L_RFG Analysis of Turkish Suspended Affixation in Nonverbal Coordination

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Abstract

Suspended affixation (SA) is a morphosyntactic phenomenon where an affix marked on an edgemost coordinand takes scope over the whole coordinate structure. Typically found in Transeurasian languages, SA is especially pronounced in Turkish, where it is subject to complex morphosyntactic constraints. The previous literature on Turkish SA asserts that it is only compatible with the inflectional domain. However, empirical evidence contrary to this claim has started to emerge from corpus-oriented research. In this regard, two possible LFG-related analyses are considered: a standard LFG analysis and the lexical sharing analysis proposed by Broadwell (2008). The present work concludes that neither solution provides an explanatory account nor a comprehensive empirical coverage. Therefore, a novel analysis is developed within the emerging framework of Lexical-Realizational Functional Grammar (L_RFG). The resulting analysis not only correctly predicts which suffix can be subject to suspension but also provides a morphosyntactic explanation as to why a Turkish suffix is (in)compatible with SA.

1 Introduction

Suspended affixation, a term whose coinage is attributed to Lewis (1967, p. 34), refers to the morphosyntactic phenomenon where an affix (or affixes) marked on an edgemost coordinand takes phrasal scope over the whole coordinate structure. Suspended affixation (henceforth abbreviated as SA) is typically associated with Transeurasian languages,[1] which are characterised by their agglutinative morphologies. A rather extreme example of Turkish SA can be seen in (1) where multiple nominal inflections marked on the final conjunct can distribute over the coordinate structure.

(1) Tebrik ve teşekkür-**ler-im-i** sun-uyor-um.
Congratulation and thank-PL-1SG.POSS-ACC offer-PRES.PROG-1SG
'I offer my congratulations and thanks.' (Lewis 1967, p. 40)

Languages that allow for SA typically designate either the first or the last conjunct as the distribution centre whose affixes can assume a phrasal role over the conjuncts. While both prefixes and suffixes can be subject to suspension (Erschler 2018), a language typically authorises one type only. When it comes to Turkish, the centre of distribution is strictly the rightmost conjunct. For instance, when we look at the coordinated noun phrases in (2a), the rightmost NP conjunct, *polis*, can only be interpreted as a singular noun since the plural suffix marked on the first conjunct is unable to trigger SA. However, when the plural suffix appears on the

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[1]This is a term coined by Robbeets and Johanson (2010, pp. 1–2) as an alternative to the term "Altaic family." The term includes Turkic, Mongolic, Tungusic, Koreanic and Japonic languages.

rightmost conjunct, as in (2b), SA is triggered and the preceding conjunct can now be interpreted as a plural noun despite lacking the overt plural marking.

(2) a. Banka-**lar** ve polis suçlu-lar-ın peş-i-nde koş-ma-dı-lar.
Bank-PL and the police criminal-PL-GEN trail-3-LOC run-NEG-PST-3PL
'Banks and the police did not pursue the criminals.'

b. Banka ve polis-**ler** suçlu-lar-ın peş-i-nde koş-ma-dı-lar.
Bank and the police-PL criminal-PL-GEN trail-3-LOC run-NEG-PST-3PL
'Banks and the police officers did not pursue the criminals.'

Previous treatments of Turkish SA by Kabak (2007) and Kornfilt (2012) assume a strict demarcation between the derivational and inflectional dimensions of Turkish morphology. The core of their argument fundamentally amounts to the claim that while derivation is encapsulated in the lexicon, inflection can assume a syntactic role. Based on this premise, they assert that Turkish SA applies only to inflectional categories, and, accordingly, rule out the possibility of SA with derivational morphemes. Nevertheless, Kabak (2007) and Kornfilt (2012) also acknowledge the existence of admissible instances of derivational morpheme suspension (Bozşahin 2007, Akkuş 2016), an example of which is represented in (3).

(3) ana ve baba-lık
mother and father-HOOD
'motherhood and fatherhood' (Kabak 2007, p. 336; Akkuş 2016, p. 10)

Both Kabak and Kornfilt regard examples like this as idiosyncratic and/or lexicalised constructions that are only acceptable due to pragmatic factors and/or a conceptual affinity between the coordinated elements and uphold their claims. Consequently, one prediction of this claim would be that we should encounter only a handful of domain-specific instances of derivational suffix suspension in Turkish corpora due to their idiosyncratic nature. However, a guided exploration into Turkish Web 2012 (a web corpus comprising 3.3 billion words; Baisa and Suchomel 2012) utilising Corpus Query Language (CQL) reveals numerous non-domain-specific counter-examples (see some simplified versions in (4)), which incorporate different derivational morphemes.[2] This corpus exploration also confirms Akkuş's (2016) web corpus evidence, which led them to argue against the "idiosyncrasy" claim of Kabak (2007) and Kornfilt (2012). In conclusion, the claim that instances of derivational suffix suspension can be reduced to idiosyncrasies seems to lack an empirical basis.

(4) a. mayo ve bikini-li afiş-ler
swimsuit and bikini-CONTAIN poster-PL
'posters containing swimsuit and bikini' (Turkish Web 2012)

[2] Approximately 1500 sample sentences were obtained through distinct CQL queries that targeted coordinate structures incorporating different derivational morphemes in the corpus. 5.89% of the sampled sentences contained SA. The number of SA instances, however, showed considerable variance among different derivational morphemes.

b. danışman ve yardımcı-lık gibi görevler
consultant and assistant-SHIP like duties
'duties such as consultantship and assistantship' (Turkish Web 2012)

c. bir ve iki-nci fıkra hüküm-ler-i
one and two-ORD paragraph adjudgment-PL-3
'adjudgments of first and second paragraph' (Turkish Web 2012)

On the other hand, based on corpus examples, arriving at the conclusion that Turkish SA is compatible with all Turkish derivational morphemes would also be misguided as suspension of certain derivational morphemes results in downright ungrammaticality:

(5) *Doğ ve öl-**üm** hakkında derin-ce tartış-tı-k.
be born and die-NMLZ about deep-ADVZ discuss-PST-1PL
Intended meaning: 'We had a deep discussion about birth and death.'

