Abstract

In this paper, we discuss the challenging task of identifying time frames that may intersect in a text (a novel, a news article, a Facebook post, etc.), in a form more or less visible for the reader. By time frame, we mean a sequence of events or statements that an author exposes voluntarily; these time frames can be considered specific writing techniques where diverse narrative threads are used for the purpose of capturing the reader’s attention regarding the story as it develops. A particularity of time frames is the fact that the transition from one time frame to another one seems to be rather difficult to discern and put in evidence by a forewarned annotator, while the consequences of the temporal discontinuities are understood naturally by a casual reader of the text. We are going to explain this notion and to determine if it is necessary to propose a remodelled temporal annotation for this issue.

Keywords: time frames, temporal ruptures, event ordering

1. Introduction

Attention towards detection of intrinsically connected sequences of events in texts is relatively new in computational linguistics. Anchored in the need to represent, extract and abstract narrative structures from streams of news, especially when gathered from different sources of information, a line of research seems to evolve towards detection of timelines and storylines. Timelines are representations of chronologically ordered events in time for a specific entity (Chambers, 2011). Timeline extraction requires event detection and classification, extraction of temporal relations, coreference resolution of entities and events, event factuality, name entity recognition and temporal expression recognition and normalization (Caselli et al., 2015). Systems as VUA-Timeline (Minard et al., 2014) are developed for extracting cross-document timelines.

Storylines, on the other hand, are more complex representations, intended to take into account temporal, causal and subjective dimensions. A storyline comprises the entire sequence of significant events exposed by the narrator or by his/her characters. But, despite the chronological order of events or the ordinary flow of the story, flashbacks, temporal ruptures, flash forwards, etc. can appear and in this way, interrupt the storyline. A storyline can be represented as the merger between individual timelines where two or more entities (characters) are involved in at least one relevant event (Laparra et al., 2015).

The necessity to determine storylines is strengthened by the fact that starting with information specialists and finishing with readers, all of them need to select large amounts of information in order to find stories, to monitor events that involve one or more participants, to reconstruct cases, etc. If the storylines are represented by schemas, these representations can reveal specific information for better selections and innovative methods used in processing texts.

In literary texts, such as novels and memories, the authors often change the current direction of time, include flashbacks, commute the story on a completely new axis, or modify the perspective through which a story unfolds. To deal with such linguistic phenomena, we introduce the notion of time frame, as a sequence of anchored or unanchored events, belonging to a delimited period of time, although the limits might be vaguely mentioned, if at all. The events of a time frame are not necessarily presented in a chronological order in the text and, as the text unfolds, switches between different time frames might also occur. Most often, the reader is aware of crossing a temporal border, even if, sometimes, with some delay during reading. Our aim is to determine if it is possible to find out clues that may indicate the transition from one time frame to another one, in order to formulate some directions for a process aiming to identify them automatically.

Literary theoreticians consider that different time frames are intentionally used by authors to introduce ambiguities and to raise the suggestive power of their stories. Often, switches between time frames can be considered a particularity of a text that would force the reader to zigzag back and forth between different story levels. The automatic identification of time frames can be an important step in disambiguating a text, reordering events, deciphering temporal relations and the general organisation of the discourse. This paper describes a tentative approach to define and recognise in free texts time borders which accommodate groups of related events called time frames. Determining the time frames can be a premise in the automatic ordering of events in texts where no temporal indications appear or their appearance is scarce.

We intend thus to broaden the sphere of temporal annotations and extend the data structures and attributes of TIMEML, the standard mark-up language for annotating events in a text. The automatic identification of time frames represents a further step in temporal information extraction and in natural language processing, that could precede or go intertwined with the operation of
determining the order of events. Moreover, the final outcome has a much ampler benefit than building a lattice of partially ordered events in time: it is intended to draw and relate the time frames one with respect to the others, thus building a general overview of the text organisation.

