



Discours

Revue de linguistique, psycholinguistique et informatique. A journal of linguistics, psycholinguistics and computational linguistics

4 | 2009

Linearization and Segmentation in Discourse

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Publisher
Laboratoire LATTICE

Electronic version

URL: <http://discours.revues.org/5852>

DOI: 10.4000/discours.5852

ISSN: 1963-1723

Electronic reference

Liesbeth Degand and Anne Catherine Simon, « On identifying basic discourse units in speech: theoretical and empirical issues », *Discours* [Online], 4 | 2009, Online since 30 June 2009, connection on 30 September 2016. URL : <http://discours.revues.org/5852> ; DOI : 10.4000/discours.5852

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On identifying basic discourse units in speech: theoretical and empirical issues

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Abstract:

In spite of its crucial role in discourse segmentation and discourse interpretation, there is no consensus in the literature on what a discourse unit is and how it should be identified. Working with spoken data, we claim that the basic discourse unit (BDU) is a multi-dimensional unit that should be defined in terms of two linguistic criteria: prosody and syntax. In this paper, we explain which criteria are used to perform the prosodic and syntactic segmentation, and how these levels are mapped onto one another. We discuss three types BDUs (one-to-one, syntax-bound, prosody-bound) and open up a number of theoretical issues with respect to their function in discourse interpretation.

Keywords:

basic discourse units, prosodic segmentation, grammatical segmentation, discourse structure

Résumé:

Définir ce qu'est une unité de base du discours et comment l'identifier joue un rôle crucial pour l'interprétation des discours. Pourtant, l'unité de base du discours ne fait l'objet d'aucun consensus dans les modèles existants. À partir de nos recherches sur le français parlé, nous soutenons que l'unité de base du discours (BDU) est multi-dimensionnelle et doit être définie sur la base de critères linguistiques observables relevant de la syntaxe et de la prosodie. Dans cet article, nous expliquons quels critères sont utilisés pour opérer une segmentation syntaxique et une segmentation prosodique de textes oraux, et comment ces niveaux d'annotation sont combinés. Nous présentons et discutons trois types de BDU (congruentes, groupées par la syntaxe, groupées par la prosodie) et soulevons un nombre de problèmes théoriques en rapport avec leur fonction dans l'interprétation des discours.

Mots-clés :

unités de discours, segmentation prosodique, segmentation syntaxique, structure discursive

TEXTE INTEGRAL / FULL TEXT

1. Introduction

- 1 Any model of discourse is in need of identifying its underlying units, the so-called “building blocks” of the discourse structure. Several reasons account for this need. Of course, “[r]esearchers are always pleased when the phenomena they are studying allow them to identify units. Units can be counted and their distributions analyzed, and they can provide handles on things that would otherwise be obscure.” (Chafe, 1994: 58), but more importantly, a “discourse theory must specify how ‘segments’ should be identified in light of the questions the theory is set up to answer.” (Polanyi *et al.*, 2004: 3). In other words, discourse segmentation is not a theory neutral operation. It gives insight in the way we think about discourse. So, while the goal of this contribution is a methodological one aiming to establish a reliable procedure to identify basic discourse units in spoken French from observable linguistic criteria, our methodological choices do of course follow from our conception of discourse. As such, our contribution also proposes to continue the ongoing debate on the nature and status of discourse units (see, Rossari, 1996, Roulet, 2002; Degand, Simon, 2005; Hannay, Kroon 2005; Steen 2005).

2. Basic units and discourse models

- 2 Be it written or spoken, discourse is a complex object. The interpretation of a piece of discourse is supposed to lead to a coherent structure, where every element fulfills a given function (Grosz, Sidner, 1986; Mann, Thompson, 1988; Polanyi, 1988; Roulet *et al.*, 2001). The assumption is that a piece of discourse is built up from smaller “building blocks” related to one another in a coherent way. What these building blocks actually look like differs according to the discourse model at stake¹. On the other hand, it is acknowledged that discourse is sensitive to its conditions of production and interpretation (Koch, Oesterreicher 2001) and to the relations established between the speakers. The assumption is that language is in the first place interactional and contextualized meaning that it “comprises all activities by participants which make relevant, maintain, revise or cancel... any aspect of context which, in turn, is responsible for the interpretation of an utterance in its particular locus of occurrence” (Auer, 1992: 4). We believe that these two conceptions of discourse, although they stem from different theories, are not incompatible. We first turn to a brief presentation of the basic tenets of both of these approaches, and then suggest our own (methodological) definition of discourse units that we believe reconciles the two aforementioned views.

2.1 Discourse as structure

- 3 A first type of approach gives priority to the (semantic) representation of the discourse structure and its organization. According to such approaches (e.g., Rhetorical Structure Theory, The Geneva Discourse Model) each discourse segment has to be related to another one (for instance, by means of a dependency or interdependency relation) to build a coherent whole. A hierarchical macrostructure visualizes the contribution of each part to the whole. In the Geneva Discourse Model (Roulet *et al.*, 2002), for instance, the discourse act, i.e. the minimal unit, is defined as “une étape du processus de négociation sous-jacent à

¹ A number of authors avoid the problem of defining the minimal segments. Mann and Thompson (1988) content themselves with stating that the minimal units are “typically clauses”, and that the same relations can hold between larger spans of text too. Others limit themselves to a (sometimes naïve) working definition in view of (automated) discourse segmentation (for a detailed overview, see Passonneau & Litman 1997: 105-108 and den Ouden 2004: 13-22).