In conclusion, while the part of the claim about the suspension availability of inflectional categories is unequivocally true, the part where derivational morpheme suspension is ungrammatical except for idiosyncratic examples seems to be false. Before delving into the primary analysis proposed in this paper, the present work will first offer a conservative LFG analysis. Subsequently, Broadwell's (2008) lexical sharing analysis of Turkish SA will be outlined and modified. And finally, based on the shortcomings of these analyses, the present work will develop a novel analysis within the emerging framework of L_RFG (Melchin et al. 2020). In addition to the analysis, a novel classification schema that aims to predict the suspension availability of a given Turkish suffix will be formulated. All in all, the present work will not only demonstrate possible solutions within vanilla LFG and distinct LFG-based frameworks, but will also highlight both weak and strong features of each analysis.

2 Conservative Approach: Standard LFG solution

A relatively straightforward approach that remains faithful to the core LFG architecture would be to modify the Turkish coordination rule so that the nominal features of the final conjunct would distribute to other conjuncts:

(6) $\text{NP} \longrightarrow \underset{\uparrow \in \downarrow}{\text{NP}^{+}} \quad \underset{\uparrow = \downarrow}{\text{Cnj[main]}} \quad \underset{\substack{\uparrow \in \downarrow \\ (\downarrow \text{CASE}) = (\uparrow \text{CASE}) \\ (\downarrow \text{NUM}) = (\uparrow \text{NUM}) \\ (\downarrow \text{POSS}) = (\uparrow \text{POSS})}}{\text{NP}}$

Once NUM, CASE and POSS are encoded as distributive features, the rule in (6) ensures that case, number and possessor values of the final conjunct will distribute to other conjuncts as well. Broadwell (2008) recognises a solution of this sort but he rejects it on the grounds that the solution ignores, in principle, that Turkish SA is only sensitive to the right periphery of the coordination. There are, however,

more practical issues with respect to this solution. First, the rule in (6) states that the value of the NUM attribute of the preceding conjuncts should always be equal to the value of the final conjunct's NUM attribute. Because of this assumption, the rule categorises the perfectly grammatical sentence in (1) as ungrammatical due to a value clash in the NUM attribute of the first conjunct, *tebrik* ('*congratulation*'). In order for this solution to work as intended, all Turkish nouns that are not explicitly marked with a plural suffix should be underspecified for their NUM attribute in their lexical entries. This can be achieved by optionalising their singular number specification in their lexical entries, which would result in the following f-description: ((↑ NUM) = SG). Even though the inclusion of optionality solves the issue, this analysis still does not truly capture the ambiguous nature of Turkish coordinate structures incorporating SA. Due to the fact that the SA reading is optional itself, the coordinate structure in sentence (7) could potentially lead to two different meanings.[3]

(7) Duvar-da-ki eski yazı ve resim-ler-e bak-tı-k.
Wall-LOC-ADJZ old inscription and painting-PL-DAT look-PST-1PL
a. 'We looked at the old inscription and the paintings on the wall.' Non-SA
b. 'We looked at the old inscriptions and the paintings on the wall.' SA

This can be handled by making the NUM distribution annotation in (6) optional, as in ((↓ NUM) = (↑ NUM)). Although this modification would generate the desired f-structures where two readings can be derived from, the modified rule would also generate an additional f-structure where no value for NUM is assigned to the first conjunct. This is because the first conjunct's NUM value is now provided only by two optional f-descriptions: one from the optional f-description in its lexical entry ((↑ NUM) = SG), and the other from the optional rule equating the second conjunct's NUM value with the first conjunct's NUM value. The ideal solution, however, should generate only two different f-structures corresponding to the readings represented in (7). This issue can be fixed by inserting an existential constraint in the lexical entries of plural unmarked Turkish nouns where they require that a value be assigned to their NUM attributes.

The very same issues arise with the CASE specification of case unmarked nouns. Here, the defining equation assigning the default nominative case to case-unmarked nouns can be optionalised as well. The same existential constraint should also be added to the lexical entries for the CASE feature. Otherwise, the proposed rule would again generate unsaturated f-structures with conjuncts unspecified for CASE. The annotation that ensures case distribution from the final conjunct can also be optionalised as in the NUM distribution annotation to allow instances of unlike case coordination. However, coordination of unlikes remains an uncharted area in Turkish syntax, and, therefore, the exact parameters of unlike coordination in Turkish are virtually unknown. For this reason, the obligatory case distribution rule should remain intact as like case coordination seems to be the standard.

[3]It is often the case that one of the readings is more available due to extra-syntactic, pragmatic factors.

The annotation obligatorily activating POSS distribution should also be optionalised to allow for conjuncts with different POSS values, which is possible in Turkish. As for nouns that lack a possessive suffix, they should be left unspecified for POSS as there is no reason to postulate a default POSS feature for them. However, these decisions regarding POSS lead to a minor drawback. Namely, if the first conjunct is unspecified for POSS, the proposed configuration generates an additional f-structure where the first conjunct remains unspecified for a POSS feature. This reading, however, does not seem to available in such environments. In summary, when we take into account the proposed modifications, the lexical entry of a non-inflected Turkish noun, such as *yazı* (inscription), would be represented using Dalrymple et al.'s (2004) DEFAULT template as follows:

(8) yazı N PRED = 'INSCRIPTION'
@DEFAULT((↑ CASE) NOM)
@DEFAULT((↑ NUM) SG)
(↑ PERS) = 3

The final version of the Turkish NP coordination rule, on the other hand, is demonstrated in (9).[4]

(9)

NP	⟶	NP^{+}	Cnj[main]	NP
		↑ ∈ ↓	↑ = ↓	↑ ∈ ↓
				(↓ CASE) = (↑ CASE)
				((↓ NUM) = (↑ NUM))
				((↓ POSS) = (↑ POSS))

Ignoring the overgeneration issue discussed above, the coordination rule in (9) coupled with the suggested lexical entry adjustments for nouns successfully parse the occurrences of Turkish SA (implemented in a grammar fragment in XLE; Crouch et al. 2017). Although this is a relatively straightforward solution that can handle the typical occurrences of Turkish SA in the inflectional domain, which constitute the overwhelming majority of Turkish SA instances, it is completely oblivious to the instances of derivational morpheme suspension that are present in Turkish corpora.

