THEORETICAL LINGUISTICS PROGRAMME, BUDAPEST UNIVERSITY (ELTE)

DOXIMP 4

GRADUATE STUDENTS' FOURTH LINGUISTICS SYMPOSIUM

June 24, 1999, Budapest

— SELECTED PAPERS —

RESEARCH INSTITUTE FOR LINGUISTICS, HUNGARIAN ACADEMY OF SCIENCES

WORKING PAPERS IN THE THEORY OF GRAMMAR, VOL. 7, NO. 1

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Contents

Contour segments and length in CV phonology

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Abstract

In a radical syllable theory, where prosodic constituents are maximally unary (i.e. they cannot branch) and all surface clusters are phonologically non-adjacent (i.e underlying empty positions are sandwiched between them), the question of how contour structures and segment length should be represented arises. Since the latter is encoded by the melodic content occupying *two* skeletal slots, both geminate consonants and long vowels have their melody attached to two positions and straddling an empty one. Diphthongs, however, contain a transition from one vowel quality to another, which requires them to have two separate sister root nodes.

These considerations lead to the introduction of an additional tier, which raises further questions, most of which will be touched on in what follows, e.g. how languages utilise the possible association combinations offered by the three tiers; how this representational method can be adapted to C positions; and to what extent the framework can remain restrictive.

Finally, I will briefly discuss the issue concerning the representation of English triphthongs. I will argue, on the basis of data from vowel shortening and vowel disorder, that their melody occupies a VCV unit on the prosodic tier.

0 Introduction

The present discussion assumes the claim (first made by Jean Lowenstamm 1996) that the syllable is universally composed of a non-branching onset (indicated by "C") plus a non-branching nucleus ("V"); surface clusters and long segments sandwich empty slots on the CV tier. Since this statement is supposed to hold *universally*, I assume it to characterise the English language as well.

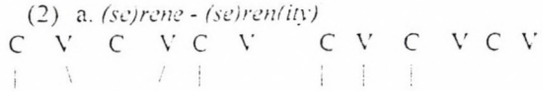
In this framework segment length is encoded by the melodic content occupying two skeletal slots. Accordingly, (1a) is a geminate consonant; (1b) is a long vowel ("α" stands for optional melody).

(1)

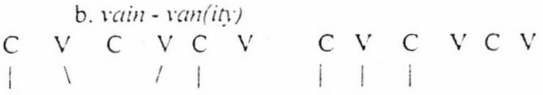
1 The representation of diphthongs

Diphthongs resemble long monophthongs in that: i. phonetically both are long; ii. phonologically both are "free" (cf. Wells 1982: 119) or "tense" (in the sense used e.g. in Nádasdy 1989), e.g. they are subject to the same phonotactic constraints as well as affected by laxing/shortening in the same manner. In Balogné (1997), I argue that laxing/shortening results from the loss of one CV unit, which causes the delinking of one portion of the long vocalic segment in order to go into the remaining skeletal structure, cf. (2a). (2b) exemplifies the shortening of a diphthong. (Only the relevant information is shown.) Notice that in *both* cases the stem of the derivative has become one CV unit shorter.

(2) a. *(se)rene - (se)ren(ity)*



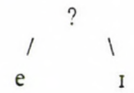
b. *vain - van(ity)*



Since the behaviour of diphthongs parallels that of long monophthongs, they should apparently be represented analogously with long vowels (viz. as shown in (1b)), i.e. they must occupy two V slots and straddle an empty C position. Therefore, the diphthong /eɪ/ in (2b) is represented correctly.

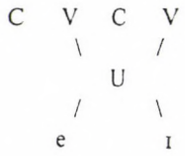
However, unlike long monophthongs, diphthongs contain a transition from one vowel quality to another, so their representation should contain two separate root nodes corresponding to the melodic material of their two halves, as in (3).

(3)



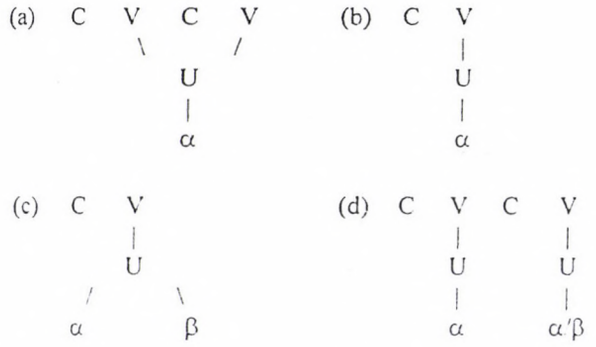
The above considerations lead to the representation in (4), i.e. to the introduction of an extra node between the CV tier and the root (corresponding to the question mark in (3)). The exact function of this node is not clear yet, although it must be indicating that the diphthong is, similarly to long monophthongs, somehow one unit (or one segment). Thus, it will henceforth be called the U(nit)-node, in a rather arbitrary way, and symbolised by U[1]. Consider the representation in (4).

(4)



The introduction of a new tier, however, makes some additional combinations possible, of which the following can be easily interpreted (α's and β's denote different melodic contents):

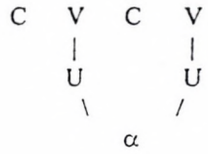
(5)



As the readers can justify for themselves, (5a) is a long monophthong, (5b) a short monophthong, (5c) a "short" diphthong (as in e.g. Icelandic), and (5d) a hiatus. If the Obligatory Contour Principle, saying that adjacent equivalent melodies are illegal, can reach as far as the roots below U, hiatuses containing two vowels of the same quality should be represented as in (6).

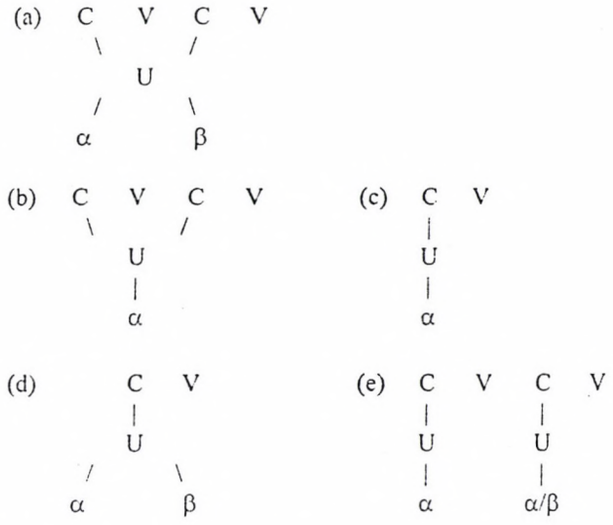
[1] Not to be confused with the melodic element U.

(6)



This representational method can be extended to C positions as well. In (7), the same configurations for consonants are given. (7a) corresponds to (4), and it is a long affricate. (7b-e) correspond to the representations in (5a-d), respectively. (7b) is a true geminate, (7c) a single consonant, (7d) a short affricate, (7e) a consonant cluster in the case of differing melodies, and a fake geminate (e.g. at morpheme boundaries in English) when the two roots have the same content.

(7)



Unfortunately, to exclude some impossible combinations we need a filter which prevents any of the C or V slots to branch. (Otherwise, if I am not mistaken, all the possible configurations are given in (4-7) above.) This highlights the redundancy resulting from the introduction of an additional (viz. the U) tier.[2]

2 The representation of triphthongs

In English, there are two channels whereby phonetic triphthongs (i.e. vocalic sounds including a glide from one vowel to a second one and then to a third one) come into being: hiatus and "breaking" (cf. Wells 1982: 238). Triphthongs produced by hiatus (e.g. the vowel in *liar*) will not contain a common U-node, so they are not "true" triphthongs; their representation will resemble the one in (5d). Thus we can restrict the class of triphthongs to those produced by *mere* "breaking", i.e. those that can be found in monomorphemic words. The two triphthongs that remain in this way are the vowels in *fire* and *hour* - probably the only triphthongs in English (if triphthongs exist phonologically and authors like Wells 1982 are wrong saying that they are only phonetically triphthongs and result from schwa-insertion after diphthongs[3]).

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[2] For ease of representation, the U-node will *not* be employed henceforth. Instead, the less detailed model, such as the one in (2), will be used.

[3] If that was true, all triphthongs should have the structure of a hiatus.

In my previous account (Balogné 1997) I suggested that they occupy three V positions. However, the introduction of the U-node necessitates the reconsideration of the whole analysis. All the more so, since my observations concerning vowel shortening in English as well as vowel disorder in children[4] have revealed that triphthongs do *not* shorten into diphthongs but short monophthongs, thus an entire CV unit is *lost* during the derivation. Consider (8).

(8) a. *lyre ~ lyr(ical)*

```
C  V  C  V  C  V   C   V          C  V  C  V
|   \    |    /    |              |  |  |
l       aɪə        (r)            l  ɪ  r
```

b. *tyre* becomes /tɔjə/ in disordered production

```
CVCVCV          CVCV
| \  | /        | | | |
t  aɪə          t ɔ j ə
```

In (8a), shortening of the triphthong /aɪə/ is exemplified. As shown in (2) above, the stem of the derivative is always one CV unit shorter. However, in (8a), it "overshortens" - it loses two CV units.

(8b) shows the process traditionally termed "bisyllabification" of the same triphthong in vowel disorder, which stems from the speaker's inability to straddle, thus long (= straddling) segments are replaced by unstraddling ones by simply splitting the U-node (9a-b). The potentially resulting hiatus is avoided by spreading the place of the first portion of the original long vowel onto the intervening C position plus adding the stop element [?], apparently default in C positions (cf. Bates et al. 1997: 374-6) resulting in the voiced palatal stop (9c).

(9) a. input *here*

```
C  V  C  V
|   \    /
h      ɪə
```

b. U-node split

```
C  V  C  V
|  |     |
h  ɪ     ə
```

c. output in vowel disorder

```
C  V  C  V
|  |  |  |
h  ɪ  ɟ  ə
```

What is of crucial importance for the present discussion is the fact that bisyllabification is *never* accompanied by shortening, i.e. the loss of a CV unit. This boils down to the realisation that the representation of the triphthong in (8) is inappropriate: it *must* consist of two CV units only; triphthongs do not occupy three V positions (which would be quite odd anyway, claiming that three degrees of vowel length exist in English) but a VCV sequence as shown in (10a)[5].

(10)

a.
```
C  V   C   V   C  V
|   \  |   /   |
t      aɪə     (r)
```

b.
```
C  V   C   V   C  V
|   \  |   /   |
l      aɪə     (r)
```

Given the representation of *lyre* in (10b), why shortening creates the form *lyr-* (8a) becomes evident.

3 Conclusion

The goal of this paper was to make an attempt at describing phonological length and the inner structure of contour segments within a strict CVCV framework. In its present state, the analysis sketched here is still in its infancy, and calls for further research.

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[4] Data from Bates et al. (1997).

[5] Whether there is a virtual /r/ at the end of *tyre* is irrelevant here.

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ON ROMANIAN CLITICS

Elena Buja

0. INTRODUCTION

This paper is meant as a review of Carmen Dobrovie-Sorin's theory of clitics, focussing on one of the most relevant issues related to the topic, namely clitic placement. My goal is to examine whether the theory put forward by her can be applied to all possible positions in which pronominal clitics occur in Romanian.The first part of the paper consists of a brief presentation of the nature of clitics and of the Romanian clitic system, meant to give the reader a 'flavour' of the language. Data and views on the placement of pronominal clitics follow the presentation of the Romanian pronominal paradigm. We briefly discuss three solutions offered on this particular topic by Kayne (1975), Roberts (1991) and, finally, by Doborie-Sorin (1994). In the second part of the paper we want to 'test' the theory put forward by Dobrovie-Sorin by analysing all possible positions of the pronominal clitics.

1. THE NATURE OF CLITICS

Before examining the behaviour of pronominal clitics in all kinds of constructions, individually or in combinations with adverbial clitics, let me place Romanian pronominal clitics in the system of clitics in general, and in the system of Romanian clitics in particular.There is great variety amongst things traditionally called clitics, in that:

a) they may or may not be restricted to a particular position in a sentence (P2 in Serbo-Croat => Wackernagel's Law) or to a particular category (auxiliary verbs, pronominals, question particles);
b) they may or may not have a corresponding, phonologically similar full form with similar meaning/function. Thus, in Romanian pronominal clitics are usually derived as shortened, unaccented forms of the full-form pronouns (*el→l* 'him' (Acc); *lui→ii, i* 'him' (Dat).
c) they may or may not trigger/undergo phonological irregular allomorphy: Romanian:

ma	*vede* vs.	*m- a vɛzut*
AcCl	sees	AcCl has seen
'He sees me.'		'He has seen me.'

In spite of these differences, there still has to be a definition of what the term clitic refers to. According to Klavans (1985) (quoted in Spencer, 1994:377) 'clitics are lexical items with their own morphosyntactic and morphophonological properties'. Clitics differ from words in that they must show liaison with some other word (clitics are usually subcategorized to attach syntactically to a phrase of some sort, which represents the domain of cliticization). At the same time, clitics also differ from affixes in that they are unrestricted in what kinds of elements they attach to.

1.1. THE ROMANIAN CLITIC SYSTEM

The clitic system of Romanian seems to be richer than that of the other Romance languages. Thus, Romanian has the following types of clitics: pronominal, adverbial, conjunctional, prepositional, posessive, auxiliary and demonstrative. For our investigation, the most relevant are the first two types, (pronominal and adverbial), which very frequently occur together. The pronominal clitics repre sent reduced, unstressed variatns of full-form pronouns : *el* (full form), *l* (clitic) 'him' (Acc), *lor* (full form),*le, li* (clitic) them' (Dat.). On the other hand, the adverbial clitics (*tot, mai* 'still', *si* 'again') do not have reduced forms. According to their POSITION, Romanian clitics can be: 1. **enclitics** (grouped with the preceding element) : *am văzut-o* 'I have seen her'; 2. **proclitics**: *l-am iubit* 'I have love him'; 3. **endoclitics** (they break up the structure of some complex verbal constructions):

iubitu- l -am	*datu - i -am*	*ganditu -s – a*
loved AcCl (3,sg.,M) have	given DCl (3.sg,M/F) have	thought ReflCl has
'I have loved him'	I have given him/her...'	'He has thought....'

The adverbial clitics may be either **proclitics** (*mai vino!* 'come again!') or **endoclitics** (*nu l-am mai chemat* 'I haven't called him again') (adverbial clitics are underlined).The most representative from a structural and typological point of view are the PRONOMINAL CLITICS since their presence in the language has important consequences for the verb morphology and for the phrase syntax.

From a **morphological point of view**, Romanian, like many other languages containing clitics, has a set of rules referring to the occurrence of the clitic with the verbal host. Compare the following examples:.

1 a) *o dau,*	*o voi da,*	*dând-o,*	*as da-o,*	*i-o dau*	(Feminine clitic pron.)
AcCl give	AcCl will give	giving AcCl	would give AcCl	DCl AcCl give '	
'I give it'	'I will give it'	'giving it'	'I would give it'	'I give it to her/him'	

b) *il dau* *il voi da* *dându-l* *l-as da* *i-l dau* (Masculine clitic pron.)
(the glosses are identical to the ones in a)).

From a **syntactic point of view**, pronominal clitics are characterized by absorbing the features attributed by the verbal host, namely CASE and THEMATIC ROLE, satisfying the subcategorization requirements of the verb. As far as the corresponding non-clitic elements are concerned, pronominal clitics pose special semantic and syntactic problems in that they need to be bound. Pronominal clitics are included in chains which bind two or three co-referential components, one being the clitic itself, and the other either an empty category

(il_i *vad* $[e_i]$) or and NP	(il_i *vad pe* Ion_i).
AcCl(3,sg.M) see	AcCl(3,sg.M) see Prep. John
'I see him'	'I see John'

We shall restrict our investigation to pronominal clitics (considering also their combination with adverbial clitics), and in spite of the fact that that there are a lot of interesting issues that could be

analyzed in connection with this type of clitics, such as clitic doubling, wh-movement and case, we will focus our attention on **clitic placement**, trying to see whether the theory proposed by Dobrovie-Sorin works for all possible pronominal clitic occurrences: in *positive* and *negative statements*, in *positive* and *negative imperatives*, in *gerundial constructions*, in *complex verbal constructions*, in combination with adverbial clitics or as such. And since Romanian has different distributions of the 3rd pers. sg. masculine and feminine clitics, we shall try to see how these clitics behave in the above-mentioned cases.

2. CLITIC PLACEMENT

Before discussing the distribution of the pronominal clitics in Romanian, it would be in order to present the pronominal paradigm.

1st person	Sg.	Pl.	**2nd person**	Sg.	Pl.
N.	eu	noi		tu	voi
G.	-	-		-	-
D.	mie, îmi, mi	nouă, ne, ni		ție, îți, ți	vouă, vă, vi
Acc.	mine, mă, m	noi, ne		tine, te	voi, vă, v

3rd person	FEM.		MASC.	
	Sg.	Pl.	Sg.	Pl
N.	ea	ele	el	ei
G.	(al) ei	(al) lor	(al) lui	(al) lor
D.	ei, îi , i	lor, le, li	lui, îi, i	lor, le, li
Acc.	ea, o	ele, le	el, îl, l	ei, îi, i

From the point of view of their distribution, Romanian pronominal clitics fall into two groups: a) the 3rd pers. sg. fem. pronominal clitics and b) all the other pronominal clitics. For the sake of simplicity, we shall narrow our analysis to the pronominal clitics in the 3rd person singular only. Compare the following examples:

2) **Positive statements**: *il / o vad*
AcCl Masc./Fem see
'I see him/her'

Negative statements: *nu il / o vad*
neg.AcCl M/F see
'I do not see him/her.'

Positive imperatives: *ajuta-l ajut-o*
Help AcCl M/helpAcCl F
'Help him/her'

Negative imperatives: *nu-l ajuta / n-o ajuta*
neg.Cl M help/neg Cl F help
'Don't help him'her'

Auxiliary constructions: *lua -te- ar naiba!*
Take AcCl 2nd pers. subj. devil
'May the devil take you1'

l - as ruga *as ruga -o*
AcCl 3/M subj. ask subj. ask AcCl 3/F
'I would ask him' 'I would ask her'

l-am rugat *am rugat-o*
AcCl 3/M have asked have asked AcCl 3/F
'I have asked him' 'I have asked her'

il voi ruga *o voi ruga / voi ruga-o*
AcCl 3/M fut. Ask AcCl 3/F fut. ask/ fut. ask AcCl 3/F
'I will ask him' 'I will ask her'

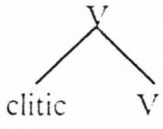
and **adverbial clitic constructions:** *il/o mai/tot vad*
Him/her AdvCl see
I still see him/her;

These examples show that clitic pronouns can appear in different positions, attached to different hosts (the negative particle, the auxiliary or the verb). Consequently, we need to account for these different positions. The analysis will be carried out within the GB framework.

2.1. VIEWS ON CLITIC PLACEMENT

As seen in the examples under 2), clitics in Romanian (and in Romance languages, in general) typically appear as morphemes bound to a verb. The assumption is that clitics appear at D- and S-structure in the following configuration:

3)



From a syntactic point of view the clitic will be considered a separate 'word', dominated by the same level node (V) as the word it is attached to. The question that arises in connection with the representation in (3) is whether the clitic node represents an argument of the verb or not. Aoun (1979) assumes that clitics occupy a non-argument (A') position, but this would pose problems for the subcategorization requirements of the verbs the clitics are attached to. **Jaeggli** (1985), on the other hand, considers that the position of the clitic is neither an A-position, nor and A'-position. Since it isn't A'-bound, it cannot be a *variable*, and since it is not A-bound, it can't be an *NP-trace.* The position being governed by the verb (otherwise no theta-role could be assigned to it),

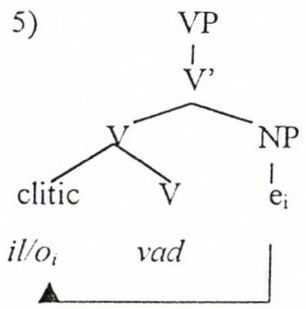
the empty category cannot be PRO either. This leaves us with one last possibility, namely that e_c =pro.

2.1.1. Kayne's solution: **the clitic is adjoined to V.**
Let us consider the following example:

4) *Il /o vad.*
AcCL 3M/F see
'I see him/her'.

The verb a *vedea* 'to see' has two theta-roles: an external one, assigned compositionally to the subject NP (but since Romanian is a pro-drop language, the subject NP may not be overtly expressed), and an internal theta-role, linked to a subcategorization feature, the one of the D.O. of the verb. The Projection Principle will determine the existence of a syntactic NP position within the government domain of the verb in order to satisfy the subcategorization features of the verb. According to Kayne (1975) (quoted in Jaeggli, 1986:17), the clitic is generated by the rules of syntax in a standard syntactic position, from which it is moved via an obligatory rule of clitic placement and adjoined to V. Thus, the example in (4) can be represented as follows:

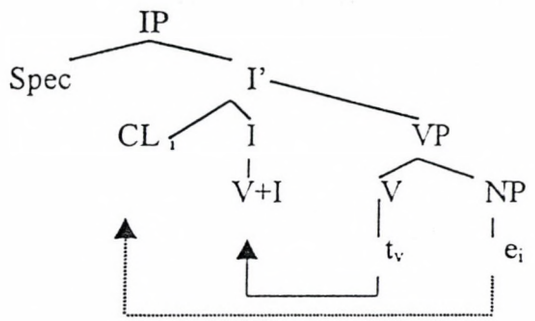
5)



(the verb assigns its internal theta-role to the NP in the object position according to the Projection Principle)

2.1.2. Roberts's solution: **adjunction to Infl.**
Kayne's proposal has been updated within the more recent theory of Head-to-Head movement. Roberts (1991) (quoted in Dobrovie-Sorin, 1994:52) presented a typology of incorporation processes based on 3 types of Head-to-Head movement:) **V-to-Infl** = an instance of incorporation by substitution into a morphologically subcategorized position: tenses and agreement morphemes would subcategorize a V position;) **cliticization** = incorporation by adjunction of one head to another;) and **Infl-to-Comp** = an instance of substitution into an empty head position. According to Roberts, clitics do not adjoin to V, but to Infl. Consequently, under this new interpretation; the example in (4) will be given the following representation:

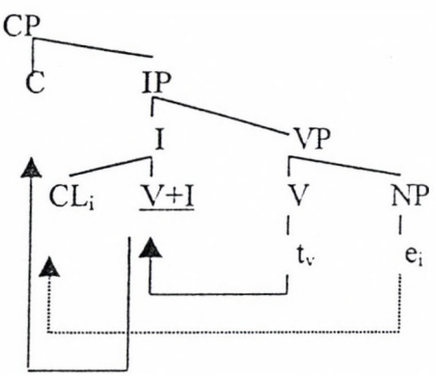
6)



il/o văd
him/her see ('I see him/her')

Robert's suggestion according to which clitics adjoin to Infl would work for the CL + V sequences in Romanian. But in this language we also encounter the V+CL order which is characteristic of imperatives, gerunds and certain subjunctives (as seen under 2)). Thus, we need to find a way to account for the two positions of the clitics (preceding and following the verb). Is there a rule of **V-preposing** or a rule of **clitic-postposing**? One solution to this problem would be to assume a rule or V-preposing, since the clitic inversion, characteristic of Romance positive imperatives is due to a rule of Move (V)-Infl-to-Comp.

7)



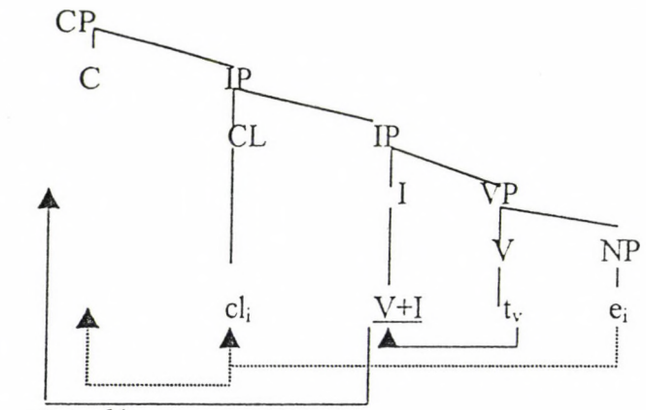
ajuta –l/o ('help him/her!')
vazandu-l/o ('seeing him/her')

The problem with this solution is that it relies on 'excorporation': in order to bypass the clitic, the sequence V+I has to move out of an incorporated sequence, **CL+V+Infl**. This process is forbidden (Baker, 1988) by a lexicalist principle which rules out words that contain traces (due to incorporation, the sequence **CL+V+Infl** is a word; by moving V+Infl out of the combination we obtain another word containing a trace: $CL+t_{V-I}$). Excorporation can also be banned by invoking an ECP violation, in that the trace of the moved inflected verb (t_{V-I}) is not antecedent governed because of the intervening clitic.

2.1.3. Dobrovie-Sorin's approach: **clitics adjoin to IP.**

A second solution (which also represents the third hypothesis with respect to clitic placement) to the above-mentioned problem (i.e. V-CL order) is offered by Dobrovie-Sorin (1994). She assumes that cliticization relies on IP-adjunction. According to this approach to cliticization, the example in (7) will be modified as follows:

8)



ajuta-l/o
vazandu-l/o

Move I-to-Comp can bypass the clitic because the node Infl does not dominate the clitic and no excorporation is needed.Dobrovie-Sorin assumes that IP has a defective character in that it lacks Spec. This is the reason why adjunction of X^0 elements to an XP projection is allowed under the current theory. She also argues that the hypothesis that pronominal cliticization involves adjunction to IP rather than to Infl (only Romanian adverbial clitics adjoin to Infl) may be derived as a consequence of a well-formedness condition on clitic chains: a pronominal clitic must c-command its trace, and an element adjoined to Infl does not c-command any position inside VP (if c-command is defined in terms of branching nodes). The c-command problem can be solved if we assume that pronominal clitics necessarily adjoin higher, to IP. They cannot adjoin higher than IP, e.g. to NegP or CP, because Neg and Comp would block antecedent government of the clitic trace by the clitic.

