BUILDING OF SEMANTICO-COGNITIVE REPRESENTATION OF
DIFFERENT TYPES OF NARRATIVES IN FRENCH

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Abstract

We propose an approach for analysing several types of narratives in French based on linguistic data available in the texts under study. The goal of the analysis is to decompose the dynamically evolving image of the world represented by the text into successive stages, each of which is cognitively relevant for the communication. Each stage is considered in terms of linguistic means (grammatical, lexical) and their interaction.

Keywords: narratives, aspecto-temporal values of propositions, temporal diagram of texts, semantico-cognitive schemata of verbs, semantico-cognitive representations of texts.

1 Introduction

We propose an incremental analysis of different types of narratives in French. The analysis is carried out in 3 steps. At step 1 the rules necessary for recognition of the text type are triggered. These rules allow to recognise different kinds of narratives on formal basis (study of tenses, modifiers, etc.) The rules at step 2 analyse the text, proposition by proposition, in order to identify the aspecto-temporal values (states, processes, etc.) of situations corresponding to each proposition. Another set of rules determines the interaction of all identified values and integrates them into the temporal diagram of the analysed text. At step 3 the aspecto-temporal values of the propositions are mapped into the Semantico-Cognitive Schemata (SCS) (Desclés 1990; Abraham 1995) of the tensed verbs. Due to this mapping we build the cognitive representation of each situation in the text. After that all representations are integrated into a new diagram that shows the spatial and temporal phases of the narration relevant for the comprehension of the text.

The proposed analysis is a part of the global mechanism for interpretation of texts by images (Battistelli and Valliez 1997) conceived within the GA&C theory (Desclés 1990).

2 Types of texts

In our approach the distinction between various text types is based on two criteria. The first one allows to determine whether all the situations mentioned in the text are located within one or several temporal frames, for example, the frame of past, present, future, potential or irreal events. The second criterion allows to classify the situations according to their temporal structure - dynamic vs. static.

Applying the above criteria we have defined three types of texts, namely, descriptions, comments and narratives.

Descriptions represent a set of situations located by the speaker over the same temporal interval, that is they constitute a unique temporal frame holding for all the situations in the text. A distinctive feature of descriptions is their intrinsically static nature, i.e. their temporal structure is incompatible with the notion of transitions from one state to another. A typical example of such texts are the apartment descriptions made by children: Our flat has 6 rooms, one kitchen, etc.

Unlike descriptions, comments do not fit
into a unique temporal frame. Comments are texts where the speaker moves from one frame to another (for example, from past to irreal, or from present to future). The lack of unique frame entails the lack of temporal structure of comments which should integrate all the situations in the text. Thus, the latter are located with regard to the speaker's position, but regardless of the positions of the other situations. Typical examples of comments are newspaper articles, in which the described events are mixed with various comments made by author.

The situations described by narratives are contained within a unique temporal frame. They represent a dynamic temporal structure expressing multiple and successive transitions from one state to another.

This unique temporal frame is associated to each narrative text by default. It can be represented by a temporal interval which "holds" not only during the situations in the text, but also before, after and between them (if they are disjoint). However, the role of this frame is not reduced to a simple background of the events contained in the narration. It also ensures the links between all the situations in the narrative texts which preserve their order regardless of the different linguistic techniques used by the speaker (flashbacks, flash-forwards or back/front-shifts).

3 Identification of narratives and their specific types (step 1)

The identification of the text types of texts is carried out by using systemically organised context-exploration rules. Their goal is to detect the presence or absence of certain linguistic markers relevant for each text type. Hence a text type can be represented as a path of options chosen in the systemic network.

In this paper we deal only with narratives. In order to demonstrate the procedure of text-type recognition we shall analyse the following examples:

1. Je roulais (1) sur la partie droite de la chaussée. Un véhicule arrivant (2) dans le virage a été complètement déporté (3). Serrant (4) à droite au maximum je n'ai pas évité (5) la voiture.

   I was driving in the right lane of the road. A car taking the bend was carried completely out. Keeping to the right as much as possible, I did (could) not avoid it.

2. Je me trouve (1) dans le carrefour, à faible vitesse environ 40 km/h. Le véhicule B me refuse (2) la priorité à droite et percute (3) mon véhicule. À cause de la chaussée glissante, mon véhicule dérape (4) et percute (5) la protection métallique d'un arbre, d'où un second choc frontal.

   I am at the intersection at a low speed of about 40 km/h. The car B refuses my right of way and crashes into me. The road being very slippery, my car skids aside and crashes into the iron bars protecting a tree which produced eventually a second frontal crash.