3 Broadwell's (2008) Lexical Sharing Analysis

Broadwell (2008) rejects the conservative analysis outlined in the previous section on the grounds that the solution does not intrinsically designate the right periphery as the site of distribution.[5] Instead, he applies Lexical Sharing (henceforth abbreviated as LS) which is an extension to the standard LFG architecture originally formulated by Wescoat (2002) to tackle the analysis of clitic and portmanteau forms. Before further discussing Broadwell's (2008) lexical sharing analysis

[4]One reviewer noted that the two optional constraints in (9) should be made "jointly" optional to ensure that SA applies in toto or not at all. The viability of this approach is questionable as some of the native speakers consulted within the context of the present study can actually extract partial SA readings.

[5]Broadwell does not fully elaborate his criticism directed towards the conservative analysis.

of Turkish SA, the following section will briefly outline the formal features of LS for the reader unacquainted with it.

3.1 Lexical sharing preliminaries

In LS, lexical items are no longer intrinsic parts of c-structure as terminal nodes, but are handled at a separate level called l(exical)-structure. In line with LFG's projection architecture, LS links the lexical items with c-structure terminal nodes (former preterminals) by introducing a novel projection function λ, which maps terminal nodes in c-structure to lexical items in l-structure. The projection function λ formally denotes a surjective function (onto but not necessarily one-to-one) where each lexical item in l-structure is associated with at least one terminal node in c-structure. This property of the λ projection implies that one lexical item can instantiate multiple c-structure terminal nodes, which would be an instance of *lexical sharing*. In addition, Wescoat (2002, 2005) imposes a crucial constraint on the projection function λ to ensure that the mapping between c-structure terminal nodes and their lexical exponents also follows the linear order expressed in both levels (it is *order preserving*). The constraint as articulated in Wescoat (2005) can be compactly expressed in the following formula:

(10) $\mathrm{X} < \mathrm{Y} \rightarrow \lambda(\mathrm{X}) < \lambda(\mathrm{Y})$

The constraint in (10) drastically limits the number of permissible instances of lexical sharing by only allowing adjacent c-structure nodes to map onto the same lexical item. Moreover, Wescoat (2005) proposes some revisions to the standard projection architecture of LFG to introduce the lexical instantiation mechanism, which incorporates the three crucial syntactic levels in LS: l-structure, c-structure and f-structure. First, Wescoat modifies the correspondence mapping ϕ in a way that it relates both l-and c-structure to f-structure, as opposed to its standard role where it only maps from c- to f-structure. Second, he defines a new metavariable '$\Downarrow$' formally corresponding to the expression, $\phi(\lambda(*))$, where $*$ denotes a c-structure node – more specifically, the c-structure node bearing the annotation. Informally, '$\Downarrow$' refers to the f-structure of a given c-structure node's lexical exponent. And finally, in addition to the conventional phrase-structure rules, he introduces lexical instantiation rules that designate a given lexical form's contribution to f-structure through its relation to the c-structure terminal nodes that it instantiates. Consider the following lexical instantiation rule which is adapted from Wescoat (2005):

(11) *I'll* $\longleftarrow$

D	I
$(\downarrow$ PRED$)$ = 'PRO'	$(\downarrow$ TENSE$)$ = FUT
$(\Downarrow$ SUBJ$) =_c \downarrow$	$\Downarrow = \downarrow$

The annotation '$\Downarrow = \downarrow$' on (11) serves the purpose of equating the f-structure associated with the annotated c-structure node (I, in this case) with the f-structure of its lexical exponent. The constraining equation on D assesses whether the f-structure of D is assigned the grammatical function SUBJ in the f-structure of *I'll*. As a result, the lexical instantiation rules combined with annotated phrase-structure rules

generate the same f-structure for both non-contracted *I will help* and contracted *I'll help* by preserving the same c-structure underlying them.

3.2 Broadwell's analysis

Compared to the conservative solution, Broadwell's (2008) analysis adopts a more fine-grained view of morphosyntax as he recognises Turkish nominal inflections as functional heads projecting their own functional categories. Although Broadwell (2008) does not explicitly formulate the relevant phrase-structure rules incorporating the introduced functional categories and heads, we can surmise from his examples that they are as follows:

(12)

NP	$\longrightarrow$	N $\uparrow=\downarrow$			
NP	$\longrightarrow$	NP^{+} $\uparrow \in \downarrow$	Cnj $\uparrow=\downarrow$	NP $\uparrow \in \downarrow$	
PluralP	$\longrightarrow$	NP $\uparrow=\downarrow$	Plural $\uparrow=\downarrow$		
CaseP	$\longrightarrow$	{NP | PluralP} $\uparrow=\downarrow$	Case $\uparrow=\downarrow$		

As can be seen in (12), these functional heads can take as their complements either a simple NP headed by an N or an NP coordination. The distribution of the final conjunct's nominal features over the coordinate structure, on the other hand, is achieved based on two distinct, yet complementary assumptions. First, the introduced functional projections are assumed to be endocentric projections where the complement NP coordination and the functional head corresponding to the nominal inflection are encoded as f-structure coheads mapping onto the same f-structure. Second, NUM and CASE are assumed to be distributive features in Turkish. These two assumptions jointly guarantee the distribution of a nominal feature over a coordinate structure provided that the nominal feature is mapped onto the f-structure containing the set of conjuncts and is not encapsulated in the f-structure of an NP conjunct.

At this stage of analysis, this configuration of phrase-structure rules assumes that the nominal inflections are independent elements. For this reason, lexical instantiation rules need to be introduced to ensure that an inflected lexical item can generate the desired phrase-structural configuration. Although Broadwell (2008) presents various examples in his paper, for the sake of simplicity, their analysis will be demonstrated on example (7), which constituted our object of analysis in the previous section as well. The lexical instantiation rules for the conjuncts (*yazı* and *resimlere*) are provided in their respective order in the following:[6]

[6]Broadwell (2008) provides only the schematic representations of lexical instantiation rules without supplying annotations. The annotations on the following lexical instantiation rules are assumed by the author to accurately reflect Broadwell's intentions.

