Representational layering in Functional Discourse Grammar

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REPRESENTATIONAL LAYERING IN FUNCTIONAL DISCOURSE GRAMMAR

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▪ ABSTRACT: The paper addresses the internal structure of layers at the Representational level in Functional Discourse Grammar (FDG), and proposes three adaptations of the representation of frames with respect to what is now standing practice (HENGEVELD; MACKENZIE, 2006; Forthcoming). Our main concern is a reappraisal of Dik's (1989, 1997) original argumentation for the endocentric use of argument variables within restrictors of terms, which we argue are fundamental to FDG theory and should be generalised over all representational layers. Based on this view, we propose a transparent usage of square brackets, which embrace equipollent configurations of which the argument variable is part. This in turn reveals problems in the representation of the nuclear event description – the verb and its arguments – as an identifiable entity, which is an old problem in FG, as well as in the representation of reference modification. As a unified solution, we invoke exocentric layers to account for the special structural properties of these units. The result is a more consistent and transparent structure of representational frames in FDG.

▪ KEYWORDS: Representational level; Functional Discourse Grammar formalism; restriction; predication.

1 Introduction: Layered structure in FDG

In recent years, the Theory of Functional Grammar (DIK, 1978; 1987, 1997) has been thoroughly revised so to be able to describe discourse in terms of the interaction between pragmatic, semantic, morpho-syntactic and phonological modules. In its overall conception, Functional Grammar (FG) was designed so that pragmatic considerations take precedence over semantic ones, which again come before morphosyntactic and phonological encoding. However, in FG pragmatic, semantic and syntactic aspects of a linguistic form were all described

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in a single representational structure. This meant that for instance denotational aspects and aspects of use had to be accounted for in a single representation, which obscured the different possible uses to which particular denotations may be put. In Functional Discourse Grammar (HENGEVELD; MACKENZIE, 2006; Forthcoming), these different mapping possibilities are now accounted for as the interaction between modules. The result is that the outer layers of FG's Underlying Clause Structure are relocated at the pragmatically driven interpersonal level.

The formal representations (HENGEVELD; MACKENZIE, 2006) have, however, remained faithful to the LAYERED STRUCTURE OF THE CLAUSE (henceforth LSC).[3] First put forward in Hengeveld (1989) and incorporated into FG (DIK, 1997), this algorithm proposes the following unified analysis for all layers (HENGEVELD; MACKENZIE, 2006, p.671):

(1) $(\pi\ \alpha_1$: [(complex) head] (α_1): $\sigma\ (\alpha_1))_\varphi$

In what follows, we will concentrate exclusively on the representational level, but this algorithm is used also to form interpersonal units of different detail and complexity.

It is important to realise that, in order to do so, the LSC relies on two fundamentally different structural configurations in which the constituent elements that determine the denotation of the overall layer can be combined: HIERARCHICAL and EQUIPOLLENT configurations. Although implicit in earlier FG, in FDG they are formally characterised for the first time. In section 2 below we discuss these configurations in detail, since their characterisation has consequences for the way the underlying representations are formalised.

Functional Discourse Grammar has also remained faithful to the way restrictors are represented in terms of open predications. In the earliest FG, restriction was limited to the denotation of individuals, but in FDG this has been generalised to all entity types. The algorithm in (1) shows α_1 is described in terms of one or more predications in which it is the argument of the predicate that further specifies its identity. However, the entity variable in these open predications has over time lost much of its status as an argument of a predicate. Arguments to drop the variable for principled reasons did not make it into the recent proposals for an FDG, but in actual use the variable is often reduced to a scope marker rather than an argument.

In this paper we address the status of this 'closing variable' in an attempt to come to a more consistent representation of denotational content in FDG. This

3 The LSC was designed specifically for the Underlying Clause Structure in FG, which was predominantly oriented towards representational semantics. In FDG, the same algorithm is used to derive structures at the interpersonal level (and arguably, the morphosyntactic level) as well.

involves a reassessment of the use of brackets, a reconsideration of the status of the nuclear predication as well as the modification possibilities of properties, and the formalisation of exocentric in addition to endocentric layers in FDG.

2 Hierarchical and equipollent configurations

The defining characteristic of hierarchical configurations is that their constituent elements together form a single LAYER, i.e. a structure to which integral reference can be made.[4] It is hierarchical in the sense that when reference is made to this single layer, the denotations of all constituent elements are by necessity included. Layers are delineated by round brackets ( ) in the representations.

The most important hierarchical operation employed in the LSC is RESTRICTION, represented by the colon (:). Restriction is used to obtain a sufficient degree of identifiability for an ENTITY ($_i$) of a certain TYPE (α).[5] The type-tagged entity α_i can be conceived of as having at the outset a heavily underspecified inherent denotation, i.e. as defining a large set of potential denotations. This set would normally be too large to be useful in successfully identifying a referent, and therefore it is typically restricted through the specification of additional features of the entity.[6] Restriction then results in a subset of entities that have all the properties specified by the superset, enriched with the property that defines the subset. Thus, while the extension of a hierarchical configuration decreases, its denotation increases. This procedure can be applied recursively, so that sub-subsets, sub-sub-subsets etc. are formed. The constructs declaring subsets are called restrictors, the internal constitution of which is discussed in section 5.

The primary restrictor is generally considered to be of special importance. It typically determines the entity type and it also brings about the largest degree of restriction (JESPERSEN, 1924, p.108). In the LSC, it is called the HEAD. Non-primary restrictors, which subsequently serve to define further subsets, are called

4 Referentiality as we use it here is not the same as a Subact of Reference, which is an interpersonal decision by a speaker to evoke a certain piece of denotation to a certain end. Rather, one could say that (representational) referentiality, i.e. the 'declaration' of a denotational element, is a prerequisite for (interpersonal) reference.