toute interaction” where “chaque acte doit faire l’objet d’un enregistrement en mémoire discursive” (Roulet *et al.*, 2002: 64). When the verbalized information coincides with the end of a syntactic dependency clause, the information becomes available for transfer to the discourse memory (‘mémoire discursive’, see Berrendonner 1993²). This hypothesis provides an operational criterion to identify the discourse act, namely the possible substitution of the segment by a definite anaphoric expression, with verification that the anaphor “points” towards a referent stored in discourse memory. This is illustrated in examples [1-2] (adapted from Roulet, 2002):

[1] j’ai téléphoné à la voisine[i] pour que la brave femme[i] m’achète du thé
I called the neighbor[i] so that the friendly lady[i] would buy me some tea

[2] mon voisin[i] m’a dit qu’il[i] /*le pauvre homme[i] était malade
my neighbor[i] told me that he[i] */the poor man[i] was ill

- 4 In [1] transfer to the discourse memory of the referent “*la voisine*” makes it possible to establish a co-referential link between the two definite expressions (*la voisine* and *la brave femme*). Hence, the sequence is analyzed as containing two discourse acts. In [2], such a co-referential link cannot be established between *mon voisin* and *le pauvre homme*, because transfer to discourse memory has not yet taken place for this segment, which is thus interpreted as a single act. The basic underlying idea is that once an act is completed, cognitive processing can take place. Transfer to discourse memory makes the elements of the processed clause available to enter in relation with the upcoming elements. The eventual hierarchic structure linking all discourse acts together is considered homologous to a semantic representation of the discourse at stake, which in turn modifies or completes a so-called “event model” (à la Van Dijk, 1997).
- 5 It seems then that according to this approach the minimal discourse unit, most often, corresponds to a syntactic clause, since the pointing relations take place between “dependency islands” (*îlots réactionnels*, Berrendonner, 1990). Prosody or punctuation does not play a role in determining the discourse units, a position which is also advocated by Monschau, Kreyer and Mukherjee (2003: 584-585):

In actual speech, the processing of syntactic structures in it-self is largely independent of prosodic information. [...] In our view, it appears to be a truism that prosody, unlike syntax, is not inherently essential to the conveyance of information in human communication.

- 6 This does not mean that these approaches do not consider prosody as a “focusing device”, for instance, which gives information regarding the speakers’ attitudes, etc. but, these dimensions are not believed to be essential to understanding “comment les énoncés sont compris” nor “comment les locuteurs se comprennent mutuellement” (Kerbrat-Orecchioni 2005: 79). In the same line, Roulet (1999) considers the discourse to be a product and the analyst’s task is to uncover its structure as a finalized and interpretable product. Lexis, syntactic structures, and discourse markers play an essential role in accounting for this structure, but the way the discourse has been produced is not considered to be essential.

2.2 Discourse as interaction

- 7 Other approaches put the emphasis on the interactional aspect of discourse and focus on the progressive construction of discourse segments. In this view, phenomena such as self-correction (Schegloff *et al.* 1977), turn-taking (Auer 1996) or increments (Vorreiter 2003; Couper-Kuhlen, Ono, 2007) are not considered as mere side effects of the speech situation and on-line production but form an inherent part of the discourse (see Schegloff 1990, Ochs

² “Mémoire discursive” roughly corresponds to the mutual cognitive environment of the audience and communicator in Sperber & Wilson inferential model (1986).

et al. 1996). Context and temporal organization of speech play a crucial role, not only to interpret deictic expressions in the immediate speech situation, but also because the interpretation is closely linked to the function the discourse is meant to fulfill in a specific context of situation. Hence, “features of talk-in-interaction are structured by their producers, and an orientation to the structure of various features of talk-in-interaction can be seen in the ways participants treat various aspects of talk” (Lerner 1996: 238).

- 8 The structures of talk-in-interaction are (part of) social structures. The main issue of these approaches is that the communicative event monitoring, as well as the social interaction, are part of the discourse:

Language users not only form or update models of events or situations they communicate about, but also of the communicative event in which they participate. (van Dijk, 1997: 192-193)

- 9 Conversational analysis, for instance, defines the turn constructing unit (TCU) as a segment that is sufficiently complete (in terms of syntax, intonation, speech activity, see Selting, 2000; Couper-Kuhlen, 2001) to enable the hearer to interpret it as a possible turn ending, and an opportunity to take the turn (Transition Relevant Place, or TRP). Here, the notion of unit is never taken for granted. The TCU is a unit that is construed progressively, projecting possible endings that are not necessarily made use of. “The TCU is thus a ‘unit’ in conversation which is defined with respect to turn-taking: a potentially complete turn. The TCU is not defined as a linguistic unit.” (Selting, 2000: 478). It could be seen as a borderline unit between grammar and interaction, co-defined by speaker(s) and hearer(s) (Lerner 1996). Ford and Thompson (1996) find that less than half of turn transitions occur at turn endings which have syntactic, prosodic, and pragmatic completeness actually coincide. This means that in the majority of cases a turn transition does occur although the speaker projects syntactic, prosodic, and/or pragmatic continuation.
- 10 Other authors view discourse in the first place as providing information step-by-step. According to Chafe (1994), for instance, every intonation unit activates a new piece of information (in terms of a new focus of attention) and carries one new idea. This was formulated as the “One new idea constraint”, according to which “[c]onversational language appears subject to a constraint that limits an intonation unit to the expression of no more than one new idea” (Chafe, 1994: 119). In this perspective of studying the progressive construal of textual units, or uncovering the efficient and effective presentation of information, major attention has been devoted to intonation arguing that final intonation contour is an indisputable indication of a strong boundary, and that it signals a locus for the cognitive processing of preceding information (Auchlin, Ferrari 1994; Simon 2001).