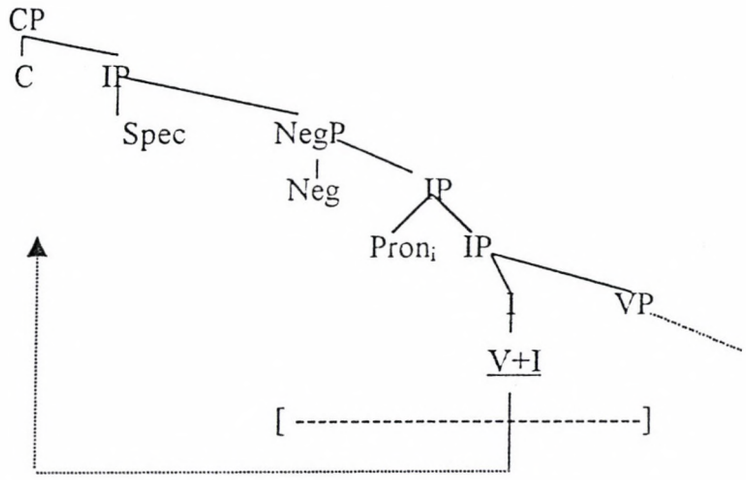
3. TRYING OUT DOBROVIE-SORIN'S THEORY

Having Dobrovie-Sorins' hypothesis (i.e. pronominal clitics adjoin to IP) as a starting point, we shall try now to investigate all the possible occurrences of pronominal clitics, either individually or in combination with adverbial clitics, to see whether the theory is generally applicable.Let us reconsider the two rules mentioned above, namely V-preposing (V+CL) and clitic postposing/V-second (CL+V). If we assume the general format of 'Move α', one might wonder how Move Infl can pick up either V+I +CL (for V-preposing, as in the Romanian positive imperatives (*ajuta-l!* 'help him!') or (Neg) CL V+I (for V-second, as in the case of negative imperatives: *nu-l ajuta!* 'don't help him!'). The solution is provided by Dobrovie-Sorin under the form of a rule of **Restructuring Incorporation**, which is dependent on another rule, namely **Functional Coindexation**.

9) **Functional Coindexation**: coindex adjacent functional X° categories.
10) **Restructuring Incorporation**: Coindexed adjacent (functional) X° categories merge into one X° category.

Rule 10 will affect the terminal strings (included in square brackets) in the following representation. These will be reanalyzed as X° categories, labelled Infl.

11)



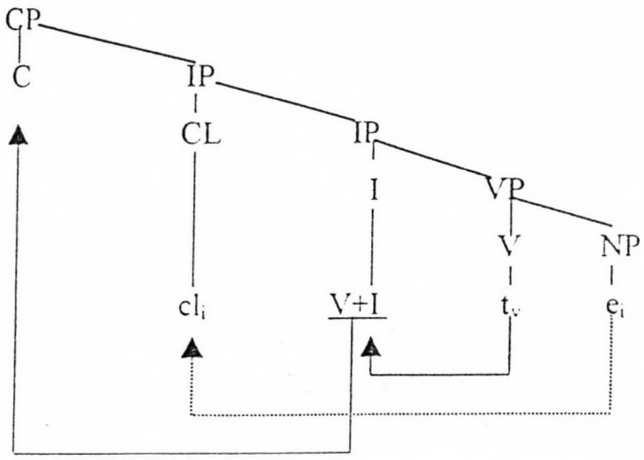
(V-second)

nu-l ajuta $t_{Neg\text{-}Pron\text{-}ViInf}$ 'Don't help him!'

If we reconsider now V-preposing (V+CL), we shall see that the proposed IP-adjunction solves the excorporation problem, but leaves us with an ECP violation. Consider the following example:

12 a) **ajuta – l* t_i

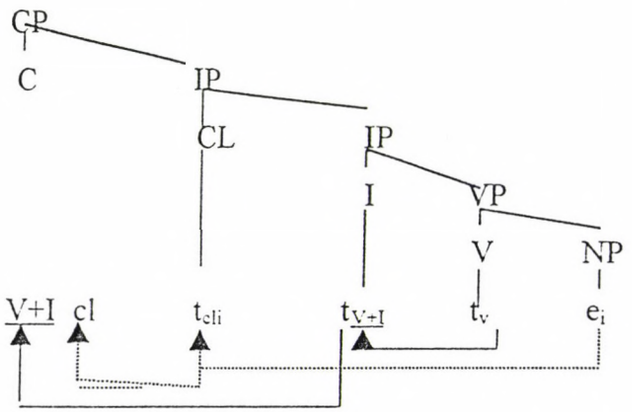
12 b)



ajuta-l 'Help him!'

This representation is illicit since the clitic is an X° category and as such it blocks the antecedent government of the trace $t_{V\text{-}Infl}$ by the raised Infl. By Functional Coindexation (9) the clitic is coindexed with the adjacent Infl; but despite this coindexation, the clitic counts as a blocking element, possibly because of its own index (functional coindexation would add a functional index, but cannot delete the original individual indices of various adjacent X° categories). One solution to avoid ECP violation would be to apply **merging**: the clitic leaves its IP–adjunction position leaving a trace behind, and incorporates into the raised Infl by adjoining to it. This is shown in 13, which is the proper representation of the sentence under 12a.

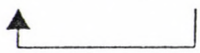
13)



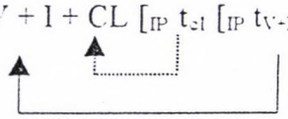
ajuta-l 'Help him!'

As a consequence of its adjunction to the raised Infl, the clitic is no longer considered an X° element, distinct from Infl, and thus does no longer block antecedent government. It is also assumed that the clitic trace t_{cli}, left behind the merging of the clitic is not visible for antecedent government. Consequently, V-preposing involves two rules:

14) **Move I-to-Comp:** $V + I \ [_{IP}\ CL[_{IP}\ t_{V+I}]]$



15) **Merging:** $V + I + CL \ [_{IP}\ t_{cl}\ [_{IP}\ t_{V\text{-}I}]]$



As the rules show, merging applies between adjacent elements. A consequence of this consatraint relates to the landing site of the preposed V: since the rule of V-preposing applies only if clitic merging applies, the preposed verb will land in the position immediately to the left of the clitic. This means that V-preposing can only skip the clitic itself.

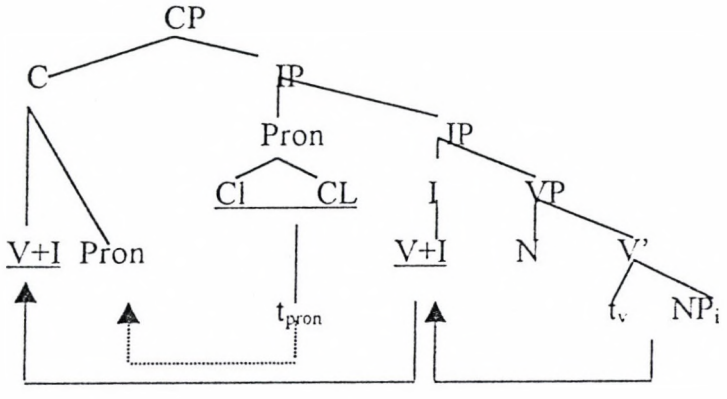
An interesting problem concerning adjacency is posed by the following Romanian examples which contain clitic clusters in positive imperatives:

16) *ajuta- le- o*
help- DatCl 3 pl- AcCl 3 sg F
'Help her for them'

ajuta-li -l
help -DatCl 3 pl - AcCl 3 sg M
'Help him for them'

In such cases, the verb bypasses both clitics in one step, provided that the pronominal clitic clusters are **flat structures**, dominated by a single node that adjoins to IP. Below is the representation of 16).

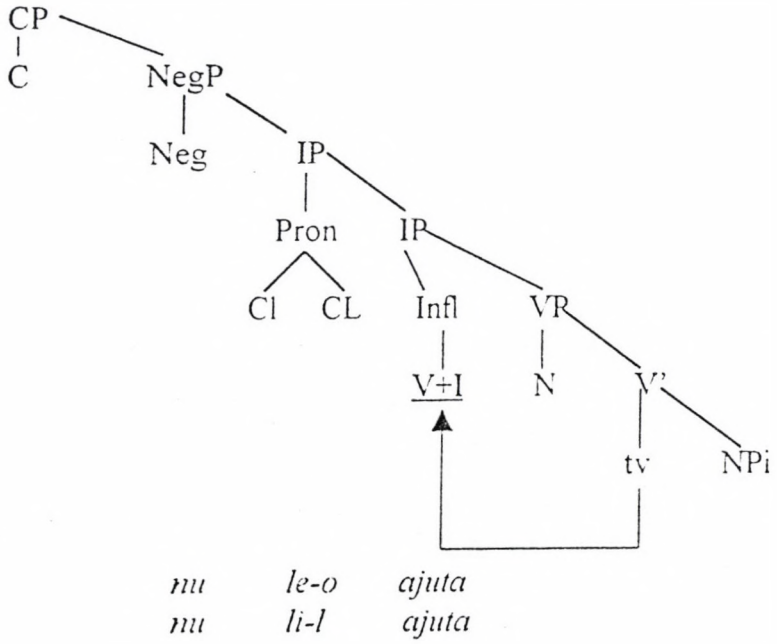
17)



ajuta-le-o t_{pron} t_{V+I}
ajuta-li-l t_{pron} t_{V+I}

This approach fares well with negative imperatives, as well.

18)



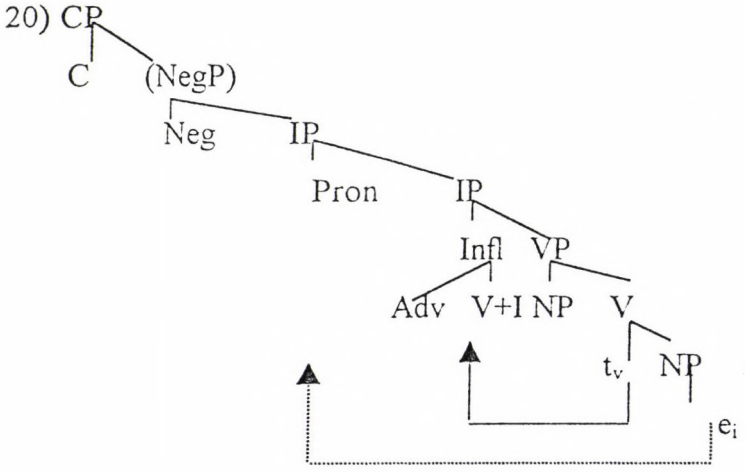
nu *le-o* *ajuta*
nu *li-l* *ajuta*

Let us now consider the **constructions containing both pronominal and adverbial clitics**. The analysis of such constructions comes to support the hypothesis that pronominal clitics are adjoined to IP. Romanian adverbial clitics represent a peculiarity of the language, since they are the only clitics that adjoin to Infl. Consider the following examples (the adverbial clitics are underlined):

19) a) *o* *mai* *iubesc* vs. * *mai o iubesc/**mai iubesc-o*
AcCl(3, sg. fem) AdvCl love 'I still love her'
b) *il* *tot* *intreb* vs. * *tot il intreb /**tot intreb il*
AcCl (3,sg, masc.) AdvCl ask 'I keep asking him'
c) *îl/o* *si cert* vs. **si îl/o cert/** si cert îl/o*
him/herAdvCl scold 'I also scold him/her'

As the examples show, adverbial clitics appear between the pronominal clitic and the verb. The representation of 19a-c would be the following:

20)



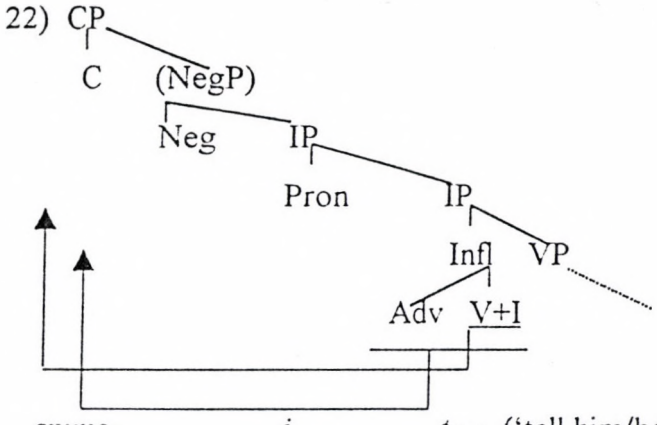
îl *tot* *intreb* 'I keep asking him'
o *mai* *iubesc* 'I still love her.'
il/o *si* *cert* 'I also scold him/her'

We shall also try to account for positive and negative imperatives containing both adverbial and pronominal clitics.

21 a) *povesteste-i!* vs. b) *mai povesteste-i!* (**povesteste-i mai*)
tell DCl(3,sgl) AdvCl tell DCl (3,sgl)
'tell him/her 'tell him/her more/again'

The difference between 21 a and 21 b can be explained on the basis of the fact that the pronominal clitics adjoin to IP, whereas the adverbial ones adjoin to Infl.

22)



spune- *i* t_{V+I} ('tell him/her!')
mai spune- *i* $t_{Adv+V+I}$ ('tell him/her more/again')
nu - *i* *spune* (don't tell him/her')
nu- *i* *mai* *spune* (don't tell him/her anymore)

This representation can be explained in the following way: the rule Move (v-)Infl-to-Comp will leave pronominal clitics behind and will take adverbial clitics along. The negative imperative sentences need no further explanation.

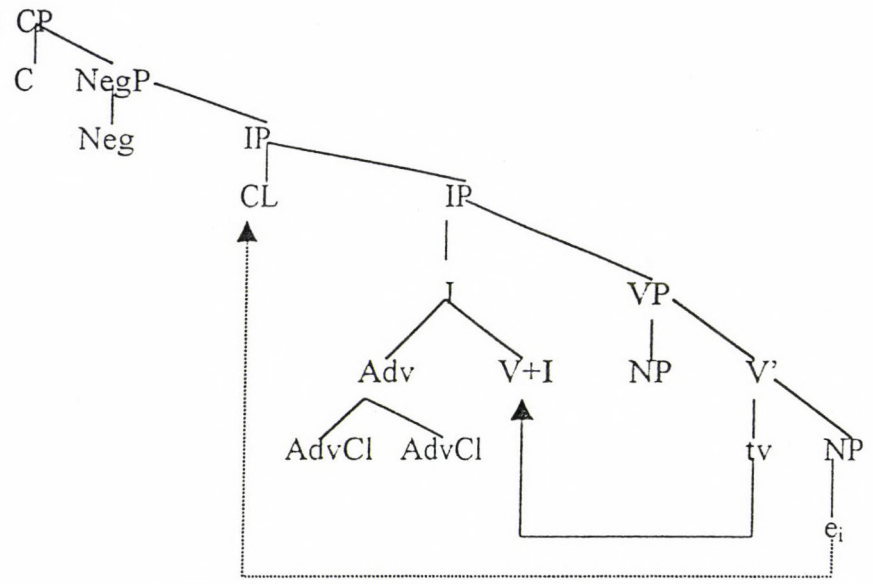
An interesting case is presented by constructions containing two adverbial clitics between the pronominal clitic and the verb. Compare the following examples(adverbial clitics are underlined):

23 a) *il mai si rog* vs. b) **si-l mai rog*
AcCl still again ask/beg 'I still beg him now and then'

24 a) *Il mai tot rog* vs. b) *Tot il mai rog* c) *Nu-l mai tot ruga!*
AcCl still see still AcCl again see Neg. AcCl still again ask
I still beg him' 'I still beg him now and then' 'Don't keep asking /begging him!'

One thing that the examples above show is that when two adverbial clitics intervene between the pronominal clitic and the verb, the order is: *mai* and then *tot/si* (compare 23 a and 24 a +c). It seems that this is due to the nature of *mai*, which expresses the idea of cumulation, but which operates as an intensifier, as well. Then, if we compare 23 b to 24 b, we see that *tot* can precede the clitic, but not *si*. This could be explained on the basis of the double nature of this particular element: it can be both an adverb and a conjunction. Our interest is to find an explanation for these two positions of the adverbial clitics.
One possible way in which we can account for the above-presented aspect would be to consider the adverbial clitic clusters as **flat structures** (just like the pronominal clitic clusters), dominated by a single node that adjoins to Infl.

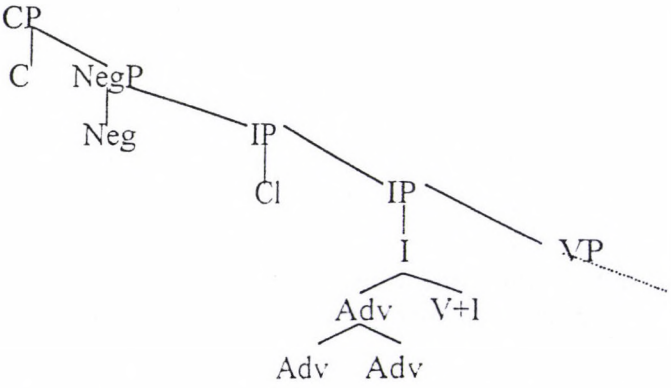
25)



Il mai tot rog 'I still ask/beg him'
Il mai si rog 'I still ask/beg him'
Nu- l mai tot ruga 'Don't keep asking'beggin him!'

More problematic seems to be the representation of the structure in which one of the adverbial clitics moves out of the adverbial node. The question that arises here is related to the landing site of the moved adverbial. My own hypothesis is that due to the fact that they are 'semi-adverbs' (i.e. they can be both adverbs, and conjunctions), and because no C-command constrains them (as they do not bind any trace) *tot* and *si* can occupy the Comp position.

26)



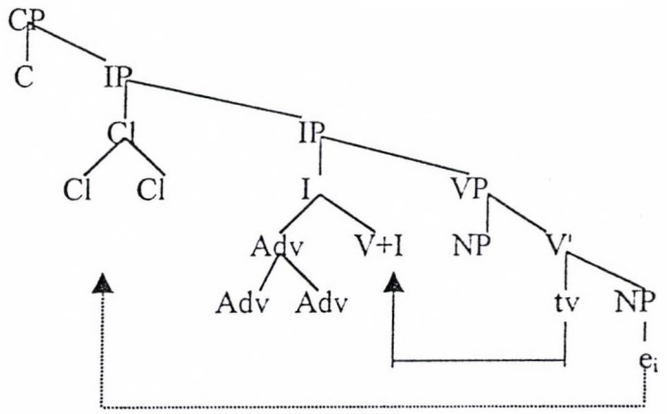
Sa (nu) il mai tot vad
Compl neg AcCl again still see 'I don't want to see him again/lest I should see him again'
A (nu) il mai vedea.....
To neg AcCl again see 'Not to see him again...."
TOT (nu) il mai vad
AdvCl neg AcCl again see 'Anyway, I don't see him anylonger'.

My assumption is based on the observation that when the Comp position is occupied by the complementizer *sa* or by the infinitive particle *a*, the adverbial cluster has to stay under the adverb node adjoined to Infl, whereas when the Comp position is available the second adverbial clitic *(tot)* climbs up to it. In Romanian we may even have structures containing both clitic clusters and adverbial clusters, as in the following example:

27) *I -o mai si spui*
DatCl AcCl AdvCl AdvCl tell
'You still/also tell it to him/her'

The representation of this example is not problematic, as the pronominal flat structure adjoins to IP, whereas the adverbial flat structure to Infl.

28)



I - o mai si spui '(To crown it all,) you also/still tell it to him/her'

Let us now see how we can account for the placement of **pronominal (and adverbial) clitics** in **auxiliary constructions** such as the ones given below. The example contains a **past perfect**, a **future** and a **conditional** sentence.

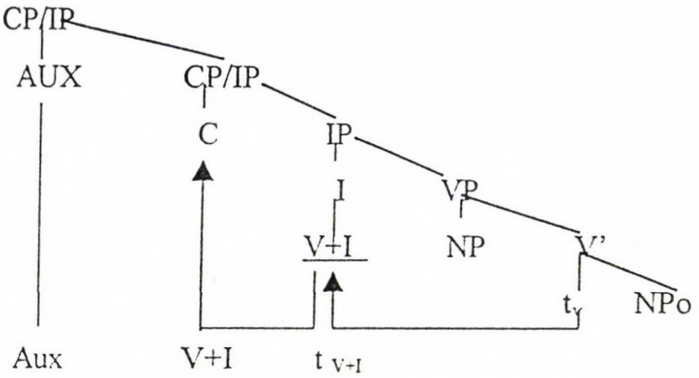
29 a) *am (mai tot) rugat-o*
Aux. AdvCl asked AcCl (3,sg.F)
'I kept asking her'

b) *voi (mai si) ruga-o*
Fut. AdvCl ask AcCL
'I will still ask her again'

c) *a(mai tot) ruga-o*
Cond. AdvCl ask AcCL
'I would still ask her again'

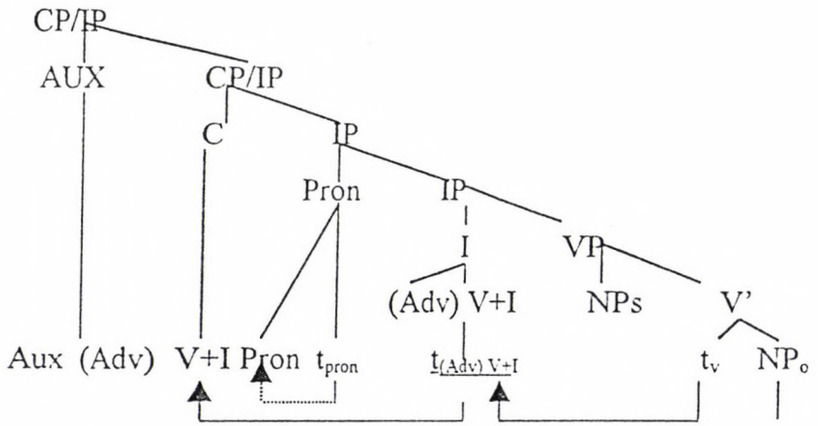
These examples show that pronominal clitics cannot interfere between the auxiliary and the verb (**am o rugat, *voi o ruga, *aso ruga)*, whereas the adverbial clitics can. Before giving the representation of the examples above, we need to show the representation of the auxiliary constructions in Romanian.

30)



In this representation the Infl node is not related to the Aux, but to the lexical verb itself; Aux adjoins to a CP/IP complement and V-preposing applies inside the lower CP/IP, as shown below. The following is the representation of the examples under 31).

31)



am	*(mai tot) rugat- o*	t_p	$t_{(Adv)\ V+I}$	*eu*	t_v	e_p
voi	*(mai si) ruga –o*	t_p	$t_{(Adv)\ V+I}$	*eu*	t_v	e_p
as	*(mai si)ruga- o*	t_p	$t_{(Adv)\ V+I}$	*eu*	t_v	e_p

Compare now the examples containing the 3rd person masculine pronominal clitic.

32)

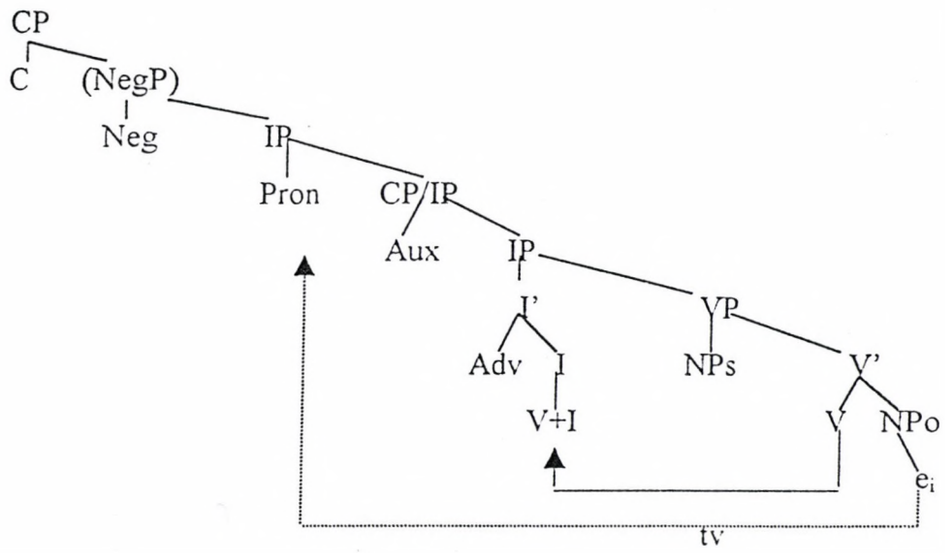
a) *l-* *am (mai tot) rugat*
AcCl(3,M,sg)-Aux,AdvCl , asked
'I have kept asking him'

b) *i l* *voi (mai tot si) ruga*
AcCl Fut AdvCl ask
'I will keep asking him) you'

c) *l-* *as (mai si) ruga*
AcCl Cond AdvCl ask
'I would still ask him'

These examples can be given the following representation:

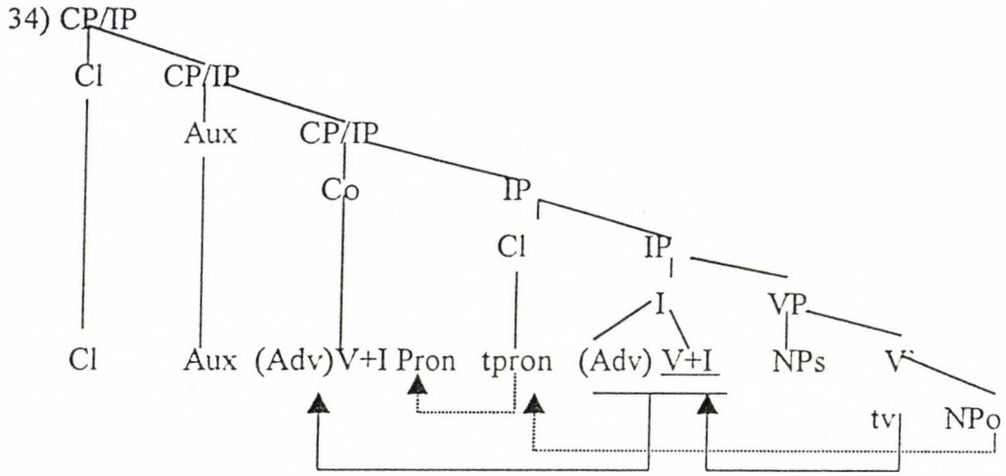
33)



(nu) *l -* *am (mai)* *rugat*
(nu) *il* *voi (mai) ruga*
(nu) *l* *-o (mai) ruga*

If one compares these examples to the ones above, he/she may wonder with respect to the canonical position of the clitic pronoun: is it the post-verbal position of the 3rd pers. feminine clitic or the pre-auxiliary position of the 3rd pers. masculine clitic? Since all the other clitic pronouns of Romanian pattern with the 3rd pers. masculine pronoun, we may be tempted to say that its position is the canonical one, whereas the one of the feminine clitic is a default case. But this is not so. The enclitic position that *o* occupies in auxiliary structures is not idiosyncratic, but the typical (canonical) pronominal clitic position and may be derived by means of V-preposing, which also occurs in imperatives (see example 17). To account for the position of the masculine clitic, we can assume that it is allowed to climb up and adjoin on the left of the auxiliary (as shown in the representation under 33). This assumption fares nicely in structures where the same compound verbal form hosts both *o* (the Ac., 3rd,fem, sg. clitic) and another clitic. In such cases **clitic splitting** arises, one clitic preceding the verb (i.e. climbing up in the syntax) and the other following it (i.e. remaining in its canonical position). Consider the following representation:

34)



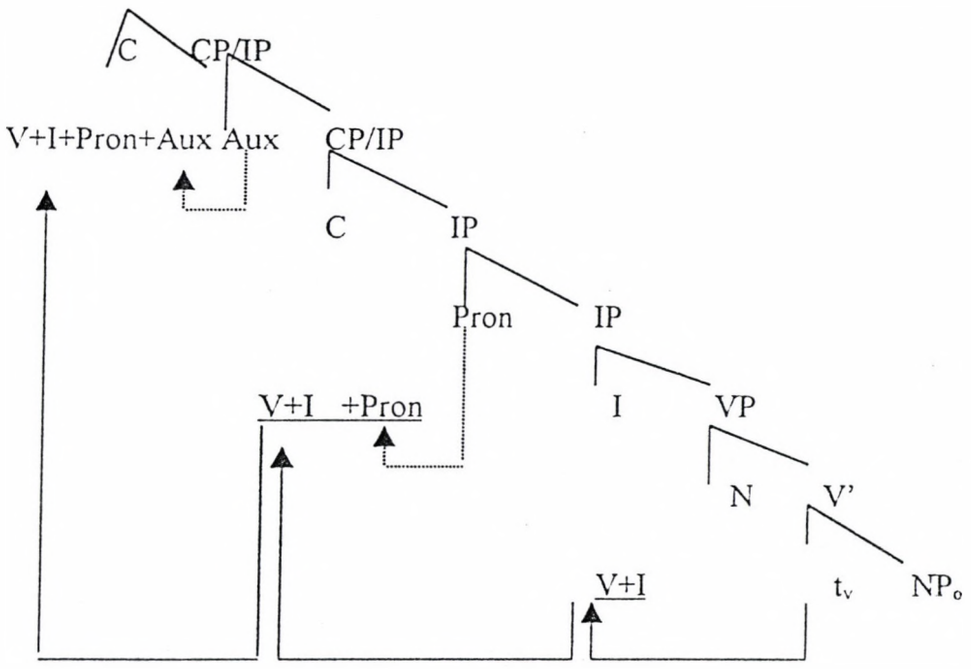
I-	*am*	*(mai) spus- o*	tpron	tAdv –V+I	tv	'I have told him this before'
I-	*as*	*(tot) spune-o*	tpron	tAdv-V+I	tv	'I would tell him this again and again'

To complete the picture of pronominal clitic distribution, we still have to consider one more case, namely that of auxiliary inversion and endoclitic pronouns. Here are some examples:

35) a) *lua-te-ar*	b) *manca-l-as*	c) *ganditu-m-am*
take-AcCL(2,sg)-cond	eat-AcCL(3,sg,M)-cond	thought-RCL-Aux
"May the devil take you'	"I would eat him/it'	'I have thought'

On the basis of the proposed hypothesis concerning the structure of auxiliary configurations and the conditions of Move I-to-Comp, we may assume that this movement occurs in two steps:

36) CP/IP



minca-l-as
lua-te-ar
ganditu-m-am

The dotted lines show merging of the pronominal and auxiliary clitics, whereas the continuous lines indi cate head-to-head movement. V+I moves to the embedded comp, bypassing the pronominal clitic, which will merge with V+I. What we obtain after this first step is Aux – V+I- Pron. In the second step, the merged V+I+Pron moves to a higher comp, passing over the Aux node. The result is V+I+Pron+Aux, characterized by endoclisis of the pronoun.