5 The subscript may also be taken as an index pointing to an address in the contextual component. Whether the address and the entity that occupies the address should be distinguished or not is beyond the present discussion. What is important to us is that the one-letter variable denotes essential ontological and configurational properties of entities or classes of entities, rather than the entities themselves.

6 An alternative way of making denotations more specific is the use of an OPERATOR (π) designating non-relational, auxiliary features of the entity (typically, semantic dimensions such as number, mood, aspect etc.). Operators will not be considered in this paper.

MODIFIERS (σ). It should be stressed that, configurationally speaking, heads and modifiers are identical; they have the exact same relationship with their immediate superset. The relation of restriction is represented by the colon. A paraphrase of the general structure of layers in FDG as given in (1) is then 'an entity 1 of type α, such that HEAD applies to it, such that MODIFIER applies to it'. Restrictors can either consist of lexical nuclei taken from the fund, or of other representational entities, commanding their own layers with their own internal complexity. This latter mechanism of layers-inside-layers ensures that recursion has its place in the model as in (2) (HENGEVELD; MACKENZIE, 2006, p.674):

(2) $(1\ x_i{:}\ (f_i{:}boy_N\ (f_i)_\varphi)\ (x_i)_\varphi)$
'a boy'

In (2), one specific entity i of type x is denoted, restricted by another entity i of type f, the property *boy*; the overall representation can be paraphrased as 'one entity i of type x, such that an entity i of type f, such that *boy* applies to f_i and f_i applies to x_i'.

It should be noted that layers do not necessarily denote mental extensions (i.e., 'mental images'); rather, their key function is that they serve as phoric domains. That is, it is conceivable that a speaker wants to refer to something mentioned earlier that does not correspond to a 'mental image'; in fact, this happens regularly at the interpersonal, morphosyntactic and phonological levels, as demonstrated in (3):

(3) <u>That</u>'s not how you pronounce 'orangutan'

In (3), the anaphor *that* does not refer to the entity denoted, nor to the referential Subact used to evoke it, but to the phonological form used in the original speaker's expression. The phoric domain in this case hence has no denotation, but is a layer at the phonological level.

While hierarchical configurations form a single layer, this does not exclude the possibility of making reference to its constituent layers in turn. This is demonstrated in (4); the phoric elements used may be different for layers in different positions in the LSC:[7]

[7] Sources of the examples, all on 4 July and 1 October 2007:
- http://news.bbc.co.uk/1/hi/world/africa/988265.stm
- http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B7GWS-4KPX95P-H&_user=496085&_coverDate=01%2F31%2F2007&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000024218&_version=1&_urlVersion=0&_userid=496085&md5=0e4201be0cadff9ed7ad38ca459fe60e
- http://harmjobinhetwild.blogspot.com/2007_04_01_archive.html

(4) a. The car that runs on air.

b. This reduction is much larger in the rich flame than in the lean one.

c. Het is nog niet bekend hoe de slachtoffers, een onbekend gebleven man en dito vrouw, om het leven zijn gekomen.

'It is yet unknown how the victims, an unidentified$_i$ man and $Ø_i$ woman, perished.'

The anaphor *that* in (4a) refers to the individual (x) *car*, in (4b), the anaphor *one* does not refer to the individual *flame* (indeed there are different flames at stake here), but to the property (f) that is ascribed to this individual as its primary restrictor; in (4c) likewise reference is to a property, but now the anaphor *dito* 'ditto' refers to the non-primary restrictor *onbekend gebleven* 'unidentified'.

Layers are also scope domains, i.e. operators and modifiers have scope over a particular layer in the representation, including all its constituent elements. In this way, the layers account for the differences in scope of modifiers such as *beaming* and *terribly* in (5a-b):

(5) a. A beaming, friendly priest

b. A terribly friendly priest

In (5a) the modifier *beaming* restricts the individual (x) on a par with the other modifier, *friendly* and the head *priest*, while *terribly* in (5b) scopes over the property (f) *friendly* only. In other words, the first example describes an individual that is 'priest', 'friendly' and 'beaming', while the second describes an individual that is 'priest' and 'terribly friendly'. To account for the nesting of restrictors both the individual and the modifying properties must form layers by themselves.

When units are combined non-hierarchically, no scope domains are formed and reference is not possible to the configuration as a whole. Hengeveld and Mackenzie (Forthcoming) call these configurations of elements of equal importance EQUIPOLLENT, and square brackets are used to represent them. The prototypical example of an equipollent configuration is formed by the predicate and its arguments, as in (6), from Hengeveld and Mackenzie (2006, p.674):[8]

(6) (Past e_i: [(f_i: $read_V$ (f_i)) (1 x_i: — boy_N —$)_{Ag}$ (1 x_j: — $book_N$ —$)_{Pat}$] (e_i))

'the boy read the book'

What (6) denotes is a past entity i of type e, restricted by the equipollent configuration of f_i, acting on x_i and x_j. These latter three units, however, do not stand in a mutual relationship of restriction, nor are they otherwise in each

8 Hyphens are conventionally used to indicate the omission of further internal complexity; x_i and x_j in (6) have the same internal structure as x_i in (2).

other's scope. Rather, they interact 'horizontally', in such a way that their compositional semantics is richer than the mere sum of the constituent layers, because an interaction takes place between them.

Within the class of equipollent configurations, one further subdivision will be made between PREDICATIONAL configurations of the format $[(\alpha_i)\ (\alpha_j)_{\varphi}]$, and JUXTAPOSITIONAL configurations of the format $[(\alpha_i)\ (\alpha_j)]$. As these abstractions make clear, the constituent units in a juxtapositional configuration are just equipollent, with no explicit interaction being specified. Predicational configurations, of which (6) is an example, consist of a unit with a relational denotation, binding a number of other units as its arguments. These arguments are marked for their FUNCTION in the interaction (φ), or more precisely, the quality of their relation with the predicate. In many cases, this function will require no specific qualification and can hence be 'zero' (represented as Ø). Note that we use 'predicate', 'predication', 'argument' and the like as *configurational* notions in this paper, i.e. referring to structural relations between units in a representation. The *representational* construct usually referred to as the (nuclear) predication, which denotes the interaction between a zero-order relation and one or more participants, is just one instantiation of that configuration.