2.3 Reconciling semantic and interactional dimensions of discourse

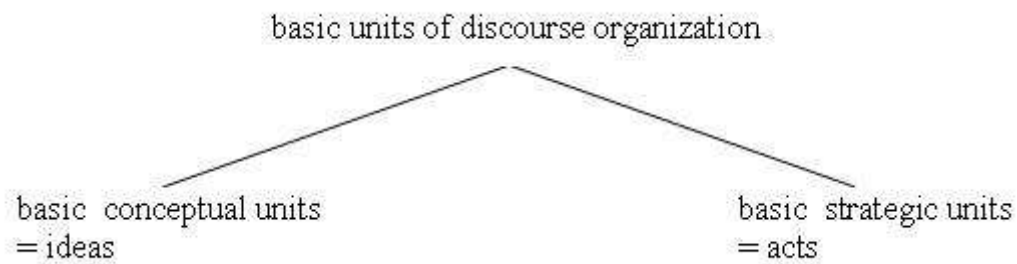
- 11 Our aim here is to define basic discourse units (BDU) viewed as the segments that speakers use to build a representation (interpretation) of the discourse, i.e. a kind of “minimal discourse interpretation segment”. Our starting point is the surface analysis of discourse, in this case the syntactic structures and the prosodic realization. In line with e.g. van Dijk (1997) and Auchlin (1999), we postulate that these surface structures are related to semantic representations, but they crucially depend on a context model³ that is in turn mediated through a text representation (or “text model”, van Dijk, 1997: 196).

³ A context model can be defined as the representation the interlocutors make of the context, the elements they find relevant for the ongoing communication, and that are salient or made salient. “Context models are episodic, personal and hence subjective interpretations and experiences of the communicative event or context (...) [they] are under permanent change.” (van Dijk, 1997: 194).

Discourse representations are gradually being constructed both by speakers/writers as well as their recipients, and are inherent part of the unfolding context, both being influenced by (other) factors of the context as well as influencing or defining that context. That is, both past text as well as planned (or expected) text will thus become part of the context and available for all participants. (van Dijk, 1997: 196-197)

- 12 In producing and processing discourse, meaning is inseparable from whom, where, why, etc. it is communicated. Thus, a “basic discourse unit” is a text segment with linguistic properties which are used to construe both semantic representations (interpretations, inferences) and the text and context models at stake. In our view, this definition frames well with Hannay and Kroon’s (2005) proposal for an alternative classification of discourse units. According to them “discourse planning involves at least two types: conceptual planning and strategic planning” (Hannay, Kroon 2005: 103). On the conceptual level the basic units are ideas that build up a conceptual model (comparable to van Dijk’s (1997) event model). On the strategic level the basic units are (discourse) acts corresponding to the discourse production steps. Thus, an idea may be realized by two strategic acts, in the same way as two (or more) ideas may be involved in one single communicative step. Figure 1 displays the different types of discourse units: the “basic conceptual units” would correspond to semantic representations and the “basic strategic units” would correspond to the observable discourse acts, i.e. information units à la Chafe that punctuate the successive steps of the discourse construction.

Figure 1. Types of discourse units according to Hannay & Kroon (2005: 106)



- 13 On the basis of this classification, Hannay and Kroon hypothesize that “in English, discourse acts are preferably realized by intonation units for the spoken language” (Hannay, Kroon 2005: 107); and furthermore, that “in English oral discourse the strategic discourse organization is more strongly reflected in the prosodic than in the syntactic structure” (*idem*: 108). This suggests that prosody may be a cue for organizing surface discourse structure, rather than for construing conceptual meaning.

2.4. Preliminary conclusion

- 14 Thus far we have raised a number of important issues:
- discourse provides both for “ideas” (semantic content), and for “surface segments” (turns, units...) that are sensitive to the speech context of situation;
 - both syntax and prosody provide linguistic cues that may be used to segment the discourse flow into delineated units;
 - syntactic structures are preferably linked to the conceptual structure of the discourse (Section 2.1): syntactic clauses carry semantic content (ideas, referents, events);

- prosodic structures are preferably linked to the strategic development of discourse (Sections 2.3-2.4): prosodic boundaries correspond to steps in the discourse progression;
 - in defining discourse units, most discourse models give priority either to syntax or to intonation; this leads to an approach that focuses either on discourse as a product (priority to syntax), or on discourse as a process (priority to intonation).
- 15 We believe that there must be an intermediate position giving rise to units of analysis that really do result from the interaction between syntax and intonation and we would like to make a proposal for a definition of basic discourse units that does not give priority to either syntax (semantic orientation) or to prosody (strategic orientation).

3. Combining syntactic and prosodic criteria

- 16 Our method consists in a two-level annotation, in (syntactic) dependency clauses and in (major) prosodic units. The two types of annotation are performed independently, the former on the basis of an orthographic transcription, the latter on the basis of the acoustic signal and a syllable-aligned phonetic string. The basic discourse unit results from coinciding syntactic and prosodic boundaries. Thus, a syntactic clause is not a basic discourse unit if its boundary does not map onto a prosodic boundary. Similarly, if a major intonation unit boundary does not correspond to a syntactic dependency ending, it does not give rise to a basic discourse unit either. In those two non fitting configurations the hearer is awaiting completion (see Selting, 2000). This definition comes close to that of a ‘talk unit’, i.e. “the maximal unit defined by syntax plus intonation” (Halford, 1996: 33, cited by Monschau *et al.*, 2003: 582), be it that a talk unit requires a falling tone to signal completeness on the prosodic channel:

Whenever prosodic and syntactic completeness coincide, the talk unit ends. [...] In a sense, the concept of talk unit boils down to a two-channel model which assumes a succession of self-contained syntagms and units of prosodic completion in speech. It is only when a self-contained syntagm is also prosodically complete that the talk unit is concluded and that a falling tone communicates finality. (Monschau *et al.*, 2003: 583)

- 17 Since this method requires coincidence of two types of boundaries, it doesn’t aim for the most minimal segmentation. The same conclusion applies to our own method. We do not aim to segment the discourse into its smallest units of information flow (e.g. intonation units à la Chafe (1994), or tone units as defined by Halliday (1994)), rather we aim for segments on the basis of which inferential processes can take place. We know since Grice that discourse relations do not hold between text segments, but between inferences drawn from text segments. This is in line with the insight that coherence is a cognitive phenomenon and “that it is not an inherent property of a text under consideration” (Sanders, Spooren, 2007: 919).
- 18 At this stage, we would like to speculate that the basic discourse unit – in view of its syntactic and prosodic completeness – represents the minimal input to the inference process. In other words, a basic discourse unit contains all information necessary to draw the necessary inferences for a coherent interpretation of the text, in the form of a coherent mental representation of this text. If we draw this line of argumentation further, this means that all basic discourse units should be related to one another by coherence relations, which may or may not be cued linguistically. After all, the inferences drawn from these basic discourse units should find their place in the subsequent mental representation of the discourse interpretation process, and “coherence relations are taken to account for the

coherence in readers' cognitive text representation" (Sanders, Spooren, 2007:924; and references cited there). Does this mean that we may not find any coherence relations below the basic discourse unit level? We wouldn't assume so, but we would again speculate that the coherence relations between basic discourse units play a more important role in the global discourse interpretation than those at the level below the basic discourse unit. However, these issues are in need of further empirical and theoretical investigation.

4. Segmentation into syntactic units

- 19 The theoretical basis of our syntactic segmentation procedure is dependency syntax (see Heringer 1993, for an overview). According to this theory, every sentence is viewed as having a coherent syntactic structure. In a sentence unit every element is embedded within (dependency) relations and none remains isolated (Theorem 2 of Tesnière's Dependency Syntax, as reformulated by Heringer 1993). The grammar of (spoken) French has been extensively described in terms of micro- and macro-syntax calling on the basic principles from dependency theory (see, e.g., Blanche-Benveniste 1997; 2002; Blanche-Benveniste *et al.*, 1990; Berrendonner, 1990; 2002; Deulofeu, 2003). Most of these studies are based on the observation that the traditional grammatical sentence is ineffective to account for numerous discourse grammatical phenomena, especially so in spoken discourse. The starting point of the analysis is a verbal micro-syntax in which the verb and its governed complements are central. This analysis leads to a so-called "dependency clause" demonstrating maximal syntactic completeness ("maximalité syntaxique", cf. Berrendonner, 2002: 24) because it has an internal structure built on dependency relations between its parts, and no external relations of the same type. In example [3] all bracketed elements are connected by dependency relations, to use Tesnière's words, *connexions*.

[3] [dans la ville de Tyr] [l'effondrement de trois immeubles] [aurait fait] [au moins cinq victimes civiles] (Valibel, irtZA1r)
'[in the town of Tyr] [the collapse of three buildings] [would have made][at least five civil victims]'

- 20 Deciding on what is and what isn't a dependent element is not an easy task. The operationalization we performed is one of clausal extraction: elements that can be clefted are connected by a dependency relation, if they cannot, they are not (Blanche-Benveniste, 2002). This is illustrated for example [3] in [3a-c].

[3a] [c'est dans la ville de Tyr que] [l'effondrement de trois immeubles] [aurait fait] [au moins cinq victimes civiles]

[3b] [c'est l'effondrement de trois immeubles qui] [aurait fait] [au moins cinq victimes civiles] [dans la ville de Tyr]

[3c] [c'est au moins cinq victimes que] [l'effondrement de trois immeubles] [aurait fait] [dans la ville de Tyr]

- 21 This micro-syntactic analysis is then expanded to the macro-syntactic level which includes so-called 'associés' ('adjuncts') which are not governed by the main verb (hence offering no possibility for clefting), but are semantically or pragmatically linked to the whole dependency clause (in a 'préfixe' or 'postfixe' establishing a pragmatic relationship to the main clause). They have a non-autonomous status in discourse. This is the case for the discourse marker *tu vois* ('you see') in example [4], or the sentence adverbial *franchement* ('frankly') in example [5]. The combination of a dependency clause with such a semantic or pragmatic adjunct leads to an "expanded dependency clause":

[4] [je l'ai pas frappé] [tu vois] (Valibel, blaJV11)
'[I didn't hit him] [you see]'

[5] [franchement] [je vois ma grand-mère] [elle // elle a mal partout]
 ‘[frankly] [I see my grand mother] [she // she feels pains everywhere]’

- 22 The whole grammatical segmentation process is manual (based on a coding scheme⁴ that is being gradually incremented by the coders, Dister *et al.*, 2008). We distinguish verbal dependency clauses, consisting of at least one conjugated verb, from averbal dependency clauses that do not contain any conjugated verb, next to elliptical and incomplete clauses. Example [6] illustrates a sequence of an averbal dependency clause (‘unité de rection averbale’, URA) and a complete dependency clause (‘unité de rection complete’, URC). Further illustration is provided in section 6.