4. IN LIEU OF CONCLUSIONS

In this paper we have presented the main distributional characteristics of Romanian clitics on the basis of some of the most representative theories in the field: Kayne's and Dobrovie-Sorin's. Since clitics occupy a syntactic position which is distinct from the position of the host, clitic clusters allow for certain internal reorderings, which have been analyzed as being the result of a rule of V-preposing (which may bypass both pronominal and auxiliary clitics). This rule triggers clitic merging, which gives rise to rigid constituents: a merged pronominal clitic leaves its IP-adjoined position and merges with the verb, and therefore can no longer be stranded .

By trying out Dobrovie-Sorin's theory on all possible clitic positions we cannot but agree with her that pronominal clitics adjoin to IP, the adverbial clitics to Infl, and the auxiliary to a CP/IP complement. Her theory accounts for all positions occupied by pronominal clitics.

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Why is *this* interesting?

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In this paper we will consider the three lenition processes in the history of English which manifested themselves in fricative-voicing. The first of these is Verner's Law, in Proto-Germanic, the second is a Pre-Old English change, the third took place in the Middle English period. All the three fricative-voicing changes happened in sonorant context and were sensitive to stress, but in completely different ways. This is all the more surprising given that neither the phonotactic properties nor the segmental inventory of the language changed essentially over this long period. An important difference, however, is that at the time of Verner's Law, the position of stress was not fixed.

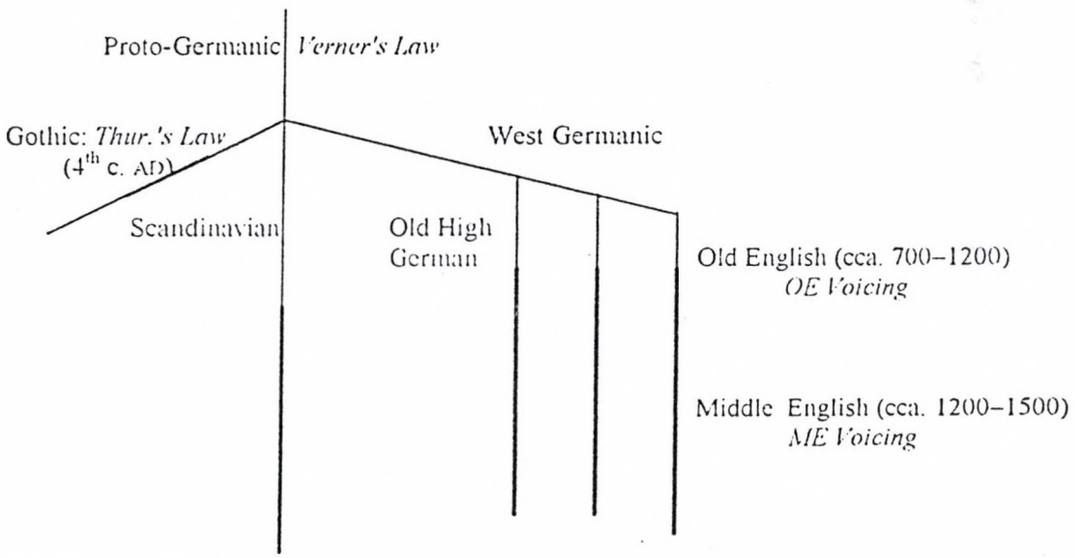
The word *this* was potential input to lenition at two sites in the Middle English period. Nevertheless, it was only affected by initial, not final, voicing. Though in this case *this* is the only example, we conjecture from it that lenitions may happen in a sequentially alternating pattern if a morpheme provides multiple inputs to it.

A remotely similar constraint on an otherwise marginal fricative-voicing phenomenon from Gothic is cited as a parallel, where voicing in certain suffixes is only effected if it produced an alternating voicing pattern in obstruents.

0. Introduction. In this paper we shall present a marginal and infrequent but interesting feature of fricative-voicing changes in the history of the English language. Such changes are always classified as lenitions, and lenitions are often claimed to be assimilatory processes. In this paper we shall claim that such fricative-voicing changes appear to exhibit dissimilatory traits in certain cases.

In order to help the reader, we provide a partial family tree of Germanic with approximate indication of the periods mentioned in the paper:

(1)



1. Verner's Law. The first large-scale fricative-voicing change in the history of Germanic languages was Verner's Law, a Proto-Germanic change whereby intersonorant and word-final post-sonorant fricatives were voiced unless they were preceded by a stressed vowel. These fricatives resulted from Indo-European stops with the exception of /s/:

(2) IE **pəté́r-* > Gmc **faðér-* (> MoE *father*, MoGerm *Vater*)
IE **bʰrā́ter-* > Gmc **brōðer-* (> MoE *brother*, MoGerm *Bruder*)

Since stress was free and partly morphologically conditioned at that stage of the language, Verner's Law introduced a high number of morphological alternations that are displayed to varying degrees by the documented Germanic languages. Three examples from Old English and Old High German verbal morphology are the following:

(3)	OE	*sni*[ð]*an*	*sna*[θ]	*snid̲on*	
	OHG	*sni̲d̲an*	*sneid̲*	*sni̲t̲un*	'to cut'
	OE	*freos̲an*	*freas̲*	*fru̲r̲on*	
	OHG	*friu̲s̲an*	*fro̲s̲*	*fru̲r̲un*	'to freeze'
	OE	*teo(h̲a)n*	*teah̲*	*tu̲g̲on*	
	OHG	*zio̲h̲an*	*zo̲h̲*	*zu̲g̲un*	'to pull'[1]

As can be seen, in Verner's Law the blocking environment of the voicing was immediate post-tonic position. This calls into question the often-made claim that post-tonic position is a typical weakening position (as it is, for instance in the case of Modern English /t/).

2. Pre-Old English Intersonorant Voicing of Fricatives. The next change whereby intersonorant fricatives came to be voiced took place in the Pre-Old English period. By consequence we have OE *wulf* but plural *wul*[v]*as* 'wolf(s)', *sna*[θ] 'I cut' but *sni*[ð]*an* 'to cut', *freas* 'I froze' but *freo*[z]*an* 'to freeze'. This change, however, was blocked by a following stressed vowel, as opposed to Verner's Law. Hence *beƒóran* 'before', *ge*[θ]*ánc* 'mind', *a*[s]*éndan* 'send away'. In Old English, as in late Germanic, stress was bound to the first syllable of the stem, so stress is not word-initial only in the case of prefixed words.

The environment of this change is precisely the same as that of the loss of /x/: **mearhes* > *meares*, but *mearh* 'horse GEN, NOM'. This latter, however, must have preceded the voicing of the other fricatives, because otherwise [ɣ] would have resulted, which would have remained until late Old English times and then be continued as a glide in Middle English (Hogg 1992:284).

3. Middle English Voicing of Fricatives. The third voicing of fricatives occurred in the late Middle English period, this time more strictly constrained than in both earlier changes. It was restricted to intervocalic, instead of intersonorant, positions, furthermore it was blocked by both preceding and following stress. This means that the voicing affected only function words (*i̲s̲, hi̲s̲, o̲f̲, wi̲t̲h̲, t̲h̲ou*) and the nearly only remaining inflectional suffix (*messe̲s̲*). The fact that monosyllabic plurals also show /z/ (as in *shoes*) does not mean that stress did not inhibit voicing: in these words the plural morpheme analogically appears in its voiced variant, so here the /z/ form is the result of a morphological, rather than a phonological change. Otherwise monomorphemic words like *goose* would also end in /z/ instead of /s/.

Given that this change only affected words belonging to a closed class (plus the suffix *-es*), the examples are not numerous. For final fricatives, we only have one instance of /f/ > /v/ (*o̲f̲*) and of /θ/ > /ð/ (*wi̲t̲h̲*), more with final /s/ > /z/, but to our knowledge there are no counterexamples. For initial position, all examples are /θ/ > /ð/, *fo̲r̲* did not undergo voicing. A couple of other potential candidates were not yet obviously function words in Middle English (eg. *some*[2]), hence cannot be considered counterexamples. Neither can *through*, since voicing is blocked by the following /r/.

The only word that could have undergone both initial and final voicing is *this*. However, it only displays initial voicing, the word is not **/ðɪz/. This appears to show that double lenition in one word is disallowed: lenition sites cannot be adjacent even on their own projection. Thus, while it may be true that lenition (in this case, voicing) is assimilation to a highly vocalic environment, it can also be argued, that on the projection of whatever features distinguish obstruents from sonorants, lenitions can, at least marginally, exhibit dissimilatory traits[3].

4. Gothic: Thurneysen's Law. A phenomenon similar to this in an important respect is found in Gothic. In this language, as opposed to Old English, there is no evidence of intervocalic voicing of fricatives. Voicing

[1] Later sound changes needed to understand the examples are the following: (i) Gmc [θ] > OE [ð] between sonorants, OHG [d]; (ii) Gmc [ð] OE [d], OHG [t]; (iii) Gmc [z] > OE, OHG [r], Gmc [ɣ] > OHG [g].

[2] The word *some* appears to be stressed more often than unstressed in Chaucer's works and is not classified as a determiner by Middle English grammars.

[3] To avoid misunderstanding, the voiced fricative /z/ at the end of *these* and *those* is the result of analogical spread, not sound change: these belong to the class of *shoes*-type words, see above.

alternations are, however, exceptionally displayed by certain suffixes, such as *-i*[θ]*a*/*-i*[ð]*a*[4], depending on the voicing value of the last consonant of the stem[5]:

(4) *meri*[θ]*a* 'fame', *weitwo*[ð]*i*[θ]*a* 'testimony, witness' but *wair*[θ]*i*[ð]*a* 'worthiness'.
fastu[v]*ni* 'holding' but *waldufni* 'power'
wrato[ð]*us* 'journey' but *gabaurjo*[θ]*us* 'lust'
jukuzi 'yoke' but *berusjos* 'parents'
arhwazna 'arrow' but *filusna* 'multitude'
hatiza 'hate' but *rimisa* 'rest'

The law essentially says that a fricative becomes voiced if it is preceded by an unstressed vowel which is itself preceded by a voiceless obstruent. The voicelessness of that preceding obstruent is overridden by a liquid immediately following it, but not by a glide (ie. after a voiceless stop followed by a liquid, a fricative will remain voiceless).

5. Conclusion. We hope to have shown, through these two examples, that at least certain instances of lenition processes can arguably be assimilations and dissimilations at the same time: assimilation to immediate environment, but dissimilation to neighbouring segments on the tier of the distinctive features of the affected sounds.

We even venture to say, though this is only a vague suggestion, that stress may not be directly related to lenition or its suspension in a phonetic sense: witness the opposite direction of its working in Verner's Law and the Pre-Old English weakening; it is possible that the function of stress is more of demarcating the possible target regions of lenition, rather than phonetically influencing it[6].

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[4] The original variant of this suffix is the one with [θ].

[5] This phenomenon is usually referred to as Thurneysen's Law. The source of the examples here is Hutterer (1990:30) and Krause (1953:124–5). The most detailed description of the Law (including its history in scholarship) is Collinge (1985:183–191). The spelling of [ð] in textual editions is ‹ d ›, [θ] has the distinct symbol called "thorn". The spelling of [v] is ‹ b ›, parallel to the dental.

[6] Bibliographical notes: Verner's Law is well described and often amply discussed in all handbooks of Germanic linguistics. In English, Prokosch (1939) and Hogg (1992: 69–70) are useful summaries. For Old English, currently the best and most detailed (historical) phonology is Hogg (1992). For Middle English, Lass (1992) is recommended. For Gothic, general descriptions are Hutterer (1990:30) and Krause (1953:124–5). The most detailed description of Thurneysen's Law (including its history in scholarship) is Collinge (1985:183–191).

DEEP AND SHALLOW: SOME NOTES ON THE DISTRIBUTION OF DIMENSIONAL ADJECTIVES

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The paper deals with the semantic properties of dimensional adjectives. Two members of this class – *deep* and *shallow* – differ in their complexity and behaviour from other dimensional adjectives. Distributional properties, semantic structure, and polysemy of *deep* and *shallow* are a primary concern in this paper.

1.General properties of the dimensional adjectives

Dimensional adjectives (DAs) represent a well-defined limited set of lexical items belonging to the core of the lexical system of the language. The conceptual interpretation of DAs is constituted by identification of spatial dimensions and their quantitative evaluation. DAs form a systematic and internally organized semantic structure consisting of pairs of antonyms relating to specific conditions on spatial dimensions [Bierwisch 1989a: 2]. Semantically, they can be interpreted as either **nominative** or **contrastive,** where in the case of nominative interpretation, a DA simply identifies a certain dimension or a scale on a dimension, e.g.

(1) *Peter is 1.30m tall.*

How tall is Peter?

while in its contrastive use, a DA marks an extreme value on this scale:

(2) *Peter is tall.*

How short is Michael?

Contrastive interpretation always depends on a contextually determined class relative to which the extreme value is fixed [Bierwisch 1989b: 79] and is in this sense norm-related.

Dimensional adjectives have received relatively little attention so far. The earlier works on the subject include Bierwisch [1967], Vendler [1968] and Teller [1969]. The only recent detailed study of DAs is Bierwisch and Lang (eds.) 1989 on the German DAs. The primary concern there, however, is with the syntax and semantics of the comparative constructions and the gradability of the DAs. Important issues like distributional properties, polysemy and metaphorical uses of the DAs haven't been discussed at all. This is particularly true of such dimensional adjectives like *deep* and *shallow* which have been unjustly overlooked. The central issues of this paper include the distributional properties of *deep* and *shallow* which are considerably more complex than those of other dimensional adjectives. Besides, both *deep* and *shallow* exhibit polysemy patterns different from all other members of this class of adjectives: in contrast to the other DAs describable in terms of semantic features which never change, irrespective of whatever object a DA is applied to, the semantic structure of *deep* or *shallow* cannot be represented by a

set of semantic features, since, e.g. in the case of *deep* even the core feature "Vertical" may change and is not present in all the meanings of this adjective. *Deep* is more polysemous than *shallow*, which can be accounted for by the fact that *deep* enters two different antonymous pairs: *deep – shallow; deep – flat*, and is the unmarked member in both pairs.

2. Polarity of dimensional adjectives

Pairs of antonyms of DAs are traditionally analyzed in terms of polarity (which is commonly viewed as playing an important role in the semantic structure and syntactic behaviour of adjectives in general, with a few exceptions only, e.g. colour terms):

(+POL):	long	high	tall	wide	broad	deep	big	large
(-POL):	short	low	short	narrow	narrow	shallow	little	small.

Polarity is not assigned arbitrarily but reflects the patterns of asymmetric syntactic behaviour of the adjectives. As a rule, only a (+POL) member of the antonymous pair can be used in a construction with a Measure Phrase (MP):

(3) *The street is 10 kms long.*
**The street is 10 kms short.*

Similar results emerge in the tests with a Factor Phrase (FP) in equative constructions:

(4) *The new road is three times as wide as the old one.*
**The old road is three times as narrow as the new one.*

Besides, only (+POL) DAs can be nominalized to acquire value-unspecified meaning:

*(5) length - *shortness*
*height - *lowness*
*width/breadth - *narrowness*
*depth - *shallowness*

Only (-POL) DAs induce presuppositions in the comparative and equative constructions or in *how*-questions:

(6) *Michael is taller than Kim* (doesn't presuppose that any of them is tall). - *Michael is shorter than Kim* (presupposes that at least Michael is, or probably both of them are, short).

(7) *Michael is as tall as Kim* (they can be both short). - *Michael is as short as Kim* (both of them are short).

(8) *How long is the street?* (it doesn't necessarily follow that the street is long) - ? *How short is the street?*(if interpretable, can only mean that the street in question is short).

The first sentence in each pair is regular and unmarked, which is due to the fact that (+POL) adjectives are considered unmarked, while (-POL) adjectives are marked and more complex. This kind of

perceptual/conceptual complexity accounts for the fact that in the former case the neutralization of the contrastive semantic component (namely (+POL)) in certain constructions takes place (as a result the adjective doesn't indicate one of the poles, but only the scale established by a given pair of DAs and a certain point within it [Bierwisch 1967: 9]), while in the latter it fails to do so, resulting in the markedness effect.

3.The interaction between DAs and the objects they modify

The interplay between the meanings of the DAs and the properties of the objects modified by them plays an important role in the semantics of dimensional designation. One of the aspects of this interplay is what can be referred to as **dimensionality conditions.** Dimensionality conditions usually specify how many dimensions an object needs to have in order for a certain DA to be applicable to it, on the one hand, and how many dimensions of an object a DA can potentially cover within one combination [Lang 1989: 273]. Every DA is characterized by its own set of dimensionality conditions, which work like selection restrictions on different combinations of DAs and object terms. *Long,* e.g., can refer to a one-, two-, or three-dimensional object (*line, field, street, pipe, etc.), high* and *wide* require at least a 2-dimensional object, while, e.g., *deep* can only be applied to a 3-dimensional object [ibid]. The number of dimensions covered by one DA in a given combination may vary, the default and most common case being one dimension, which however does not preclude alternative opportunities, e.g., *thick* , as in *long and thick windowsill*, may define two dimensions. *Big, little, large* and *small* (in their dimensional use) stand out from the other DAs due to their property of extending over all three dimensions and their ability to be applied to probably all spatial objects, besides, they are probably the only ones applicable to globular or spheric objects out of all DAs. Apart from the number of dimensions and the shape of an object, its position and orientation in space plays an equally important role in dimensional designation. Spatial objects can be divided into 3 three groups according to their orientational properties. The first group is characterized by **canonical orientation** in space which is defined as the normal functioning position of an object (e.g. *wardrobe, chest, tower*) [Lang 1989:275]. Another group of objects is assigned **inherent orientation** (e.g., a dimension determined by an inscription in the case of *book* or *tombstone*). The objects belonging to the third group show the same dimension assignment independent of their position, they are considered to be **unspecified** as to spatial orientation (*brick, pipe, etc)* [ibid: 277]. Spatial objects can also undergo **contextually induced orientation** when the surrounding is taken into account, or **contextually induced perspectivization** when a certain dimension of an object is identified referring to the (potential) observer's line of sight. The observer's position, orientation and the possible motion of the object play an important role here [Vandeloise 1988: 403]. Contextually induced orientation and perspectivization are at work when a change of dimensional assignment takes place, e.g. the maximal dimension of a *pole* can be described by *long*, if the pole is positioned horizontally; but if it is placed

vertically, the same dimension will be referred to by the adjective *high*, such a shift being a result of contextually induced orientation.

Lang's orientation classification, however, seems insufficient for our purposes since it is mainly concerned with the artifact objects and doesn't cover the whole range of nouns that *deep* and *shallow* can be applied to. Besides, these adjectives, as opposed to other dimensional adjectives, exhibit asymmetrical distribution in that not all terms that allow one of them can also be modified by the other.

4.The application of 'deep' and 'shallow'.

In their literal dimensional meaning *deep* and *shallow* seem to be applicable to several groups of objects and entities (a feature common to all of them – being containers or container-like objects):

1) Different bodies of water seen as deepenings in the ground filled with water, e.g. *ocean, sea, lake, pond, river, stream, ditch, pool, well, puddle,* etc. When applied to these nouns, *deep* and *shallow* display full antonymy and exhibit symmetric distribution, in that both can be applied to a term fixing a value on a scale of *'shallow-deep'* . The few exceptions are due to the presence of a lexicalized component in the meaning of the term in question specifying the expected range of values on the given scale:

(9) *deep ocean - *shallow ocean* (but *The ocean is quite shallow here* is possible because some parts of an ocean can be less deep than would be expected of an ocean to be in general);

With this group of nouns, *deep* and *shallow* specify the downward (vertical) dimension.

2) Deepenings in a surface:

b) Deepenings in the earth (without water), e.g. *cave, cavern, grave, cellar, trench,* etc. Only *deep* applies to this group of terms, and the combinations with *shallow* are not acceptable, even if possibly interpretable:

(10) *deep cave - * shallow cave*
*deep cellar - *shallow cellar*
*deep bunker - *shallow bunker, etc.*

With this group of nouns *deep* , like in the case of (1), also designates the downward extent of the entity in question.

The "shallow" meaning can only be expressed by means of a paraphrase (*This cave is not deep, etc.*). This irregularity can probably be explained by the fact that all members of this group are inherently specified as to their expected minimal parameters, including depth. By virtue of this specification, *shallow caves, cellars* or *bunkers* are ruled as contradictory. In the case of cellars and bunkers, this contradiction is also based on functional inadequacy. Another possible explanation for the asymmetric use of *deep* and *shallow* with this group of nouns can derive from the fact that in expressions like *deep cave, deep bunker,*

etc. deep means 'situated far down or beneath the surface' rather than 'having a great extent downwards' (as in the case of (1)). And on this interpretation, *deep* is antonymous to *high* in certain interpretations, namely 'situated far above the ground', displaying multiple antonymy pattern.. Therefore, a different scale of measurement is evoked and *shallow* simply fails to apply.

c) Deepenings, with unspecified surface. This group of entities is the figure-ground patterned extension of group (2a) by abstraction.. Where the figure (which can be defined as a substructure perceived as standing out from the remainder [Langacker 1987: 120]) is the actual deepening, and the ground (the scene around the figure providing the setting for it [ibid]) is the surface. (The figure-ground organization being a valid and fundamental feature of cognitive functioning.) This group would comprise a variety of terms like *cut, split, crack, wound, hole, niche, etc.* Only *deep* is acceptable with this group:

(11) *deep wound* - **shallow wound* (but *surface wound*)

deep cut - **shallow cut (surface cut), etc.*

In this case *deep* specifies the extension inward from the surface or exterior, which might not be necessarily vertical. Only *deep* is compatible with this group of nouns, all combinations with *shallow* being ungrammatical. This can be due to the fact that whenever *deep* doesn't refer to the vertical dimension, *shallow* is ruled out.

3). The last group includes various artifacts:

a) various vessels and similar objects;

b) bags and similar objects;

c) articles of furniture.

The first subgroup (3a) includes items like *dish, tray, cup, glass, jar, vase, pan,* etc.

This group is very diverse as to the possibilities of its members' combination with *deep* and *shallow.* Only *dish, bowl, pan, frying-pan, saucepan* show symmetric distribution of *deep* and *shallow,* where both DAs are applicable. But the majority of the adjectives in this group tend to only allow *deep,* and even though the possible combinations with *shallow* are interpretable to a certain degree, the expressions would still be ungrammatical. These nouns, however, allow combinations with *flat* as an antonym to *deep.* Contrary to Bierwisch and Lang (1989), it seems possible to consider *flat* a dimensional adjective rather than evaluative, admitting though that it is not a DA proper (being different from the most salient members of this class), since it doesn't only refer to the dimensional parameters of an object, but to its shape characteristics as well. Several nouns don't even allow the combinations with *deep – cup, glass, jug, decanter, canister, vase.* The latter can possibly be explained away by referring to the concept of Inherent Proportion Schema (IPS) which the characteristic measurement ratio determined by the particular gestalt properties of the given object. IPS is a part of conceptual subsystem representing space and is based on the principles of object delimitation, which are anchored in the human perceptual system

and are a necessary base for the discrimination of spatial axes of an object by IPS [Lang 1989:346]. The interaction of the objects' actual shape and their IPSs determines the choice of *tall* over *deep* for the vertical dimension marking in this particular case. But, it is necessary to notice that *jar* is combinable with both *tall* and *deep*. This can possibly be accounted for by the following: *deep jar* is supposed to be at least wide, while a *tall jar* can only be narrow by virtue of the meaning of *tall*, so choice of either of them would be presupposed, again, by the actual shape and proportions of the *jar* and would reflect different perspectives of the same dimension. This is confirmed by the fact that sentences like **This is a deep and tall jar* are deviant because the same dimension is specified twice within a single situation. Considering that all objects have a typical measurement ratio, it's possible to suggest that whenever the horizontal dimension is considerably more salient than the others, the objects are inherently specified for depth and *deep* doesn't apply, and therefore, *shallow* is also ruled out.

(3b) This group includes objects like *bag, suitcase, briefcase, handbag, trunk, etc.* and is characterized by more or less uniform behaviour with respect to *deep* and *shallow:* only *deep* again can be applied to them. The unapplicability of *shallow* feel intuitively similar to that in (3a) but its nature still has to be determined.