3. Je roule (1) sur la Route Nationale 4. Une voiture a dérapé (2) et a touché (3) la barrière de sécurité. Elle est (4) en travers de la route. Je ne l'évite pas (5).

   I am driving on the National Road 4. A car has skidded aside and has touched the safety fence. It is standing across the road. So, I cannot avoid it.

In Figure 1 we present only those options of the network which have been triggered by the examples here above, options which are relevant for the assignment of the text type ("narrative" in this case).

The presence of past tense forms as well as the absence of present tense forms allow to identify the Text 1 as narrative. Text 2 has also been recognised as "narrative" due to the following parameters: a) all verbs are in present tense; b) the text contains verbs which are non-static (2, 3, 4, 5 represents a description of a world where all completed events are considered as totally ordered (V(εi, εk) εi{<,>}εk). The English translation of these texts is almost literal as our goal has been to preserve as much as possible the original French constructions.

1For the sake of simplicity we have chosen a specific type of narrative, that of accident reports, as it
5); c) it does not contain any deictic expressions (counter-indices); d) it contains verbs expressing telic situations (3, 4, 5).

Text 3 is also a “narrative” because it: a) contains non-static verbs (1, 5); b) lacks deictic expressions; c) satisfies the rules of tense distribution which determine the position of different tensed forms in the narratives with different tenses; d) contains verbs in present tense expressing telic situations (5).

Figure 1 shows also that the use of linguistic markers allows not only to recognise the type of text (for example, narrative vs. description), but also its subtypes (i.e. narratives in past (text 1), in present (text 2) or in past+present (text 3)).

Figure 1: Sets of options identifying each of the three narratives

<table>
<thead>
<tr>
<th>PAST</th>
<th>Passé Composé +other past tenses</th>
<th>Text 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRES</td>
<td>contains non-static verbs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>no counter indices</td>
<td>PRES = telic situation</td>
</tr>
<tr>
<td>PRES+PAST</td>
<td>contains non-static verbs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>no counter-indices</td>
<td>Rules = on Tense Distribution (satisfied)</td>
</tr>
<tr>
<td></td>
<td>in PRES</td>
<td>PRES = telic situation</td>
</tr>
</tbody>
</table>

I was driving in the right lane of the road.

Events describe situations perceived as an indivisible whole, containing initial and final breaks. They are represented by closed intervals, the predication holding over the whole interval, bounds included:

The car touched the safety fence.

States denote situations with no explicitly marked beginning and end. They are represented by open intervals where the value of the predication is identical at every point of the interval.

The car stands across the road. (* The position of the car is perpendicular to the road)

The tables below show the values of each text, proposition by proposition. In order to illustrate the functioning of the context-exploration rules (Berri, 1991) and their interaction with the information obtained at step 1 of the analysis (identification of narratives), we present the markers which have led to the assignment of each value, as well as the intervals corresponding to these values.

<table>
<thead>
<tr>
<th>P̃</th>
<th>value</th>
<th>markers</th>
<th>interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>P₁</td>
<td>process</td>
<td>tense: imparfait</td>
<td>[------]</td>
</tr>
<tr>
<td>P₂</td>
<td>process</td>
<td>present participle</td>
<td>[------]</td>
</tr>
<tr>
<td>P₃</td>
<td>event</td>
<td>tense: passé composé; unspecified</td>
<td>[------]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>in past narrative: event</td>
<td></td>
</tr>
<tr>
<td>P₄</td>
<td>process</td>
<td>present participle</td>
<td>[------]</td>
</tr>
</tbody>
</table>
The normal predicative forms (NPF_i) of the propositions are obtained by categorial analysis (Biskri 1995). For example, the NPFs of the first text will be represented as follows:

NPF_1 = (sur rouler (la-partie-droite-de (la chaussée)) [je])
NPF_2 = (dans arriver (le virage) [un véhicule])
NPF_3 = (complètement (être déporté) [un véhicule])
NPF_4 = (au maximum (à serrer droite) [je])
NPF_5 = (ne pas éviter (la voiture) [je])

4.2 Temporal diagram of the texts

The identification of the aspecto-temporal values of the propositions allows us to build the temporal diagram of the entire text. The procedure is based on the following principles and rules:

I. General principles.

1. Events account for the evolution of the narration (Gagnon 1993; Gagnon and Lapalme 1995). They express situations in their integrity (i.e. with explicitly marked beginnings and ends), and hence represent the successive changes in the described world.

[skidded]_eve < [crashed]_eve

2. Processes and states are the values which create the background (dynamic and static, respectively) for these changes.

[taking the bend]_process ⊃ [was carried out]_eve

Static situations are intrinsically incompatible with changes. Processes express situations in evolution where the changes are not perceived as cognitively relevant and therefore not verbalised (Battistelli 1997a).