[6] [sécurité routière sur les autoroutes URA]
 [de nouvelles mesures vont être prises dès le premier septembre URC]
 [notamment davantage de contrôles techniques mobiles dans les parkings des autoroutes pour les poids lourds principalement Adjunct]
 ‘[road safety on motorways] [new measures will be taken from the first of September]
 [such as more mobile car safety tests on the motorway car parks for trucks mostly]’

- 23 Input to the segmentation and annotation procedure is the orthographic transcription of the original sound files from the VALIBEL data base (Dister, Simon, 2008). The results appear in a single PRAAT tier (Boersma, Weenink, 2007) so that confrontation with the prosodic segmentation is facilitated.

5. Segmentation into prosodic units

- 24 There has been extensive work on prosodic units in French (see Simon, 2004, for an overview). Phonological approaches claim that intonation mainly depends on syntactic, and hence metric, structure. Syntactic constituents provide a representation of stress groups which may be reorganized according to rules such as eurhythmicity (Di Cristo 1998). A stress group consists of a lexical (stressable) word plus the adjacent clitics that are governed by it (Di Cristo 1998: 196). It forms the locus for the realization of intonation patterns. In this view, prosodic units are hierarchically structured: Tonal Units form the lower level and Intonation Units group them at a higher level of prosodic structure. An Intonation Unit (or Intonation Phrase) “is marked by a major continuation rise or a major final fall” and “by a large final lengthening” (Jun, Fougeron, 2000: 220).
- 25 On the other hand, phonetic approaches to prosodic units try to segment the speech flow using acoustic correlates of boundaries. Segmentation may rely on silent pauses (Campioni, 2001, Candea, 2000), fundamental frequency (Hermes, 2006, Mertens, 2004, Hirst, Espesser, 1993), syllable lengthening, etc. Although it may be tempting to segment speech using the acoustic signal only, it is nevertheless impossible to completely exclude information about linguistic structure, such as syllable, word or phrase boundaries. Furthermore, prosodic cues interact in such a way that it is impossible to carry out segmentation on the basis of one parameter only.
- 26 Our approach is hybrid in the sense that it combines linguistic information (semi-automatic annotation of syllables and silent pauses) with a mix of acoustic correlates of prosodic boundaries. The resulting unit of this procedure is close to the *période intonative* defined by Lacheret-Dujour & Victorri (2002) and automated within the ANALOR software.

5.1 Principles of the segmentation procedure

- 27 It is widely acknowledged that prosodic boundaries are signaled by a combination of rhythm and intonation cues. Subsequently, our segmentation procedure relies on acoustic

⁴ The coding scheme is available online at URL: <http://www.uclouvain.be/valibel>

parameters and we attach equal importance to intonation contour, final lengthening and final pause. Before turning to our segmentation procedure proper, a number of our assumptions concerning French intonation have to be commented on:

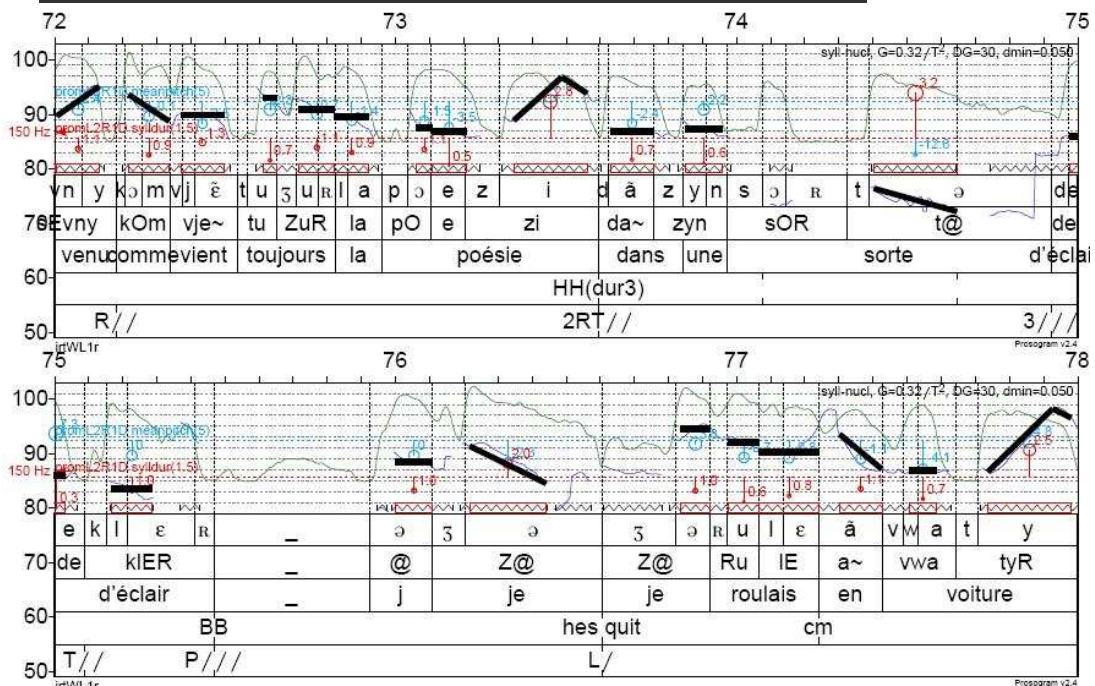
- in French, the final syllable of a lexical word is the only possible locus of a final prosodic boundary (Mertens 1993, Di Cristo 1998: 198). Consequently, lengthening, F0 movement and subsequent pause have been computed for each syllable in word final position;
- prosodic segmentation can be carried out independently from the syntactic constituent structure;
- hesitation markers, such as “euh” in French or extra-lengthening of the final syllable of a grammatical word prevent from perceiving a prosodic boundary (see Lacheret-Dujour & Victorri 2002: 63, Candea 2000: 146, for a similar view)