The last subgroup (3c) provides us with a number of interesting facts about the distribution of *deep* (*shallow* doesn't seem to be applicable to any of them). Combined with *drawer, chest* or *cabinet* it specifies the downward (vertical) dimension inside the object. Such a usage can be explained as functionally determined. When applied to *bookcase*, *deep* undergoes "directionality shift", for in this case, it designates horizontal dimension, parallel to a (potential) observer's line of sight when he faces the object. This is functionally determined, as well, and reflects the canonical orientation of the given object. Another group of objects in this class reflects a totally different mechanism of dimensional designation for *deep*: these are nouns like *bed, sofa, chair, armchair, etc.* When *deep* is applied to any of these objects, it designates a dimension which is spontaneously created (or at least identified) by using these objects: *a deep bed* usually means 'soft, allowing to go down when seated on it', the same holds for other members of this group, except for *stool*, which obviously cannot produce similar effect and, therefore, cannot be modified by *deep*.

The analyzed data suggest that *deep* is polysemous in its literal meaning. The primary meaning of *deep* refers to the vertical dimension of different bodies of water seen as container-like deepenings in the ground typically filled with water (e.g. *ocean, lake,* etc.). This meaning is further extended in two different directions. In the first case, the primary meaning of *deep* is extended to denote the vertical dimension of various kinds of container-artifacts (e.g. *dish, bowl, pan,* etc.). The second shift leads to the meaning extension where only one component of the original meaning is present: *deep* denotes the inward dimension of a deepening in any kind of surface, leaving out both the "container" and the "vertical" components of meaning of the adjective (e.g. *split, wound, crack,* etc.):

(12) **DEEP 1** ——————————— **DEEP 2** ——————— **DEEP 3**

vertical dimension of a container-like deepeninng in the ground

vertical dimension of a container-like object

inward dimension of any deepening

The polysemy of *deep* follows the pattern of the impoverishment of semantic structure - more general extended meanings are derived from the more specific primary meaning by leaving out different semantic components at each step of the derivation process. As a marked member of the pair, *shallow* is more restricted in its meaning – it is only antonymous to *deep1* and *deep2* and does not enter further generalization. Both *deep* and *shallow* allow metaphoric transfers based on the container pattern. *Shallow,* however, is more restricted here as well, which can possibly be explained by cognitive principles.

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Operator and head movement in Hungarian: From Checking to Marking

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This paper is a reaction to some serious conceptual as well as empirical problems posed by a checking approach to operator movement in minimalism (Chomsky 1995). Here I argue that such an approach cannot be maintained without unattractive complications and should be replaced – at least for operator movement – by an alternative treatment, the central syntactic relation of which I will refer to as Marking. Marking is an asymmetric syntactic (licensing) relation between expressions equipped with a morphological operator feature (e.g. [wh], [foc]) and an identical morphological feature appearing on a head ('marker'), canonically in Spec–Head relation. Marking, by definition, cannot involve a chain link without the relevant morphological feature – a head link of an 'covert chain' is argued to lack one. Overt operator- and accompanying head-movement will be triggered if and only if it results in a Marking relation. Brody's (1997) Mirror Theory will be adopted as a theory of phrase structure, which is able to express a configuration resembling multiple specifiers in an antisymmetric representation. Richards' (1998) generalisation about movement to multiple specifiers is integrated into the present theory. The marking approach to operator movement is able to draw up an attractively elegant account of the overt/covert distinction, which the standard minimalist model is arguably in need of. The discussion here will center on obligatory and optional operator movement constructions, as well as apparent competition effects in Hungarian.

0 Introduction

The present work is an effort to repair some conceptual and empirical problems found with the standard checking-driven approach to operator movement in minimalism. The checking account creates puzzling inconsistencies in this area, more specifically in the domain of simultaneous XP and head-movement to the same projection and multiple operator constructions, and is notoriously circular with respect to the precise trigger for overt (operator) movement. Here I will present an alternative account – embedded in Brody's (1997) Mirror Theory of phrase structure – which makes use of the asymmetric relation of Marking, canonically licensed in the specifier–head configuration. Marking involves the licensing of a morphological operator feature reflecting the presence of a syntactic operator. Overt operator- (and accompanying head-) movement will be obligatory if and only if it results in a Marking relation. Discarding the arguably unnecessary stipulation of Procrastinate of Chomsky (1993), this last assumption will constitute the core of our theory of the overt/covert distinction. The theory will be illustrated in the domain of obligatory and optional operator movement constructions, multiple operator constructions and operator competition effects in Hungarian.

The paper is organised as follows. Section 1 motivates doubts about the applicability of checking in the scope of operator movement phenomena. Section 2 discusses a recent account of Hungarian multiple focus constructions by É.Kiss (1998a). I will accept her arguments for the existence of this construction, but not her conclusions about the particular syntactic analysis to be favoured. I will point out that the arguments put forward to support that analysis are not conclusive, and will also highlight serious complications in the resulting picture. Section 3 sets out from where Section 2 left off, namely, the treatment of the overt/covert aspect of multiple focus constructions. I introduce the concept of marking and the Marking relation. The question of the exact nature of marking will be raised and discussed, effecting the fundamental issue of the overt/covert contrast in the domain of operator movement. At this point the relevance of Brody's (1997) Mirror Theory (MTh) of phrase structure is discussed. The present proposal also bears on the open mirror theoretical issue of the precise conditions for so-called 'wiggles' in the structure. The assumed feature composition of operators as well as Richards' (1998) generalisation will become highly relevant in accounting for some competition effects and asymmetries. Finally, I run brief speculations about accommodating negation to the system developed. The now standard approach of *nem* 'not' analyses it structurally as the head of NegP, i.e. Neg^0. I point out some basic flaws with this hypothesis which arise under a restrictive theory of adjunction such as the Kaynean approach, in a standard minimalist setting. I will speculate on an alternative analysis of *nem* treating it as specifier of NegP, i.e. the negative operator itself. This will raise significant questions for the present programme, which I discuss briefly. Section 4 concludes, pointing out possible research questions.

1 Is checking omnipotent?

Chomsky (1995) holds the view that all movement is driven by checking. However, it appears that a checking treatment in the domain of operator movement entails some significant complications. One obscure issue is related to the disjunction involved in the definition of the checking domain. Oversimplifying to some extent, the checking domain of a head H includes adjunction position to H itself as well as the specifier position of H.

In effect, it is unclear what determines the choice of satisfying a feature of H by means of head-movement to H, or by means of XP-movement to [Spec, H]. Even more problematically, under this view simultaneous applications of both movement types to the same head – as is often the case with operator movement constructions – are not easy to understand. Naturally, there exist a number of conceivable ways out of this problem, but perhaps a theory not creating the problem itself would fare considerably better. Also, multiple XP (e.g. operator) movement to the same head – especially if assuming a derivational model of syntax, where a many-to-one checking configuration is difficult to derive – may require the presence of multiple instances of some feature on the attracting head, and then, possibly an absorption of these features for purposes of interpretation. A further puzzle is posed by the apparent circularity of the strength feature in Chomsky (1995). This flaw is particularly made visible in the context of [+Interpretable] operator features, which are non-deletable due to Recoverability. The conspicuous lack of a theory of the overt/covert movement distinction can be illustrated by considering some multiple operator constructions. In the configuration of one operator raising in overt syntax, while the rest of the operators being raised only covertly, it seems that one of the operators must have a strong feature, but at the same time all the others cannot. This unexplained pattern can be circumvented by stipulating that the strength feature is only present on the attracting head, but then the actual relation of checking and elimination under *identity* becomes questionable. Further, it still remains unclear what explains some apparent competition effects of operator movements. Consider (1) below:

(1) a. *CSAK ENDRE vett egy csokrot kinek?
ONLY ENDRE bought a bouquet for-whom
intended interpretation: Wh>Foc (see Fn. 14)
b. Kinek vett egy csokrot CSAK ENDRE?
for-whom bought a bouquet ONLY ENDRE
'Who did ONLY ENDRE buy a bouquet for?'
c. *Kinek CSAK ENDRE vett egy csokrot?

The focussed expression and the Wh-expression appear to be in competition for the same position – a common assumption in the literature on Hungarian. However, it is not immediately clear how an account is formulable in terms of checking which would predict that it is invariably the Wh-expression that should win the competition.

These considerations cast doubts on a checking approach to operator movement serious enough to motivate a search for an alternative. In the next section, I will discuss a recent account of Hungarian multiple focus constructions (É.Kiss 1998a), which could potentially answer the question of the overt/covert opposition raised here, if only in the relevant domain of multiple foci. I will argue, however, that that account comes with problems of its own, both empirical and theoretical, and in consequence, cannot be easily maintained. Then, in section 3, I lay out a novel alternative.

2 The all overt focus movement (AOFM) hypothesis

A theory which does not contain an overt/covert distinction (e.g. Kayne 1998) may appear to stay clear of the problematic circularity of the strength feature, but of course then the question of deriving the same effects remains to be accounted for. Here I will discuss a more narrow proposal by É.Kiss (1998a), which holds that all focus movement in Hungarian is overt.

É.Kiss (1998a) suggests that there is no asymmetry in Hungarian between topic and focus constituents with respect to their recursion possibilities, i.e. multiple FP projections are allowed in the functional architecture. In disagreement with Rizzi's (1995) idea of excluding non-presuppositional (e.g. focus) constituents within the complement of $\overline{F}^0$, she dismisses Rizzi's semantic restriction ruling out multiple focus constructions as merely stipulative. She cites evidence from superlative predicative adverbs, which carry out ordering on the set introduced by a Wh-phrase in preverbal focus position with respect to the set invoked by the allegedly focussed constituent in the postverbal field:

(2) Mikor énekelte el MARI a népdalt a legszebben?
When sang PREF M. the folksong the most-beautiful
'When was it MARY who sang the folksong the most beautifully?'

Given that such an ordering domain is normally introduced by a focus operator (Farkas & É.Kiss 1995), she concludes that the postverbal stressed element must be true focus. She also provides evidence for the multiple focus construction pointing out that categories typically carrying a focus feature (e.g. Wh-phrase, *kevés ember* 'few people') may appear postverbally in a clause with a filled preverbal focus position. In multiple focus structures, 2nd etc foci will invariably remain linearly postverbal due to the independent requirement forcing

the verb to adjoin to the highest F^0. If multiple focus exists, and if scopes of foci can be unambiguously nested, the conclusion is that there must exist a certain recursion of FP projections in the clausal hierarchy.[1, 2]

Then the question is raised as to the overt/covert status of the movement to the motivated focus projections. É.Kiss contrasts English type multiple Wh-questions with Hungarian multiple focus constructions, arguing that only the former can be scopally ambiguous:

(3) a. Who has read which book?
Wh1>Wh2
Wh2>Wh1

b. CSAK KÉT LÁNY választott CSAK EGY KÖNYVET.
ONLY TWO GIRLS chose ONLY ONE BOOK
Foc1>Foc2
*Foc2>Foc1

From this contrast, she concludes that the movement of the 2nd / 3rd etc focus in Hungarian cannot be covert – hence the opposition in (3). However, it is not difficult to imagine an alternative explanation of this contrast. For lack of space here, I refer merely to the clausal architecture proposed for Hungarian based on considerations laid out in the preceding paragraph leading to the picture of multiple – consequtively dominating – FP projections.[3] This argument for a purely overt focus movement therefore cannot be considered as particularly strong.

Another observation which is pointed out is the competition effect cited in (1) above. É.Kiss, in an earlier manuscript, comments that if the focussed phrase in (1b) type sentences were in-situ and were raised only at LF, it is not clear what would derive the contrast in (1). However, whatever derives the contrast in an all overt movement analysis can be used to do the same under an in-situ treatment. (É.Kiss actually derives it by assigning the Wh-expression a special status of sentence operator with maximal scope (although clearly not necessarily maximal scope with respect to other Wh-operators, SB).)

Not only are the arguments in favour of the hypothesis inconclusive, but they also lead us to a number of perplexing difficulties. Once we admitted recursion of FP, we also are forced to admit a radically freer hierarchy of functional projections: TopPs and QPs are allowed to freely intermingle with FPs. At least this is the case for the postverbal domain. However, precisely this fact calls for explanation: Why is this freedom

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[1] Note, however, that this conjecture crucially depends on the hypotheses adopted about scope assignment.

[2] É.Kiss also presents another observation to support the idea of multiple foci. She cites the generalisation that the attested Indefiniteness Effect is neutralised by a focus operator in the sentence, but only if that focus operator is not the definite expression itself:

(i) *Az énekkar alakult.
the choir formed

(ii) Az énekkar TAVALY alakult.
the choir LAST YEAR formed
'It was LAST YEAR when the choir was formed.'

(iii) *AZ ÉNEKKAR alakult.
'It was THE CHOIR that was formed.'

Based on this, she argues that the accented postverbal constituent in (iv) must be a focus operator, since it also successfully cancels the Indefiniteness Effect:

(iv) AZ ÉNEKKAR alakult TAVALY.
'It was THE CHOIR that was formed LAST YEAR.'

However, unfortunately for the argument, the postverbal constituent does not need to be focus at all (it can be non-accented and part of the presupposition):

(v) AZ ÉNEKKAR alakult tavaly, nem a ZENEKAR
THE CHOIR formed last year not the ORCHESTRA
'It was the CHOIR that was formed last year, and not the ORCHESTRA.'

This fact is presumably explainable using Szabolcsi's (1986) assumption about the Indefiniteness Effect. Szabolcsi argues that definites are excluded from such contexts due to the fact that the arising proposition would assert and presuppose the existence of the denotation of the definite expression at the same time – a semantic incongruity. However, (v) escapes the Indefiniteness Effect precisely because the predicate does not merely assert the existence of the choir, it asserts more. Thus, a postverbal does not play an active role focus in this neutralisation phenomenon. Consequently, no effective argument can be made for its status of a focus operator.

[3] Once again, the decisive issue is the scope assignment mechanism assumed. It is conceivable to entertain a mechanism even under a multiple specifier approach (Chomsky 1995) that assigns wider scope to an outer specifier.

Indeed, an argument can be constructed to treat 'real' multiple questions in Hungarian (cf. É.Kiss 1992a) (involving a pre- and a post-verbal Wh-expression) as involving Wh-operators moved (or related in some other fashion) by LF to the same [Spec,FP] (see Fn. 20). Also, the interpretations assigned (by É.Kiss) to (3a) are strikingly reminiscent of the interpretation of questions involving multiple pre-verbal Wh-phrases in Hungarian (cf. É.Kiss 1992a); hence the LF structure of (3a) may well not contain adjunction to the same specifier after all. As these matters are not of immediate concern at this stage, I will put them aside.

limited to the postverbal domain, but attestedly not to the preverbal field (cf. e.g. É.Kiss 1992a, 1994), where for instance a QP>TopP order is disallowed. A distinct, but related unexplained asymmetry is that if a strong version of Shortest Move is maintained[4], the analysis implies that Q and Top heads under the highest FP will have to have [strong] attracting features, while the same categories apparently have [weak] features[5] above the highest FP.

Also, admitting a plethora of projections to the postverbal field coupled with the assumption of AOFM leads us to expect relative scopes determined by surface order in the domain to the left of the last focus operator. This, clearly, is not attested:

(4) a. Ki olvasott fel két lánynak is három dolgozatot CSAK A VIZSGA UTÁN?
who read out two girls-for also three tests-ACC ONLY AFTER THE EXAM
'Who read out three tests even to two girls ONLY AFTER THE EXAM?'
2>3
3>2

b. Ki olvasott fel minden lánynak CSAK KÉT DOLGOZATOT?
who read out every girl ONLY TWO TESTS
'Who read out ONLY TWO TESTS to every girl?'
every>Foc
Foc>every

c. Ki vett meg CSAK KÉT FIÚNAK CSAK HÁROM KÖNYVET?
Who bought Pref ONLY TWO BOYS-FOR ONLY THREE BOOKS
'Who bought ONLY THREE BOOKS FOR ONLY TWO BOYS?'
Foc1>Foc2
Foc2>Foc1[6]

In addition, a new problem is created for the head-adjunction account of verbal prefix. É.Kiss (1998) is forced to assume a right-adjunction of the prefix to the functional head of F in case the prefix immediately follows the verb in a focussed clause, and also to allow the prefix to optionally be stranded in a similar right-adjoined position to lower functional heads of Top and Q. Two complications are introduced by this move. One concerns the status of right-adjunction itself: right-adjunction makes this analysis incompatible with the restricted theory of phrase structure developed by Kayne (1994). Second, the (empirically attested) stranding of the prefix in some intermediate position would involve excorporation of the V at that point. It is also unclear how the neutral order of prefix-V would be derived. Notice that an XP-treatment of the prefix would also be problematic, although for different reasons. This treatment claims that the verbal prefix realises its aspectual function in some clausal specifier, perhaps [Spec,AspP] (cf. É.Kiss 1998b). Due to its aspectual nature, this specifier will invariably be sufficiently close to the VP, at any rate lower than QP and TopP projections (cf. Cinque 1999). Excluding the further complexity factor of the possibility of movement of such an aspectual XP (here across quantifiers and topics to landing sites not easily definable), linear orders in a focussed clause involving a postverbal prefix that precedes a 2nd focus will remain impossible to structurally describe without loosening up the theory.

In this section, I have argued that (i) the motivation for the AOFM hypothesis is not conclusive, and (ii) an AOFM approach faces severe complications, both empirical and theoretical in nature. Note that I have presented arguments NOT in favour of a purely in-situ analysis of 2nd etc focus operators, but only arguments against their *obligatory* overt movement. If the reasoning here is correct, Hungarian multiple focus operator constructions are not exceptional: they too are in need of an account alternative to the checking treatment.

3 Marking

3.1 From checking to marking

I propose that checking should be replaced by a different notion in the domain of operator movement, and accompanying head movement. We need to tentatively speculate on what properties this alternative notion will ideally have to remedy flaws of the checking approach. I will introduce these properties below in several steps

[4] One where Attract is not relativised to [q], [top] and [f] features.
[5] Or any other distinction of the trigger for overt vs. covert movement.
[6] Note that – provided that stress relations remain constant – postverbal quantifiers in Hungarian often (to varying degrees) have a preferred reading where relative scopes are mapped from surface precedence relations. This I ascribe to processing difficulty of the non-transparent c-command relations in the non-preferred readings.

as I proceed.

First, some problems with checking originate from its bidirectional nature: a pair of features are symmetrically cancelled in the relevant sense in a checking configuration. Due to this assumption, questions of simultaneous XP- and head-movement to the same head (perhaps involving two distinct checking relations), and of mulitple XP-movements to the same head (again potentially involving multiple checking relations), and more generally, the problem of the predicted independence of the distinct checking relations arose. This in turn also renders it difficult to construct a simple theory of the overt/covert distinction. My conclusion is that the alternative relation which is potentially able to circumvent these complications should crucially be asymmetric. Asymmetric in the sense of the operators bearing this relation to heads, but not vica versa. This relation – building on remotely related insight in Cheng (1991) and Aoun & Li (1993) – I will coin Marking[7]. So, operators can potentially enter an asymmetric Marking relation with heads in the functional hierarchy. The licensing structural configuration is at first approximation that of a specifier and a head. Established morphological effects on the heads are then reflections of this Marking relation. The triggered morphological reflection may be the realisation of some marker affix or other morpheme on the head, but in lack of these it is the realisation of some other morpheme (e.g. the verb) in the marked head position if that is made possible by principles of the grammar.[8] I propose that to enter the relevant Marking relation operators must move (occupy their scope positions) overtly, i.e. Marking is overt. Consider the schematic representation of a multiple focus construction from Hungarian:

(5) a. [Foc1 V . . . Foc2]
b. *[Foc1 Foc2 V . . .]
c. *[. . . V Foc1 Foc2]

One and only one focus expression raises to the left periphery, and is immediately followed by the verb (essentially similarly to English multiple Wh-questions, cf. Brody 1990). This (recurring) schema I take to indicate that obligatory overt operator movement is triggered by a marking requirement which the raising of the 2nd etc operator would not satisfy, therefore this latter movement is not enforced by marking needs. Once this picture of marking is adopted, we need to speculate about the nature of the marking requirement. If it is a semantic/interpretative requirement, we expect it to trigger obligatory overt movement invariably[9]; however, the sketched analysis for Hungarian multiple foci indicates the opposite. I take the view here that it is morpho-syntactically conditioned. A number of questions arise immediately:

(6) a. What is the nature of this condition?
b. Why only overt operator movement can carry out marking?
c. Why is the 2nd etc operator unable to satisfy the marking requirement?

Clearly, these questions are intimately related, especially (6a) and (6b). To address them, I will first turn to the nature of the functional heads that the operators raise to the specifier position of, using the Foc head to illustrate.

I assume that there is a fundamental mirroring effect involving syntactic operators and morphology. Grammar enforces the point of a syntactic operation to be marked for morphology as well. This point is the node (representing the constituent) which is affected by the operation. Idealizing here[10], I will identify this node to be the head of the projection hosting a syntactic operator. The morphological marker is an abstract morphological operator feature, a 'marker'. For concreteness, in the case of a focus operator I will call this [foc]. However, a morphological [foc] feature needs to be licensed. It can (canonically) be licensed by an identical morphological [foc] feature in a Spec–Head relation.

Note that *morphological* [foc] features and syntactic [foc] features are distinct objects. Importantly, morphological operator features are not interpretable for semantics, similarly to some morphological case features or gender features. For example, Chinese Wh-expressions show clear signs of this dissociation. They can be argued to lack a morphological [wh] feature altogether: they are morphological indefinites; however,

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[7] 'Marking' is used only as a term to refer to this alternative relation, and in no way implies a procedural operation. In this paper I think of it as a syntax–morphology interface notion – see the relevant discussion below.

[8] The precise nature of the realisation of the head is an open issue. I will take it to be obligatory in Hungarian true syntactic operator movement contexts. The configuration of multiple specifiers in the representational theory of phrase structure of Brody (1997) to be adopted below, which involves multiple instances of 'heads' to express multiple specifiers, raises the question of which of the instances will need to host the marker or here: the verb. This question is obviously contingent on the exact definition of the geometric relation involved in the Marking relation. See section 3.5.

[9] Unless semantic requirements may be violable – a debated issue (cf. especially the OT literature on semantics, or the syntax–semantics interface).

[10] This idealization is fully motivated by properties of phrase structure in Mirror Theory, adopted below. In MTh, the head and the phrase of the standard phrase structure are represented by a single node, in a representation accessed simultaneously by the semantic and the morpho-phonological systems. The operator will be the syntactic specifier of this node. See section 3.2.

syntactically they function as Wh-expressions, hence they have syntactic [wh] features. A significant consequence of the uninterpretable nature of these morphological features is that they can be present in multiple instances (just like gender and case features) – they are interpreted by morphology, not by semantics.[11]

If this distinction is valid, we can meaningfully ask question (6b), and interpret the notion of marking as a licensing relation just described in the preceding paragraph. Given that below I will adopt a representational theory of phrase structure, I will raise the question of the distinction between overt and covert (operator) movement in that context. In such a representational theory, presumably, overt movement involves a chain with a higher copy of syntactic (and semantic) and morpho-phonological features, and a lower copy with identical syntactic (and semantic) features with the morpho-phonological features silenced, or deleted under Recoverability. Covert movement, then, is a chain with syntactic (and semantic) features upstairs and the same features plus the morpho-phonological features downstairs (or in case of multi-member chains, in all non-head link positions). Crucially then, unlike overt chains, covert chains lack the relevant morpho-phonological features – among them, in our example, the morphological [foc] feature – in the head link. But this answers (6b): as a result, covert chains are unable to carry out marking, i.e. to license a morphological feature in a Spec–Head relation based on identity.

This approach to marking also entails that only one operator will be triggered to license a morphological operator feature on any *one* head, hence the lack of a marking trigger for 2nd etc operators: the marking requirement in (6c) is already satisfied.

Admittedly, there are a number of immediate loose threads in the discussion. For instance, what is the analysis of simultaneous multiple operator movements to *distinct* heads (e.g. distinct Foc^0-s)? What determines which operator will raise overtly in a multiple operator construction? If 2nd etc overt operator movement is not triggered by marking needs, can 2nd etc operators never raise overtly?

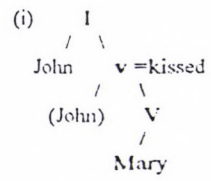
These issues, I argue, are essentially structural, therefore we need to address them within some particular theory of phrase structure. Here I will adopt Brody's (1997) Mirror Theory (MTh), and will show how structure in MTh interacts with marking. Inasmuch as relevant issues can be resolved more naturally in Mirror Theory, the present account gives support to MTh itself.

3.2 Marking in Mirror Theory

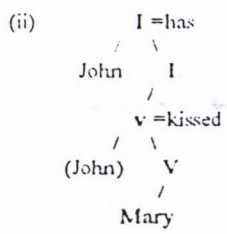
For reasons of space, I will not present MTh here in detail, but refer the reader to Brody's original work.[12] I only note two aspects of MTh pertinent to our present concerns: (i) the fact that MTh is able to express the configuration of multiple specifiers in an antisymmetric representational model, and (ii) the notion of

[11] Note that I am not making use of an enforced elimination of semantically uninterpretable features in syntax. Morphological features are relevant for morphology, but in syntax they may require a syntactically conditioned licensing (see the discussion below).

[12] Mirror Theory accomodates a radically simplified, inherently antisymmetric phrase structure (eliminating the X' intermediate level projection, as well as the head–phrase distinction), making the Mirror Principle (cf. Baker 1985) its axiom. Syntactic and morphological Spec–Head relations mirror each other: the 'complement line' constitutes a Morphological Word (MW) (with nodes pronounced in mirror order, i.e. from bottom to top), while syntactic specifiers express the standard syntactic specifier and complement relations to heads – building on recent antisymmetric work. A simple illustration from English is provided below:

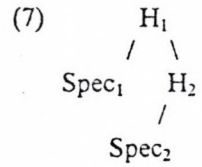


In (i), the subject *John* has been raised – in standard terminology – from [Spec,vP] to [Spec,IP], the object is in [Spec,VP]. The I–v–V complement series – or, in other words, morphological specifier series – constitute a single Morphological Word (MW), and is pronounced in the v position; this replaces the standard operation of head movement. Generally, a specifier precedes the head. A 'wiggle' arises for example when an extended projection (in the sense of Grimshaw) is composed of more than one MW, one of them being in a specifier position of some node in the other. Take (ii) for example:



In (ii) the extended projection goes through both morphological specifiers (i.e. syntactic complement positions) and syntactic specifier positions, i.e. it is 'wiggly'.