3. Events, processes and states used in narratives are projected onto a static background (open interval) created by default for each narrative text.

]OPEN INTERVAL OF NARRATION[
    ⊃ ((skids]_eve < [crashes]_eve...)

II. Rules of interaction of aspecto-temporal values in narratives (by pairs of propositions).

1. P_{state} - P_{i+1 state}.

If P_i and P_{i+1} are states, they denote situations whose beginnings and ends (open bounds) coincide:

]----------------[
    ]----------------[

2. P_{state} - P_{i+1 process}.

If P_i is a state, and P_{i+1} - a process value, then the beginning of the static situation precedes the beginning of the process:

]-----------[
    ]-----------[
3. P\textsubscript{state} - P\textsubscript{i+1}event.

If P\textsubscript{i} is a state and P\textsubscript{i+1} - an event, then the closed interval of the event is included in the open interval of the state:

\[
\text{--|--.--|--|--|--.--|--|--|--|--.--|--}
\]
\[
\text{--------|--}
\]

4. P\textsubscript{process} - P\textsubscript{i+1}process.

If P\textsubscript{i} and P\textsubscript{i+1} are processes, then the beginning of P\textsubscript{i} precedes the beginning of P\textsubscript{i+1}.

\[
\text{--|--.--|--|--|--.--|--|--|--|--.--|--}
\]
\[
\text{--------|--}
\]

5. P\textsubscript{process} - P\textsubscript{i+1}event.

If P\textsubscript{i} is a process and P\textsubscript{i+1} - an event, then the interval of the event P\textsubscript{i+1} is included in that of the process P\textsubscript{i}.

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\text{--|--.--|--|--|--.--|--|--|--|--.--|--}
\]
\[
\text{--------|--}
\]

6. P\textsubscript{event} - P\textsubscript{i+1}process.

If P\textsubscript{i} is an event and P\textsubscript{i+1} - a process, then their relation remains partially undetermined. All we can define in this rule is that the beginning of the event P\textsubscript{i} precedes that of the process P\textsubscript{i+1}, and that its end precedes the open right bound of the process. However, the relative positions of the end of the event and the beginning of the process remain unspecified.

\[
\text{--|--.--|--|--|--.--|--|--|--|--.--|--}
\]
\[
\text{--------|--}
\]

7. P\textsubscript{event} - P\textsubscript{i+1}event.

If P\textsubscript{i} and P\textsubscript{i+1} are events, then we can have three configurations of intervals: a) the event of P\textsubscript{i} precedes the event P\textsubscript{i+1}; b) the event of P\textsubscript{i} and the event P\textsubscript{i+1} coincide; c) the event of P\textsubscript{i} includes the event P\textsubscript{i+1}.

\[
\text{--|--.--|--|--|--.--|--|--|--|--.--|--}
\]
\[
\text{--------|--}
\]

The three examples of accident reports presented above illustrate only the first configuration which is usually considered as a default relation between two events in a narrative (Dowty 1986; Lascarides 1990; Moeschler 1993). Since the identification of configurations b) and c) requires additional inference rules in order to capture different discourse relations between two or more events (Asher and Lascarides 1991), we shall not consider them in the present paper.

8. The end of all processes and states coincides with the end of the (open) interval of the narration.

This rule can be applied directly to accident reports as the events in these texts (including the crash) do not necessarily preclude the vehicles from changing their positions after these events - they can keep on moving after the crash. However, the span of a process or a state can be limited by some following event, if it denotes a situation temporally incompatible with the situation expressed by the process or a state. This situation can be illustrated by the following example: *I was driving on National Road 4. A policeman stopped me. He fined me for speeding,* where the act of fining implies that the car was motionless. At this stage of our work, however, we cannot propose a solution to this problem, and we shall limit our analysis to texts for which the rule 8 is applicable.

The above rules will produce the temporal diagrams shown on Figure 2 & Figure 3.

Despite the difference of tensed verb forms (past vs. present), the descriptions provided by Text 1 and Text 2 are very similar. The order of the sentences corresponds to the sequence of events which are projected onto the background introduced by the first sentence. The choice of present tense in Text 2 reflects the speaker's attempt to create an immediate and lifelike image of the story. Due to the diversity of tensed forms, the narrative in past & present can represent the reality by different techniques. The text can follow the events in the past, but it can also introduce break-ups in their
sequence by referring to events preceding, or following the initial focus of narration (Webber 1988).