28 We designed a 3-level prosodic segmentation procedure for major, intermediate, and minor prosodic units (see Simon, Mertens & Degand in prep. for a detailed presentation of the procedure, and evaluation of results). Within the framework of this contribution we will limit ourselves to the rules for identifying major prosodic units. The rules are as follows:

- 1. Do not assign a boundary to a final syllable when the syllable marks a hesitation.
- 2. Assign a major boundary to a final syllable: when syllable duration prominence > 3 (i.e. 3 times as long as the context mean); or, when this syllable is followed by a pause ≥ 200 ms; or, when the intra-syllabic pitch rise ≥ 4 semi-tones (ST) and the syllable mean pitch prominence ≥ 5 ST (i.e. 5 ST higher than the context mean).

29 These rules have been poured into scripts in PRAAT so that segmentation may be carried out semi-automatically (see Simon *et al.*, in prep.).

30 For our present purposes of identifying basic discourse units, there is no need to perform a detailed analysis of the internal structure of the Major Prosodic Units, nor of the additional meaning of the boundary tones (emphasis, implication, list, etc.). The fact that Major Prosodic Units show a different behavior according to their rising, level or falling tone ending is not relevant either. In other words, we focus on their segmentation function only. Figure 2 displays a prosogram (Mertens, 2004) representing the perceived pitch on each syllable (thick black lines). For each syllabic nucleus (the most intense and stable part of the syllable, Mertens 2004), the parameters of lengthening, subsequent pause, mean pitch prominence, and pitch rise are calculated. As soon as a parameter reaches one of the abovementioned thresholds, a boundary is assigned to the syllable. The detection is then validated manually by suppressing those boundaries that do not correspond to the final syllable of a lexical word.

Figure 2: Prosogram plus manual and automatic detection of boundaries

Analyze of the excerpt « c'est venu comme vient toujours la poésie dans une sorte d'éclair j/ je roulais en voiture », with 3 major intonation units (vertical lines). The first three tiers provide segmentation into phones, syllables and words. Tier number 4 provides the manual segmentation and tier 5 the automatic segmentation.

- 31 In this six seconds long fragment, three Major Prosodic Boundaries have been detected by the algorithm.

[7] c'est venu comme vient toujours la poésie /// (a) dans une sorte /// (b) d'éclair /// (c) 'it arose like poetry always arouses /// in a kind ///of lightning'

- 32 The first boundary (a) is caused by the combination of a sharp rising movement on the last syllable of *poésie* with a pitch prominence. The second boundary on *sorte* (b) has been manually suppressed because it corresponds to a hesitation induced lengthening. The last boundary (c) has been detected because of a subsequent silent pause longer than 200 ms. In ongoing work, we apply a more refined algorithm that indicates the boundary degree by computing the relative weight of the silent pause, final vowel duration and F0 movement.
- 33 The final step of the prosodic segmentation process is to include the results of this segmentation into a PRAAT tier (Boersma, Weenink, 2007), which will thus appear in parallel to the grammatical annotation tier (see section 4). Note that by proceeding as such, we adopt a very linear approach to discourse, in contrast to more hierarchized approaches. We consequently do not pay attention to more “global” phenomena, such as intonation reset (Couper-Kuhlen, 2001) or rhythmic organization (Auer *et al.*, 1999; Simon, Grobet, 2005), although these undoubtedly play a role in discourse organization.

6. Basic discourse units

- 34 The mapping of Syntactic Dependency Clauses and Major Intonation Units yields three types of Basic Discourse Units, which all fulfill our requirement of having prosodic ending and syntactic closure coincide. The three types are as follows:

- Type 1: one syntactic dependency clause corresponds to one major intonation unit;

- Type 2: one syntactic dependency clause corresponds to two or more major intonation units;
- Type 3: two or more syntactic dependency clauses correspond to one major intonation unit.

35 We first give the details of the mapping procedure through an illustrative example and then proceed to the description of the different basic discourse unit types.

6.1. An example

36 Example [8] illustrates the mapping procedure. On a syntactic level, it comprises seven dependency clauses (unités de réction complètes, URC) and five “discourse markers” (DM).

[8] mais (DM)
 ‘but’
 c’est + c’est + c’est venu comme vient toujours la poésie + dans une sorte d’éclair
 (URC)
 ‘it + it + it arose like poetry always arouses + in a kind of lightning’
 je + je roulais en voiture sur l’autoroute de Bruxelles à Charleroi (URC)
 ‘I + I drove in my car on the motorway from Brussels to Charleroi’
 et (DM)
 ‘and’
 je me + je me suis sentie euh dans un état heureux euh + plus qu’heureux euh (URC)
 ‘I + I felt er in a happy state er + more than happy’
 pourtant (DM)
 ‘yet’
 j’ai pas eu de poème en tête au moment même (URC)
 ‘I didn’t have a poem in the head at that same moment’
 mais (DM)
 ‘but’
 vous savez (URC)
 ‘you know’
 ça arrive parfois qu’on se sente tout à coup (plein de) dans une sorte de béatitude
 (URC)
 ‘it sometimes happen that one suddenly feels (full of) in a kind of beatitude’
 et (DM)
 ‘and’
 j’ai pensé à ce moment à + à l’expérience de Pascal (URC)
 ‘I thought at that moment of + of the experience of Pascal’

37 Within the process of syntactic segmentation, discourse markers (including connectives) are given the status of “non dependent” elements, since they do not complement any verb or noun. The so-called *empilements paradigmatiques* (repetitions or enumerations, Blanche-Benveniste *et al.*, 1990) are grouped within the same unit (with the sign +). Finally, when the speaker leaves an unfinished structure, this is put into brackets. Each line in example [8] corresponds to one separate unit resulting from the syntactic analysis.