Morphological Word (MW). MTh is able to express multiple specifiers in the configuration of a series of identical adjacent heads in a MW, as illustrated below:

(7)


Let H_1 and H_2 be heads hosting multiple operators in their specifiers. Even if H_1 and H_2 are members of the same MW, given that they are separate nodes in a MTh representations, it may be argued that inasmuch as they are distinct, they both need licensing of their morphological operator features. But we have seen that the presence of one overtly raised operator is sufficient to meet licensing needs. So, it appears that a morphological operator feature [op] can be licensed by an identical morphological feature in an appropriate syntactic Spec–Head (Marking) relation, and also by an already licensed feature in the same MW which, I will assume, has to be in a domination relation with [op], again under identity. If this is correct, then the two fundamental relations of syntax – also conspiring to produce c-command effects (cf. Brody 1997) – figure equally in marking, i.e. licensing of morphological operator features.

3.3 Marking and some multiple operator movements

This definition of the licensing relation can also explain why in a Foc1>(. . .>)Foc2 scopal context (where . . . may be null, or may be filled by a universal quantifier, for instance) it will be Foc1 whose overt movement is obligatorily triggered: the licensing of [foc] on F1 (head of Foc1) entails a licensing of [foc] on F2 (head of Foc2). I will make the additional assumption (strengthening the idea in section 3.1; see Fn. 8) that a morphological operator feature can be licensed only if it is lexicalised, but the focus head itself in Hungarian arguably lacks any associable lexical element, which is why it 'attracts' the verb: the MW of the verb is spelled out in its F node. If a construction involving multiple overt focus movement exists in Hungarian[13], then it is correctly predicted to have the verb invariably in the head of the highest focus. If a hierarchically lower focus had the verb in its syntactic head (and hence were able to 'mark' its head), then by the definition of licensing morphological features through domination, the head of the higher focus could not be marked. The possibility of a wiggly/non-wiggly extended projection (i.e. one involving a number of/one MW) is introduced but is left largely unconstrained in Brody (1997) (see Fn. 12). I argue that it is constrained by marking needs: whenever a wiggle would prevent marking, it is blocked. The need for the verb (or in fact the MW of the verb) to be pronounced in the marked F forces the extended projection in multiple focus constructions to be non-wiggly (i.e. to be one MW), otherwise the higher focus head would remain unlexicalised. The considerations up to this point answer the questions raised at the end of section 3.1 for focus movement.

Operators, however, can be multiply moved in less homogeneous contexts as well. For instance, Wh and focus operators can both be present in a clause. Observe the pattern that obtains with one Wh and one focus operator:

(8) a. [Wh V . . . Foc . . .]
b. *[Foc V . . . Wh . . .]
c. *[Wh Foc V . . .]
d. *[Foc Wh V . . .][14]

The pattern above, in terms of the model developed here, suggests that the lack of marking by the focus is not offending if the Wh operator carries out marking, but not vica versa. However, the Wh and the focus operators are to a large extent symmetric in Hungarian: for example they both are overtly raised and immediately followed by the verb if only one of them appears in the sentence. As can be seen from (8b,c), they are mutually exclusive in the preverbal position. Rizzi (1995) assigns them to the same position in Italian for similar reasons. Horvath (1985) claims, based on their distributional and alleged semantic symmetries, that this is because the Wh operator is equipped with a [foc] feature (as well as a [wh] feature). But if this view is correct, in this model we have a straightforward explanation of facts in (8): given that the set of features of Wh is

[13] At this point, this is an open empirical issue. (See end of section 2.) However, an argument can be constructed supporting the optionality of the overt raising of 2nd etc foci based on the considerations related to the aspectual verbal prefix at the end of section 2 and relative scope data. A further argument may be built on the conflict between implications of data in (4) and certain parasitic gap licensing patterns appearing in a manuscript version of É.Kiss (1998a). I will not pursue this matter here, altough such a finding would be in direct support of the present marking approach to operator movement.

[14] Note that (8d) may be ruled out semantically, given that a focus operator cannot scope over a Wh operator in the same clause.

{[foc], [wh]} and that of Foc is {[foc]}, it will be sufficient to carry out marking with Wh, the [foc] feature on the lower[15] F head will be licensed through domination within the same MW. Note that such an elegant account is not easily formulable in a checking treatment.

Although data here are murky, a similar pattern is found with the interaction of negated focus (like 'NOT JOHN') and ordinary focus, presumably carrying the feature set {[foc], [neg]}: [nFoc V . . . Foc . . .] being grammatical, but *[Foc V . . . nFoc . . .] not. The same explanation should hold. If the Wh operator must have wide scope for independent semantic reasons (cf. Fn.14), then even if no subset relation obtains between the sets {[foc], [wh]} and {[foc], [neg]}, [Wh V . . . nFoc . . .] is correctly predicted. (The question of the non-marked [neg] in this latter case is left open. 'Underparsing' discussed in the following section may potentially be relevant, however. For, it seems that in this latter case of [Wh V . . . nFoc . . .], nFoc has an 'underparsed' [Neg] feature: it does not easily license NPIs in its c-command domain, while if it is in marking position (where it has no reason to undergo underparsing – as in [nFoc V . . . Foc . . .] above), it will more naturally license NPIs from there.)

No explicit claims have been made concerning optional movement to this point. However, crucially, if no additional principle is assumed relevant to the matter of the overt/covert status of chains, such as the arguably stipulative (and probably unnecessary) Procrastinate of Chomsky (1993), the system drawn up so far predicts in itself that non-marking operator movement (operator movement which does not result in a marking which otherwise would not be ensured) does not need to be, but may be, overt, i.e. it is optionally overt. In the present model, operator movement as such is triggered (as a last resort) by semantic requirements – for our purposes, it is sufficient to refer to scope reasons. Yet, given that we have discarded checking features (for operator movement), a PF requirement of overt versus covert movement is not formulable along the lines of Full Interpretation. Unless operator movement serves marking, it is expected to be optionally overt. Indeed this is the case for universal quantifiers in Hungarian (in line with data, although not with the analysis, in e.g. É.Kiss 1994). Universal quantifiers arguably belong to a different syntactic and semantic class than focus, Wh, negative and other true syntactic operators. It is not unmotivated to claim that they do not carry out a semantic operation comparable to the latter. (Perhaps they do not even take their scope position in independent projections of their own at all (see Hornstein 1995, Kitahara 1996).) If that is true, on these grounds they can be claimed not to require a 'marker' morphological feature either – and therefore no licensor is needed. Given that they fall outside of marking, they will be insensitive to the overt/covert distinction: they will raise to their scope position optionally overtly, be it singular or multiple instances.[16]

3.4 Multiple Wh

Multiple Wh questions in Hungarian exhibit two patterns. I will turn to the whole-sale movement pattern first. This type is apparently problematic for the theory developed here, as multiple overt movements appear to be enforced in this type; moreover, they are forced to the same head. A highly relevant finding, however, comes from É.Kiss (1992b), who shows that the interpretation of these questions is that of a single question, while non-last Wh-expressions are interpreted on a par with universal quantifiers. This generalisation can in fact lead to a better understanding of this movement pattern in the present framework. For, if the question is a single one, then there must be not more than one Wh-operation carried out. In consequence, only one Marking relation is expected to be necessary. The grammar has to decide which Wh-expression will carry out the required marking. However, the mechanism cannot be identical to the one activated in multiple focus constructions, given the distributional contrast. Then, the relevant contrast is expected to lie with the difference in the nature of the focus and Wh operators. Recall the claims made about their featural composition in the previous section: a focus operator presumably has a [foc] feature only; while a Wh-expression is equipped with a [foc] and a [wh] feature (and possibly a [q] feature as well, hence its ability to be interpreted as a universal quantifier). Now let us assume – in line with pertinent considerations mentioned in the previous section – that it is the focus feature that carries out the relevant syntactic and semantic operation of focalising or turning a constituent into a question (when a syntactic [Wh] feature is also present). Let us also make the plausible assumption that the deletion of the [Foc] feature off a Wh-expression is possible, since it is recoverable from its [Wh] feature. Given that the [Foc] feature appears to be inactive in a whole-sale movement context, we may safely suppose that in this context it is deleted off the relevant Wh-phrases. Note that such a deletion is ruled out in multiple focus contexts, because there the deletion would effectively violate Recoverability – the source of the contrast in the present conception. The next question concerns the choice of the 'full' Wh operator instance. It appears from the data that it is invariably the one occupying the hierarchically lowest position in the MW, and therefore also having the narrowest scope. This effect is difficult to capture in a MTh

[15] See Fn. 14.

[16] However, optionally overt movement is also predicted by this system for 2nd etc foci. This, indeed, is arguably borne out by the data (cf. Fn.13.)

representation without complications[17]; I will tentatively refer to it as the 'Low Marking' generalisation, pending further research. Due to 'Low Marking', the lowest Wh will act as a true operator in every respect; with the other Wh-phrases sitting in higher specifier positions presumably of the same MW.[18] The remaining question is: What explains the obligatory overt movement of all other Wh expressions in such a context? The answer is provided by Richards' (1998)[19] generalisation that in multiple specifier configurations covert movements have to target inner (i.e. lower) specifiers than overt movement. Given that the marking (therefore overtly raising) Wh has to be the lowest one ('Low Marking'), by Richards' generalisation it follows that all other Wh expressions will need to move overtly. If the [Foc] feature cannot be deleted due to Recoverability in pure multiple focus contexts, they will all carry out a focalisation operation in their respective ('LF') positions, hence the respective heads will all need licensing – which is the reason why the verb will realise (and allow to be 'marked') the highest F head, which, through domination, will license all the lower [foc] features. Although the picture is not without open questions, we have derived the overt/covert movement properties of this type of multiple Wh construction, relating them to their interpretation.

The other pattern is coined 'real' Wh construction by É.Kiss (1992b), due to the fact that it involves multiple questions:

(9) a. Ki vert meg kit?
who beat PREF who-ACC
'Who married whom?'
b. Endre verte meg Pétert.
'Endre beat Péter.'
c. *Endre verte meg Pétert es Palit, Géza verte meg Jánost es Bélát, etc.
'Endre beat Péter and Pali, Géza beat János and Béla, etc.'

In support of the claim that this distributional pattern represents a double Wh-question, É.Kiss points out that (9b) is a possible answer to (9a), while (9c) is not.[20] If this view is correct, then there must be two distinct interrogative operations in this sentence; hence multiple instances of marking features (and no deletion). In effect, this construction is parallel to the multiple focus construction, which I have already treated.

3.5 Negation

This section contains some speculations about negation, and how it could be accommodated to the present system. The discussion here is preliminary and therefore concise.

The main drawback of some current approaches to negation in Hungarian (Puskás 1996, Olsvay 1998) is that they involve a right-adjunction of the verb to the Neg head. Such a move is disallowed, however, by the recent restrictive theory of phrase structure developed by Kayne (1994). Also, to account for some word orders involving negation, a basic asymmetry has to be stipulated between the negative head that is below focus and the one that is above focus – or more precisely, in case of multiple foci, this would be reinterpreted as an asymmetry between the negation head not dominating any focus and the ones dominating at least one focus. Then the asymmetry (represented by Olsvay (1998) as NEG and Neg, or Neg_F and Neg) can be phrased in terms of feature strength: Neg_F does not attract the verb, while Neg does.

I argue that these problems, as well as equivalent ones which would arise in an attempt to carry the analysis over to MTh, stem from the assumption that the negative element *nem* 'not' in Hungarian is a head category. Here I venture to speculate on a treatment of negation analysing *nem* as a speficier element, essentially a negative operator also carrying out marking, and point out what questions need to be resolved.

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[17] Although not so impossible in a standard phrase structure with multiple specifiers: the inner(most) specifier(s) do(es) the Marking. (A comparable difference is maintained between the inner and outer specifiers in Chomsky (1995).) In the particular case of syntactic focussing (such as Wh-movement) in Hungarian, in a standard representation it may be argued alternatively that the 'Low Marking' effect is due to a ban on the appearance of non-marking material between the marking operator and the head.

[18] There is some distributional evidence to suggest this. Also, given that the 'underparsed' Wh expressions are compatible with the 'full' Wh, assuming a general Economy of Representation, multiple specifiers, i.e. less MWs (i.e. less wiggles, hence less nodes in the representation) will be favoured by default.

[19] Richards derives this generalisation from the conspiracy of Featural Cyclicity (Chomsky 1995) and Shortest Move. Here I am building on the generalisation without attempting to derive it in the representational theory of MTh.

[20] It is still not entirely clear to me empirically whether an answer like (i) below is possible:

(i) Endre verte meg Pétert, es Géza verte meg Palit.
'Endre beat Péter, and Géza beat Pali.'

This would run counter to É.Kiss's (1992a) claim about the (9a) type question that it involves two distinct questions 'Who beat and who was beaten?'. It would make (9a) more similar to English multiple questions, perhaps with an absorption of Wh-operators to allow for pairs of individuals (but not sets!) in the answer. I will not pursue this matter here, and will also put aside the arising possibility of 'mixed' ('real' and 'non-real') type questions (not treated explicitly in the literature) – they are presumably covered by the principles already laid out.

Let us limit our attention to the following three basic patterns:

(10) a. NEM V . . .
b. Foc NEM V . . .
c. NEM Foc V . . .

(10a) can be interpreted to mean that NEM – much like Foc – attracts the verb to its head, which position it marks, licensing a [neg] feature. If immediately preceding it, NEM phonologically cliticizes to the verb. Following Sportiche (1992) and Cardinaletti & Starke (1994), clitics are argued in Brody (1998) to involve XPs that phonologically cliticize to their heads under a 'full agreement' with the head. This I will take to be the case for NEM as well, dismissing any argument against its phrasal status built on its clitic like behaviour when to the immediate left of the verb. In both (10b) and (10c), a 'Low Marking' effect seems to hold – whatever is the explanation for this effect in the case of multiple Wh constuctions discussed above, should carry over to these cases without additional stipulation. This symmetry in (10b,c) is an expected one, due to the distinctness of the two one-member feature sets, {[foc]} and {[neg]}. The remaining immediate question is: What accounts for the fact that the respective non-lexicalised higher heads ('F' / 'Neg') in patterns of (10b) and (10c) are apparently non-offending? It appears that in the relevant sense in these cases the 'F' and 'Neg' nodes seem to form one head within the MW, the reason why the verb can simultaneously lexicalise both. A formal expression of this intuition in MTh awaits further research.[21] Here I will not pursue this extension of the theory in more detail.

4 Conclusion

In this paper I argued against the relevance of checking for operator movement, and offered an alternative. The alternative relation is Marking, an asymmetric licensing relation between identical morphological operator features based on the two fundamental syntactic relations: the specifier–head and the dominance relation. The marking requirement (i.e. presence of 'marker' feature to be licensed) is triggered only in case of true syntactic/semantic operators being active in the construction. For other operators – e.g. universal quantifiers, 2nd etc instances of operators that are unable to mark for some reason ('underparsing', lack of lexicalisation (here: by the verb)) – optionally overt movement is predicted as a default. The default however may be overriden by additional factors, for instance Richards' generalisation. The present theory avoids complications associated with the checking account such as simultaneous XP and head movement to the same head, apparent competition effect between operators, and the more general lack of a theory of the overt/covert distinction. The model presented here holds that obligatory overt operator movement is required by a mirrored symmetry of syntax and morphology at the point of operator application.

I briefly mention a number of interesting research questions. How can 'Low Marking' effects (see Fn. 17 and Fn.21) be derived in MTh? What is the marking status of elements occupying immediately preverbal position (often referred to as the VM position) in neutral contexts, but being freely postverbal in focussed sentences? If their preverbal position is that of an aspectual operator, what is the nature of such an operator with respect to marking? What is the treatment is this system of negative universal quantifiers of the type *senki (sem)* 'nobody (nor)' and their interaction with *nem* 'not'? How naturally do facts of language variation fit into the model? What aspects of the model (e.g. existence of certain morphemes ('markers'), for example Chinese interrogative markers) can be adjusted to account for patterns of variation?

[21] Note that this question does not arise in a standard phrase structure with multiple specifiers: NEM and Foc are specifiers of the same one head, which is lexicalised by the verb. As is implied, the theory must allow for different Marking relations to hold between operators and distinct features of the same head.

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Vowel-zero alternations and syllable structure*

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The focus of the paper is the behaviour of unstable vowels in Hungarian roots and suffixes (eg. *bokor, bokr+ok* 'bush' pl. and *gáz+t* 'gas' acc. *ház+at* 'house' acc.) and the relationship between the absence vs presence of these vowels and syllable structure. The framework used is that of Optimality Theory.

Traditionally two solutions have been proposed to account for such vowel alternations: floating vowels , i.e. vowel features not linked to a root node, and root nodes without vowel features. I will argue that the former treatment is superior because it easily captures the fact that the vast majority of the unstable vowels are mid (except for those cases when an unstable suffix vowel follows a lowering stem and thus surfaces as low). This fact is hard to account for with the help of the second approach since some extra machinery is needed to exclude high and low unstable vowels.

Another observation that can be made concerning unstable vowels is that they only appear if they are followed by exactly one consonant in the syllable. I will show that an Optimality Theoretic analysis has the advantage of not having to stipulate any additional constraints but the above observation follows from universal markedness constraints and their relative ranking with respect to each other. Namely, the fact that unstable vowels are always followed by a single coda consonant can be explained by ranking the constraint NoComplexCoda, requiring that there be no branching codas, above the more general constraint NoCoda, requiring that syllables be open

Introduction

Vowel-zero alternations, including such Hungarian phenomena, have long been one of the central issues of generative phonology because of the several possible treatments. This paper examines some of the Hungarian vowel-zero alternations, namely the suffix initial and stem internal ones. The framework of the analysis will be that of Optimality Theory as proposed by Prince and Smolensky (1993) and the Correspondence Theory of Faithfulness as in McCarthy and Prince (1995) and Beckman (1997, 1998). I will argue that, following Zoll (1996), latent vowels in Hungarian are best represented as underlying floating feature nodes as opposed to underlyingly root nodes without any dependent feature specifications. This kind of account allows a uniform treatment of vowel-zero alternations in Hungarian roots and suffixes. Also, the fact that unstable vowels only surface if followed by exactly one consonant receives a straightforward explanation if we assume that the presence and absence of coda consonants and coda clusters is governed by the constraints NoCoda and NoComplexCoda penalising coda consonants and coda consonant clusters respectively, the latter outranking the former.

1. Suffix initial alternation

1.1 The data

In Hungarian, several suffixes display an alternation of the suffix initial vowel. The examples in the table show the main types of these alternations.

(1)

		plural	superess.	1sg poss.	acc.	Gloss
-C#	*bál*	*bál-ok*	*bál-on*	*bál-om*	*bál-t*	'ball'
	pad	*pad-ok*	*pad-on*	*pad-om*	*pad-ot*	'bench'
	gáz	*gáz-ok*	*gáz-on*	*gáz-om*	*gáz-t*	'gas'
	tök	*tök-ök*	*tök-ön*	*tök-öm*	*tök-öt*	'pumpkin'
-V#	*kapu*	*kapu-k*	*kapu-n*	*kapu-m*	*kapu-t*	'gate'
	nő	*nő-k*	*nő-n*	*nő-m*	*nő-t*	'woman'
	sí	*sí-k*	*sí-n*	*sí-m*	*sí-t*	'ski'
	hiba	*hibá-k*	*hibá-n*	*hibá-m*	*hibá-t*	'mistake'

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As can be seen in the consonant final stems, the suffix vowel of the plural, superessive and possessive is always present if the root ends in a consonant: The accusative behaves in a different way in this respect: the vowel is only present if the branching coda resulting from the combination of the word final consonant+t would be illegitimate, as in *bál+t* 'ball' vs. *pad+ot* 'bench'.

(2)

		plural	superess.	1sg poss.	acc.	Gloss
-C#	*vad*	*vad-ak*	*vad-on*	*vad-am*	*vad-at*	'wild'
	ház	*ház-ak*	*ház-on*	*ház-am*	*ház-at*	'house'
	fal	*fal-ak*	*fal-on*	*fal-am*	*fal-at*	'wall'
	szűz	*szüz-ek*	*szűz-ön*	*szüz-em*	*szüz-et*	'virgin'
-V#	*keserű*	*keserű-ek*	*keserű-n*	*keserű-m*	*keserű-t*	'bitter'
	városi	*városi-ak*	*városi-n*	*városi-m*	*városi-t*	'urban'
	hű	*hű-ek*	*hű-n*	*hű-m*	*hű-(e)t*	'faithful'
	férfi	*férfi-ak*	*férfi-n*	*férfi-m*	*férfi-t*	'man'

The roots in (2) belong to the lexically marked morpheme class of lowering stems requiring that the suffix vowel immediately following them be low. The superessive suffix is not influenced by lowering, its vowel is always mid. The plural always includes a low vowel whether the lowering stem ends in a vowel or consonant. The possessive and accusative behave identically since the (low) vowel is always present after consonant final lowering stems but never after vowel final ones. The only exception from under this is the stem *hű* 'faithful', which can occur with or without a suffix vowel in the accusative.

1.2 The analysis

Let us now try to account for these different patterns of suffix vowel behaviour. The above alternations can be explained if we assume that the underlying representations of the suffixes are different and this, intertwined with some lexical marking, is what causes the presence or absence of the vowel in the suffix after different stems. Since the first three suffixes, the plural, superessive and possessive, behave the same way after normal stems they must be similar in some respect. Similarly, the possessive and the accusative must be similar in some way because of the absence of the vowel after vowel final lowering stems.

Traditionally two kinds of representations have been proposed for unstable vowels: they were either represented as full vowels which are subject to deletion under certain circumstances or they were inserted by epenthesis, i.e. were not present in the underlying representation. Other possible representations for unstable vowels have also been proposed by Szpyra (1992), suggesting defective root nodes, and Hyman (1985), Kenstowicz and Rubach (1987) and Rubach (1993), suggesting segments lacking timing units. Zoll (1996) on the other hand suggests that there is another way of distinguishing such segments from full vowels, namely latent segments are floating features or feature nodes lacking a root node. In the present analysis I will rely on Zoll's treatment of subsegments and build the argument around her observations.

Before we start with the actual analysis we have to note that there is a third type of vowel initial suffixes, those that always surface with a vowel regardless of the last segment of the stem. These suffixes, let us call them Type A, include the terminative *-ig* and the causal-final *-ért*. These suffixes definitely have an underlying full vowel the presence or absence of which is not influenced by the morpho-phonological environment.

The plural, superessive and possessive form another group of suffixes, let us call them Type B, which always have a vowel after (normal and lowering) stems ending in a consonant, independent of its quality. For this reason we can claim that these suffixes have an underlyingly latent vowel, a floating feature or class node without a root node. Of course, there must be some representational differences between the superessive and the other two suffixes since the first is not influenced by lowering while the other two are. This can be done by claiming that the plural and the possessive lack an underlying specification for the feature [low]. For this reason lowering can affect these suffixes but it cannot change the underlying [-low] specification of the superessive, a clear case of faithfulness to input representations as we will see below[1].

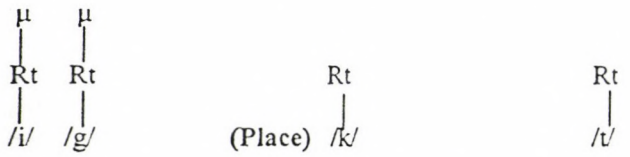
The Type C suffix, the accusative only appears with a vowel for two reasons: 1) after a consonant with which the suffix *–t* cannot form a legitimate branching coda (or a coda+appendix[2]), or 2) following a lowering stem. However, we have to note that there is no suffix vowel in the accusative after vowel final lowering stems, a peculiarity explained below. For the above reasons we can assume that the accusative does not have an underlying vowel, the vowel is clearly epenthetic, which appears either for phonological reasons, i.e. to break up

[1] For a more detailed analysis of lowering see Szentgyörgyi (1999a and 199b) and Ringen and Szentgyörgyi (to appear)
[2] For a detailed analysis of coda clusters in Hungarian see Törkenczy (1994).

an ill-formed cluster, or for a morphological one, i.e. after a lowering stem requiring a low vowel in the subsequent suffix.

Thus we end up with the following representations for the three types of suffix[3]:

(3) Type A: terminative Type B: plural Type C: accusative



Type A suffixes have underlying full vowels, Type B suffixes have underlying floating feature class nodes and Type C suffixes do not have underlying vowels at all. This trichotomy is reflected in the behaviour of the three types as we have seen. To account for these behaviour patterns let us turn to the constraints and their hierarchy governing the relationship between underlying and surface forms.

As Zoll (1996) claims, there are two constraints that interact to result in different patterns of segmental and subsegmental behaviour, MAX(segment) and MAX(subsegment) requiring that underlying segments/subsegments be present on the surface, i.e. prohibiting deletion of segments and subsegments respectively. We also have to add another constraint that penalizes epenthesis, a DEP constraint.

(4) MAX(segment) Segments in the input have a correspondent in the output. (No deletion of segments)

(5) MAX(subsegment) Subsegments in the input, i.e. floating features or feature class nodes not linked to a root node, must have a correspondent in the output. (No deletion of subsegments)

(6) DEP(segment) Segments in the output have a correspondent in the input. (No epenthesis)

1.2.1 Non-lowering stems

Now let us see how these constraints select the optimal surface forms for the consonant final non-lowering stems followed by the three types of suffix. Tableau (7) shows a non-lowering consonant final stem followed by the Type A terminative suffix.

bálig 'ball' term.

(7)

UR: ba:l+ig	MAX seg	MAX subseg	DEPseg
a. ☞ ba:lig			
b. ba:lg	*!		
c. ba:l	*!*		

Both candidates (b) and (c) violate MAXseg because of the deleted suffix segments. For this reason candidate (a) not violating any of the constraints is selected as optimal. Note that we cannot determine the relative ranking of the constraints with respect to each other based on this example[4].

[3] The difference between the superessive and the others in type B is not detailed here. The only difference is that the former does, the latter do not have a specification for [low]. Place in parentheses stands for a floating Place node.

[4] In fact, we would not be able to determine the ranking of the constraints on the basis of any of the sample words with the terminative for the simple reason that the terminative always appears the same way on the surface.

bálok 'ball' pl.

(8)

UR: ba:l+Ok[5]	MAX seg	MAX subseg	DEPseg
a. ☞ ba:lok			*
b. ba:lk		*!	
c. ba:l	*!	*	

MAXseg, MAXsubseg >> DEPseg

The form in (8) is the stem we saw in (7) but this time with the Type B plural suffix. Candidate (c) violates MAXseg because of the deleted input suffix segment /k/, while candidate (b) violates MAXsubseg since the input subsegment /O/ does not have an output correspondent. Candidate (a) not violating either of the MAX constraints but only the DEP constraint because of the inserted root node for the suffix vowel hence wins. This shows then that the MAX constraints must dominate DEPseg. Should their relative ranking be the reverse, candidate (b) or (c) would be selected as optimal, a most unwelcome result.

One might ask, however, why the optimal candidate (8a) surfaces with a mid vowel, why not a low one? Since the input subsegment is unspecified for [low], this would be possible indeed. Thus there has to be a constraint or constraints that rule out such a candidate. In fact, if we assume that vowels form a markedness hierarchy, and claim that in Hungarian the default height is mid[6], then the explanation is straightforward. Thus we only need a markedness hierarchy of vowels expressed in constraints, two of which are given in (9) and (10).