(13) *yazı* ⟵ N
(↓ PRED) = 'INSCRIPTION'
⇓ = ↓

resimlere ⟵ N (↓ PRED) = 'PAINTING' ⇓ = ↓ Plural (↓ NUM) = PL ⇓ = ↓ Case (↓ CASE) = DAT ⇓ = ↓

The combination of the phrase-structure rules provided in (12) with the lexical instantiation rules yields the l- and c-structures represented in Figure 1:

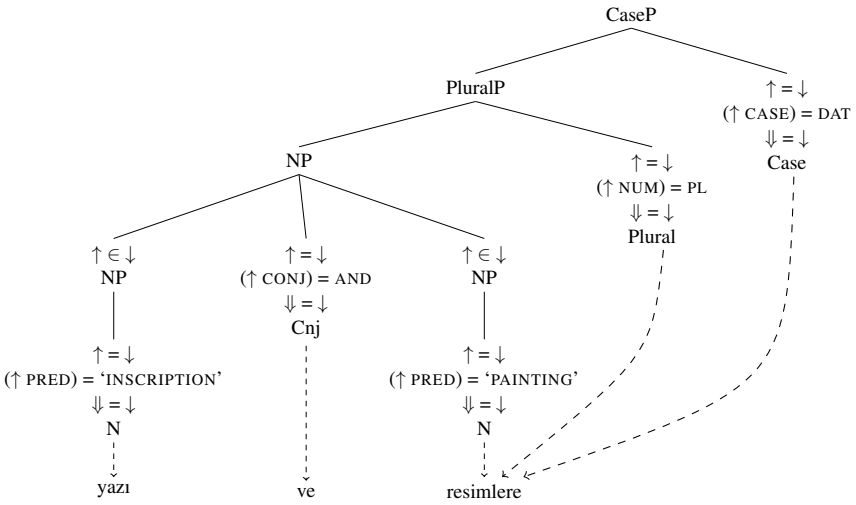

Figure 1: l- and c-structures of *yazı ve resimlere*

Broadwell's analysis, however, requires two revisions to be fully operational in correctly parsing instances of Turkish SA. The first revision concerns the fact that the coordination rule currently cannot provide ambiguous readings present in Turkish SA where conjuncts can either share the same NUM value or not. One solution to this problem would be to add an additional coordination rule such that the phrase-structure category of the second conjunct can be PluralP and that the preceding conjuncts can be either of category NP or PluralP to admit coordinate structures where both conjuncts are marked for plural. Moreover, the category of this type of coordination must be different from the uniform NP coordination rule in (12), hence the category name NP_{c_pl} in (14). Otherwise, the grammar would generate sentences where the plural suffix on the second conjunct is duplicated. The additional rule in (14) solves the problem by generating an alternative phrase-structure configuration where the plural head is encapsulated in the final conjunct, rather than obligatorily attaching to an NP coordinate structure and distributing to the conjuncts.

(14) NP_{c_pl} ⟶ { NP | PluralP }$^{+}$ Cnj PluralP
↑ ∈ ↓ ↑=↓ ↑ ∈ ↓

The second revision concerns the lack of coverage on the possessive suffix, which can be solved by postulating that the possessive suffix also heads its own functional projection just like other nominal inflections. Accordingly, the second revision in (15) introduces an additional phrase-structure rule for the possessive suffix and modifies all the existing rules in (12) to accommodate the plural coordination rule shown above.

(15)

$NP_{c\_uniform}$	$\longrightarrow$	NP^{+} $\uparrow \in \downarrow$	Cnj $\uparrow=\downarrow$	NP $\uparrow \in \downarrow$	
NP_{c_pl}	$\longrightarrow$	$\{ NP \mid PluralP \}^{+}$ $\uparrow \in \downarrow$	Cnj $\uparrow=\downarrow$	PluralP $\uparrow \in \downarrow$	
PluralP	$\longrightarrow$	$\{ NP \mid NP_{c\_uniform} \}$ $\uparrow=\downarrow$	Plural $\uparrow=\downarrow$		
PossP	$\longrightarrow$	$\{ NP \mid NP_{c\_uniform} \mid NP_{c\_pl} \mid PluralP \}$ $\uparrow=\downarrow$			Poss $\uparrow=\downarrow$
CaseP	$\longrightarrow$	$\{ NP \mid NP_{c\_uniform} \mid NP_{c\_pl} \mid PluralP \mid PossP \}$ $\uparrow=\downarrow$			Case $\uparrow=\downarrow$

The final version of phrase-structure rules illustrated in (15) along with relevant lexical instantiation rules should work as intended.[7] Namely, it should successfully parse only the grammatical occurrences of Turkish SA, which, for Broadwell (2008, p. 7), correspond to SA in the inflectional domain since he claims derivational morpheme suspension is "impossible" in Turkish. In this respect, Broadwell's analysis, just like the conservative solution outlined, fails to account for a small yet substantial portion of SA occurrences in Turkish, which can be interpreted as a disadvantage of the lexical sharing analysis. Moreover, Broadwell's lexical sharing analysis can actually be framed in the standard LFG framework in a less cumbersome way as demonstrated in the previous section. Thus, this can be considered as an additional disadvantage of Broadwell's analysis because a simpler solution that achieves the same result exists. On the other hand, one can argue that Broadwell's lexical sharing analysis offers a more fine-grained view into the morphosyntactic contribution of inflectional suffixes now that their hierarchical dominance over the coordination is visible in c-structure.

The dilemma presented here amounts to the question whether attaining this fine-grained view is worth expanding the repertoire of phrase-structure rules, which ultimately pertains to the more general debate on syntax vs. lexicon. Within the context of an agglutinative language, like Turkish, where morphemes can take part in syntactic relations and exhibit an internal organisation resembling clausal syntax, the fine-grained view seems to be not only justified but also sometimes necessary to properly model phenomena observed in such languages (Çetinoğlu and

[7] The phrase-structure rules presented so far for lexical sharing analysis are by no means exhaustive. In a full-scale grammar of Turkish, numerous other coordination rules must be added for the grammar to accept other types of non-SA coordination as well.

Oflazer 2006). In this respect, Broadwell's cartographic approach to a phenomenon where the morphology-syntax distinction is blurred can be justified. Nevertheless, if the central reason behind adopting this morpheme-based view is to better model the morphosyntactic processes behind phenomena, developing such analyses within the framework of LS does not seem to be appropriate. A framework suitable for this aim should qualify as a fully-fledged theory of morphosyntax that can formally integrate syntactic analysis with a theory of morphology. It is true that LS can also constitute the basis of a morpheme-oriented analysis thanks to the flexibility of lexical instantiation rules. But when we actually look at the level where morphosyntax is modelled in LS, which is the lexical instantiation rule, there seems to be a lack of detailed information regarding morphemes. One can even argue that lexical instantiation rules do not have an intrinsic notion of a "morpheme" as they merely signify a correspondence between a lexical item's formal features and (a) c-structure node(s) that it instantiates. For instance, suppose that a phenomenon that primarily involves morphosyntactic processes required us to refer to the morphophonological or morphotactic properties of a morpheme. Lexical instantiation rules provide no theoretical tools to model such complex interactions.