38 The prosodic segmentation of the same excerpt, in [9], produces nine Major Prosodic Units (marked by ///). Hesitations (tagged with an ‘h’) do not give rise to a separate Prosodic Unit.

[9] mais (h) c’est c’est c’est venu comme vient toujours la poésie ///
 dans une sorte d’éclair ///
 je (h) je roulais en voiture /// sur l’autoroute de Bruxelles à Charleroi ///
 et ///
 je me (h) je me suis sentie euh (h) dans un état heureux ///

euh (h) plus qu'heureux euh (h) ///
 pourtant // j'ai pas eu de poème en tête au moment même mais ///
 vous savez ça arrive parfois qu'on se sente tout à coup (plein de) dans une sorte de
 béatitude ///
 et (h) j'ai pensé à ce moment ///
 à (h) à l'expérience de Pascal ///

- 39 As mentioned before, basic discourse unit segmentation occurs when the end of a syntactic unit coincides with a major prosodic boundary. The great advantage of this method is that it leads to an easy identification of the BDU. Table 1 gives the seven Basic Discourse Units in our excerpt.

Table 1: Basic discourse units in text sample

1	mais c'est c'est c'est venu comme vient toujours la poésie /// dans une sorte d'éclair
2	je je roulais en voiture /// sur l'autoroute de Bruxelles à Charleroi ///
3	et ///
4	je me je me suis sentie euh dans un état heureux /// euh plus qu'heureux euh ///
5	Pourtant // j'ai pas eu de poème en tête au moment même mais ///
6	vous savez ça arrive parfois qu'on se sente tout à coup (plein de) dans une sorte de béatitude ///
7	et j'ai pensé à ce moment ///à à l'expérience de Pascal ///

- 40 Six out of seven basic discourse units include at least one syntactic unit governed by a verb. The third basic unit consists of one “discourse marker” with prosodic autonomy. Thus, we may have different types of basic discourse units which will be developed further in the following section.

6.2. Types of basic discourse units

- 41 So far we developed a method of analysis that produces basic units out of the flow of spoken speech. The example commented on illustrates how different those basic discourse units can be. Some are very short (‘et’) and others are quite complex, either because they contain more than one syntactic clause (‘vous savez ça arrive parfois qu'on se sente tout à coup plein de dans une sorte de béatitude ///’) or because they have been uttered incrementally (‘je me je me suis sentie euh dans un état heureux /// euh plus qu'heureux euh ///’). A first classification of our basic discourse units rests on their syntactic and prosodic shaping, leading to the aforementioned three types:

- Type 1 is the “one-to-one” BDU: a basic discourse unit with congruent mapping between syntax and prosody, in the sense that each syntactic unit ((expanded) dependency clause or discourse marker, or adjunct) realizes one major prosodic unit (example 10).
- Type 2 is the “syntax-bound” BDU: a basic discourse unit uttered in such a way that the speaker pronounces one dependency unit into successive prosodic units (example 11).
- Type 3 is the “prosody-bound” BDU: a basic discourse unit uttered in such a way that the speaker groups two or more syntactic dependency units (or adjuncts) into one major prosodic unit (example 12).

[10] c'est le titre d'un d'un assez long poème ///
'it's the title of a fairly long poem ///

[11] et il a conservé ce billet /// dans la doublure de son vêtement ///
'and he has kept this note /// in the lining of his cloth ///

[12] on s'est empoignés on s'est poussés puis je dis dégage d'ici ///
'we grabbed at one another we pushed and then I say get out of here ///

- 42 A complementary classification of basic discourse units could be drawn on semantic criteria. When distinguishing between substantive, regulatory and fragmentary units, Chafe (1994: 63) rests on the semantic content and function of Intonation Units. Fragmentary units are truncated and they are left undiscussed by Chafe (but see, Apotheloz, Zay, 1999 for a discussion of the function of truncated units). Substantive units “convey substantive ideas of events, states, or referents” while regulatory units fulfill a function “of regulating interaction or information flow” (Chafe, 1994, 63), e.g., by regulating the development of the discourse at the textual level (‘and then’, ‘well’), regulating turn taking between interactants (‘mhm’, ‘you know’), expressing the speaker’s mental processes (‘oh’, ‘let me see’), or validating the information being conveyed (‘maybe’, ‘I think’) (Chafe, 1994: 64). Of course, these different functions have been established for intonation units, but we believe that the same kind of classification may apply to our BDUs. A similar approach to syntax-prosody mapping has been proposed by Lacheret-Dujour and Victorri.

“Nous parlons de ‘condensation’ pour designer les constructions qui intègrent dans une seule et même période intonative plusieurs phrases syntaxiques. Nous appelons ‘dislocation’ le cas opposé où une phrase syntaxique est segmentée en plusieurs périodes” (2002, 64).

6.3 An exploratory study

- 43 So far, we restricted ourselves to consider different types of BDUs on the basis of their prosodic and syntactic shaping. We expect that these different types fulfill different functional roles in the construction of the ongoing discourse, especially in terms of information management and activity type.
- 44 In an exploratory study (Degand, Simon, 2008) we analyzed the three mapping strategies in three different types of discourse: read-aloud speech from radio news; semi-prepared speech from broadcasted interviews; informal unprepared speech from everyday conversations⁵. Table 2 clearly demonstrates the divergent distribution of the mapping strategies over the three samples ($X^2 = 18.77$ (df = 4), $p < 0.001$). These divergences are due to the unequal distribution of the syntax-bound and the prosody-bound patterns. Radio news and interview very regularly have recourse to ‘syntax-binding’, which hardly ever occurs in conversation. The opposite is true for ‘prosody-binding’, a pattern occurring in close to 50% of the cases in conversation, and a lot less frequently in the two other genres. Strikingly, the one-to-one mapping does not seem to be influenced by genre, displaying a homogeneous distribution of approximately one third of the cases in each of the three samples.