(9) *ɔ Do not be a short back low vowel

(10) *o Do not be a short back mid vowel[7]

The effect of adding the two vowel markedness constraints to the constraint hierarchy is shown in (9).

bálok 'ball' pl.

(11)

UR: ba:l+Ok	MAX seg	MAX subseg	DEPseg	*ɔ	*o
a. ☞ ba:lok			*		*
b. ba:lk		*!			
c. ba:l	*!	*			
d. ba:lɔk			*	*!	

*ɔ >> *o

Candidates (a), (b) and (c) in (11) are identical to those in (8). Candidate (d) is identical to (a) except for the quality of the suffix vowel. For this reason these two candidates fare equally well on the first three constraints, the only difference lies in their violations of the markedness constraints. Candidate (d) violating the higher ranked *ɔ constraint is ruled out and lets (a) win.

bált 'ball' acc.

(12)

UR: ba:l+t	MAX seg	MAX subseg	DEPseg	*ɔ	*o
a. ☞ ba:lt					
b. ba:lot			*!		*
c. ba:lɔt			*!	*	
d. ba:l	*!				

Tableau (12) shows the same stem with the accusative. Candidate (d) has a fatal violation of one of the highest ranked constraints since the input suffix segment has no surface correspondent. Candidates (b) and (c) both violate DEPseg because of the inserted suffix vowel. This way candidate (a) is correctly allowed to be selected as optimal. Let us now see another form ending in a consonant which cannot form a legitimate coda with the accusative *-t*.

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[5] Capital 'O' stands for the floating class node containing the feature specifications [-high] and [ROUND], but unspecified for [low] and [back]. The backness of the suffix always depends on the stem, cf. Ringen and Vago (1998a, 1998b), while the mid or low quality always depends on the stem being normal or lowering, cf. Szentgyörgyi (1999a and 1999b).

[6] It is also indicated by the fact that the vast majority of unstable vowels surface as mid, unless required to be low because of a preceding lowering stem, of course.

[7] Instead of these constraints the constraints *[+low] and *[-low] penalising low and non-low vowels respectively could also be used.

tököt 'pumpkin' acc.

(13)

UR: tök+t	MAX seg	MAX subseg	DEPseg
a. tököt			*!
b. ☹ tökt			
c tök	*!		

The non-lowering consonant final stem *tök* 'pumpkin' followed by the accusative shows that this hierarchy is not able to select the actual surface form as optimal. It is so because there is no constraint requiring that syllables be well-formed. It is obvious that such a constraint would rule out (b) because of the coda cluster [-kt] which is not permitted in Hungarian[8]. Let us then add the following constraint to our hierarchy:

(14) Syll Syllables are well formed[9].

tököt 'pumpkin' acc.

(15)

UR: tök+t	Syll	MAX seg	MAX subseg	DEPseg
a. ☞ tököt				*
b. tökt	*!			
c tök		*!		

Syll >> DEPseg

Tableau (15) shows that if Syll dominates DEPseg, then candidate (a), the correct form, is selected as optimal. Should the ranking be the opposite, candidate (b) would be the winner. Note that the addition of the constraint in (14) does not affect the selection of the optimal candidates in the preceding tableaux. Thus we can conclude that the hierarchy is able account for the behaviour of all three kinds of suffixes after consonant final non-lowering stems.

Let us now take a look at non-lowering stems that end in a vowel. Recall that there is never a suffix vowel in any of the Type B and C suffixes after such stems. Type A suffixes, which always surface with a suffix vowel after any kind of stem, will be treated later.

kapuk 'gate' pl.

(16)

UR: kɔpu+Ok	Syll	MAX seg	MAX subseg	DEPseg	*ɔ	*o
a. kɔpuk			*!		*	
b. ☹ kɔpuok				*	*	*
c kɔpuɔk				*	**!	
d. kɔpu		*!			*	

Candidate (16d) violates MAXseg since the input suffix consonant does not have an output correspondent. The actual surface form in (a) violates MAXsubseg as the input floating class node is not present in the output. The remaining two candidates, (b) and (c), both violate DEPseg once because of the root node of the suffix vowel, which does not have an input correspondent. Of the two candidate (b) is more optimal since it violates the higher ranked markedness constraint once while (c) violates it twice. This tableau shows the need for another constraint that prefers (a) to (b) and (c).

(17) Onset Syllables have onsets. (No hiatus)

This constraint is one of the core constraints responsible for syllabification. It prohibits VV sequences as shown in tableau (18) [10].

[8] Törkenczy (1994) notes that there are about 10 monomorphemic words ending in this cluster. These are truly exceptional. For further details see Törkenczy (1994).

[9] Note that this is rather the umbrella term for a group of constraints that govern syllable well-formedness. For the exact formulation of these constraints see Szentgyörgyi (1999a).

[10] Only constraints relevant for the evaluation of the candidates are shown.

kapuk 'gate' pl.

(18)

UR: kɔpu+Ok	MAX seg	Onset	MAX subseg	DEPseg
a. ☞ kɔpuk			*	
b. kɔpuok		*!		*
c kɔpuɔk		*!		*
d. kɔpu	*!			

MAXseg, Onset >> MAXsubseg

If Onset and MAXseg are ranked above MAXsubseg, then the actual surface form in (a) is allowed to win. However, one might argue that this ranking also allows for another kind of candidate, one with an epenthetic consonant breaking up the VV sequence. Note that such a candidate would be more optimal than (a) since it would not violate Syll, MAXseg, Onset or MAXsubseg. The highest ranking constraint it violates is DEPseg. This sheds some light on the characteristic feature of Hungarian that a hiatus can only be avoided by deleting one of the vowels but not by inserting an onset consonant. For this reason the output-input faithfulness constraints for consonants must be higher ranked than input-output constraints for vowels. Thus it seems reasonable to break up the DEPseg constraint into two: DEP-C and DEP-V as suggested in Stiebels and Wunderlich (1998).

kapuk 'gate' pl.

(19)

UR: kɔpu+Ok	MAX seg	Onset	DEP-C	MAX subseg	DEP-V
a. ☞ kɔpuk				*	
b. kɔpuok		*!			*
c kɔpuɔk		*!			*
d. kɔpu	*!				
e. kɔputok			*!		*

DEP-C >> MAXsubseg

Tableau (19) indicates the effects of separating the two DEP constraints and adding another candidate with an epenthetic consonant between the stem final and suffix initial vowels. As can be seen candidate (e)[11] violates DEP-C which is a fatal violation since the optimal candidate in (a) only violates MAXsubseg. It follows from this tableau then that DEP-C must dominate MAXsubseg. Now let us recall that in tableau (8) the established ranking was MAXseg, MAXsubseg >> DEPseg, which might seem problematic. However in all the preceding tableaux where we considered consonant final stems, it was always an output vowel without an input correspondent, i.e. an epenthetic vowel, that had to be penalised. Thus ranking the constraint prohibiting consonant epenthesis has no consequences in any of those tableaux.

Let us now examine a Type C suffix like the accusative attached to the same stem as in (20).

kaput 'gate' acc.

(20)

UR: kɔpu+t	MAX seg	Onset	DEP-C	MAX subseg	DEP-V
a. ☞ kɔput					
b. kɔpuot		*!			*
c kɔpuɔt		*!			*
d. kɔpu	*!				
e. kɔputot			*!		*

As the tableau shows, the accusative behaves exactly the same way as Type B suffixes, i.e. the actual surface form is correctly allowed to win just as in (19). The only difference between (19) and (20) is that the candidates in the latter do not have any violations of MAXsubseg since there is no underlying floating subsegment in the accusative.

The next tableau in (21) shows the same stem with a Type A suffix, the terminative *-ig*, which always appears with a suffix vowel.

[11] Note that the epenthetic consonant can be any of the consonants. The fact that here it is a coronal stop has no significance.

(21) *kapuig* 'gate' term.

UR: kɔpu+ig	MAX seg	DEP-C	Onset	MAX subseg	DEP-V
a. ☞ kɔpuig			*		
b. kɔpug	*!				
c kɔpig	*!				
d. kɔpu	*!*				
e. kɔputig		*!			

DEP-C >> Onset

Candidates (b), (c) and (d) all violate MAXseg because of the input suffix segments not having an output correspondent. Candidate (e) with the epenthetic consonant between the stem final and suffix initial vowels violates DEP-C while the optimal candidate, (a), violates Onset because of the hiatus. This is why it is crucial that DEP-C be ranked higher than Onset or otherwise (e) would be more optimal than (a).

Thus we can conclude that the above constraints and the established rankings can account for all three types of suffix behaviour after non-lowering stems. In the next section we will consider lowering stems followed by the three suffix types.

1.2.2 Lowering stems

As we saw in (2) the plural is always followed by a low vowel whether the lowering stem ends in a vowel or consonant while the possessive and accusative behave identically as the (low) vowel is always present after consonant final lowering stems but never after vowel final ones. For the treatment of lowering Szentgyörgyi (1999a and 1999b) proposes the following morpho-phonological constraint.

(22) Lowering (ALIGN right, lowering morpheme; left, [+low]) — The right edge of a lowering morpheme is aligned with the left edge of [+low] in a subsequent suffix.[12]

Recall that this constraint can only have an effect if the suffix vowel is unspecified for [low], other suffix vowels should not be affected. Let us take a look at the interaction of Lowering and the constraint hierarchy we have established so far[13]. First we consider consonant final stems followed by Type A suffixes like the terminative.[14]

(23) *falig* 'wall' term.

UR: fɔl^{L}+ig	MAX seg	Lowering
a. fɔlig		*!
b.☹ fɔlɛg		
c fɔlg	*!	*
d. fɔli	*!	*
e. fɔl	*!*	

MAXseg >> Lowering

Tableau (23) shows the need for another constraint since it is not the actual surface form that is selected by the hierarchy. Candidates (c), (d) and (e) are correctly ruled out by MAXseg because of the deleted suffix segments. The constraint violated by candidate (b) is the one that belongs to the constraint family requiring that input and output specifications for certain features be identical:

(24) IDENT-IO$_{low}$ — Corresponding segments in the input and output have identical specifications for the feature [low].[15]

---

[12] This constraint is violated if there is a misaligned [+low] feature in the suffix, i.e. not aligned with the left edge of the suffix, or if there is no [+low] feature in the suffix.

[13] Since the ranking of Lowering with respect to the other constraints does not influence the selection of the optimal candidates in the case of non-lowering stems, they will not be revisited in this part of the paper.

[14] Lowering stems are indicated with a superscripted capital 'L' after the morpheme in the input. Only relevant constraints are shown in the tableaux.

[15] I assume that filling in a binary feature does not constitute an IDENT-IO violation as assumed by Orgun (1995). In any other case IDENT-IO is violated.

If we add this constraint to the hierarchy so that it dominates Lowering, then we get the desired result, candidate (a) is selected as shown in the relevant part of tableau (23) repeated for convenience.

(25)

UR: fɔl^{L}+ig	MAX seg	DEP -C	IDENT-IO$_{low}$	Lowering
a. ☞ fɔlig				*
b. fɔlɛg			*!	

IDENT-IO$_{low}$ >> Lowering

Let us now turn to Type B suffixes like the plural. Tableau (26) shows the same lowering stem with this suffix.

falak 'wall' pl.

(26)

UR: fɔl^{L}+Ok	MAX seg	Lowering	MAX subseg	DEP -V
a. ☞ fɔlɔk				*
b. fɔlok		*!		*
c fɔlk		*!	*	
d. fɔluk		*!		*
e. fɔl	*!		*	

Since the underlying representation of the suffix vowel lacks the specification for [low], the Lowering constraint now clearly has an effect on the vowel. The optimal candidate, (a) has the underlying subsegment realised with a low vowel, this way satisfying all the high ranking constraints and violating only DEP-V and one of the markedness constraints not shown in the tableau. Candidates (b), (c) and (d) violate Lowering either because their suffix vowel is not low or because they do not have a suffix vowel. Candidate (e) violates MAXseg because of the deleted suffix segment.

In the very first part of the paper we noted that the superessive behaves slightly differently from the plural because its vowel is not lowered as a result of its underlying [-low] specification. This is shown in the following tableau. Note that the capital 'O' in the input now refers to a floating class node containing the features [–low], [ROUND], [-high], i.e. the suffix vowel is underlyingly also specified for the feature [low].

falon 'wall' superess.

(27)

UR: fɔl^{L}+On	MAX seg	IDENT-IO$_{low}$	Lowering	MAX subseg	DEP -V
a. ☞ fɔlon			*		*
b. fɔlɔn		*!			*
c. fɔln			*	*!	
d. fɔl	*!			*	

Note that the candidate [fɔlun] missing from tableau (27) would violate IDENT-IO$_{high}$, which requires that corresponding input and output segments have identical specifications for the feature [high]. This constraint is ranked very high since the feature [high] is never changed in Hungarian, being the most stable vowel feature.

falat 'wall' acc.

(28)

UR: fɔl^{L}+t	MAX seg	Lowering	MAX subseg	DEP -V
a. ☞ fɔlɔt				*
b. fɔlot		*!		*
c fɔlt		*!		
d. fɔlut		*!		*
e. fɔl	*!		*	

Finally, tableau (28) shows the same stem with the accusative, a Type C suffix. Similarly to the previous examples candidates violating Lowering are ruled out just like the candidate with the unparsed suffix segment. This way all the suffix patterns after a consonant final lowering stem can be described with the constraints.

In the first section of the paper in table (2) we noted that the patterning of the suffixes is very different after vowel final lowering stems since it is only Type A and some of the Type B suffixes, like the plural for

instance, that have a suffix vowel. The rest of Type B suffixes together with Type C suffixes surface without their vowel after such stems. This is the problem that we turn to now.

(29) *városiak* 'urban' pl.

UR: va:roʃi^{L}+Ok	MAX seg	Lowering	Onset	MAX subseg	DEP -V
a. ☞ va:roʃiɔk			*		*
b. va:roʃiok		*!	*		*
c va:roʃik		*!		*	
d. va:roʃɔk	*!				*
e. va:roʃi	*!			*	

Lowering >> Onset

Candidates (d) and (e) both violate MAXseg since an input segment remains unparsed in them, a fatal violation. Candidates (b) and (c) on the other hand both violate Lowering because the suffix vowel in (b) is mid and not low and the suffix in (c) does not have a vowel, and thus no [+low] feature at all. This way candidate (a) is correctly allowed to win. Of course, all lowering stems behave the same way when concatenated with the plural suffix. The tableau shows that Lowering has to dominate Onset, because it is more important to have a low vowel in the suffix after a lowering stem than have an onset for the syllable of the suffix vowel.

Now we turn to suffixes that pattern in a different way. First we consider the accusative as the most typical of these suffixes.

(30) *városit* 'urban' acc.

UR: va:roʃi^{L}+t	MAX seg	DEP -C	Lowering	Onset	DEP -V	*ɔ	*o
a. va:roʃit			*!				*
b. va:roʃiot			*!	*	*		**
c. ☹ va:roʃiɔt				*	*	*	*
d. va:roʃɔt	*!				*	*	*
e. va:roʃitɔt		*!			*	*	*

Tableau (30) presents us with a problem since it is not the actual surface form that is selected as optimal by the constraint hierarchy. According to the constraint hierarchy, it is more optimal to have an epenthetic low vowel than violate Lowering. Note that we encounter the same problem with the possessive the only difference being that the possessive contains a floating class node underlyingly.

(31) *városim* 'urban' 1 sg poss.

UR: va:roʃi^{L}+Om	MAX seg	DEP -C	Lowering	Onset	MAX subseg	DEP -V
a. va:roʃim			*!		*	
b. va:roʃiom			*!	*		*
c. ☹ va:roʃiɔm				*		*
d. va:roʃɔm	*!					*
e. va:roʃitɔm		*!				*

We cannot change the relative ranking of Lowering and Onset, although that would solve this problem, since that would change the selection of the optimal candidate in (29). As we can see there is a conflict between (29) vs (30) and (31): the former requires the subhierarchy Lowering >> Onset, the latter require Onset >> Lowering. If we assume that the accusative suffix, and the possessive as well, is marked for reranking the two constraints Onset and Lowering, then the actual surface form can be selected as optimal as shown by (32) and (33).

városit 'urban' acc.

(32)

UR: va:roʃi^{L}+t	MAX seg	DEP -C	Onset	Lowering	DEP -V	*ɔ	*o
a. ☞va:roʃit				*			*
b. va:roʃiot			*!	*	*		**
c. va:roʃiɔt			*!		*	*	*
d. va:roʃɔt	*!				*	*	*
e. va:roʃitɔt		*!			*	*	*

városim 'urban' 1 sg poss.

(33)

UR: va:roʃi^{L}+Om	MAX seg	DEP -C	Onset	Lowering	MAX subseg	DEP -V
a. ☞va:roʃim				*	*	
b. va:roʃiom			*!	*		*
c. va:roʃiɔm			*!			*
d. va:roʃɔm	*!					*
e. va:roʃitɔm		*!				*

Thus we can conclude that whenever the accusative or the possessive are added to a stem, the reranking Onset >> Lowering takes place. This way the behaviour of all three types of suffixes can be described after all four kinds of stems.

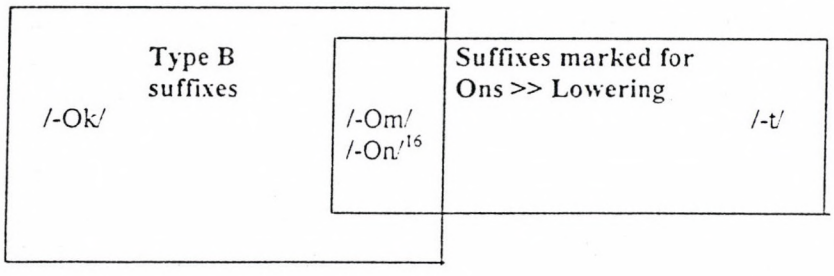
One more thing we have to address here is the behaviour of some vacillating words like *hű* 'faithful', *sértő* 'insulting' and *bántó* 'annoying'. The first may appear with or without a suffix vowel in the accusative while the latter two behave the same way with the plural.

The first exceptional word can be treated simply by claiming that it is exceptional because it vacillates between allowing or not allowing for the reranking of the constraints Onset and Lowering required by the accusative. If the stem allows reranking then we get the variant without the suffix vowel, i.e. *hűt*; if it does not, the optimal surface form will contain a low vowel, i.e. *hűet*. There seems to be a reason for this vacillation, namely the existence of a homophonous form *hűt* 'refrigerate' 3 sg. The vacillation may be the result of a strategy to avoid homophones in the language.

Forms like *sértő* 'insulting' and *bántó* 'annoying' are vacillating when followed by the Type A suffixes like the plural. In this case it is clearly the lowering nature of the stems that is vacillating. It is not a very rare phenomenon since there are roots that also vacillate, e.g. *tányér – tányérok/tányérak* 'plate' pl. or *szótár – szótárok/szótárak* 'dictionary' pl. Usually there is no variation within the speech of one and the same speaker, there is rather variation among speakers. We can conclude then that these forms are lowering for some but not all speakers.

Thus summing up the first part of the paper we can say that the organisation of suffix types is the following:

(34)



[16] Note that the capital 'O' in quaternary suffixes stands for a floating Place node containing [ROUND, -high] while the same symbol in /-On/ represents a floating Place node specified as [ROUND, -high, -low] but unspecified for the feature [back].

1.3 Why not empty root nodes?

One might ask the question: Why not to treat vowel-zero alternations assuming underlying empty root nodes instead of underlying floating feature nodes? There are several reasons to this question. On the one hand, it would be an interesting coincidence that the vast majority of these vowels surface as mid vowels[17]. The second reason for preferring the floating feature node analysis to the empty root node analysis is that in the latter case the deletion of an empty root node can be considered just as serious as the deletion of a full segment since it is the root node that anchors the segment to the timing tier. This way the analysis would be very similar if not identical to the old deletion type analysis and thus we would not be able to predict which vowels are deleted and which are not, i.e. morphological marking with the help of diacritic features would be made necessary by the analysis. Finally, root internal vowel-zero alternations are better treated by the first type of analysis as demonstrated in the next section. This way a uniform treatment of vowel-zero alternations becomes possible.

2. Stem internal alternation

2.1 The data

In this section of the paper we turn to stem internal vowel-zero alternations. In Hungarian there are a few hundred such stems, all in the last syllable of the stem as shown in the following tables.

(35) Liquid final		
bokor ~ bokr-	[bokor] ~ [bokr]	'bush'
lepel ~ lepl-	[lɛpɛl] ~ [lɛpl]	'veil'
töröl ~ törl-	[töröl] ~ [törl]	'wipe'
becsül ~ becsl-	[bɛtʃül] ~ [bɛtʃl]	'estimate'
kazal ~ kazl-	[kɔzɔl] ~ [kɔzl]	'stack'

(36) Nasal final		
izom ~ izm-	[izom] ~ [izm]	'muscle'
álom ~ álm-	[a:lom] ~ [a:lm]	'dream'
torony ~ torny-	[toroɲ] ~ [torɲ]	'tower'

(37) Obstruent final		
piszok ~ piszk-	[pisok] ~ [pisk]	'dirt'
dolog ~ dolg-	[dolog] ~ [dolg]	'thing'
szerez ~ szerz-	[sɛrɛz] ~ [sɛrz]	'get'
bajusz ~ bajsz-	[bɔjus] ~ [bɔjs]	'moustache'
ajak ~ ajk-	[ɔjɔk] ~ [ɔjk]	'lip'

As can be seen in the above tables, the unstable vowel of these so-called epenthetic stems is mid in most cases except for the very few examples where it is low or high. Some of these are listed below the horizontal lines in (35) and (37).

2.2 The analysis

Let us start with addressing the question of the underlying representation of the unstable vowel in these roots. As the vowel does not only appear for reasons of syllable well-formedness, we cannot claim that the vowel is epenthetic. This is shown by triplets such as *török* [török] 'Turk' – *far(o)k* [fɔr(o)k] 'tail' – *park* [pɔrk] 'park', where the first word has a stable vowel that is never deleted, the second one has an unstable vowel deleted if followed by vowel-zero alternating suffixes and the last one does not have a vowel between the members of the word final cluster at all showing that it is a possible cluster in the language. Traditionally analyses of unstable root vowels have either claimed that the vowel was inserted or deleted for some reason. However, neither analysis is possible since if the vowel was inserted, then we would expect *park* 'id.' to surface as incorrect *[pɔrok]. Similarly, if the alternation was the result of deleting an underlying full vowel, then we

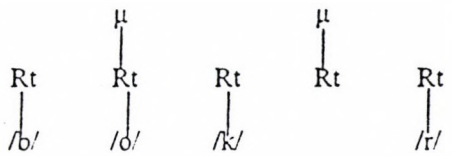
[17] A possible explanation of this fact is that these vowels surface as mid because mid vowels are the default ones in Hungarian. Note that Polgárdi and Rebrus (1997) argue that [ɔ] is the default back linking vowel in Hungarian and not a mid vowel. That is, they claim that non-lowering is the marked case.

would expect *török* 'Turk' to surface without its second vowel when followed by a suffix with an unstable vowel, i.e. as *[törk]. For this reason the unstable vowel must be present underlyingly in some form but not as a full vowel. It is either present as a root node without some of the vowel features or as a floating class node without a root node, a problem already discussed in 1.3. Let us now see whether the first or the second representation would work better.

2.2.1 Underlying root nodes

Let us assume that roots with vowel-zero alternations contain a root node underlyingly, but that this is a moraic root node not linked to vowel features, an empty moraic root node. The representation of the root *bokor* 'bush' is given in (38)[18].

(38)



Let us now see how the constraint hierarchy selects the optimal candidates[19].

bokor 'bush'

(39)

UR: bok•r[20]	Syll	MAX seg	DEP -V	*ɔ	*o
a. ☞ bokor					**
b. bok		*!*			*
c. bokr	*!	*			*
d. bokro[21]	*!	*	*		**
e. bokrɔ		*!	*	*	*
f. bokɔr				*!	*

Tableau (39) shows a bare vowel-zero alternating root. Candidates (c) and (d) violate Syll because (c) contains an illegitimate coda and (d) contains a word final short mid rounded vowel which is not allowed in Hungarian. Candidate (b) violates MAXseg twice since the empty root node and the word final consonant are both deleted. Note that from this point of view a root node unspecified for features counts as a normal segment. Candidates (e) and (f) are eliminated because of their violation of the higher ranking vowel markedness constraint. Although candidate (a) violates *o twice, it is allowed to win because a double violation of the lowest ranking constraint is better then even a single violation of any higher ranking constraint

Tableaux (40) and (41) show the same stem followed by the plural and the accusative respectively as representatives of their types of suffixes.

bokrok 'bush pl.'

(40)

UR: bok•r+Ok	Syll	MAX seg	MAX subseg	DEP -V	*ɔ	*o
a. bokrok		*!		*		**
b. bokork			*!			**
c. ☹ bokorok				*		***
d. bokrk	*!	*	*			*
e. bokrɔk		*!		*	*	*

In tableau (40) an incorrect candidate wins over the actual surface form, candidate (a). Candidates (a), (d) and (e) all violate MAXseg because of the unparsed root node in the root. Candidate (b) is eliminated by its violation of MAXsubseg since the floating Place node of the plural is unparsed in the output. This way, incorrectly, candidate (c) is allowed to win. We should note however that the form in (c) is not an impossible form in Hungarian. A proper name like *Bokor* would behave exactly like shown in tableau (40) if used in the plural, i.e.

[18] Segments between slant lines stand for the feature tree of the segments.
[19] Only relevant constraints are shown in the tableaux.
[20] The symbol '•' refers to a moraic root node unspecified for features. I assume that the deletion of any root node, specified or unspecified for features, results in a violation of MAXseg.
[21] This form violates Syll because no word can end in a short mid rounded vowel, i.e. [o] and [ɔ] in Hungarian

it would surface as *Bokorok*. Thus this is a strong argument against treating unstable root vowels as underlyingly unspecified root nodes. Thus we can claim that once we treat vowel-zero alternating suffixes the way described in section 1 of this paper, we are forced to treat root internal unstable vowels the same way.

Tableau (41) shows that the situation is similar with the accusative in spite of the fact that this suffix is marked for reranking Lowering and Onset. Since Onset has not been shown in the previous tableau because there were no instances of hiatus, reranking will have no effect whatsoever.

(41) *bokrot* 'bush acc.'

UR: bok•r+t	Syll	MAX seg	DEP -V	*ɔ	*o
a. bokrot		*!	*		**
b. ☹ bokort				*	**
c. bokorot			*!		***
d. bokrt	*!	*			**
e. bokrɔt		*!	*	*	*
f. bok		*!**			*

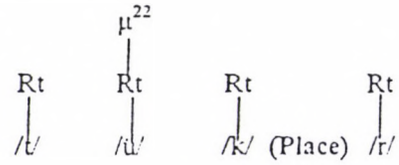
In (41) an incorrect candidate is selected as optimal once again. Candidates (a), (d), (e) and (f) violate MAXseg for the same reason as in (40). Candidate (d) violates Syll because of the resulting impossible coda cluster. Candidate (b) is preferred over (c), as opposed to (40), because (c) violates DEP-V. The difference between candidates (b) and (c) in (40) and (41) is that in the former tableau one candidate violates DEP-V because of the insertion of a root node in the suffix and the other violates MAXsubseg because of the deletion of the floating Place node in the suffix. In (41) there is no floating Place node in the suffix and thus neither candidate violates MAXsubseg allowing (b) to win. Note again, that although candidate (b) is an impossible form of the input, it is a possible output if the input is the proper name *Bokor* mentioned above, the accusative form being *Bokort*.