The distinction between hierarchical and equipollent configurations was manifest in FG's differential treatment of modifiers in the term,[9] as in *the fascinating book*, and modifiers of the (nuclear) predication, as in *the boy read the book in the library* (DIK, 1997). The former are analysed as restrictors, while the latter are SATELLITES, which enter into a predicational rather than a hierarchical relationship with the layer they are used to modify. This opposition, however, disappeared after Rijkhoff's (1990; 2002) convincing demonstration of strong parallels between term structure and clause structure. This led to two proposals for unification of the two types of modifiers. Rijkhoff (1990) argues all modifiers are satellites; Hengeveld (1989) and also Hengeveld and Mackenzie (2006; Forthcoming) analyse all modification as restriction.

3 Square brackets

In the previous section, we said that in the FDG formalism hierarchical relations were indicated by round brackets and equipollent relations by square brackets. Both types of bracketing were used in FG, but to our knowledge they have never been introduced explicitly, nor are they accounted for in the lists of

9 The notion 'term' as used by Dik (1978; 1989; 1997) is a conflation of the configurational notion argument, the denotational notion individual, and the interpersonal notion referent. In the context of this paper, we are referring to the denotational use of the notion. Within the FDG framework, 'term' is no longer used.

‘abbreviations used in FG-representations’ in Dik’s work. Now that they are explicitly characterised, however, some questions arise as to how they were commonly used in representations before and whether they should be relocated. In order to address this, we go back in history a little, to show how the square brackets were used before.

In early work on FG, Dik (1978) uses square brackets to delineate the domain over which satellites such as those with the semantic function Manner had scope, which is the nuclear predication consisting of the verb and its arguments.[10] This relationship between satellite and nuclear predication, as was pointed out above, he considers to be one of predication, and not restriction. That is, in the example below, *cautiously* in Dik’s view does not specify a subset of occurrences of Peter removing the lid from the jar (as *friendly* would do in the set of *priests* in (5a)), but rather modifies the whole nuclear predication (cf. DIK, 1997, p.235-36):

(7) e_i: [*remove* (*Peter*) (*the lid*) (*from the jar*)] (*cautiously*)$_{Manner}$
‘Peter cautiously removed the lid from the jar’

The representation in (7) makes explicit that the part between square brackets, while not commanding a variable, configurationally acts as a predicate with respect to its Manner argument (i.e. ‘cautiously is how Peter removed the lid from the jar’). In later work, Dik remains faithful to this use. As Dik (1997, p.227) puts it, “*cautiously* specifies the way in which the three-place relation *remove* was established between (Peter), (the lid) and (from the jar)”.

As mentioned earlier, Hengeveld and Mackenzie (Forthcoming) follow Hengeveld (1989) and generalise term structure over all semantic types, with Dik’s satellites in (7) being recast as restrictors. The square brackets are now used to indicate that the argument variable e_i in the restrictor is not itself an argument of the verb. If we apply these changes to (7), the representation in (8) results:

(8) e_i: [—*remove* (*Peter*) (*the lid*) (*from the jar*) —] $(e_i)_Ø$: (—*cautiously*—) $(e_i)_Ø$

However different these two conceptions of modification, it will be clear that the relation between on the one hand the equipollent domain [*remove* (*Peter*) (*the lid*) (*from the jar*)] and on the other *cautiously* in (7) and (e_i) in (8) is structurally identical. On both occasions, the bracketed material constitutes a configurational domain, which predicates something over its argument, which in (8) is indeed indicated by the semantic function on the argument variable (e_i). However, this

10 In later publications manner adverbs would be analysed as predicate modifiers, rather than predication modifiers.

entails further equipollent relations in (8): between the nuclear predication and (e_i) in the first restrictor and between *cautiously* and (e_i) in the second. And this should also be captured by square brackets as in (9):

(9) e_i: [[*remove* (*Peter*) (*the lid*) (*from the jar*)] $(e_i)_\emptyset$]: [(—*cautiously*—)$_{Manner}$ $(e_i)_\emptyset$]

The double occurrence of square brackets is caused by the presence of a predicative unit that is in itself also an equipollent configuration.

Now, recall the structure of individual-denoting units according to Hengeveld and Mackenzie (2006, p.674), as discussed in (2). In the light of the previous discussion, they can now be rewritten as in (10):

(10) (1 x_i: [(f_i: [boy_N $(f_i)_\emptyset$]) $(x_i)_\emptyset$])

This formalisation shows an interesting structural parallel between the nuclear predication and (e_i) in (9) and between *boy* and (f_i) in (10): both form predications. This parallel is absent in the formalisations provided in Hengeveld and Mackenzie (2006, p.673).[11] While they rely on two different abstract representational frames, our more consistent bracketing shows that a single schema underlies both, the difference between them being that the former is internally complex while the latter is not.

While in itself a minor notational adjustment, our formalisation sheds new light on two old issues in Functional Grammar: the question whether the nuclear predication (and, by extension, the lexical head) serves as a phoric domain, and should therefore command a variable of its own, and the status and necessity of the argument variable as part of the restrictor.

4 A variable for the nuclear predication?

The status of the nuclear predication as a construct without its own variable has been addressed by several authors. Cuvalay-Haak (1997) and Vet (1990), for instance, have noted the descriptive problem in the representation of events whereby the head of an event that typically consists of an equipollent predication does not serve as a separate domain for anaphoric reference and hence does not command a variable of its own. However, a considerable number of languages have expression strategies that allow for phoric reference to nuclear predications, showing that it must command a variable. Van Staden (In preparation) shows

[11] It should be noted that the parallel between layers with complex and simplex heads has been noted by the authors themselves as well, but that their way of bracketing does not capture this.

that nuclear predications may be joined in serial verb constructions, for which this layer is also required.