4 Lexical-Realizational Functional Grammar (L_RFG) as an Alternative Framework

Originally formulated in Melchin et al. (2020), Lexical-Realizational Functional Grammar (henceforth abbreviated as L_RFG) is a novel framework that combines Distributed Morphology (henceforth abbreviated as DM; Halle and Marantz 1993) with LFG. The end product is a robust theory of morphosyntax that integrates the modular and correspondence-based grammatical architecture of LFG with DM's realizational, morpheme-based model of morphology.

4.1 Overview of L_RFG architecture

The syntactic features of L_RFG are similar to standard LFG in that L_RFG continues to model syntax without adopting the notion of derivations assumed in Minimalist syntax, which constitute the main combinatorial engine behind standard DM. In this regard, L_RFG is classified as a constraint-based, non-derivational architecture of grammar, like its parent framework LFG. In order to incorporate DM's realizational, morpheme-based approach to morphosyntax, however, L_RFG introduces certain crucial modifications to the standard LFG projection architecture:

- L_RFG keeps c-structure as the level where information such as constituency and categorial information are represented in terms of phrase-structural terms. Crucially, unlike the c-structure in standard LFG, the terminal nodes of c-structure are not words, but bundles of f-descriptions, which can be defining and constraining equations, as well as meaning constructors.

- Unlike standard LFG, L_RFG's c-structure does not only map to f-structure via projection ϕ, but also to a distinct level called v(ocabulary)-structure, which is a morphophonological feature structure where Vocabulary Items (VIs) realise the f-descriptions and meaning constructors at c-structure terminal nodes via L_RFG's exponence function ν. V-structure forms the basis of the phonological string as it further maps to prosodic structure via the correspondence function ρ.
- Vocabulary Items (VIs) in L_RFG denote a mapping from three distinct types of information present at c-structure (c-structure category, f-descriptions and meaning constructors) to a morphophonological form that realises the relevant arguments. An example of a fully-fledged VI can be demonstrated with the Turkish derivational morpheme *-lɪ* (see (4a)), which derives adjectives from nouns. The derived adjectives roughly mean *having the quality/property of the base noun*.

(16) $\langle$ [adj], $\Phi\{(\uparrow \text{PRED}) = \text{`WITH<OBJ>'}\}$, $\lambda P.\text{WITH}(P)$ $\rangle$
$\xrightarrow{\nu}$
($\bullet^{8}$ PHONEMIC.REPRESENTATION) = /lɯ/
($\bullet$ TYPE) = ADJECTIVAL
($\bullet$ DEPENDENCE ALIGN) = RIGHT
($\bullet$ DEPENDENCE IDENTITY) = NIECE
($\bullet$ HOST TYPE) = NOMINAL
($\bullet$ HOST PFRAME) = (/.../*, /...([obs])[round–,back+]([obs])/)$_\sigma$)

As can be seen in (16), the VIs map from a 3-tuple to a set of morphemic descriptions that output a v-structure, if the VI in question is selected by the exponence function ν. Note that the descriptions listed do not only contain morphosyntactic and morphophonological information about the morpheme itself, but also about its host. For instance, the HOST features in (16) specify that the host must be a nominal and the nucleus of its last syllable (possibly preceded/followed by 0 or more syllables) must be an unrounded back vowel, as stated in HOST PFRAME.[9]

4.2 L_RFG's exponence function ν

4.2.1 Input arguments

The exponence function ν (Melchin et al. 2020, 2021, Asudeh and Siddiqi 2022) takes three arguments present at c-structure as input to yield v-structure. The first argument is an ordered list of pre-terminal categories. The order of the list conforms to the linear order that the preterminal categories have in the c-structure tree. Although the cardinality of the list is typically 1, corresponding to only one

[8] "$\bullet$" denotes "the current v-structure."

[9] In the subsequent representations of VIs, the HOST PFRAME entry will be omitted as the current analysis does not deal with the morphophonological aspects of the phenomenon in question.

c-structure preterminal node, the list can in principle contain multiple preterminal c-structure nodes so long as they are adjacent, which would be an instance of *spanning*.[10] The second argument is a function called the bridge function (symbolised as Φ) which maps the provided f-descriptions to the set of f-structures that are valid for them. The third argument takes as its input a set of meaning constructors specified in terms of Glue Semantics (see Dalrymple et al. 2019, Chapter 8; Asudeh 2022).

4.2.2 Exponence constraints

The main duty of the exponence function ν can be described as deciding the winner of the competition between VIs to realise grammatical and semantic features specified at c-structure. In order to ensure that ν selects the VI that best realises the given grammatical and semantic features, the following constraints are proposed in L_RFG theoretical work (Melchin et al. 2020, 2021, Asudeh and Siddiqi 2022):

- **MostInformative**$_f$ ensures that the exponence function ν selects the VI that is best subsumed by the f-structure defined by the f-description(s) given as input to the second argument. The reason why the second argument is a function taking f-description(s) stems from the fact that this constraint is modelled on a subsumption relation (see Dalrymple et al. 2019, p. 240), which only applies to f-structures. In other words, it is not the respective f-descriptions of a c-structure node and a VI that are compared per se, but the f-structures defined by their f-descriptions. Accordingly, this constraint compares two VIs and prefers the VI whose second argument is subsumed by the other's. And among the ones that are subsumed by the f-structure in question, if there is more than one, MostInformative$_f$ selects the one that has the greater number of additional features.
- **MostInformative**$_c$ selects the VI that realises the greater number of preterminal categories supplied as a list to the exponence function ν. The selection is formally modeled as a proper subset relation on lists-as-sets. From a practical point of view, this constraint favours portmanteau forms if the morphosyntactic context allows.
- **MostInformative**$_s$ returns the VI that provides the most specific meaning given the meaning constructors supplied as inputs to ν. This constraint is formally modeled as a proper subset relation on set-denoting expressions.
- **MostSpecific** selects the VI that imposes the greater number of restrictions on its host as specified in the HOST features of the VI. This is modelled using the proper subsumption relation between v-structures pertaining to HOST features.

[10] The mechanism of spanning in L_RFG is similar to the many-to-one mapping property of the λ projection in lexical sharing where one lexical form can instantiate multiple c-structure nodes.

