwaisen die sieben Brüder

und gehen auf das Feld arbeiten.

Der Zarr sieht die Kinder arbeiten und will adoptieren.

Er fragt sie, welches Handwerk sie ausüben wollen.

Sechs Simeons nennen ihm ein gutes Handwerk,

nur der siebte will Dieb werden,

Nach einer Zeit kommen die Brüder zum Zar und jeder zeigt ihm sein
Handwerk.

Der siebte Bruder sagt, er wird Helena die Schöne für den Zar stehlen.
Die Brüder machen sich auf und reisen mit dem Schiff in das entfernte Königreich.

Der siebte Simeon holt Helena die schöne durch List auf das Schiff und sie verschwinden.

Der Zar ist bei ihrer Ankunft sehr glücklich und zufrieden mit den Brüdern.

Er heiratet die Prinzessin und es gibt ein großes Fest.