In order to shift the focus, the narratives in past & present use specific markers which establish a new reference point for the situations in the sentences to follow. The context-exploration rules detect these markers, fix a new reference point and locate the situations expressed in the next sentences with regard to this new reference point. Other markers are then used to resume the initial focus.

Text 3 represents a narrative which contains a back-shift. The present tense used by the speaker establishes the initial reference point of narration. Changing the tense, the speaker shifts (shift 1) the time of reference to a moment prior to this point (Figure 4). Regardless of this shift we can still locate the events in the shift zone within the temporal frame of present tense forms established at the beginning of the narrative and resumed after the shift (shift 2). The above claim is possible due to the information obtained at step 1, namely, the analysed text is a narrative and therefore possesses a unique temporal frame.

5 Semantico-cognitive representation of texts (step 3)

The last step of our approach consists in building the global semantico-cognitive representation of the texts which is based on a) the aspecto-temporal values of each proposition and b) on the meaning of each verbal predicate applied to its arguments.

This representation reflects the dynamic system which underlies the verbalisation of the situations according to the way they are perceived and expressed by the speaker, and interpreted and reconstructed by the listener.

5.1 The motion in language

The fact that no change has been perceived and verbalised does not imply that no change at all has taken place in the physical world. It rather means that this change has not been considered as cognitively relevant and hence not expressed.

In order to describe objects in motion (vehicles) the speaker locates himself within a spatial and temporal frame where the positions of the objects are fixed with regard to their initial, intermediate and final position (which may or may not be achieved). Not all the phases of motion are necessarily considered as equally salient: there are grammatical and lexical operations which show that the motion...
could be described by focalisation on certain (but not all) positions of the objects. In our particular case, we shall study the way the intrinsic meanings of predicates interact with aspec-totemporal information and account for the phases which are cognitively relevant for the text comprehension by the reader.

5.2 Interpretation of the topological bounds
The aspec-totemporal values reflect the different points of view from which situations are perceived (aspectual information) and identify the position of these situations on the time axis of the speaker (temporal information).

The interpretation of the topological bounds becomes a powerful mechanism for spatial and temporal reasoning which allows us to infer which information is considered by the speaker as relevant. If the right bound is open, the event (motion) is perceived as evolving. Due to the open bound, evolving events can imply either situations tending towards their end (keeping to the right), or events where no final point can be anticipated (was driving). This distinction however is made at a later stage of the analysis. If the right bound is closed, the event has either reached its final point or has been interrupted before (crashed). The open left bound denotes a change in the state of the described world.

5.3 The meanings of verbs
The meanings of verbs are expressed by Semantico-Cognitive Schemata (SCS). SCS are formal structures, represented by typed λ-expressions and built on the basis of visual perception. They allow to deal with cognitive problems such as specification of
The SCS can be either static (denoting properties, relations or positions in space & time), or cinematic (denoting motion or change of state) or dynamic (expressing intentional actions implying the use of instruments and bringing about changes in the state of the object). The SCS of motion verbs encodes the transition (rendered by MOUVT primitive) from one situation SIT\textsubscript{1} to another SIT\textsubscript{2}, "salient from the point of view of visual perception".

![Figure 5: SCS of verbs of motion](image)

The spatial relator \(\varepsilon_0\) in combination with the primitives for topological specification (\(\text{in, ex, fr, fe}\)) locates the objects with regard to the interior, exterior, frontier or closure of a site (loc).

Each SCS is mapped to the arguments of the corresponding NPF\textsubscript{i} in order to obtain the semantico-cognitive representation of the proposition. In the global analysis of the text the SCS are completed by specifications of sites obtained from representations of spatial prepositions (Flagel 1997). The information coming from the aspecto-temporal values allows to extract the components of the SCS (for example, SIT\textsubscript{2}) which are considered by the speaker as realised or not. Due to the temporal organisation of the obtained components we can infer the successive positions of the objects in each temporal phase.

In the following section we represent the SCS only of two verbs: ‘arriver’ (arrive) and ‘éviter’ (avoid). The former is a typical verb of motion, and is therefore it is representative for the rest of the motion verbs encountered in our texts. The latter deserves special attention as its SCS encodes a mental state contained in its lexical meaning of the verb.

The SCS of ‘arriver_dans’ (arrive_at) denotes the scope of visibility of \(A\), marked as \(\text{VIS}(A)^2\). It is represented as follows:

![Figure 6: SCS of verb arriver_dans](image)

At SIT\textsubscript{1}, the domain of \(B\) is outside of the scope of visibility of \(A\). At SIT\textsubscript{2} it is inside. We shall consider only the information provided by SIT\textsubscript{2}. As SIT\textsubscript{1} contains information concerning the movement of \(B\) in a scope not visible to \(A\), it will not be relevant for our analysis. On the other hand, SIT\textsubscript{2} is decomposed into two situations: SIT\textsubscript{21} and SIT\textsubscript{22} related by the primitive CONSV which denotes the fact that the movement is not disrupted. Each SIT\textsubscript{21} and SIT\textsubscript{22} are again represented as a spatial and temporal transition between two subsituations (see Figure 5).