MostInformative$_f$ and MostInformative$_c$ are classified in the framework as morphosyntactic constraints as they manage f-structure and c-structure category relations. However, MostInformative$_s$ is classified as a morphosemantic constraint, while MostSpecific is a morphophonological constraint.

5 L_RFG Analysis of Turkish Suspended Affixation

The strict demarcation postulated between the syntactic status of inflectional and derivational suffixes in Turkish SA cannot be considered conclusive in the presence of empirical evidence showing otherwise (see Akkuş 2016). A further analysis should not merely state which suffixes are permissible in SA but also propose an explanation as to why certain suffixes can take part in SA while some of them cannot. To achieve that, the present work introduces a novel classification of Turkish suffixes. The resulting classification aims to be predictive about the plausibility of a given Turkish suffix to take part in SA in the context of nonverbal coordination.

5.1 Classification of bound morphemes in Turkish

Following Yoon's (2017) terminology, the present paper proposes two major classes of suffixes: *opaque* and *transparent* suffixes. The former is further divided into *strict-opaque suffixes* and *semi-opaque suffixes*. For the classification schema, the present work proposes one semantic and one morphosyntactic criterion for assigning a class to a given Turkish suffix:

- **The SEM Influence criterion** evaluates whether a given suffix can have an impact on the lexical meaning of its host. In L_RFG terms, this semantic impact is automatically assumed to be present if the VI of a given suffix contains an f-description with a PRED attribute as in example (16). This criterion renders all inflectional suffixes "$-$" for SEM Influence as they only contribute nominal features rather than a semantic form. All Turkish derivational suffixes, however, can be marked with "$+$" for this criterion as they introduce a new semantic form saturated by their hosts.

- **The Acategorial Root criterion** ($\sqrt{\text{X}}$) checks whether the host of a given suffix is a Root ($\sqrt{\ }$) or a categorially stable free stem. The primary distinction between a Root and a free stem is that Roots lack syntactic categories without their category assigning suffixes and fail to take part in syntax, while free stems can behave as syntactically independent elements. All Turkish derivational suffixes that are traditionally classified as attaching to "verbal" bases receive "$+$" for $\sqrt{\text{X}}$, while the remaining derivational and inflectional suffixes are marked with "$-$" for this criterion.

5.1.1 Opaque suffixes

The characteristic feature of opaque suffixes is that they seldom take part in phrasal syntactic phenomena and even if they do, they are subject to multiple constraints. All Turkish derivational morphemes fall under this category. The present paper

hypothesises that the majority of opaque suffixes are incompatible with Turkish SA.

Strict-opaque suffixes attach to Roots and are responsible for assigning a syntactic category to them in the process. The term "strict opacity" essentially refers to this first phase 'inner-word formation' being opaque to syntax. Consequently, it can be claimed that strict-opaque suffixes cannot take part in the syntactically driven process of SA and leave behind their acategorial bases as bare conjuncts, which also addresses Kabak's (2007) observation that only morphologically complete words can be remnants in Turkish SA. Furthermore, strict-opaque suffixes exert a semantic influence on their hosts. In conclusion, they receive "+" for both $\sqrt{\text{X}}$ and SEM Influence criterion. These properties of strict-opaque suffixes can be seen in their VIs. The VI of a suffix classified as strict-opaque suffix is schematically represented as shown in (17):

(17) $\langle$ [n_{str_op} | adj_{str_op} | adv_{str_op}], $\Phi\{(\uparrow \text{PRED}) = \text{`SEMFORM}< \ldots >\text{'}\}$, $\lambda P.\text{MEANING}(P)$ $\rangle$
$\xrightarrow{\nu}$
(● TYPE) = NOMINAL | ADJECTIVAL | ADVERBIAL
(● DEPENDENCE ALIGN) = RIGHT
(● DEPENDENCE IDENTITY) = SISTER
(● HOST TYPE) = ROOT

As can be seen in (17), a strict-opaque suffix contributes a semantic form, specifies that it is dependent on its host as its sister, and requires its host to be a Root. If these constraints are satisfied, they can project their own subclass of nominal, adjectival and adverbial phrases acting as heads. The class of strict-opaque suffixes is hypothesised in this paper to be completely incompatible with Turkish SA.

Semi-opaque suffixes typically attach to nominal or adjectival hosts and they derive either a nominal, adjectival or an adverbial. In this respect, they are different from strict-opaque suffixes in that their hosts are not Roots, which renders them "−" $\sqrt{\text{X}}$. But like strict-opaque suffixes, they still contribute a semantic form saturated by their host's meaning. Hence, they are still marked "+" for SEM Influence. These properties of a semi-opaque suffix would be reflected in its VI as demonstrated in (18):

(18) $\langle$ [n_{sem_op} | adj_{sem_op} | adv_{sem_op}], $\Phi\{(\uparrow \text{PRED}) = \text{`SEMFORM}< \ldots >\text{'}\}$, $\lambda P.\text{MEANING}(P)$ $\rangle$
$\xrightarrow{\nu}$
(● TYPE) = NOMINAL | ADJECTIVAL | ADVERBIAL
(● DEPENDENCE ALIGN) = RIGHT
(● DEPENDENCE IDENTITY) = NIECE
(● HOST TYPE) = NOMINAL | ADJECTIVAL

Similar to strict-opaque suffixes, semi-opaque suffixes also project their own categories. Unlike strict-opaque suffixes, however, they are generally available for SA although their availability seems to be constrained by pragmatic factors, such as the conceptual and contextual similarity between the conjuncts.

5.1.2 Transparent suffixes

Transparent suffixes attach to NOMINAL hosts. Unlike opaque suffixes, they simply encode grammatical information rather than exerting a semantic influence. For this reason, the f-descriptions realised by such forms are strictly limited to nominal features, such as CASE, NUM, and POSS. The representative VI of a transparent suffix is presented below:

(19) $\langle$ [plur|poss|k], $\Phi\{$(↑ NUM|POSS|CASE) = VAL$\}$, (M.CONSTRUCTOR) $\rangle$
$\xrightarrow{\nu}$
(● TYPE) = NOMINAL
(● DEPENDENCE ALIGN) = RIGHT
(● DEPENDENCE IDENTITY) = NIECE
(● HOST TYPE) = NOMINAL

Since the semantic representation of such suffixes drastically differ depending on the nominal feature, the VI in (19) omits listing them separately. Also note that the transparent suffixes project their own functional categories as functional heads, similar to the other classes of suffixes.