Hengeveld and Van Lier (Submitted), seeking to establish a unified analysis of lexically specified and complex events, invoke an additional f-layer, which contains the nuclear predication as its head, as exemplified in (11). In this way the head of a complex event is of the same type – $[(f_i)\ (e_i)_{\varnothing}]$ – as the head of a lexical event (12b):

(11) $(e_i: (f_i: [\ (f_j: \text{die}\ (f_j))\ \ (x_i: (f_k: \text{man}\ (f_k))\ (x_i): (f_l: \text{old}\ (f_l))\ (x_i))]\ (f_i))\ (e_i))$
'The old man died'

(12) a. $(e_i: (f_i: [\text{—nuclear predication—}\ ]\ (f_i))\ (e_i))$ complex event
b. $(e_i: (f_i: [\text{—lexeme—}\ (f_i)])\ (e_i))$ lexical event

Note that the authors do not formalise the predicational configuration consisting of f_i and e_i in the restrictor of e_i. Using the formalisation proposed above in (10), using square brackets to consistently embrace all equipollent relations, the representation of lexical and complex events is as follows:

(13) a. $(e_i: [(f_i: [\text{—nuclear predication—}\ (f_i)_{\varphi}])\ (e_i)_{\varphi}])$ complex event
b. $(e_i: [(f_i: [\text{—lexeme—}\ (f_i)_{\varphi}])\ (e_i)_{\varphi}])$ lexical event

In both examples in (13), the e_i in the restrictor is an argument of the predicate formed by f_i, which is restricted by a nuclear predication in (13a) and by a lexeme in (13b).

Apart from unifying complex and lexical events, Hengeveld and Van Lier's f_i-layer has the added advantage that it offers an opportunity to differentiate between the scope of restrictors specifying the internal duration of an event, and the scope of those that give information about its external position in a wider set of occurrences. Without going into the exact ontological nature of e-type entities and quantified predications, it is vital that duration occurs within the scope of location, and not the other way around (cf. TENNY, 2000 for a discussion). When both types of modifiers were still located at the event layer, this scope relation could not be accounted for, but with the introduction of this added layer, it can.

It should be stressed that the f_i-layer advocated by Hengeveld and Van Lier does not correspond to the nuclear predication, but rather subsumes it as the predicate of the first restrictor. This becomes clear when additional restrictors occur, specifying internal duration. The f_i layer thus does not correspond to the nuclear predication, but to an augmented construct *including* duration modifiers, which we will call QUANTIFIABLE PREDICATION.[12] In other words, notwithstanding the merits of this new layer for other purposes, this leaves unsolved the problem of the nuclear predication as a phoric domain. In view of the other established parallels between them, we may hypothesise that the attested referentiality of the nuclear predication as a complex head is mirrored in lexical heads. In order to pursue this line of thought, we first examine the internal structure of restrictors in further detail.

5 The structure of restrictors

In section 2, restrictors were discussed without paying attention to their internal constitution. It was stated that the relation between restrictors and variable can be formalised as in (14):

(14) (x_i: HEAD : σ^1 : σ^2 : ...)

'an entity i of type x, such that HEAD, such that σ^1, such that σ^2, ...'

In the original conception of FG, each restrictor in a term x was thought of as an open predication, meaning that it denotes 'things that are the case' about x. Each restrictor takes the form of a predication that takes as its argument the x-type entity i whose denotation it instantiates: 'there is an x_i such that x_i has the property f_i' (DIK, 1997, p.62). The repeated variable is thus part of the restrictor. Since these restrictors are typically states, the semantic function of the argument is typically zero.

It has also been noted in 2 that the formal operation of restriction is equivalent to subset formation: the extension of the entity under construal is constrained by predicating hierarchically ordered sets of properties of the entity. Trivially, in this subset formation, every subset is contained in its superset; the relation between them is ENDOCENTRIC. This is reflected in Dik's notation of restrictors, which accordingly are endocentric predications, crucially predicating properties over an argument coreferential with their superset, rather than over some other entity.

In the case of multiple restrictors, they apply in order. A term like *the old white elephant* in (15) thus denotes 'there is a definite singular entity x_i such that the property ELEPHANT is predicated over x_i, such that (furthermore) the property WHITE is predicated over x_i, such that (furthermore) the property OLD is predicated over x_i':

(15) (d1 x_i: [—*elephant*— $(x_i)_{\emptyset}$]: [—*white*— $(x_i)_{\emptyset}$]: [—*old*— $(x_i)_{\emptyset}$])

'the old white elephant'

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12 After Rijkhoff (2002).

Restrictors need to be ordered to rule out the possibility that (17) is expressed as **the elephantine old white (one)*; that is, Dik (1997, p.132 ff) follows Dahl (1971) and argues that ordering of defining properties matters, and that consequently, term instantiation is to be thought of as subset formation rather than set intersection, as is generally claimed in formal semantic theories. The interpretation of (15) is that there is a superset of individuals with the property ELEPHANT, a subset of which is WHITE, and this subset of white elephants then contains a subset of OLD white elephants. In other words, the entity 'picks up' increasingly more denotation as the subsets in which it is contained get smaller yet more specific.

The formalisation of term structure as an ordered set of restrictors that take the shape of endocentric predications is given in (16a) below. However, Dik (1997, p.63) argues that in many cases the representation appears unnecessarily cumbersome, since the restrictors are endocentric and therefore the argument variable is fully predictable. Therefore, he proposes the simplified structure (16b), which has been widely adopted in subsequent literature. Usually, if the argument variable was given at all, its semantic function was omitted since it was always 'zero' (consider e.g. the representations in Hengeveld and van Lier quoted in this paper):

(16) a. $(x_i: (f_i) (x_i)_{\varnothing})$
b. $(x_i: (f_i))$[13]

Note, however, that this is merely a notational simplification; the underlying logic in the argumentation (at least, as far as Dik is concerned) remains unaltered.

