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A FrameNet lexicon and annotated corpus as DRD resource: Causality in the Asfalda French FrameNet

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1 Introduction

A FrameNet for French has been developed within the Asfalda project [5]. This new freely available resource¹ consists of a set of frames updated with respect to the original FrameNet for English [4] with new, merged or semantically redefined frames, a lexicon and an annotated corpus of written text. The project did not aim at full coverage, so the resource has been developed using a domain-by-domain methodology around 4 notional domains [8]. The causality domain includes 11 frames associated to 332 French lexical units (simple or complex, with POS) giving rise to 3,895 annotated occurrences² in a corpus of French treebanks of 624,187 tokens [13]. I argue here that this resource, while not designed for this purpose, is of interest as a Discourse Relational Device (DRD) resource, at least for this causality domain.

Freely available French corpora of written texts annotated with discourse relations are few. The first-ever resource built is Annodis [10], on which the Explicadis resource dedicated to causality has been built [2, 3]. LexConn, an inventory of 328 discourse connectives [11], is another important DRD resource for French. LexConn serves as a basis for annotating the French Discourse Treebank (FDTB) [6], the only other such corpus I am aware of, in which annotation is still in progress. With such few resources, any addition is worth considering, especially with a corpus already POS-tagged and parsed, something Annodis lacks.

2 Frames and discourse relations, and their associated lexicons

Frames in FrameNet and Asfalda are descriptions of prototypical situations, semantically characterized by their participants (called frame elements) and how these are related. The set of frames is structured by frame-to-frame relations such as inheritance. Frames are associated with triggering lexical units (called frame-evoking elements in FrameNet), and the annotation of such lexical units with a frame requires the annotation of its frame elements occurring in the sentence.

Of course, frames are not discourse relations (DRs), and triggering lexical units cover all sorts of parts of speech. Nevertheless, 6 out of 11 frames of the causality domain in Asfalda (Causation, Evidence, FR-Reason³, FR-Cause_Enunciation, Explaining_the_facts, FR-Contingency-Objective_Influence) are semantically close to DRs and associated to a significant number of DRDs or discourse markers. These 6 frames are also used to describe the semantics of propositional contents and associated to nouns, verbs and adjectives as triggers. Still, lexical units that operate as DRDs can be simply selected through their POS in the lexicon: adverbials, prepositions or conjunctions. A few additional expressions used as DRDs, such as “*suite à*” (*due to*), “*résultant de*” (*resulting from*) or “*résultat*” (*as a result*) were not tagged as prepositions or

¹ <https://sites.google.com/site/anrasfalda/>

² Not all occurrences of the 332 lexical units have been annotated. The annotation of frequent lexical units is limited to 100 occurrences.

³ Frames whose name starts with “FR-” are new or significantly modified frames for Asfalda.

adverbials in the treebank, but the corresponding annotations of nouns and verbs can be manually selected without much effort. This extraction process yields a sub-resource of 6 frames and 81 lexical units with 1,215 annotated occurrences. This is significant, as the Explicadis resource contains 8 DRs with 319 annotated occurrences in which 53 lexical clues (not all of them being discourse markers) appear, and the causal part of LexConn contains 98 lexical units associated with 5 causal DRs.

Two main features of Asfalda (and FrameNet) certainly are weaknesses and would require further annotation efforts to make the extracted part of Asfalda a full DRD resource. First, frames are annotated only through the occurrence of a triggering lexical unit, while it is well-known that many DRs are unmarked in texts, a phenomenon estimated in Explicadis at around 39%. Second, the annotation of “frame elements” or thematic roles, among which we find the two arguments of the DR corresponding to the frame, is done within the sentence in which the trigger appears only. Since DRDs may relate discourse units appearing in different sentences, in many cases, one of the two discourse units is not annotated.⁴

In Asfalda (and FrameNet), there is no distinction in the (rhetorical) order of presentation. This means that each frame, e.g., Causation, is used to annotate the occurrences of discourse markers that would be annotated with two different relations, e.g., Explanation and Result in Explicadis. However, this rhetorical distinction can be directly computed from the corpus annotations, since no causal discourse marker is ambiguous in this respect.