5.2 Analysis of different Turkish SA configurations

5.2.1 Templates of nominal features

As in LFG (see Dalrymple et al. 2019, p. 230-237; Dalrymple et al. 2004), L_RFG commonly utilises templates to compactly encode bundles of f-descriptions. Although providing a template for each Turkish suffix is impossible due to space limitations, we can still encode the nominal features as templates:

Template	f-description	Explanation
@CASE-x	(↑ CASE) = x	x is a placeholder for all Turkish cases
@PLUR	(↑ NUM) = PL	plural marker
@x{SG|PL}-POSS	(↑ POSS PRED) = 'PRO' (↑ POSS NUM) = {SG|PL} (↑ POSS PERS) = x	x is a placeholder for possible person values: {1,2,3}

Table 1: Templates of Nominal Features in Turkish

5.2.2 C-structure rules

The newly introduced functional categories of each suffix type are incorporated into c-structure with the following phrase-structure rules in (20).[11] The *x* in the rules stands for *n*, *adv*, and *adj* as the current paper does not deal with verbal and postpositional phrases.

[11] The X′ schema and adjP rules are implicitly assumed although not explicitly presented in the c-structure rules. Moreover, the list contains only the rules that are relevant for the analysis of Turkish SA. Multiple other types of coordination rules should be included to allow non-SA coordination instances.

(20) a. $xP_{lexical} \longrightarrow \underset{\uparrow=\downarrow}{\sqrt{}}\ \underset{\uparrow=\downarrow}{x_{lexical}}$

b. $xP_{str\text{-}opaque} \longrightarrow \underset{\uparrow=\downarrow}{\sqrt{}}\ \underset{\uparrow=\downarrow}{x_{str\text{-}opaque}}$

c. $xP_{sem\text{-}opaque} \longrightarrow \underset{\uparrow=\downarrow}{xP}\ \underset{\uparrow=\downarrow}{x_{sem\text{-}opaque}}$

d. $xP_{coord} \longrightarrow \underset{\uparrow=\downarrow}{(Cnj[pre])}\ \underset{\uparrow\in\downarrow}{xP_y{}^{+}}\ \underset{\uparrow=\downarrow}{Cnj[main]}\ \underset{\uparrow\in\downarrow}{xP_y{}^{12}}$

e. $nP_{c\text{-}pl} \longrightarrow \underset{\uparrow=\downarrow}{(Cnj[pre])}\ \underset{\uparrow\in\downarrow}{\{\, nP_y{}^{+} \mid PluralP \,\}}\ \underset{\uparrow=\downarrow}{Cnj[main]}\ \underset{\uparrow\in\downarrow}{PluralP}$

f. $PluralP \longrightarrow \underset{\uparrow=\downarrow}{\{\, nP_{lexical} \mid nP_{str\text{-}opaque} \mid nP_{sem\text{-}opaque} \mid nP_{coord} \,\}}\ \underset{\uparrow=\downarrow}{Plural}$

g. $PossP \longrightarrow \underset{\uparrow=\downarrow}{\{PluralP \mid nP_y\}}\ \underset{\uparrow=\downarrow}{Poss}$

h. $KP \longrightarrow \underset{\uparrow=\downarrow}{\{PossP \mid PluralP \mid nP_y\}}\ \underset{\uparrow=\downarrow}{K}$

While (20a) is for lexical items that are neither inflected nor derived from another base, (20b) and (20c) reflect the properties of opaque suffixes presented in the previous section. (20d) and (20e) are the modified coordination rules whose functions have been discussed within the context of (14). The last three rules, on the other hand, pertain to the functional categories projected by transparent suffixes.

5.2.3 Phenomenon 1: SA in the inflectional domain

Now that the core components of the L_RFG analysis have been introduced, we begin by illustrating its application to SA in the inflectional domain, by working through an analysis of sentence (21).

(21) Kitap ve defter-ler-im-i unut-tu-m.
Book and notebook-PL-1SG.POSS-ACC forget-PST-1SG
'I forgot my books and notebooks.'

In the modified projection architecture of L_RFG, c-structure precedes both f- and v-structure. Therefore, the analysis starts from the level of c-structure, which is warranted by the phrase-structure rules listed in (20). As can be observed, the terminal nodes of the c-structure represented in Figure 2 are populated by f-descriptions or templates rather than lexical forms.[13]

The next step in the analysis is the application of the exponence function ν to select VIs that best realise the information associated with (a) given c-structure node(s) and construct the v-structure. The constraint family MostInformative$_{f,c,s}$ and MostSpecific select the most appropriate VIs the given the input from preterminal and terminal nodes, which are listed in (22).[14]

[12] Here the subscript y is a placeholder for all subtypes, such as *lexical* and *sem-opaque*.

[13] The functional annotations expressing cohead relationships are omitted due to space limitations.

[14] Although the right-hand sides of $\xrightarrow{\nu}$ contain much more information, as sketched in the previous sections, here they are only represented as strings for representational simplicity. Furthermore, since the constraint MostInformative$_s$ is only indirectly relevant to the present analysis, the third argument of the VIs (meaning constructor) is omitted in (22).