In some of the publications in the new FDG framework, while retaining FG's notion of restriction, the function of the argument variable appears to be reduced to that of a marker delimiting scope (HENGEVELD; VAN LIER, submitted): "Note furthermore that the FDG formalism (at all levels of analysis) makes use of a colon to represent a restriction operation, and a 'closing variable' between brackets at the end of each of these restriction operations, to mark off its scope." Such scope issues indeed occur, for instance when restrictors are themselves further restricted, as in *a terribly friendly priest*. In such cases, we need to make sure that independent reference is enabled to all constituent elements separately, and to the complex property *terribly friendly*, but that *terribly* does not have immediate scope over *priest*. However, the formalism already commands means to capture this: the round brackets that delimit layers. Thus, if their function is indeed reduced to scope marking, the argument variable might as well be omitted altogether.

13 Note that Dik (1997) only uses square brackets to delimit nuclear predications, which is why they are absent in this representation.

Mackenzie (1987) argues that the proposal in (16a) should be abandoned in favour of its simpler counterpart not for notational simplicity, but for principled reasons. First, he argues that this representation of terms does not do justice to the referential act that it carries out. Rather than assuming that a speaker carries out a referential act of the form 'there is an individual i such that i applies to f', a speaker in Mackenzie's view simply puts 'there is an i such that I tender f'. In other words, Dik's endocentric conception of term structure is replaced by an EXOCENTRIC alternative in which the layer variable does no longer occur as an argument in the restrictor. It follows that the formal relation between the restrictor and the entity it is applied to is lost.

With the introduction of the Interpersonal Level in FDG and the principled distinction between representational denotation and interpersonal evocation, this is no longer an issue (cf. also fn. 9). Acts of reference are now a matter of the interpersonal level, while the representational level describes the denotation. At the level of the semantics, meanwhile, it would seem preferable to retain Dik's original formalism. Indeed if the formalism is (x_i: f_i), to be paraphrased 'there is an x_i such that f_i', and the defining characteristic of f-type units is their applicability, one may well wonder what it is that f_i applies to.[14] If the answer is x_i, we are back at square one.

A second problem with Dik's account of term structure that Mackenzie points to, is a strange obscurity in representational structure that arises when terms are restricted by so-called β-relational predicates.[15] Consider (17), in which x_i, *government*, takes an argument x_j, *China*:

(17) (x_i: —*government*— (x_i) (x_j: —*China*—))
'the government of China'

According to this representation, both x_i and x_j are equal-ranking arguments of a bivalent predicate *government*, which is obviously not in accordance with the intended denotation. With the introduction of square brackets for the various predicational configurations, the event variable e_i, the property variable f_j for the predication contained in it, and f_i for the predicate itself, the problem may be restated as follows:

(18) e_i: [(f_j: [(f_i: —*government*—) (x_j: —*China*—)$_{Ref}$ (f_j)$_{Ø}$]) (e_i)$_{Ø}$]

Now it is (x_i) and (f_j) that appear to be equal-ranking arguments of f_i, *government*.

14 In Hengeveld's (1989) analysis, the formalisation of term restriction is paraphrased as 'an individual, such that a property applies', which also leaves the applicant implicit.

15 β-relational predicates are second-order entities that designate relationships between first-order entities; α-relational predicates are zero-order entities that designate relationships. An exacter definition is given in Mackenzie (1987; p.7).

While Mackenzie (1987) confined the discussion to complex nominals, the same problem in fact exists for their verbal counterparts:

(19) (e_i: [(f_j: [(f_i: —*govern*—) (x_j: —*China*—)$_A$ (x_k: —*Taiwan*—)$_U$ (f_j)$_Ø$] (e_i)$_Ø$])
'China governs Taiwan'

Here, we see ourselves confronted with the exact same problem; as soon as an additional f-layer is added to enable referentiality of the predication contained in the event, as proposed by Hengeveld and van Lier, the endocentric argument variable of that layer causes scope ambiguity. Mackenzie's proposal to omit (rather than suppress) the variable argument does indeed solve this issue. But the resulting formalism is somewhat incongruous with the argumentation underlying it – it would denote 'an individual i such that government of China', without stipulating the relation this description bears to the individual itself. Also, this solution suggests that the problem was one of notation rather than one of representation. We would therefore prefer to find a more principled solution, whereby the argumentation behind the formalism may be retained and which addresses what we believe to be the issue: the aforementioned fundamental distinction between endocentric and exocentric layers. We address this by first examining the representation of simple lexical heads, and then extend our argument to the cases just discussed.

6 Modification of lexical heads

Let us first consider a case in which a first-order entity is restricted by two predications:

(20) x_i: [(f_i: [*priest*$_N$ (f_i)$_Ø$]) (x_i)$_Ø$]: [(f_j: [*friendly*$_A$ (f_j)$_Ø$]) (x_i)$_Ø$]
'a friendly priest'

In this case the individual i is restricted by two predications: x_i is described as 'being a priest' and as 'being friendly'. But what if the second restrictor does not modify the individual, but rather the property attributed to this individual in the first restrictor? In other words, how is REFERENCE MODIFICATION (cf. BOLINGER, 1967; HENGEVELD, Forthcoming) as opposed to REFERENT MODIFICATION[16] in (20) represented in FDG? Some examples of reference modification are given in (21):

[16] It should be noted that, contra FDG terminology, the canonical terms *referent modification* and *reference modification* do not pertain to interpersonal, but to representational notions.