Section 3 will address the semantic specificities of the set of causal frames in Asfalda. Without entering in those details yet, a semantic correspondance can be established between the 6 Asfalda frames selected and Explicadis DRs. Explicadis’s 8 DRs are SDRT’s Explanation and Result [1] plus 6 additional DRs: epistemic Explanation_{ep} and Result_{ep}, inferential Explanation_{inf} and Result_{inf}, and pragmatic (or speech-act) Explanation_{prag} and Result_{prag}.⁵ The annotation of discourse markers with the frame Causation corresponds to either an Explanation or a Result; the frame Evidence corresponds to Explanation_{ep} or Result_{ep}; and the frame FR-Cause_Enunciation to Explanation_{prag} or Result_{prag}. The frames FR-Reason, FR-Cause_Enunciation, Explaining_the_facts, FR-Contingency-Objective_Influence have no exact counterpart in Explicadis (nor in SDRT and LexConn), but their occurrences on discourse markers may be considered as cases of Explanation or Result. On the other hand, Explicadis’s distinction of Explanation_{inf} and Result_{inf} has not been adopted in Asfalda; such cases would be annotated with the frame Evidence, reflecting the fact that inferential DRs are sub-relations of epistemic ones. LexConn uses SDRT’s Explanation, Result, Explanation* and Result*, plus an Evidence relation. Explanation* and Result* can be considered as corresponding to the frames Evidence or FR-Cause_Enunciation, and the DR Evidence to the frame Evidence.

There is a large overlap between the three lexicons; overall, they contain 146 lexical units. Asfalda contains 15 new (with respect to Explicadis and LexConn) lexical units with 115 occurrences, e.g., “*sous l’effet de*” (*as a result of, under the influence of*) and “*au vu de*” (*given*), and 4 more without occurrences. Some differences are accounted by the facts that Explicadis contains some lexical clues that are not discourse markers, and only those appearing in its corpus, and that LexConn considers also lexico-syntactic patterns such as “à + Vinf”. Table 1 shows the merged lexicon, with its distribution and its association with frames or DRs in the three resources. It reveals the polysemy of these lexical units and the variable scope of the frames and DRs in the three resources. Bold is used to signal a lexical unit not already present in Explicadis

⁴ When a frame element is not filled within the sentence, a typology of “null instantiations” was used to flag the frame element, especially “Definite null instantiation” if the frame element is expressed elsewhere in the text. Identifying such elements is required to check the semantics while annotating.

⁵ These 6 new DRs have been introduced and characterized in Explicadis to clarify the confusing uses of SDRT’s Explanation* and Result* in Annodis [2, 3].

and LexConn, or a new meaning on the basis of the correspondances described above. Frame-X means the marker is associated to that Frame in Asfalda albeit with no annotated occurrence (Frame-? when annotation for that lexical unit has not been done yet). O stands for the rhetorical order of the lexical unit: E for Explanation-like, R for Result-like.