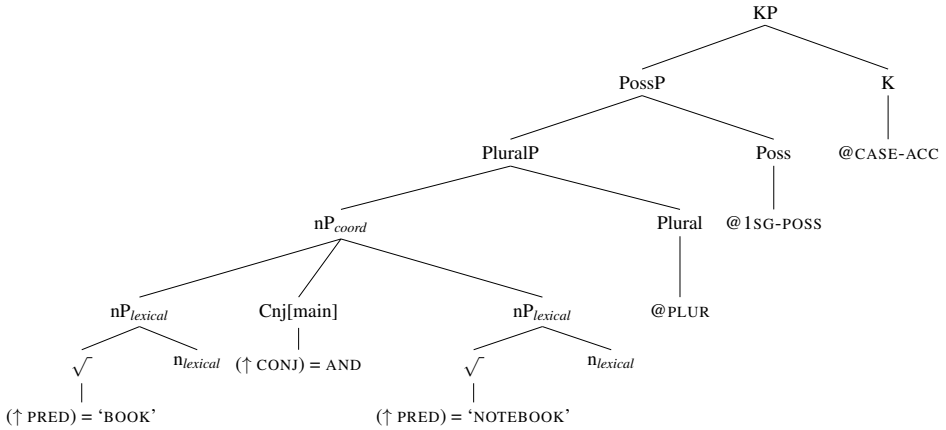

Figure 2: c-structure of *kitap ve defterlerimi*

(22) **Input Arguments to ν**

Preterminal Categories	Bridge Function Φ	v-structure
$\langle[\sqrt{}, \text{n}_{lexical}]$,	$\Phi\{(\uparrow \text{PRED}) = \text{'BOOK'}\}\rangle$	$\xrightarrow{\nu}$ *kitap*
$\langle$[Cnj[main]],	$\Phi\{(\uparrow \text{CONJ}) = \text{AND}\}\rangle$	$\xrightarrow{\nu}$ *ve*
$\langle[\sqrt{}, \text{n}_{lexical}]$,	$\Phi\{(\uparrow \text{PRED}) = \text{'NOTEBOOK'}\}\rangle$	$\xrightarrow{\nu}$ *defter*
$\langle$[Plural],	$\Phi\{@\text{PLUR}\}\rangle$	$\xrightarrow{\nu}$ *-ler*
$\langle$[Poss],	$\Phi\{@\text{1SG-POSS}\}\rangle$	$\xrightarrow{\nu}$ *-im*
$\langle$[K],	$\Phi\{@\text{CASE-ACC}\}\rangle$	$\xrightarrow{\nu}$ *-i*

The output of the exponence function ν yields the morphophonological string *kitap ve defterlerimi* (in reality a feature structure listing morphophonological specifications) which takes its final form once it is projected to prosodic structure. When it comes to f-structure, since NUM, CASE and POSS are encoded as distributive features, the nominal features that attach to the coordinate structure distribute to the conjuncts. Note that there can be an alternative c-structure in which the coordination has the category nP$_{c_pl}$ with its final conjunct being categorised as PluralP. The latter c-structure would project an f-structure with conjuncts bearing different NUM values.

5.2.4 Phenomenon 2: SA in the derivational domain

As discussed throughout the paper, some derivational suffixes in Turkish seem to be perfectly compatible with SA while some of them are not. The classification schema developed in this paper can predict whether a given Turkish suffix can be available for SA or not. Consider the Turkish derivational suffix *-(G)Aç*, which has roughly the same meaning as the instrumental suffix *-er* in English (e.g., *shred-(d)er*). *-(G)Aç* only attaches to Roots ($\sqrt{\text{X}} = +$) and derives a nominal

with a different meaning (SEM Influence = +) in the process. These observations lead to the conclusion that *-(G)Aç* is a strict-opaque suffix, which is hypothesised to be utterly incompatible with Turkish SA. This is confirmed by the lack of corpus examples incorporating SA with *-(G)Aç*. And even if we force-construct an example SA sentence with *-(G)Aç*, the resulting sentence is highly ungrammatical. Moreover, none of the possible c-structure rules listed in (20) can generate a valid c-structure for (23).

(23) *Del ve süz-geç al-dı-m.
pierce and strain-INSTRUMENT buy-PST-1SG
Intended meaning: 'I bought a puncher and a strainer.'

What about the derivational suffixes that are perfectly compatible with Turkish SA (see (4))? Consider the attested example (24) found in Turkish Web 2012 corpus. The suspended suffix in question, *-lü*, produces an adjectival when it attaches to a host (SEM Influence = +), which can only be a nominal as required by *-lü* ($\sqrt{\text{X}} = -$). These observations lead to *-lü* being classified as a semi-opaque suffix, hence the prediction that it may be compatible with SA, which is exactly the case.

(24) şeker ve alkol-lü içecek-ler
sugar and alcohol-CONTAIN drink-PL
'sugar and liquors' Non-SA
'sugar and alcohol containing drinks' SA

The proposed c-structure rules not only validate the grammaticality of the example but also predict the ambiguity present in (24) by generating different c-structures corresponding to the different readings, which can be observed in Figures 3 and 4.[15] All in all, the L_RFG analysis proposed here not only makes accurate predictions about the suspension availability of a given Turkish suffix, but also provides a fine-grained morphosyntactic explanation supporting the predictions.

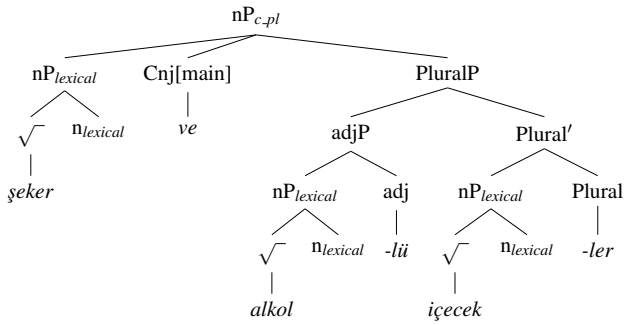

Figure 3: Non-SA reading

[15]Due to space limitations, the terminals of the c-structures in Figures 3 and 4 are the outputs of the VIs. In reality, the terminals of licit L_RFG c-structures are bundles of formal descriptions.

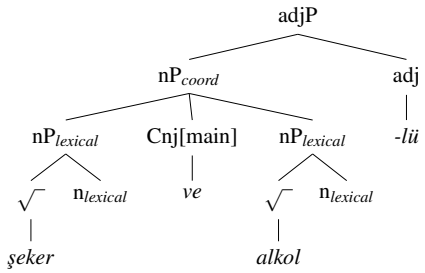

Figure 4: SA reading

6 Conclusion

The present paper attempted to offer two solutions to the problems posited by Turkish SA phenomena and reconsidered Broadwell's (2008) LS analysis of Turkish SA. The first solution remained faithful to the core LFG architecture. This solution neither utilised extended formalisms nor introduced functional categories. The second solution was formulated within the framework of L_RFG and favoured an atomic approach where the analysis was couched in the properties of morphemes and specific interactions between them. While the first solution offers a simple, yet powerful mechanism to account for the majority of Turkish SA instances, the empirical coverage of the second type is far more comprehensive. Moreover, since the second solution frames the Turkish SA in terms of morphemic properties, it can be viewed as a more explanatory analysis rather than a descriptive one. A further analysis may investigate the possible impact of morphophonological properties of derivational morphemes involved in Turkish SA, which can be achieved in L_RFG.

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