(21) a lousy doctor
a criminal lawyer
a government official
military dress
a civil decoration

Let us consider the last example in detail. A representation analogous to (20) would incorrectly depict the denotation of *civil decoration* as a case of referent modification: an individual such that it has the property *decoration*, such that it has the property *civil*. It means that the entity is *civil* in addition to being a *decoration*, just like in a *friendly priest* the individual is *friendly* in addition to being a *priest*, which is obviously not the intended denotation. To avoid this, the representation has to make explicit that x_i denotes an individual restricted by a single complex property that denotes a particular kind of decoration. In short, *civil* has to restrict f_i, which in turn restricts x_i:

(22) x_i: [(f_i: [*decoration*$_N$ $(f_i)_{\emptyset}$] : [*civil*$_A$ $(f_i)_{\emptyset}$]) $(x_i)_{\emptyset}$]

This representation describes an individual such that the property denoted by f_i is applicable to it, whereby the property f_i is restricted by the subsequent application of *decoration* and *civil*. But neither of these properties now have layer status themselves, which leaves unaccounted for the fact that they may be referred to independently:

(23) The *Légion* is not a civil decoration, nor a military <u>one</u>; it encompasses both.[17]

The same problem turns up in manner expressions, and in further modification of properties as in *a terribly friendly priest*. In each case the scope of the modifiers and the referential potential of the properties show them to be layers in themselves with their own variable.

What we propose, therefore, is that in line with Keizer (2004, p.11) restrictors such as *friendly* and *decoration* have their own variable and constitute an embedded layer within the layer f_i:

(24) x_i: [(f_i: [(f_j: [*decoration*$_N$ $(f_j)_{\emptyset}$]) $(f_i)_{\emptyset}$]: [(f_k: [*civil*$_A$ $(f_k)_{\emptyset}$]) $(f_i)_{\emptyset}$]) $(x_i)_{\emptyset}$]

Although this would appear to have solved the non-referentiality of *decoration* and *civil*, it has created a problem of infinite nesting. Namely, as soon as an additional restrictor is added to f_j or f_k, the problem of (22) resurfaces: a layer arises in which separate reference to its constituent elements is impossible.

[17] http://en.wikipedia.org/wiki/Talk:L%C3%A9gion_d'honneur

The only way to solve this would be to add yet another layer for each of its restrictors, which then suffers from the same problem *ad infinitum*.

For cases like (24), it may be argued that the problem of infinite nesting is artificial since languages do not seem to allow further restriction of layers like f_j and f_k, and the ambiguity will therefore never arise. However, if we return to cases in which the first restrictor is internally complex, as in (18) and (19), we find that the same issue is at stake. But now it can no longer be considered trivial. In the case of (24) it could still be argued that reference to f_j is tantamount to reference to the primitive *decoration* and the role of the layer variable as argument in the restrictor is unproblematic. Yet, in (25) it is obvious that f_m cannot be an argument at the same depth as the lexical arguments *China* and *Taiwan*, since that results in denotational ambiguity. The only 'licit' way of solving this ambiguity is to add another layer in which the nuclear predication is embedded, at which point we are back at square one: the only 'innovation' seems to be an increase in complexity that is not warranted by the structure of linguistic expressions (26).

(25) (e_i: [(f_j: [(**f_m**: [(f_i: —*govern*—) (x_j: —*China*—)$_A$ (x_k: —*Taiwan*—)$_U$ **(f_m)$_Ø$**] (f_j)$_Ø$] (e_i)$_Ø$])

(26) (e_i: [(f_j: [(f_m: [**[**(f_i: —*govern*—) (x_j: —*China*—)$_A$ (x_k: —*Taiwan*—)$_U$**]** (f_m)$_Ø$] (f_j)$_Ø$] (e_i)$_Ø$])

What we need, is a principled way to reconcile these two problems, ensuring full referentiality on the one hand, while avoiding ambiguity and unwarranted nesting on the other.

7 The role of exocentric layers in extension construal

In recapitulation, considering the arguments and problems presented thus far we find that:

(27) a. the transparency and simplicity of the LSC is served by reinstating and generalising the proposal by Dik (1978; 1987), regarding the endocentric predicational structure of restrictors, for all layers;

b. certain scope ambiguities and referentiality problems which arose because the nuclear predication / lexical nucleus used not to command a variable can be solved by invoking an additional f-layer;

c. the addition of such a layer causes new referentiality problems, which necessitate the addition of a further layer with the same problem, etc. This entails unwarranted nesting.

In this section, we propose a type of layer that can be anaphorically referred to, thereby resolving the problem pertaining to cases like (26). At the same time, the problem in (25) appears to call for a representation in which the variable does not occur as an argument in its own restrictors, unlike the other layers discussed so far. The representation of such an EXOCENTRIC layer is given in (28):

(28) α_i: $[(\alpha_h)\ (\alpha_{\neg i})_{\varphi}]$

It is stipulated here that the argument in the restrictor of an exocentric layer cannot be coreferential with the layer variable. We argue that exocentric layers serve a special function in the construal of mental extensions: they introduce lexical primitives, either lexemes or frames, from the Fund into the Formulator.

Before elaborating on the distinction between endocentricity and exocentricity, we need to be somewhat more specific on what is meant in FDG by lexical primitives. Following FG, FDG has a strongly lexicalist conception of semantics. There is no abstract set of language independent semantic primitives. Rather, the lexical primitives of a specific language "are contained in the lexicon in a form in which they can actually appear in the expressions" (DIK, 1997, p.23). We take this to be compatible with our view that the Formulator in individual languages never (de)composes to a deeper level of semantic granularity than is reflected by the morphosyntax. Meaning distinctions are treated as lexical if they have no repercussions for grammatical structure. To take a simplistic example, even though *cat* and *dog* have quite different extensions, the semantic features that distinguish them (barking ⇔ meowing, social ⇔ solitary, scavenger ⇔ predator, etc.) do not trigger any differences in grammatical behaviour between the two expressions in English. Therefore, their differences can be captured in two distinct lexical primitives, inserted in identical layered structures.