Lexical unit	O Frames – Asfalda	Drs - Explicadis	DRs - Lexconn	Lexical unit	O Frames - Asfalda	Drs - Explicadis	DRs - Lexconn
à + Vinf	E			avant	E		
à cause de	E Causation	Explanation		devant	E		
à ce point que	R Causation		Result	donc	R Causation, Evidence	Explanation, Result, Result_ep, Result_inf	Result, Result*
à ce rythme	R	Result_inf		du coup	R Causation, Evidence		Result
à défaut de	E Causation-X		Explanation	du fait de	E Causation, Evidence	Explanation	
à en + Vinf	R		Result	du fait que	E Causation, Evidence-X		Explanation, Explanation*
à force de	E Causation		Explanation	du reste	E		Evidence
à force	R Causation-X		Result	effectivement	E Evidence		Evidence
à l'origine de	R Causation			en + V-ant	E		Explanation
à la suite de quoi	R Causation-X			en ce sens que	E		Explanation*
à la suite de	E Causation	Explanation		en conséquence	R Causation, Evidence		Result
à présent que	E		Explanation*	en effet	E Causation, Evidence, FR_Cause_en	Explanation, Explanation_ep, Explanation_inf	Explanation*
à preuve	E Evidence		Explanation*	en raison de	E Causation, Evidence	Explanation	
à tel point que	R Causation		Result	en témoignage de	E	Explanation	
à telle enseigne que	R		Result	en vertu de	E FR_Reason		
		Result, Result_ep, Result_inf	Result	et	R	Result, Result_ep	
ainsi	R Causation, Evidence-X			et pour cause	E Causation		
alors	R Causation, Evidence	Result	Result, Result*	étant donné que	E Evidence	Explanation_ep	Explanation
après tout	E		Explanation*	étant donné	E Evidence	Explanation_ep, Explanation_inf	
attendu que	E		Explanation	faute de	E Causation	Explanation	Explanation
au motif que	E FR_Reason			grâce à	E Causation	Explanation	
au point de	R Causation		Result	instantanément	R		Result
au point que	R Causation	Result	Result	jusqu'à ce que	R Causation	Result	Result
au prix de	R	Result_ep		jusqu'à	R Causation-X		Result
au vu de	E Evidence, FR_Reason			la preuve	E Evidence-X (preuve.n)		Evidence
aussi	R Causation-X, Evidence	Result_ep	Result	le fait est que	E		Explanation*
aussitôt	R		Result	le temps de	E	Explanation	
aussitôt que	E		Explanation	lorsque	E		Explanation
aut dire que	R		Result	maintenant que	E		Explanation*
autrement dit	R		Result*	même que	E		Evidence
avec	E	Explanation		par	E	Explanation	
avec pour conséquence	R Causation (conséquence.n)	Result		par conséquent	R Causation		Result
bref	R		Result*	par contre	R Causation		
c'est à dire que	E		Explanation*	par exemple	E		Explanation*
c'est dire que	R Evidence-X			par la faute de	E Causation		
c'est pourquoi	R Causation, Evidence	Result, Result_ep	Result	par le fait que	E		Explanation
c'est que	E Evidence-X, Explaining_TF	cf. si ... c'est que		par suite	R Causation		Result
		Explanation, Explanation_ep, Explanation_inf	Explanation*	par voie de conséquence	R Causation		
car	E Causation, Evidence, FR_Cause_en		Explanation*	parce que	E Causation, Evidence	Explanation, Explanation_ep, Explanation_inf	Explanation, Explanation*
cette fois que	E		Explanation*	pendant que	E		Explanation*
comme quoi	R		Result*	pour	E	Explanation	
comme	E Causation, Evidence	Explanation	Explanation*	pour cause de	E Causation		
conclusion (adv)	R Causation-X			pour commencer	E		Explanation
conduisant à	R (conduire.v)	Result		pour conclure	R		Result*
conséquent	R Causation-X		Result	pour (une(des...) raison(s) de	E Causation, Evidence, FR_Reason (raison.n)	Explanation, Explanation_ep	
conséquence de	E Causation (conséquence.n)	Explanation		pour le coup	R		Result*
conséquence (adv)	R Causation			pour preuve	E Evidence		Evidence
considérant que	E		Explanation*	pour résumer	R		Result*
considéré que	E		Explanation	pour	R Causation-X	Result	
d'abord (...ensuite)	E		Explanation	pourquoi	E Causation, Evidence		
d'après	E Evidence			premierement	E		Explanation
d'autant moins que	E Causation-X, Evidence-X			preuve que	R Evidence	Result_ep	Result*
d'autant plus que	E Causation-?, Evidence-?	Explanation	Explanation	puisque	E Evidence, FR_Reason	Explanation, Explanation_ep	Explanation, Explanation*
d'autant que	E Causation-?, Evidence-?	Explanation_ep	Explanation	résultat (adv)	R Causation (résultat.n)	Result	Result
d'ou que	R		Result	résultat de	E Causation (résulter.v)		
d'ou	R Causation, Evidence	Result_inf	Result	sachant que	E		Explanation*
d'un côté (...d'un autre côté)	E		Explanation	selon	E Evidence		
d'une part (...d'autre part)	E		Explanation	si ... c'est que	E cf. c'est que	Explanation	
d'ailleurs	E		Evidence	si bien que	R Causation	Result	Result
dans la mesure où	E Causation, Evidence	Explanation_ep	Explanation*	sinon	R Evidence-X		
dans le coup	R		Result	sitôt que	E		Explanation
dans le sens où	E		Explanation*				
dans le sens que	E		Explanation*	sous l'effet de	E Causation, FR_Cont-Obj_inf		
de	E	Explanation		subséquent	R Causation-X		Result
de ce fait	R Causation, Evidence		Result	suite à	E Causation (suite.n)	Explanation	
de façon que	R Causation-X		Result	sur tout que	E		Explanation
de fait	E Evidence		Explanation*	tant et si bien que	R Causation		Result
de sorte que	R Causation	Result, Result_inf	Result	tant que	R	Result	
de telle façon que	R		Result	tel ... que	R	Result	
de telle manière que	R Causation-X		Result	total (adv)	R		Result
décidément	R		Result*	tout d'abord	E		Explanation
déjà	E	Explanation		vu	E Evidence, FR_Reason-X	Explanation_ep	
depuis	R		Result				
dès lors que	E Evidence		Explanation*	vu que	E Evidence, FR_Reason		Explanation, Explanation*
dès lors	R Causation, Evidence, FR_Cause_en	Result	Result*				
dès que	E	Explanation	Explanation				
des suites de	E Causation (suite.n)	Explanation					