The SCS of ‘éviter’ (avoid) is more complex as it contains both a representation of an action and a mental representation. The latter denotes possible events as opposed to real ones.

![Figure 7: Representation of verb éviter](image)

The situations located on the axes of possible events represent "mental states". A anticipates the situation \(\text{crash}(A, B)\) and triggers an action whose goal is to bring about the situation described by \(\text{N(crash}\)

\(2\)Given the fact that the speaker is at the same time one of the agents in the scene, he creates an egocentric description of the events in this scene.
A, B). The SCS of 'éviter' (avoid) encodes precisely this information.

![Figure 8: SCS of verb éviter](image)

The SCS of 'éviter' (avoid) expresses the fact that: a) A imagines (REPRES) the states (crash A, B) and N(cash A, B); b) A anticipates (ANTICIP) the movement between SIT1 and SIT2 which represents the crash between A and B; c) A triggers an action (CHANGT) in order to attain SIT2 which represents the state of "non-crash" between A et B; d) A keeps on moving; e) A controls (CONTR) the change.

5.4 Semantico-cognitive representation of texts

In Figure 9 we visualise five spatial and temporal phases. The information in the upper part of the schema indicates qualitative oriented positions of agents A and B. For example, the notation Loc1(A2) > Loc2(A2) denotes the fact that A, in the temporal phase 2, moves from site Loc1 to site Loc2. According to the context and the representation of the global site (Valliez State(A5,B5)), the transitions between different sites are indicated.
1994), these sites can be instantiated or not. The notation \( \text{loc}_i(B_j) \in_0 \text{VIS}(A_j) \) indicates the scope of visibility of \( A \) during the accident. The \( d_i \) express the qualitative distances separating the vehicles. The lower part of the schema resumes the temporal diagram of the text 1 (Figure 2). The phase 4' shows the construction of a mental representation of the verb éviter which implies an action. As the implied action fails, it is N(SIT\(_2\)) which is realised instead. Hence, it is represented in the phase 5'.

The semantico-cognitive representation of text 2 is build in the same way as that of text 1.

The spatial and temporal phases of text 3 are represented in Figure 10. In phases 1, 2 and 3 \( B \) is out of the scope of visibility of \( A \). That is why the qualitative distance between the two vehicles can be measured only starting from phase 4, that is, from the phase in which \( B \) enters this scope.

The propositions 1 and 2 are assigned the aspecto-temporal value 'event' which implies the realisation of situation SIT\(_2\) in the SCS of verbs skid and crash (see also Figure 5). The realisation of SIT\(_2\) indicates that, as a result of the movement, the object has achieved a new position different from the one in SIT\(_1\). In Figure 10 these new positions are marked by \( \text{loc}_2 \).

The realisation of SIT\(_2\) plays an important role for the representation and the comprehension of the text. As in the phases 1 and 2 \( B \) is out of the scope of the visibility of \( A \), the speaker (\( A \)) is not a witness of the scene, and has to reconstruct it using exclusively the information encoded in \( \text{loc}_2 \).

The state value of the third proposition determines the identical position of \( B \) at every point of the interval: \( \text{loc}_B3 \) in phase 3 is identical to \( \text{loc}_B4 \) in phase 4 and to \( \text{loc}_B5 \) in phase 5. Since static verbs (for example, be) do not express transitions, their SCS contain only one situation. Respectively, the notation indicating the successive spatial positions of \( B \) does not assign them subscripted indices \( \text{loc}_B(B_j) \) vs. \( \text{loc}_C(B_j) \) which are otherwise used to distinguish between qualitatively different phases in the text.

6. Conclusion.

In the present paper we propose an approach for automatic representation of the semantico-cognitive structures of texts, based on linguistic data. In the process of representation two different problems have to be considered: a) the identification of text type; b) the interaction of cognitive representations brought about by grammatical tense and lexical meanings of the verbs containing implicit temporal information. The identification of text types (in our particular case - the narrative) allows us to infer that the text is composed of successive temporal phases. These phases are then identified due to the aspecto-temporal values of propositions. At the last stage of the analysis the intrinsic meanings of the verbs are mapped onto the identified temporal phases in order to build the spatial and temporal phases of the scene relevant for the comprehension of the texts.

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