Given this lexicalist view, we take it as highly significant that languages do not appear to allow for further restriction of layers such as f_j and f_k in (24) which are used to introduce the lexical primitives *decoration* and *civil*. It appears that they represent the lowest possible level of semantic decomposition that still has grammatical relevance. Here, we are dealing with true primitives, to which no further internal structure should be assigned. To explicate the special status of primitives, consider example (29):

(29) x_i: $^1[(\quad)\ (x_i)_{\varnothing}]$: $^2[(f_j$: —*fat*—$)\ (x_i)_{\varnothing}]$: $^3[(f_k$: —*old*—$)\ (x_i)_{\varnothing}]$

f_i: $^4[(f_m$: —*doctor*—$)\ (f_i)_{\varnothing}]$: $^5[(\quad)\ (f_i)_{\varnothing}]$

f_p: $^6[($—lousy—$)\ (f_p)_{\varnothing}]$

'old fat lousy doctor'

As we said in section 2, language users construe mental extensions by declaring an entity of the appropriate type, and then restrict its extension by predicating characteristics over that entity. This act of predication locates the entity under construal in a so-called POTENTIAL EXTENSION SET, denoted by an open predication. This is the set of all potential entities of which that characteristic is the case.[18] Multiple potential extension sets can be hierarchically related, forming subsets and supersets. Potential extension sets can be nested in which case they are based on a characteristic that is itself again an internally complex representational entity with its own layered structure.

Figure 1 illustrates the construal of x_i in (29). The extension of x_i is constrained by three potential extension sets (1-3). These sets denote all entities to which the properties f_i, f_j and f_k apply, respectively. Further nesting arises from the fact that f_i has internal complexity: it is a complex property, constrained by two potential extension sets (4 and 5) which denote all entities to which the properties f_m and f_p apply. The latter in turn exhibits internal complexity, and is constrained by placement in potential extension set 6.

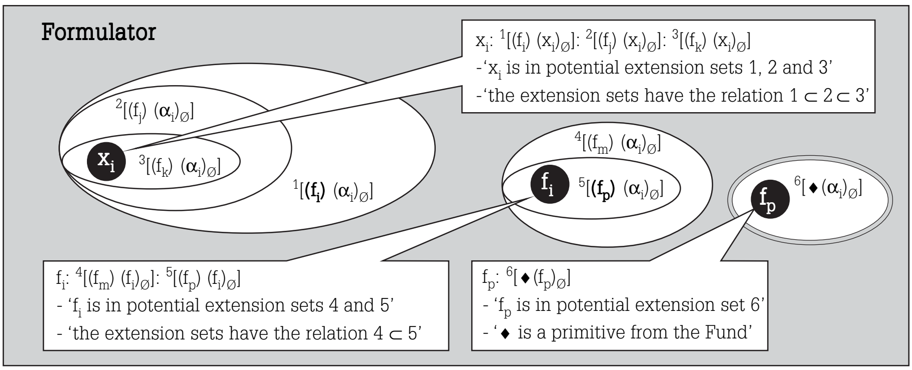

Figure 1 – The construal of *old fat lousy doctor*

Figure 1 brings out the special status of primitives. Whereas the extension sets that are used to restrict x_i and f_i depend themselves on further decomposable representational entities, this is different for the set that is used to restrict the extension of f_p. For the definition of this set, a primitive (represented by ♦) is taken from the fund. It is clear that layer status of ♦ within the restrictor of f_p is required, to ensure the possibility of unambiguous reference to that primitive, should f_p be restricted further (as in *an* *astonishingly* *poor doctor*, where *astonishing* modifies *poor* within f_p, and f_p in turn modifies the property *doctor*). However, ♦ is a primitive, and embedding it in an endocentric layer would impose

[18] Other potential entities in a potential extension set turn up in cases like *a lousy doctor*$_i$ *and an excellent one*$_i$, where *one* construes a second entity in the potential extension set that denotes all entities with the property *doctor*.

a false sense of decompositionality on *poor*. Indeed, the essence of an endocentric layer is that an element is defined in terms of something else, where the essence of a primitive is that it is not. It follows that primitives must form exocentric layers, since this does not entail decompositionality.

The question is now whether this approach to lexical primitives also applies to the other type of primitives: the configurational frames. Does the introduction of an exocentric layer also solve the problems in (25) and (26)? If we treat configurational frames in an identical fashion to lexical primitives, we arrive at an analysis that is strikingly similar to Mackenzie's (1987) proposal to omit the layer variable from the closed predication in cases like (18), as is exemplified in (30):

(30) (e_i: [(f_j: **[(f_m:** [(f_i: —*govern*—) (x_j: —*China*—$)_A$ (x_k: —*Taiwan*—$)_U$] ($f_j)_Ø$] ($e_i)_Ø$])

The difference is that we use it only for the insertion of primitives while retaining endocentricity for other layers. Uninterpretability of the layer variable as in (25) and non-referentiality of the layer as in (26) have now been taken care of, but recall that we noted before how this solution is hard to reconcile with an analysis in terms of subset restriction. The exocentricity of (18) was problematic since it obscured the relation between the restrictor and the entity itself and the same now holds for the relation between f_m and the nuclear predication in (30).

This requires a reconsideration of the cognitive status of exocentric layers. It may be argued that primitives have no mental extensions and hence cannot be considered entities. After all, a layer that denotes the primitive *dog*, *run* or *white* does not activate a corresponding mental image: only once the primitive is used to construe an entity of a specific type (by means of embedding in an endocentrically restricted layer headed by the appropriate entity variable) does the individual or property arise. And because primitives do not denote entities and lack extension, it follows that restriction does not apply to them. Therefore, we argue that lexical and configurational primitives taken from the fund are best represented not with a variable, but by means of an indexed 'placeholder', to reflect their lack of extension. To this end, we introduce $\$_{i.}$[19] Furthermore, since restriction does not apply in the case of primitives, we propose the use of a new system operator, definition (|).[20] In the most abstract form, these two innovations amount to the following representations:

(31) α_i: [($\$_m$| [($\alpha_h$) ($\alpha_g)_\varphi$]) ($\alpha_i)_\varphi$] : …

(32) α_i: [($\$_m$|♦) ($\alpha_i)_\varphi$] : …

19 This is fully compatible with Hengeveld's (p.c.) suggestion that lemmas in the Fund are assigned an index to facilitate lexical retrieval, in which case it would coincide with our use of the subscript $_i$.