Table 1. Causal discourse markers (or clues) in Asfalda, Explicadis and LexConn, and their associated frames or DRs.

3 Causal frames in Asfalda and their interest for discourse annotation

Beyond Asfalda’s decent size, the specific subset of 6 causal frames in Asfalda makes it an interesting DRD resource despite its annotation limitations.

The well-known content-level (or semantic or subjective) / epistemic-level distinction in the uses of causal discourse markers [9, 12, 7], is not present in Annodis nor in LexConn (except marginally with 6 lexical items associated with the Evidence relation), but has been introduced in Explicadis. It is also present in Berkeley’s FrameNet through the distinction between the Causation and the Evidence frames, a distinction that has been much clarified in the Asfalda project as reflected in the annotation guide.⁶ In addition, FrameNet distinguishes the frame Reason for triggers that are specific to content-level causation links in which the effect is an action or a mental attitude, a frame considered in Asfalda as semantically subsumed by Causation, and for this and other modifications morphed into FR-Reason. FR-Reason is closely related to the “volitional causal” relations of Degand and Pander Maat [7], so one step higher than Causation in their subjectivity scale, while this notion is completely absent from Explicadis and LexConn. Here is an excerpt of the frame FR-Reason in Asfalda, bold signalling the frame elements:

FR-Reason

Definition: A volitional **Agent** is responding to some situation **State_of_Affairs** by performing some **Action** (or holding some mental attitude). Alternatively, an **Actor**, a participant of some implicit **State_of_Affairs** stands in for the **State_of_Affairs**, in other words, an **Actor** volitionally or not pushes an **Agent** to perform some **Action** (or hold some mental attitude).

Distinctions with other frames:

≠ Causation: In Causation the effect can be any sort of situation, not only actions and mental attitudes as in FR-Reason. Note though that FR-Reason is evoked only by those lexical units that have at least one subcategorization in which the **Agent** is subcategorized. Compare:

La crise de 1929 a amené la guerre (The crisis of 1929 brought the war): Causation

La situation a amené le gouvernement à réagir (The situation has prompted the government to react): FR-Reason

≠ Evidence: The main difference is that although volition or cognition is involved in the **Action**, FR-Reason is still a frame for factual objective causation, while Evidence is for epistemic causation or argumentation in which the “state-of-affairs” (cause) is presented as a support for a proposition (effect), which is a less established fact argued to be true. For a thorough examination of this distinction, which can be tricky, see the Evidence/Causation disambiguation guide.

Core Frame Elements:

Action The action that the **Agent** performs in response to a **State_of_Affairs**. This can also be a mental attitude held by the **Agent**.

Actor An entity (not a situation, but not necessarily a sentient) which participates in an implicit **State_of_Affairs** (e.g., the **Actor**’s existence, presence, behaviour or action), perhaps volitionally and perhaps not.

Agent (Semantic Type: Sentient) The person who responds to a **State_of_Affairs** by performing some **Action**.

⁶ http://asfalda.linguist.univ-paris-diderot.fr/documentation/asfalda_guide_desamb_Causation_Evidence.pdf

State_of_Affairs The eventuality that motivates the **Agent**'s performing a particular **Action** in response to it.

Having introduced the new frame FR-Cause_Enunciation, Asfalda also includes a “pragmatic” or “meta-talk” causal frame in which the effect is a speech act, just as Explicadis does (and to some extent LexConn, although mixed up with epistemic causal relations). There are 19 occurrences of this frame, while only 3 Explanation_prag and Result_prag (unmarked) occurrences in Explicadis.