2. Time Frames in Texts

We focus on sequences of events which are not necessarily paired with temporal information, as given by the TIMEML standard. As the dimensions of time can be expressed on 3 axis – the real time (of the reader), the discourse time (following strictly the text) and the time of the story (in which the time inversions that appear in the text are reordered) – we state our interest as focussing the discourse time, as our intention is to decipher temporal and semantic relations established among different time frames, intentionally placed by the writer.

Time frames often denote flashbacks, producing temporal ruptures which bring into attention things that happened before the current flow of the story. A reader usually decipher without difficulty these flashbacks, which she/he will connect later to the developing story, thus reconstructing the complete intended mis-en-scene.

The following examples highlight the existence of multiple time frames in two short texts.

Example 1 (source: a Facebook post):

1 [Between the two rounds of preparing tomato sauce and a quick chat on Facebook, I remembered that ...] 2 [I put Teodor Baconschi’s book “Facebook. Factory narcissism” among the books labelled “to necessarily read” ...] 3 [I published this year by Humanitas ...] 4 [I could not stop myself from reading it until the end ...]

A closer look to this short text reveals three different time frames emphasized by several sequences of events: the first frame includes the events indicated by the preparation of the tomato sauce, the chat and the remembrance; the second frame exposes the moment when the book was placed on a shelf; and the third frame is represented by the publication of Teodor Baconschi’s book. The final sentence brings the reader back onto the second frame (because there is little chance that the reading of the mentioned book would be made in sequence with the events on the first frame). The square brackets and their small attached figures make visible the 3 frames.

Example 2 (source: a novel):

1 [Someone told me once that ...] 2 [he had taken a bus full of odours and noises to return to another city. At some point, the noises reverberated, reminding him the leitmotif of the movie ...] 3 [that foreshadowed a warning for a possible nuclear war; on the east coast of Australia, the wind of a dead ocean struck the window on which was hung a bottle of Coca-Cola, which in turn struck a Morse signal at each burst, ...]

This example shows another disposal of time frames: in the first frame the author tells, sometimes in the past, a story about a character, mentioned here as “someone”; in the second frame, this “someone” remembers a movie; and the third frame develops the story in the movie.

A time frame encompasses one or more sequences of events, temporal scenes or episodes belonging to a specific period of time with clear or vague limits that the reader discovers or establishes once he/she continues to follow the storyline.

The example below shows an intersection of two time frames within a paragraph. The adverb phrase (it was a long time ago) clearly separates the first time frame from the next one.

Example 3 (source: a novel)

1 [Wait! Adam wanted to call him, to yell at Karl to return. Do not go, this is what he wanted to scream. But he remained silent and motionless, hidden in dense the foliage full of thorns. Now he was able to master and keep silence, held his breath and counted slowly to ten ...] 2 [It was a long time since he had learned to control such a fear ...]

3. Types of Time Frames and Lexical Features Announcing Transitions

In this section we suggest a categorisation of time frames. The intention is to study the possible transitions between types and their signalling clues in the language. Our investigation till now has put in evidence the following types: NAR – the narration frame (where the time flows constantly ahead); REM – the frame of remembers belonging to a character (also a narration frame, but whose time limits are back in time with respect to a preceding narration type frame); SUP – the supposition frame (where the time is vaguely attached to a plausible, wanted or unwanted, world); GEN – the general knowledge frame (where there is no time anchor, only statements about generally accepted things); FIC – a fiction, an invented reality, like in a movie, a play or a novel (also a narration frame, but whose time limits have no connection with respect to the current story time).

Aiming to detect the borders between time frames belonging to these types, we started to investigate if there are textual clues which signal the different types of transitions.

Table 1 shows the types of time frames and the cue expressions announcing transitions for the three examples presented above.

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1 The post in Romanian can be found on: https://www.facebook.com/teodor.baconschi/posts/949492091778957.