⁵ Our data stem from the VALIBEL database (for more information, see <http://www.uclouvain.be/valibel>).

Table 2: Distribution of mapping strategies in three genres based on data from Degand and Simon (2008)

	Radio news	Interview	Conversat.	Total
One-to-one BDU	17 (33.3%)	18 (35.3%)	18 (35.3%)	53 (34.6%)
Syntax-bound BDU	20 (39.2%)	20 (39.2%)	3 (5.9%)	43 (28.1%)
Prosody-bound BDU	14 (27.5%)	12 (23.5%)	3 (47%)	24 (32.7%)
Truncated BDU	0	1 (2%)	6 (11.8%)	7 (4.6%)
Total	51	51	51	153

- 45 On the basis of these first results, we could conclude that these mappings are bound to the degree of formality and planning of each “genre” (see also Simon *et al.*, in press). Yet, a more interesting issue would be to consider whether these mappings correspond to genuine discourse strategies.
- 46 In terms of information management prosody-bound basic units may serve to indicate that a complex stretch of discourse is to be considered as one and only one segment of interpretation (see example 12, above). The latter case is intuitively easy to understand. In spontaneous conversation in particular, speakers deliver information in one go when they get carried away by their story, or when “there is no need in the language producer’s estimation for the addressee to process this information independently” (Hannay, Kroon, 2005: 110). Another reason could be that the speaker does not want to get interrupted. In this sense prosody-binding could be considered as a (prosodic) turn-holding device (Selting, 2000). This, however, needs further investigation.
- 47 With respect to the syntax-bound discourse units we suggest that they are mainly used for activating or reactivating a topic. This is especially the case of left-dislocated elements which Hannay and Kroon interpret as a specific type of discourse act they call “launching”. The objective is “to give preliminary notice of what the focus of interest is going to be.” (2005: 111). The authors classify this type of discourse act as a regulatory act. This use is related to the management of activity types or footing (Goffman, 1981). We thus expect that syntax-bound BDUs may be used for cueing a change in activity and opening a new activity sequence (see Simon, Grobet, 2005, for examples).
- 48 Other reasons to use syntax-bound BDUs include information management or information focus. In example [11] above, the speaker prefers to deliver her message in two separated intonation units corresponding to two different information units. The first segment of the clause is uttered about ‘he’, while the second segment of the same clause is uttered about the fact of keeping a note. That is, the prosodically dislocated clause introduces two different topics. Brazil (1995, cited in Hannay, Kroon 2005) proposes a similar interpretation in informational terms, appealing to a distinction between two kinds of aboutness. In [13] it is information focus that is at play. The dislocated segment is emphasized, an emphasis which is reinforced syntactically by repetition.
- [13] si vous pouvez / toucher au moins toucher
‘if you can / touch at least touch’
- 49 Systematic analysis of the different types of BDUs should give further evidence of the interactions between discourse type, discourse units, and discourse structure.

Conclusion

- 50 In this contribution, we have tackled the question of basic discourse units in spoken language. A first aim was to discuss the methodological principles underlying our procedure for reliable identification of such units in spoken French. The method relies on observable surface criteria, i.e. syntactic structure and prosody.
- 51 The mapping of syntactic dependency clauses, on the one hand, and major prosodic units on the other hand, results in basic discourse units. Those basic units are self-contained segments. They allow the hearer to start drawing inferences and seeking for coherence relations between segments of discourse.
- 52 Furthermore, we claim that basic discourse units are of different types, and are motivated by the different functions they fulfill with respect to the discourse information and activity management. Further investigation is needed in order to understand how different types of basic discourse units (one-to-one, syntax-bound, and prosody-bound) contribute specifically to discourse interpretation.
- 53 Directions for further investigation can be found in a more complex view of the discourse interpretation process (van Dijk 1997, 192-193; Gumperz, 1997). Basic discourse units, according to their shape and semantic content, are susceptible to contribute either to the update of events models or to the management of context, and even text, models. That is, a number of discourse segments do not update the mental representation under construction but play a role on the level of textual and interactional management. As a consequence, not every basic discourse unit plays a role in updating the mental representation. Further investigation should provide criteria making explicit the categorization of BDUs according to the role they play in discourse interpretation.

Acknowledgements: The first author is research associate at the Belgian Science Foundation (FRS-FNRS). This research was supported by FRFC grant nr. 2.4523.07 from the Communauté française de Belgique. We sincerely thank Mike Hannay (VU Amsterdam), Bernard Victorri (LaTTiCe, Paris), Sylvain Kahane (Paris 10, Nanterre) and Cathrine Fabricius-Hansen (Oslo University) for very useful and constructive comments on an earlier version of this paper. Finally, we should like to thank Jennifer Thewissen (Université catholique de Louvain) for revising the English of parts of this article.

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To quote this paper :

e-reference: **Liesbeth Degand and Anne Catherine Simon**, On identifying basic discourse units in speech: theoretical and empirical issues, *Discours*, 4 | 2009, [En ligne], mis en ligne le 30 juin 2009. URL : <http://discours.revues.org/index5852.html>.