20 The alternative is to use the colon to represent two qualitatively distinct operations, which would yield a type of formal inconsistency that is incompatible with the aspirations of the LSC (cf. ANSTEY, 2006, p.70 ff).

In (31), $\$_m$ is an exocentric layer that gives a nuclear predication, 'of α_g, it is the case that α_h'. Being a primitive, $\$_m$ cannot be further restricted within the Formulator. Next, the definition $\$_m$ is endocentrically predicated over α_i; 'there is an entity i of type α, such that $\$_m$ is the case of α_i'. This layer can itself be restricted further. In (32), we see the insertion of a lexical primitive in an identical fashion. Configurational and lexical primitives differ only in the sense that they supply open slots, which are saturated by construing further entities.

To return now to the problem summarised at the start of this section, the inclusion of an exocentric nuclear predication layer solves the non-referentiality problem, while at the same time it makes explicit the relation of definition that exists between the indexed place-holder and the nuclear predication:

(33) (e_i: [(f_j: [($\$_m$| **[**($f_i$: —*govern*—) ($x_j$: —*China*—)$_A$ (x_k: —*Taiwan*—)$_U$**]** (f_j)$_Ø$] (e_i)$_Ø$])

The problem of infinite downward recursion is also resolved. Since elements like $\$_m$ are primitives taken from the fund, there is a natural stop to the decomposition that the formulator is capable of. The layers in which \$-units are embedded, all fully conform to the mechanism of restrictors as endocentric predications.

8 Conclusion

In this paper we have proposed a number of modifications to the interpretation and application of the formalism at FDG's representational level. We have introduced an additional layer of property restriction to allow for reference modification, and proposed to apply the square brackets consistently in line with their interpretation as markers of equipollent relations. More importantly, we have proposed to treat the insertion of lexical entries, in analogy to the selection of a predicate-argument frame, not as a restriction operation on a property, but as an operation of definition. In this way, all primitives taken from the fund are treated in equal fashion. This introduces exocentric relations of definition in addition to the established endocentric relations of restriction. We have argued that the matter of centricity must be viewed separately from referentiality and layer status. While layer status is required to ensure referentiality and to interpret scope, the referentiality of a layer does not automatically make it endocentric. In fact, lexical primitives in this respect are on a par with elements like phonological strings and syntactic constituents which, although referential as exemplified in (3), are not decomposable at the representational level either. Interestingly, aspects of the modifications that we propose have long been present in FDG theory, and merely needed to be amalgamated. Mackenzie (1987) provides the exocentric layer; Dik (1987; 1997) the predicational shape of restrictors, while Hengeveld (1989) generalises its endocentricity.

Although the result might appear to add to the complexity of FDG representations, we believe that it is preferable for four reasons. First, the proposed use of the square brackets is a fully consistent application of their theoretical position in FDG. Second, this proposal retains the original logic underlying the notion of restriction as consisting of the application of a property to an argument. Third, it nevertheless solves the problem noted in Mackenzie (1987). And fourth, the result gives an elegant and theoretically correct parallel between simple and complex heads in representational frames, the former consisting of just a lexeme, and the latter of a predicate-argument structure.

Most importantly, however, the increased 'complexity' is amply compensated for by the much simpler logic now needed to generate representations in the formulator. In essence, all representational layers in FDG are now consistently of one of the following shapes:

(34) a.	α_i | ♦	lexeme insertion
b.	α_i | $[(\alpha_j)\ (\alpha_k)_\varphi]$	lexical predicate frame insertion
c.	$\alpha_i : [(\alpha_j)\ (\alpha_i)_\varphi]$	subset restriction of α_i

Of these frames only (34c) is generated by the formulator at the representational level, while the other two layers are taken from the Fund. This adapted formalism retains the unified applicability of the Layered Structure of the Clause put forward in Hengeveld (1989), as the same argumentation regarding the nature of restriction applies in equal measure to domains other than denotation. In Smit (this volume) the formal implications of the present proposal for the interpersonal level are explored in more detail. Using a restrictive algorithm that relies on recurrent combinations of restriction and (endocentric) predication, and a fund consisting of simplex primitives and composite ones which obey the same mechanism, we have shown that the full array of denotational complexity can be accounted for.

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SMIT, N.; VAN STADEN, M. A organização em camadas do nível representacional na Gramática Discursivo-Funcional. *Alfa*, São Paulo, v.51, n.2, p.143-164, 2007.

- RESUMO: Este trabalho aborda a estrutura interna de camadas no nível representacional na Gramática Discursivo-Funcional e propõe três adaptações da representação de esquemas no que diz respeito à prática vigente (HENGEVELD; MACKENZIE, 2006; no prelo) O nosso principal interesse é reavaliar a argumentação original de Dik (1989, 1997) a favor do uso endocêntrico de variáveis de argumento no âmbito dos restritores de termos, que acreditamos serem fundamentais para a teoria da GDF e deveriam ser generalizadas para todas as camadas representacionais. Com base nessa pespectiva, propomos um uso transparente de colchetes, que delimitem configurações equipolentes das quais a variável de argumento faz parte. Por sua vez, isto revela problemas na representação da descrição do evento nuclear – o verbo e seus argumentos – como uma entidade identificável, que é um antigo problema na GF, e também na representação de modificação de referência. Como uma solução unificada, nós recorremos a camadas exocêntricas para explicar as proporiedades estruturais especiais dessas unidades. O resultado é uma estrutura mais coerente e transparente dos esquemas representacionais na GDF.
- PALAVRAS-CHAVE: Nível representacional; formalismo na Gramática Discursivo Funcional; restrição; predicação.

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