2 The example is a fragment from Octavian Paler’s book “Life on a Platform”.

3 Example 3 represents a fragment of Tash Aw’s book, Map of the Invisible World.
Table 1: Types of time frames and cue phrases announcing transitions

<table>
<thead>
<tr>
<th>Plan no.</th>
<th>Type of plan</th>
<th>Transitions</th>
<th>Cue phrases announcing transitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>[3]</td>
<td>NAR</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example 2:

<table>
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<th>Cue phrases announcing transitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>[3]</td>
<td>REM&amp;SUP&amp;FIC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example 3:

<table>
<thead>
<tr>
<th>Plan no.</th>
<th>Type of plan</th>
<th>Transitions</th>
<th>Cue phrases announcing transitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>[1]</td>
<td>NAR</td>
<td></td>
<td>It was a long time</td>
</tr>
</tbody>
</table>

Figure 1: Graph representations showing interconnections of time frames

5. Relation with other Work

The field of extracting temporal information is well-studied: from a delimitation of time-denoting expressions (Schilder and Habel, 2001) as explicit references (precise dates: 06.02.2010), indexical references (temporal expressions which depend on a given index time: today, next Monday) and vague references (three days ago, in the summer, in several weeks) and the ontology of complex events (Mele and Sorgente, 2011), there is a growing interest on ordering the events on a time axis and on determining the storyline. In a story, the common chronological order of the events is not observed (Vossen et al., 2015) and each story may contain more than one fabula (by fabula, we mean logically and chronologically related events that are caused or experienced by participants in events).

On the other hand, the notion of narrative container (Pustejovsky and Stubbs, 2011) is introduced in order to delimitate the events appeared in a text without any explicit temporal anchor. The challenging work of these authors emphasizes the importance of the text style and genre in the attempt to fix in time not explicitly anchored events.

We believe that, more often than not, the events belonging to the same time frame are ordered temporally, even if different segments of the same time frame are not continguously displayed in the text. An annotation of the events (EVENT tags) belonging to the same time frame (following the TimeML or ISO-TimeML specifications) is thus necessary. Temporal links (TLINK tags) establish relationships between two or more events and order the

4 We thank to the Humanitas Publishing House for offering us the Romanian version of the book for research purposes.
events in time. The temporal expressions as dates, durations, times, etc. (TIMEX3 tags) will bring anchoring information that will help to position different time frames or segments of time frames in time.

6. Conclusion

In this paper we propose a new way of looking at a text that combines elements of time analysis and text structure. The approach resides on the identification of segments of texts, called time frames, that are individualised by coherent placements of sequences of events, observations about certain phenomena, places, general knowledge, etc., which are temporally situated on different time intervals or characterising opinions of different characters. In the unfolding of a text, time frames could be interrupted and interleaved, but their relationship can be represented as a graph that structures the text with respect to places, moments or intervals of time, characters and situations, being them real, supposed or fictive. Identification of time frames is important in deciphering the structure of the discourse. Apart from being relatively well delimited in time, time frames could be related or not among them with respect to the time axis.

There is much work to be done in the future. We intend to do several things: continue this analysis by completing the classification of types, inventorying possible signals for frame transitions, proposing annotation conventions in view of a corpus analysis and performing comparative annotation in order to see to what degree different annotators have similar opinions about time frames.

The technique of frame story or story within a story could be a premise in detecting the style of each author, the creativity of her/his writing and the level of involvement in order to attract the interest of a reader. This has much to do with our time frames.

Working on literary texts, our challenge is to investigate complex text structures, rich in flashbacks and constructions about fictive worlds, frequent ruptures of time, and other types of time frames that could raise new ideas and formalisations, with the final goal to develop a process that would do an automatic identification.

This research highlights a preparatory analysis that can end up in the development of a tool capable to identify and graphically represent time frames in a text. This will be a tremendous step forward towards the goal of mirroring in the machine the human capacity of deep understanding of a text.

7. Bibliographical References