Thus we can conclude that the assumption that unstable root vowels are underlyingly empty root nodes gives us wrong predictions when fed into the feature hierarchy developed in the previous section. For this reason we turn our attention to the other possibility concerning the underlying representation of unstable vowels, the approach already applied to Type B suffixes in the first section, i.e. underlying subsegments.

2.2.2 Underlying subsegments

The other possible way to represent the unstable vowel in vowel-zero alternating roots is to posit a subsegment, a Place node underlyingly not linked to a root node. This Place node will be linked to an epenthesized root node if made necessary by higher ranking constraints but will remain uninterpreted if not. The representation of such a root is given below.

(42)



This way the representation of vowel-zero alternating segments is made uniform since we assumed the same kind of underlying structure for Type B suffix vowels. Thus vowels behaving the same way are treated the same way by the theory. Whether or not these Place nodes appear on the surface linked to an inserted root node should follow from the constraint hierarchy. Also note that the claim that the underlyingly floating Place node contains the dependent features [-high, -low, ROUND] predicts that there will be no cases of front rounded vowels in the first syllable followed by front unrounded vowels in the second in epenthetic stems[23]. This prediction is in fact borne out. Whenever such roots have a front rounded vowel in the first syllable, the second (unstable) vowel is always also rounded, as in *tülök* 'horn' for instance, while if it is unrounded the unstable mid vowel is always unrounded, as in *lepel* 'veil', since a front mid rounded vowel following an unrounded vowel would result in the violation of the constraint Link [ROUND] proposed by Ringen and Vago (1998b). This means that there are no forms like the hypothetical non-existent nonce words *tek(ö)r*. There are some exceptional forms where a front unrounded vowel is followed by a front rounded vowel, but in such cases the

[22] Symbols between slanting lines stand for the feature trees of the segments; The Place in parentheses stands for a floating place node with the dependent feature specifications [-high, -low, ROUND]

[23] In fact there is one such stem as suggested by an anonymous reviewer, őriz [ö:riz] 'to guard'.

rounded vowel is always high, i.e. the root belongs to the irregular class of vowel-zero alternating stems containing high or low unstable vowels. The Link [ROUND] constraint is not sensitive to high vowels, so it will not penalise such co-occurrences.

Let us now consider the behaviour of unstable vowels in bare roots and suffixed forms as shown in the following tableaux[24].

(43) *bokor* 'bush' [25]

UR: $bokO_1r$	Syll	MAX seg	MAX subseg	DEP -V	*ɔ	*o
a.☞ $boko_1r$				*		**
b. bok		*!	*			*
c. bokr	*!		*			*
d. $bokro_1$[26]	*!			*		**
e. $bokrɔ_1$				*	*!	*
f. $bokɔ_1r$[27]				*	*!	*

Tableau (43) shows a bare unstable vowel stem. Of the generated candidates, the ones in (c) and (d) are eliminated by Eval since they both violate the high ranking Syll constraint for the former contains an impossible coda cluster while the latter has a short mid rounded vowel word finally, a prohibited structure in the language. Candidate (b) violates MAXseg and MAXsubseg because of the unparsed root consonant and Place node respectively. Candidates (a), (d), (e) and (f) all violate DEP-V for a root node has to be inserted to support the underlyingly floating root node, a case of overparsing. For this reason the decision is passed on to the markedness constraints which favour candidate (a) as it contains only back mid vowels as opposed to the back low vowels in (e) and (f). Thus low vowels only occur on the surface if made necessary by a higher ranking constraint like Lowering or if underlyingly present.

The next tableau shows a bare lowering root with an unstable vowel and the actual surface form is selected as optimal by the hierarchy.

(44) *farok* 'tail'

UR: $fɔrO_1k^L$	Syll	MAX seg	MAX subseg	DEP -V	*ɔ	*o
a.☞ $fɔro_1k$				*	*	*
b. fɔr		*!	*		*	
c. fɔrk			*!		*	
d. $fɔrko_1$	*!			*	*	*
e. $fɔrkɔ_1$				*	**!	
f. $fɔrɔ_1k$				*	**!	

Candidate (d) is eliminated in (44) because it violates the highest ranking Syll constraint. Candidate (b) on the other hand violates the MAX constraints since the word final consonant and the floating vowel Place node are not parsed in the output. Candidate (c) violates MAXsubseg but this violation is enough to eliminate it since the optimal candidate does not violate this constraint. Candidates (a), (e) and (f) all violate DEP-V to be able to parse the floating Place node and thus to avoid the violation of MAXsubseg. Finally, the decision between (a), (e) and (f) is passed down to the markedness constraints: (e) and (f) violate *ɔ twice while (a) violates it only once just like in the previous tableau and thus wins.

Now that we have seen that the constraint hierarchy selects the actual surface forms as optimal for all kinds of roots with unstable vowels, let us take a look at the suffixed forms of these roots.

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[24] Only the relevant constraints are shown, Lowering and Onset are not included.

[25] Subscripted numbers show the correspondence relations of vowels, coindexed vowels are considered to be corresponding ones. If a vowel has two indices, e.g. 1,2, then it does not matter which vowel it corresponds to.

[26] We assume that in candidates (43d) and (43e) the word final vowel is the realisation of the underlying floating Place node and an epenthetic root node and will do so in subsequent tableaux as well. More details on this matter will be given in (49). Such candidates with a different order of features in input and output forms would seem to violate Linearity but if we assume that Linearity constraints on features are ranked low, then they will not have an effect. Note that if the linear order of features underlyingly linked to a root node changes then such candidates will always violate relatively high ranked Identity constraints.

[27] This candidate also violates IDENT-IO(low).

(45) *bokrot* 'bush acc.'[28]

UR: bokO$_I$r+t	Syll	MAX seg	MAX subseg	DEP -V	*ɔ	*o
a. ☞ bokro$_I$t				*		**
b. ☞ boko$_I$rt				*		**
c. boko$_I$rot				**!		***
d. bokrt	*!		*			*
e. bokrɔ$_I$t				*	*!	*
f. bok		*!*	*			*

The same hierarchy cannot properly select the optimal candidate when the root is followed by a Type C suffix like the accusative. Candidate (d) violates Syll because of the ill-formed coda cluster and is eliminated. Candidate (f) has two unparsed segments and an unparsed subsegment, so it is excluded for violating MAXseg. The rest of the forms all violate DEP-V. Since the candidate in (c) violates it twice as opposed to the one violation of the other three candidates, this second violation is fatal. Candidate (e) has a violation of *ɔ and is hence also eliminated. Candidate (a) and (b) thus fare equally well on the hierarchy and neither of them can be selected as optimal alone. This shows the need for another constraint penalizing complex codas[29].

(46) NoComplex No complex codas.

This way a universal markedness relation is reflected in Hungarian, namely that branching codas are more marked than non-branching ones, i.e. CVCC syllables are more marked than CVC syllables. All languages having CVCC syllables have CVC syllables as well, hence the implication. Of course it means then that NoCoda, the constraint penalizing coda consonants must be ranked lower than NoComplex, i.e. NoComplex >> NoCoda. Tableau (47) is the same as (45) with the added NoComplex constraint.

(47) *bokrot* 'bush acc.'

UR: bokO$_I$r+t	Syll	MAX seg	MAX subseg	No Complex	DEP -V	*ɔ	*o
a. ☞ bokro$_I$t					*		**
b. boko$_I$rt				*!	*		**
c. boko$_I$rot					**!		***
d. bokrt	*!		*	*			*
e. bokrɔ$_I$t					*	*!	*
f. bok		*!*	*				*

As it can be seen, NoComplex eliminates the unwanted candidate in (b) and correctly allows candidate (a) to win. The rest of the candidates are excluded by the other constraints as in (45). Since in the previous tableaux the optimal candidates do not have complex codas, the insertion and ranking of the new constraint will not influence the selection of the candidates.

It seems then that our hierarchy amended the above way selects the actual surface forms for bare roots with unstable vowels and also when such roots are followed by Type C suffixes like the accusative[30]. Let us now focus on the same kind of roots followed by the plural suffix, being representative of Type B. Tableau (48) shows the non-lowering root *bokor* followed by the plural. Unfortunately, the wrong candidate is selected as optimal in this case.

[28] Lowering is not shown in the tableau because it is not relevant for non-lowering stems. On the

[29] Note that the coda cluster in (45b) is well formed it can be found in monomorphemic words, e.g. *part* [pɔrt] 'shore', and also in plurimorphemic ones, e.g. *pár+t* [pa:rt] 'pair' acc.

[30] Note that a lowering unstable stem like *farok* 'tail' followed by the accusative behaves the same way except for the height of the suffix vowel. The height of the suffix vowel is low in this case because Lowering penalises lowering stems followed by non-low suffix vowels.

bokrok 'bush pl.'

(48)

UR: $bokO_1r+O_2k$	Syll	MAX seg	MAX subseg	No Complex	DEP -V	*ɔ	*o
a. $bokro_{1,2}k$			*!		*		**
b. $boko_{1,2}rk$			*!	*	*		**
c.☹$boko_{1,2}ro_{1,2}k$					**		***
d. bokrk	*!		**	*			*
e. $bokrɔ_{1,2}k$			*!		*	*	*
f. bok		*!*	**				*

Candidate (d) is excluded from the race since it has an ill-formed coda cluster. Candidate (f) has unparsed segments and thus violates MAXseg, this violation is fatal. Candidates (a), (b) and (e) all violate MAXsubseg as they have one of the two underlying floating Place nodes unparsed. Since candidate (c) has both subsegments parsed in the output, it is incorrectly allowed to win. This tableau shows the necessity of having another constraint penalising forms like candidate (b) but not forms like (a). The key to understanding the behaviour of the floating Place nodes seems to lie in forms containing more than one underlyingly unlinked subsegments. Before the formulation of such a constraint, let us take a look at which subsegments are realised if the input has several of them.

(49)	UR	Surface forms	Incorrect forms
a.	$bokO_1r$	$boko_1r$	
b.	$bokO_1r+t$	$bokro_1t$	$*boko_1rt$
c.	$bokO_1r+O_2k$	$bokro_{1,2}k$	$*boko_1ro_2k$ $*boko_{1,2}rk$
d.	$bokO_1r+O_2k+t$	$bokro_1ka_2t$	$*boko_1ro_2kat$ $*bokoro_1ka_2t$ $*bokrka_{1,2}t$ $*boko_{1,2}rkt$ $*bokro_{1,2}kt$

As table (49) shows, whenever there is just one underlying subsegment as in (a) and (b), it is always realised in the output. If there are two subsegments underlyingly as in (c) and (d) at least one is always realised. In (c) only one of the subsegments is realised and thus it occupies the nucleus of the last syllable of the word. In (d) both subsegments are parsed. Note that the last three of the incorrect forms all have one subsegment unparsed and violate the syllable well-formedness constraint. Thus in this case syllable well-formedness requires that both subsegments be present in the output. Also note that the first incorrect form in (d) differs from the actual surface form in that the output correspondents of the input subsegments are not aligned to the right edge of the prosodic word. This suggests that an alignment constraint requiring that output correspondents of input subsegments be right aligned with the prosodic word might be at work here.

(50) ALIGN(subseg, PrWd, R) Output correspondents of input subsegments are aligned with the right edge of the prosodic word[31].

Let us now see whether the constraint hierarchy with this new constraint is able to select the actual surface forms as optimal for all kinds of inputs with unstable segments. As we saw, whenever there is just one unstable vowel in the word, it always shows up in the output and, of course, is right-aligned with the rightmost syllable. This way forms like *bokor*, and *bokrot* are not relevant. On the other hand, if there are several floating class nodes in the input their parsing is of interest to us.

[31] The right edge here means the rightmost syllable. Violation is counted by syllables. Also note that the constraint is not violated if some underlying subsegment is not present in the output. The only thing this alignment constraint penalises is output correspondents of input subsegments not aligned to the rightmost syllable of the prosodic word.

(51) *bokrok* 'bush pl.'

UR: $bokO_1r+O_2k$[32]	Syll	MAX seg	ALIGN subseg	MAX subseg	No Complex	DEP -V
a. ☞bok.ro_1k				*		*
b. ☞bok.ro_2k				*		*
c. bo.ko_1.ro_2k			*!			**
d. bo.ko_1rk				*	*!	*
e. bokrk	*!			**		
f. bokr	*!	*		**		

Candidates (e) and (f) in (51) are ruled out for reasons of syllable well-formedness since they all contain coda clusters not allowed in Hungarian while candidate (d) is out of the race because of the complex coda it contains. Candidate (c) has an alignment violation because the output correspondent of one of the underlying subsegments is not right-aligned with the prosodic word, i.e. is not in the last syllable. Candidates (a) and (b) avoid violating this constraint by having one of the subsegments unparsed. These two candidates fare equally well on all constraints. The decision between them can be done by Linearity. In candidate (a) the order of the Place nodes of [r] and [o_1] is the reverse of those in the input. Note again that (a) and (b) are phonetically identical but as far as correspondence is concerned (b) is "better'" than (a). This way candidate (b) can be properly selected as optimal.

(52) *bokrot* 'bush acc.'

UR: $bokO_1r+t$	Syll	MAX seg	ALIGN subseg	MAX subseg	No Complex	DEP -V
a. ☞bok.ro_1t						*
b. bo.ko.ro_1t						**!
c. bo.ko_1rt					*!	*
d bo.ko_1rot			*!			**
e. bokrt	*!			*	*	
f. bo.ko_1r		*!				*

Tableau (52) shows the same root followed by the accusative suffix. In this case there is only one underlying subsegment, i.e. that of the root. Only candidate (e) has the subsegment unparsed in the output. This way an ill-formed coda cluster arises, which is penalised by Syll. Candidate (f), on the other hand, has the suffix consonant, a full segment, unparsed and thus violates MAXseg. Candidate (d) has an alignment violation because the output correspondent of the subsegment is not in the last syllable. Candidate (c), (b) and (a) fare equally well on the higher ranking constraints. Candidate (c) violates the constraint penalising complex codas and is eliminated. Candidate (b) violates DEP-V twice because of the two epenthetic vowel root nodes while (a) violates it only once and wins.

(53) *bokrokat* 'bush pl. acc.'

UR: $bokO_1r+O_2k_L+t$	Syll	ID low	ALIGN subseg	MAX subseg	DEP -V
a. ☞bok.ro_1 k$ɔ_2$t			*		**
b. bok.ro.k$ɔ_1$t		*!		*	**
c. ☞bo.ko_1r.k$ɔ_2$t			*		**
d. bo.ko_1 ro_2 k$ɔ$t			**!*	**	***
e. bo.ko.ro_1 k$ɔ_2$t			*		***!
f. bokr.k$ɔ$t	*!			**	*

Tableau (53) shows the latent segment root with multiple suffixes, plural and accusative. Candidate (f) violates Syll because of the coda cluster of the first syllable. Candidate (b) on the other hand violates IDENTITY(low), because the underlyingly [ROUND, -high, -low] Place node surfaces as [ROUND, -high, +low]. Candidate (d) violates ALIGNsubseg three times while (a), (c) and (e) violate it only once. Hence (d) is also eliminated. The remaining three candidates all violate DEP-V, but (e) violates it three times while the other two only twice. Candidates (a) and (c) fare equally well on all constraints, i.e. the hierarchy cannot unambiguously select an

[32] Note that the capital 'O' in the root and the suffix do not represent exactly the same things. the one in the root stands for a floating Place node containing the features [ROUND, -high, -low] while that in the suffix represents a floating Place node containing [ROUND, -high]. Thus the only difference is that the root 'O' is but the suffix one is not specified for [low] underlyingly.

optimal candidate. Clearly another constraint is needed. If we compare (a) and (c), we can notice that (a) contains as a substring the plural form of the word, i.e. the string [bokrok]. For this reason, it can be argued that there is a constraint that prefers identical plural forms of the same stem in every suffixed form containing the plural. This is clearly a case of output-output correspondence requiring that instances of the plural of a stem be identical irrespective of whether there is another morpheme following in the same word or not.

(54) IDENTITY Output correspondents of the plural of a morpheme are identical.
Output-Output (Plural) The base form is the bare plural without any other suffixes[33].

Let us now see whether this constraint together with the others in the hierarchy can correctly select the optimal candidate.

(55) *bokrokat* 'bush pl. acc.'

UR: $bokO_1r+O_2k_L+t$	Syll	ID low	ALIGN subseg	MAX subseg	IDENT-OO	DEP -V
a. ☞ bok.ro$_1$.kɔ$_2$t			*			**
b. bok.ro.kɔ$_1$t		*!		*		**
c. bo.ko$_1$r.kɔ$_2$t			*		*!	**
d. bo.ko$_1$.ro$_2$.kɔt			**!*	**		***
e. bo.ko.ro$_1$.kɔ$_2$t			*		*!	***
f. bokr.kɔt	*!			**		*

This way the hierarchy selects (a), the actual surface form as optimal. Note that there is no evidence for the relative ranking of the IDENT-OO constraint.

Conclusion

As we have seen in the paper, vowel-zero root and suffix alternations can be accounted for if we assume that the unstable vowels are underlyingly represented by floating Place nodes which only surface if a root node is inserted for reasons of syllable well-formedness or lowering. Also, I have argued that this approach is superior to analyses claiming that unstable vowels are underlyingly present as empty root nodes. This way a uniform analysis of the same phenomenon in roots and suffixes is possible. Also, it is possible to capture the generalisation that unstable vowels only surface if followed by exactly one consonant with no extra machinery since this observation follows from the universal ranking of NoComplex and NoCoda, the former dominating the latter, i.e. it is not the presence or absence of a consonant after the unstable vowel that is important but rather the fact that singly closed syllables are less marked than those with two coda consonants.

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[33] Identity is violated by changing or deleting a segment. This constraint constitutes the OT treatment of paradigm uniformity.

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POLYSEMY AND CROSS-LINGUISTIC EQUIVALENCE

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The two level semantic and frame semantic approaches to polysemy are studied and compared in the light of a set of data of bilingual dictionary entries. I rely on the regularities in the lexicographical description with respect to a better understanding of the term polysemy.

1. Introduction.

The aim of this article is to come to a better understanding of the mechanisms of polysemy. The topics of vagueness and ambiguity are addressed here in connection with polysemy. The study compares the ideas about meaning and polysemy as they are set out in frame semantics and two-level semantics, contrasting the theoretical views with representations of nominal and verbal meanings in bilingual dictionaries. Since in some theoretical and practical works of both theories the claim is made about their suitability in representing meaning in multilingual environments, it is challenging to take a closer look at what could be the bases for these claims. Polysemy is a notion that is defined on the basis of similarity in meaning. The study, however, employs the notion of bilingual (or multilingual) contrast to check which claims about meaning and polysemy are supported by the data as recorded in dictionaries. As a working hypothesis of studying the question of meaning and polysemy, the equivalents of L1 in L2 are contrasted: if the meaning of a L1 lexical item diverges in its translation to L2, then the item in L1 is polysemous.

Polysemy, ambiguity and vagueness. Polysemy is a phenomenon of natural language expressions to have several related senses. What is polysemy, and what is the best representation for it? The answers are theory-dependent, it is clear that there are many problems in giving an uncontroversial account about how to determine whether an item is polysemous. As an evidence, the lexical semantic and lexicographic accounts offer divergent interpretations to the term polysemy. In lexicography it is commonly practiced to check an item's polysemy by means of ambiguity/vagueness tests. However, there are ambiguous contexts which are not classified as instances of polysemy in lexicography. Here I think of cases that differ from the classical notion of sense relations the exampleis from Bierwisch (1983) :

(1)**Die Schule, die aus der Geschichte Europas nicht wegzudenken ist, liegt neben dem Sportplatz*

'The school, which has played a major role in the European history, is situated next to the athletic field.'

But the following readings are combinable (Pause, Botz and Egg 1995:269):

(2) *Die Schule, die neben dem Sportplatz liegt, hat einen grösseren Betrag gestiftet.*

'The school which is situated next to the athletic field, has donated a major sum.'

(3)* *He drank his cup and then put it in a sink.*

(4)* *He opened the bottle and the lid.*

Relative distance between the readings seems to be dependent on the items' particular type of meaning variation. There is a distinction between ambiguity which emerges due to a lack of common semantic features of the items in question, referred to in semantics as contrastive ambiguity (*bank* of the river, *bank* as a financial institution), and ambiguity between related senses of a lexical item (*bank* as a financial institution, *bank* as a building), this is referred to as complementary ambiguity. An item has simultaneously ambiguous as well as vague readings. Vagueness is a general term, readings of a word are considered instances of one vague meaning when no ambiguity tests classify the readings, the word's uses in contexts, as ambiguous (as in the case of kinship terms, e.g. *grandmother*, which is vague as to the distinction between maternal and paternal grandmothers). In lexicographical practice, cases of contrastive ambiguity are termed homonymy or polysemy, and complementary ambiguity is classified as polysemy or as instances of use. Complementary ambiguity is also referred to as regular polysemy. Shortly, it is evident that the vagueness-ambiguity tests sometimes classify more and sometimes less items as ambiguous than it would be acceptable for a representation of polysemy, either for lexical semanticists or lexicographers. On the one hand, the nature of the tests could be revised, and this is indeed done by some scholars. This study, however, concentrates on the notion of polysemy, the grounds for regarding an item polysemous from the viewpoint of two semantic frameworks which have shown interest in the multilingual representation of polysemy.

The two semantic frameworks. Opposite views on polysemy are thus offered on this matter by the two already mentioned semantic frameworks, by what are called frame semantics and two-level semantics. The main opposition between the two theories concerns the layeredness in the representation of meaning: frame semantics believes the meaning to be representable on basically one level, and two-level semantics, as the name suggests, believes meaning to be represented on an underspecified semantic level and to come to full interpretation only on a different, conceptual level of representation. Consequently, the views on the nature of concepts and thus the nature of polysemy differs in frame semantics and two-level semantics. Frame semantics denies the existence of the problem of polysemy according to its own formulations, and regards the polysemy phenomena as a natural consequence flowing from frame structures. However, it is not always clear how cross-linguistic lexical differences are being accounted for, and as a related problem, how are the lexicalized concepts distinguished from the non-lexicalized ones. Two-level semantics regards polysemy as emerging in the course of the instantiation of a basic, core semantic meaning in different contexts, so polysemy is basically seen as a matter of conceptual variation. However, it seems to be a problem to allot the variation of meaning only to the conceptual level, if cross-linguistic variation, divergence occurs, provided that the conceptual level of meaning is more or less universal for speakers of different languages and the semantic level language-specific: should (at least some types of) polysemy be accounted for on the semantic level in the theory? Language-specificity could be studied in order to find out some new facts about both theories, since it is anyway difficult to find other direct evidence for the layeredness or non-layeredness of meaning.

What would be the knowledge we learn from bilingual dictionaries? Language specific lexical data are contrastively represented in bilingual dictionaries. Determining and classifying the variety of

meanings that a single word may assume in different contexts is the common research ground for lexical semanticists and lexicographers. Masses of data about descriptions of polysemy are gathered by practical lexicography. The data of the study comprise a selection of the cases that are called divergence (or convergence, depending on perspective) in lexicographical practice, i.e. cases where different readings of a L1 a word are rendered by different words in L2 (or vice versa). In nominal ambiguity, in the case of regular polysemy the question arises, whether the nature of the phenomenon is language-specific or universal. Dictionaries are a guide to the answer. First, we are confronted with contradicting data from ambiguity tests from different languages on the one hand:

(5) English:*He drank his cup and then put it in a sink.
(6) Finnish: Joi mukinsa ja pani sen altaaseen.
(7) Estonian: Jõi oma kruusi tühjaks ja pani selle kraanikaussi.

In some dictionaries, these differences are recorded (see Section 3); however, it is expected that a monolingual dictionary treats these items more conscientiously than a bilingual dictionary.

Second, it is a lexicographic constant that especially the general, frequent verbs cannot be translated with one equivalent only, and that the nominal variation of meaning is not only an item of unpredictable ambiguity. Moreover, different dictionaries are unable to agree on the representation of verbal polysemy, on the number and character of verbal senses. A study into the patterns of equivalents might reveal some new facts about verbal polysemy: which differences are lexicalized in L2, what does it depend on, how to give an account of the regular differences, and how of the irregular ones? A similar predicament is found with respect to nouns: we have regular polysemic cases in L1 where the regular polysemic pattern is not retained in L2:

(8) L1 reading1 *opera*/art – L2 W1 *ooper*
L1 reading1 *opera*/building – L2 W2 *ooperihoone*

How is polysemy recorded in bilingual dictionaries? Is regular polysemy a phenomenon of nouns, or of verbs as well as determined on the basis of data? To what extent is polysemy lexical, or conceptual, if to be represented in the two-level model, and how to account for nominal regular polysemy in the frame semantic theory? The enterprise of comparing words means partly moving on thin ice. In Section 3, constraints on the vast data set are offered.

What is found where: The views on polysemy as offered by two semantic frameworks, the frame semantics and the two-level semantics are presented in more detail in Section 2. Section 3 of this study takes the reader through a number of bilingual dictionary entries, and Section 4 contrasts the findings with the assumptions made within the two aforementioned semantic frameworks. Final conclusions are placed under Section 5.

2. Two approaches to polysemy.

2.1 . Two-level semantics.

Two-level semantics distinguishes between two levels of meaning, the semantic and the conceptual level. This means that a distinction is made between a concept and the meaning of a word which represents the concept. The work of Bierwisch (1983) turn the attention to the phenomena of meaning variation. Two-level semantics envisages polysemy as being a phenomenon which does not belong to the semantic level, representing it on the level of conceptual structure. Polysemy, however, is also represented on the level of semantic structure, but only if it is idiosyncratic, lexical.

The semantic level comprises lexical meanings. The lexicon links each lexical unit with an abstract meaning SEM, this is the lexical meaning. Lexical meanings are a central aspect of language. Many lexical meanings assign concepts to word forms. SEM's are composed of semantic primes, they are core meanings that are common to all the contextual variants. The SEM's are thus units of the semantic level, they stand for words in the semantic representations. SEM's are neutral with respect to the contextual variants of a word and they denote complex functions which determine whole conceptual families. In many cases, SEM's are not natural concepts but conceptual schemata. Lexical meaning, SEM, is language specific.

The conceptual structure consists of concepts. The term *concept* is used to refer to mental constructs by means of which we process our experience and organize our knowledge. Concepts represent our encyclopedic knowledge, they are autonomous to the faculty of language, they are flexible and changeable. But when a concept is lexicalized, i.e. linked to a word form by a meaning function, it is subject not only to the requirements of cognition, but also to those of communication and grammatical structure. It has structural relationships to other lexicalized concepts: semantic relatedness and contrast, syntactic categorization, morphological relatedness, phonological similarity.