These 4 frames —Causation, Evidence, FR-Reason and FR-Cause_Enunciation— are the major ones able to encode causal DRs in Asfalda. The other 2, Explaining_the_facts and FR-Contingency-Objective_Influence, are only very marginally relevant to discourse; they contribute only with 2 lexical units and 3 occurrences.

The distribution of lexical units on this set of 6 frames in the corpus confirms earlier work on the famous French causal markers *parce que*, *car* and *puisque* (*because*, *since*). In particular, the distinction between Causation and FR-Reason allows to correctly account for the semantics of *puisque* which triggers only Evidence and FR-Reason in Asfalda and, crucially, not Causation. *Puisque* has been repeatedly shown not to be a simple content-level causal marker [9, 7, 14]; nevertheless, the lack of relation dedicated to volitional causation implied that examples (1) and (2) were considered occurrences of Explanation in LexConn and Explicadis respectively. (3) shows the single occurrence of *puisque* annotated with FR-Reason in Asfalda, as most are occurrences annotated with Evidence.

- (1) **Puisqu'**il est mort je veux mourir (Since he is dead I want to die)
- (2) Aujourd'hui, les paléontologues donnent à Homo sapiens un âge d'environ 200 000 ans **puisque** les plus vieux ossements retrouvés sont deux crânes datés de -195 000 ans (Today, paleontologists give Homo sapiens an age of about 200,000 years since the oldest bones found are two skulls dated to 195,000 years ago)
- (3) Les syndicats s'y opposent [à la création d'un statut de cadre dirigeant] **puisque** ils prétendent représenter l'ensemble des employés face au patronat (Trade unions oppose it [the creation of a senior management status] since they claim to represent all employees against employers)

Finally, the occurrences of the frame FR-Cause_Enunciation specific to pragmatic or speech-act level causal links show a phenomenon that, to the best of my knowledge, has not been described previously, except for a brief hypothesis in [3]. Only in few of these 19 occurrences is the effect a standard explicit speech act, e.g., an order, a recommendation or a rhetorical question. The majority are 13 cases of explanation of presupposition where the effect is an **implicit** speech act, the expression of that presupposition. Below are two examples.

- (4) Cette mesure est justifiée par la fin de l'hyperinflation au Mexique. La hausse des prix de détail a **en effet** atteint 12 % seulement cette année, contre plus de 100 % par an à la fin des années 80. (This measure is justified by the end of hyperinflation in Mexico. Indeed, the rise in retail prices reached only 12% this year, compared with over 100% a year in the late 1980s.)
- (5) “Nous avions bon espoir d'obtenir d'elle un prêt-relais pour acheter les matières premières nécessaires au redémarrage de l'activité, **car** dans l'usine, les machines sont arrêtées depuis le 14 janvier dernier” explique le directeur d'EFI Michel Balandier. (“We were hopeful to get a bridge loan to buy the raw materials needed to restart the

production, because in the factory, the machines are stopped since last January 14th” explains EFI’s CEO Michel Balandier.)

In (4), the second sentence including *en effet* (indeed) justifies the presupposition carried by the definite description *la fin de l’hyperinflation* (the hyperinflation ending): the inflation rate is indeed now considerably lower than it used to be. In (5), the proposition introduced by *car* (because) justifies the presupposition carried by the definite description *le redémarrage de l’activité* (production restarting): the production has indeed stopped.

Such examples show that sophisticated annotation tools for DRs should include the possibility to annotate spans that are not standard discourse units but any constituent that may carry a presupposition, as done in Asfalda for these cases. Moreover, one may wonder whether another DR dedicated to presupposition explanation could be necessary.

4 Conclusion

I believe Asfalda has a large potential to study discourse relational devices and their annotation. Beyond the few examples given here, the fact that Asfalda is originally not a DRD resource and includes nouns, verbs and adjectives in its lexicon makes it an excellent tool to study of the fuzzy boundary between causal discourse markers and the expression of a causal link within the propositional content of an elementary discourse unit.

I have here included in the sub-resource extracted from Asfalda prepositions and other constructs taking an event noun as complement, like *à cause de*, *en raison de*, *suite à*, *vu* as discourse markers, like done in Annodis and Explicadis. But this is still controversial and such lexical units are absent from LexConn. Further study of their behaviour in discourse is probably necessary to settle the issue. Because all sorts of parts of speech are annotated with the same set of frames, Asfalda provides an excellent starting point for this.

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