Depending on the context, a SEM acquires a contextual meaning through an associated conceptual operation (9).[1] SEM is not concrete, and we do not have direct access to it. The general underspecified meaning becomes realized, observable, "tangible" in concrete contexts, and on the basis of discourse and encyclopedic knowledge.

Conceptual structure is formed by the following functions or operations:

- conceptual shift (e.g. in the case of nouns, like in *school* – institution, building, activity, employees etc);

- conceptual specification or differentiation (e.g. in the case of verbs, like in *open* – concrete, abstract entities).

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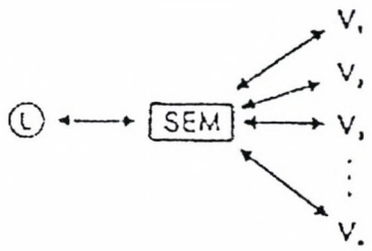
[1] The figure is from Pause, Botz and Egg (1995:252).

(9)



Two levels are assumed for the representation of lexical items as well as sentences.

Here I will sketch shortly how in a two-level semantic framework a representation would look like. The institution words in Bierwisch (1983:86) are represented as follows:

λ x [PURPOSE[x w]]

In the case of *school,* the meaning is represented on the semantic level as follows:

SEM ("school") = λ x [PURPOSE [x w] & PROCESSES_OF_STUDY_ AND_ TEACHING[w]]

The value of x is determined on the conceptual level. This value as the different readings of *school* are instantiated by functions, for instance such as:

λ x [INSTITUTION[x] & PURPOSE [x w]]

λ x [BUILDING[x] & PURPOSE [x w]]

λ x [PROCESS[x] & PURPOSE [x w]]

The application of one of the functions assigns the value of institution, building, process etc to the variable in the SEM of *school.* This results then in a representation on the conceptual level. As a contrast to frame semantics, where verbal as well as nominal meanings are seen to develop metonymy, this term is not used by Bierwisch. It is important to emphasize that polysemy of the described type is not lexical, dictionary-type polysemy, but it is located at the conceptual level, so it is not a purely linguistic phenomenon.

The verb *open* as analysed in Bosch's (1993), has four SEM's, a symmetry of transitive/intransitive meanings. There are two kinds of *opening*, according to what is the theme of the event of opening. In one case, the theme is a boundary (a lid, a door), and in the other case the theme has a boundary (a bottle, an exhibition). In both cases, the opening events there are two states, one, in which the boundary is closed, and the other, where the boundary is open. Since the sentence *He opened the x and the y* cannot offer an interpretation where x refers to the boundary and y to something that has a boundary but is not a boundary. Thus there must be two different concepts of opening events and correspondingly, two different lexical meanings of the verb, both transitive and intransitive. The result of extracting lexical concepts from a plethora of what Bosch (1993: 29-30) terms contextual concepts of the verb *to open* follows.

Intransitive *open 1* has a theme which denotes a boundary, as in *The door opened*:

(10) λ x [∃e ((OPENING(e) & THEME (e,x) & BOUNDARY (x)) ⊢
(TRANSITION (e)
& ∃s_1 PRECEDING_STATE (e,s_1)
& CLOSED (s_1)
& THEME (s_1,x))
& ∃s_2 RESULTING_STATE (e,s_2)
& ¬CLOSED (s_2)
& THEME (s_2,x))))]

Intransitive *open 2* has a theme which denotes a bounded entity, as in *The exhibition opened*:

(11)λ z [∃e ((OPENING(e) & THEME (e,z) & BOUNDED_SPACE (z)) ⊢
(∃x (BOUNDARY (z,x))
(TRANSITION (e)
& ∃s_1 PRECEDING_STATE (e,s_1)
& CLOSED (s_1)
& THEME (s_1,x))
& ∃s_2 RESULTING_STATE (e,s_2)
& ¬CLOSED (s_2)
& THEME (s_2,x)))]

Transitive *open 1* has a theme which denotes a boundary, as in *He opened the door*:

(12) λ x λ y [∃e (OPENING(e) & THEME (e,x) & AGENT (e,y) & BOUNDARY (x)) ⊢
(∃e_1 ∃e_2 (CAUSE (e_1,e_2)
&ACTION (e_1)
& AGENT (e_1,y)
& OPENING (e_2)
& THEME (e_2,x)))]

Transitive *open 2* has a theme which denotes a bounded entity, as in *He opened the exhibition*:

(13) λ x λ y [∃e ((OPENING(e) & THEME (e,x) & AGENT (e,y) & BOUNDED_SPACE (z)) ⊢
(∃e_1 ∃e_2 (CAUSE (e_1,e_2)
&ACTION (e_1)
& AGENT (e_1,y)
& OPENING (e_2)
& (∃x (BOUNDARY (z,x))
& THEME (e_2,x)))]

It is interesting that there is a distinction between the conceptual and semantic levels of representation, but the representations given above depict the concepts as well as lexical meaning, the latter is formulated in terms of inferences from minimal environments for the occurrence of a lexical expression. The partition in two SEMs would only partly be predictive in our hypothesis, since contrasting English with the Estonian equivalents (see for more details Section 3), the distinction between the transitive and intransitive versions shows divergence, but the distinction cross-cutting the intransitive and transitive meanings would not result in a contrast cross-linguistically. But the idea of contrasting concepts and the relevant inference sets cross-linguistically, along the lines that Bosch sets about to implement in a monolingual environment, is inspiring for this study.

The verb *risk* would be represented as follows in the two-level-semantic framework. No reference would be made to metonymy or underlying schemas and scenarios in the meaning as it is done in frame semantics (cf. the following subsection 2.2.). An abstract core meaning would be assumed for the verb *risk* and the functions of conceptual differentiation determine the full meaning of the verb in contexts. The ambiguity is attributed to the interpretational mechanisms of the nonlexical, conceptual level of representation. There are two options for core meanings: first, there would be one SEM, or second, the three senses identified in the frame practice (see Section 2.2.) would be probably equivalent with the three SEM-s associated with the given word form within the verb category. If the first option is chosen, then we have again two options: which of the senses would be considered the core, the more specific one, as in: *risk doing something that could result in losing his life*, or the more general one, as in: *risk his life*. Were it the case that the three senses are considered as the basis for three SEM's, then it is the question, why is there intuitively a strong semantic relation between the SEM's, which is not captured in the theory. The link between them can be given through the use of the same constants, as it is possible in the previous example of *to open*. But due to the sketchy nature of the paper, it is impossible to offer a solution for what are the primitives, the constants in this description as it seems to be a separate problem. A 'simple' verb like *risk* also raises the problem of how to account for the difference in the objects that are disambiguated by means of reference to two different schemas in frame semantics, e.g. between the two readings of *You risked your life*.

Below, also the problems around the nature of core meaning as envisaged in two level semantics will be addressed while roaming through dictionary articles. It is in fact not always clear even in the works of other two level semanticists what the core meaning exactly consists of. A core meaning is compositionally built of semantic primes, it has the form of functor-argument structure. The compositions consist of constants (operators, motion, location, action) or variables (most of them stand for arguments of predicates). Within abstract core meanings, concepts may be represented by variables and in some approaches, they are specified by rules of usage (in Pause, Botz and Egg 1995:269). It is a moot point whether a word is assumed to have several core meanings conforming to the different subcategorization frames it has, in this case one core meaning is contained by another, more complex core meaning (e.g. in causatives); or the most complex composition is considered the only core meaning of the word, in that case, various operations must involve only parts of the core meaning. A group of the two-level semantic tradition doubts the feasibility of core meaning as such: Pause, Botz and Egg (1995:279) claim that it is difficult to uphold the postulate of distinctivity for core meanings of general predicates with a large spectrum of variants. They attribute this problem to the fact that some core meanings are devoid of content, apart from some aspectual operators. It is impossible for those predicates to restrict the range of their conceptual variants by their core meanings. Perhaps one can find out more about the borderline between SEM and a concept, and the nature of core meanings via bilingual contrast.

It has been pointed out that there are basic differences in the representations of the meanings of verbs and nouns. The differences in the nature of verbal and nominal polysemy within the two-level semantics are discussed in Kiefer (2000). Verbs have a basic meaning; in the case of nouns, it is more feasible to

regard one underspecified SEM as the primary meaning, and not as the basic meaning. In comparison to the verbs' SEM, which is general, that of nouns is referentially determined. These properties of SEM's consequently determine the nature of verbal and nominal polysemy.

On the basis of some data from dictionaries, I study the possibility of systematic variation of meaning occurring at both levels, semantic and conceptual. Within the framework of two-level semantics, this possibility emerged on the basis of French and German data analyzed by Schwarze and Schepping (1995:288), who claim that systematic variation in meaning on the level of semantic structure is conventionalized, but it is motivated and made learnable by conceptual structure. In their account, a conceptual variation, which is available in one language, can be blocked on a non-conceptual level in the other language. Diversity of language may be accompanied by a diversity of concepts, but this type of diversity must be kept apart from the lexicalization diversity, lexical contrasts. Lexical contrasts do not necessarily reflect conceptual diversity, they can be language-specific. In this case they must be explained by the assumption of a semantic level that reshapes and conventionalizes conceptual structure. Schwarze and Schepping write about three types of lexical contrasts (Schwarze and Schepping 1995: 284-286):

- lexical gap occurs when there is a concept which is lexicalized in L1, but not in L2 like in : *der Schlüssel steckt im Schloss* and *La clef est sur la porte* ('The key is in the lock').
- lexical differentiation occurs when there is a given global concept which is lexicalized both in L1 and L2. But there is a distinction within this global concept which is lexicalized only in L1, not on L2; like in : *Er sah auf die Uhr* ('He looked at his watch') which translates like *Il regarda sa montre.*, but. *Er sah meine Uhr* ('He saw my watch') which translates *Il vit ma montre.*
- lexical variation occurs when there is a concept which is lexicalized in both L1 and L2. The word forms which are linked to it are W1 in L1 and W2 in L2. But W1 and W2 do not have the same variation. The term "variation" covers two different things: polysemy and the modification of valence.

Polysemy in the sense that there is a concept which is lexicalized in L1 as W1 and in L2 as W2. But W1 and W2 do not have the same polysemous readings : *kommen* ('come') has in different context the equivalents *venir* ('come') and *arriver* ('arrive').

The modification of valence in terms of a concept which is lexicalized in L1 as W1 and in L2 as W2. But W1 and W2 do not have the same modifications of valency:

(14) *Wilhelm schoss auf den Apfel.*
Guillaime tira sur la pomme.
'Wilhelm shot at the apple.'
Die Lava schoss aus dem Boden.
*La lave *tira/jaillit du sol.*
'The lava gushed forth from the soil.'

For the cases of lexical gap and lexical differentiation it is clear that bilingual contrast emerges from the lexical polysemy of the source language lexical item, so the contrast is based on the semantic

representation. Contrast of variation might also be accounted for on the semantic level. The French data seem to be explainable by the assumption that a conceptual shift has been conventionally blocked on the semantic level.

I will search bilingual dictionaries whether they contain examples which confirm this type of meaning representation that is depicted in (9). As the figure suggests, vagueness is a basic quality of the abstract complex SEM as it is lexicalized in language, the emergence of ambiguity is a matter of the conceptual structure, dependent on whether the conceptual structure licenses the by default assigned conceptual operations (shifts for nouns and differentiation/specification for verbs). If a dictionary entry were built up conforming to the two-level semantic ideas, one would expect a to find target language equivalents, perhaps several of them, grouped according to and around source language SEM's together with example sentences and their translations, where the translation equivalent(s) given to the SEM do not necessarily re-occur. If there were just one level of semantic representation, the translation should be more or less one to one, not necessarily on the word level, but sense level, and the translations of the example sentences would always contain the translation equivalent of entry word, since the concepts are directly linked to the word forms.

2.2. Frame semantics.

In order to shortly introduce the main theoretical difference of frame semantics versus two level semantics, the words of Fillmore, a leading frame semanticists are quoted: "It is my opinion that the final correct theory of the semantics of ordinary language will find no need for a level of semantic representation, that the everyday notion of meaning is more naturally associated with elements of cognitive representations, and that the concepts of semantics can be limited to the notion of the mapping between form and meaning" (Fillmore 1984:103). Fillmore's claim is thus the same as that of other cognitive semanticists: that the linguistic and encyclopedic knowledge cannot be separated. What is meaning is closely connected with use. "Frame semantics makes it possible to separate the notion of the conceptual underpinnings of the concept from the precise way in which the words anchored in them get used. We need the means of associating a word (or a group of words, or a group of word uses) with particular semantic frames, and then to describe the varying ways in which the elements of the frame are given syntactic realization. We ought not to have to regard each of these varying mappings as different senses of the word," write Fillmore and Atkins (1992:101).

The framework is interesting for this study since it is generally preferred for the purposes of several dictionary formats for turning special attention to words in use, for its flexibility in representing both extralinguistic and linguistic knowledge associated with lexical items. A frame semantic approach to the representation of meaning in dictionaries stresses the central importance of corpus-based example sentences. This arrangement is seen as a key to explaining the continuum of polysemy. I quote here

Fillmore and Atkins' (1992:76) aims in this respect: "The dictionary must be, in principle, capable of allowing its users access to *all* the information that speakers possess about the words in their language...".

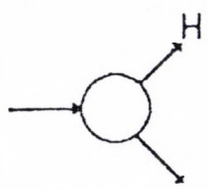
The frame semantic description, however, is not meant for standard print dictionaries, it is rather a system for online lexical resources. Words are linked with frames, which are visual, or more or less formal representations of cognitive structures. In this lexicographic approach, a special link between the lexical meaning and lexico-syntactic patterns is assumed. Each component of a lexico-syntactic pattern is indexed with an element or aspect of an associated frame. The frame semantic approach to lexical meaning is holistic in the sense that it denies polysemy in the form of splitting up a word's meaning in distinct senses in the traditional, sense enumeration way, which is the main problem also in 'paper' dictionaries.

2.2.1. Verbs.

In the frame-based literature, there is a considerable lack of consensus about the terminology. I use the terminological apparatus of Fillmore and Atkins of the 90-ies. The central units of lexicon are schemas and frames. The term 'schema' denotes conceptualizations of events. Frames contain different ways of indexing the schema, so frames reflect the different perspectives on an event. The classical example of frame semantics is a buying-selling event. One role might be focused in the event, and this results in a different indexing in the schema. Different associations of roles and syntactic functions result in different frames. The event consists in a frame semantic representation of one "*commercial transaction* event" schema, which is related to two frames, "buying" and "selling", depending on the perspective on the event. One verb can be so associated with a number of complementation patterns.

Here an illustrative example is offered for the depicting of the verb *'risk'* in terms of schemata and frames. The diagrams that represent the schemata, follow certain conventions. In the case of *'risk'*, the circles represent chance and the squares represent choice, the probability of entering the path which contains the chance to encounter Harm, pointed at by an arrow. Figure in (15)[2] depicts risk-running, Figure 3 risk-taking, Figure 4 the putting of some valued object of a victim at risk. The three schemas together form the scenario of *'risk'*, i.e. the making of a decision which could lead to a bad outcome. Schemas are basically depictions of typical situations. The schema in (15) the circle denotes a situation with two possible outcomes, one of which may cause harm. This is the schema of risk-running, e.g the sentence *He risked falling down* evokes the schema in (15).

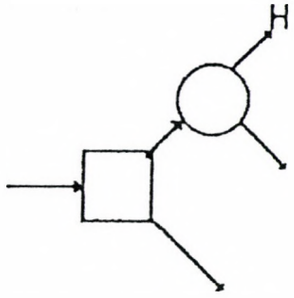
(15)



[2] Figures 15, 16 and 17 are from Fillmore and Atkins (1992: 80, 81, 84 respectively).

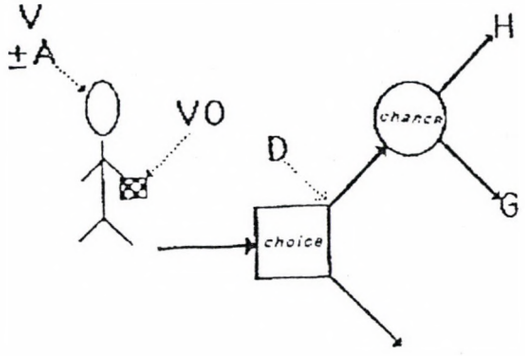
Risk-taking has an additional element of choice and the figures reflect the fact that all instances of taking risks include the running of risks. The choice square depicts the decision made by the protagonist in (16). The sentence *He risked climbing the mountain* or *He risked his life* evoke the schema in (16).

(16)



The predicates are associated with much more numerous thematic or semantic roles than used in other frameworks, and they are partly different in content. For instance the label G (i.e. Goal) at the end of one arrow in (17) denotes the intention or goal that is pursued by the protagonist. The sentence *You risked your life for such a worthless cause* or *He risked his life* evoke the schema in (17). Figure in (17) represents in fact a more detailed picture about the elements in a schema of a frame (Harm, Goal, Deed, Valued Object, Victim, Actor). The presence or absence of these elements explain the ambiguity of a word or sentence and its relation to other words or sentences in one language or cross-linguistically.

(17)



This type of descriptions are found useful as a ground for depicting bilingual dictionary entries, the contrasting concepts. I have not found any special frame semantic writings yet on the systematic discrepancies in bilingual equivalence relations, where for instance in L1 taking a risk is not lexicalized,

and in L2 it is lexicalized. Atkins' work on bilingual representations (English and French) shows that for establishing the equivalents of a verb, quite some context and conceptual knowledge is necessary in a representation. In a frame semantic bilingual prototype, several syntactic environments must be included to compensate for the discrepancies between the lexicalized concepts of two languages. The schemata are considered universal, but the frames depict cross-linguistically varying perspectives.

In contrasting the Estonian corpus data about *risk* with the findings in Fillmore and Atkins (1992), considerable divergence can be noted: first, in contrast to the English verb (but not noun), the Estonian corpus example show that one can risk with a valued object of someone else:

(18) (a)... *ei või kellegi saatusega oma soovide kohaselt **riskida** ...*

cannot no-one fate.COMIT own whims.GEN accordingly risk

"She can put no one's fate at risk following her own whims."

(b) *kas abiellumine ei tähenda niisamuti teise inimese saatusega **risk**imist ...*

would- marrying not mean just other person.GEN fate.COMIT risk.PARTIT

"(wouldn't) marrying mean just so, without any reason, putting some other person's fate at risk"

Both examples derive from the Tartu Corpus of Estonian, source reference : (ILU1970\ilu0039).

Second, the verb diverges into *riskima* and *riskeerima*, the second of which is not compatible with the schema in (15).

2.1.1. Verbs.

As a result of no distinction between the levels of concepts and meaning, the question about a distinction between ambiguity and vagueness fails to rise in connection with the frame approach in its traditional yes-no form in the case of verbs. Meaning left open to considerable extent, it has certain structure, and ambiguity is partly a matter of which schema is evoked, which frame elements are realized in a given sentence, of where an item is indexed and then perhaps finally, of the qualities of the fillers of the slots.

The combination of frame elements is not seen as a source of numerous senses, but a natural consequence of the information structured according to a conceptual schema. Ambiguity is a matter of contrast between concepts, therefore, it must be difficult to adapt a frame semantic approach in a traditional dictionary. "The usual lexicographic practice is to identify as separate individual senses those uses for which separate paraphrases are required to fit particular grammatical environments. Thus, if the verb RISK is paraphrased as "put at risk" in one context but "face the risk of" in another context, these must be taken as evidence for different senses of the verb. Such differences founded on differences of grammatical pattern are altogether unlike the kinds of secondary semantic developments created by such

general processes a s metaphor and metonymy, " write Fillmore and Atkins' (1992:100), so making a difference of concepts accommodated under one word unit. "It ought to be possible to recognize the difference between the kind of polysemy resulting from a transfer of a semantic frame to a new domain [...] and the kind that reflects merely the accommodation of a word to different syntactic patterns." The distinction is relevant, but exact mechanism of the former is yet unclear in the framework.

The lexicographical and frame semantic notions of ambiguity differ, though the relation is not absolutely clear. On the one hand, the dictionaries and semanticists give a different priority for the senses, or they blur them, regarding sense (c) as the basic one. Three senses are distinguished as follows:

(19) (a) risk doing something that could result in losing his life (action)
(b) risk losing his life (event)
(c) risk his life (object)

According to this description in frame semantics, (a) is the basic sense, (b) metonymically derived form (a) and (c) is metonymically derived from (b). The direct object of the verb *'risk'* can fall into three semantic classes: object, event and action. But the polysemy of the verb *'risk'* has a different basis in frame semantics as that of dividing into senses as described above. In frame semantics, polysemy exists when the uses of a word instantiate different schemas. A sentence *You risked your life* is ambiguous between schemas in (16) and (17), and may be disambiguated in sentences from Fillmore and Atkins' (1994:357).

You risked your life without knowing it .
You risked your life for such a worthless cause.

In the frame semantic entry of *'open'*, the transitive and intransitive variants would be related to different frames. The frames are similar as far as they are based on the same "*opening* event" scenario, which to the first view consists of one schema, and they *differ* from each other as far as the associations of syntactic functions and thematic roles differ, that is, in "*open 1*" frame an Actor or Agent and Theme and in "*open 2*" only the Theme becomes indexed in the schema. Cross-linguistically viewed, the patterns of indexing a schema are systematic, this systematicity is extensively studied by Talmy (1985). In the bilingual context English-Estonian, the Estonian lexicalization diverges exactly at this point of indexing.

The rough distinction is made at different representations, depending on the nature of the level of representation: whether the variation occurs on the level of indexing in the schema, this results in the distinction of *'open'* transitive and intransitive, or within one of the transitive verb frames, this would result in the distinction within one of, for example, *open the door* and *open the lid*. Further division depends on the qualities of the complements. But the variation between *open the door* and *open the exhibition* can be attributed to the difference in indexing to the general schema exactly as the transitive and intransitive *'open'*, since there are meaning differences which are reflected in thematic roles and complementation patterns, *open the door* could have an additional Goal PP (e.g. *to the garden*) and *open the exhibition* would not have an additional Goal PP. But, also, the difference between *open the door* and *open the exhibition* can derive from different schemas that are activated. The frame semantics would

predict the ambiguity in the sentence *He opened the door* – whether the door is opened to reach some other entity, or the door is opened for the inspection of its contents - and attribute it to the fact that *open* is ambiguous between two frames or schemas, one with the optional Goal PP and the one without it. So the ambiguity is not attributed to lexical polysemy as it is envisaged in two-level semantics by Bosch (1993).

It is not always clear, however, what is taken as waterproof evidence for the construction of a new schema within a scenario: variation that reveals itself in complementation pattern or variation which emerges from the knowledge about the content of the complements in question, of the type *climb up the hill* and *climb up the tree*, or even from the metaphorical and metonymic sense extension. The assignment of frames to words is in fact arbitrary as a comparison across languages would show, as one language can be 'blind' to the family resemblances occurring in an item of another language (as in the example of the English *climb*), the two readings of which are realized in divergence e.g. in Estonian (*ronima, tõusma*). In frame analysis, for some arguments we want to claim that they have more relevance in the variation of a word, while other arguments have less influence on the meaning and the meaning is vague as to specifying them. This type of variation is attributed to a general cognitive basis, but it is not clear how the distinction between relevant and irrelevant restrictions on arguments can exactly be spelled out by the theory.

2.2.2. Nouns.

The Fillmore/Atkins' representation of the noun *'risk'* is based on the same schemas as described in connection with the *'risk'* verb. For the sake of comparison, I try to envisage the schoolbook example of the two level semantics, *school,* with its frame semantic representation.

The representation of a *school* frame (or perhaps rather schema) contains information about its typical purpose, physical consistence, temporal qualities, etc. The *school-institution* and the *school-building* fall in fact under different frames, those of institutions and artifacts respectively, and have different values for purpose, physical consistence etc. The link between the *school-institution* and the *school-building* is realized by the fact that in an optional slot 'location' of the *school-institution* frame there is a filler *school-building* ; and an optional slot 'purpose' of a *school-building* frame is occupied by *school-institution* filler. No similar relation is found in the cases of the following two ambiguous readings of *bank*, where the purpose of a *river bank* is not to house a financial institution.

Konerding (1993) offers a frame semantic account of the relation between the different readings of nouns. His aim is to systematize the relations between the readings on the basis of stereotypical knowledge and naive theories. He constructs matrix frames, which represent a language speaker's world knowledge, and in particular, the stereotypical knowledge. He also adopts a procedure of typical questions-answers in this frame system. As Bierwisch, Konerding exploits a monolingual dictionary entry of *school* for the illustration of his approach. The modern language, common language readings are singled out and provided consequently with information about their hyperonyms, which are typed according to a noun typology. So he considers 7 readings of *school*:

1. Learning institution -> Institution
2. Building -> Thing – Artefact – Discontinuity

3. Education -> Activity

4. Education -> Process/Result

5. Teachers, students -> Social group, set (of people)

6. In art, science -> state of a set of people, social group

7. Textbook or workbook of a discipline -> Thing – Artefact - Discontinuity

According to the hyperonym type, each reading is assigned a separate matrix frame. According to the matrix frame, and eventually, their iterated appendices within the framework of the question-answer procedure, the stereotypical knowledge linked with the reading-specific meaning, can be accessed. For a focused reading, those classes of predicators are and the matrix frames are selected whose specification leads to other readings. In the example of *'school'*, except one reading, all of the readings can be reached within "two steps" in the procedure. Sense number 6 has no link with other readings. The lack of a traceable link is attributed to the fact that even though the link exists, it is not part of the stereotypical knowledge. Indeed, there do not exist other linguistic expressions that bear the same relation to each other.

There are thus divergent views on the language-specificity of the meaning within the frame semantics. Also, I do not see how the readings surfacing from some contexts and motivated by the frame structure of *school* (*administration, one representative of school, pupils, school time, learning, an object associated with school* etc) can be distinguished from those of items belonging to the same semantic field – *college, institute, opera, theatre, church, parliament, government, publishing house* etc. – which do not always develop the same polysemic structure, although the motivation is there in their frames all right. The same problem emerges in bilingual comparison, since regular polysemic structures (as well as for nouns as for verbs or adjectives) may be different across languages – this hypothesis, of course, will be studied in the course of this paper. Further, regular polysemy and metonymy-based relations still cannot escape the sense enumerative treatment in frame semantics, even if the motivation for those relations is fixed by procedures. The approach to nouns relies on the existing monolingual dictionaries – although it is well known that not all the interpretations a word might have are included in monolingual dictionaries. The sense enumeration approach in the form that it has turned out in frame semantic treatment of nouns has the additional drawback of not explaining why the combining of the different readings of a noun gives different results in ambiguity tests. The last problem is also left unsolved in the two-level semantic approach. Studying bilingual dictionaries might offer some theoretically interesting empirical material for both semantic frameworks. The tentative preliminary steps in selecting and analyzing dictionary articles are presented in the following subsection.

3. Approaches in lexicography

In what follows I take a look at two sets of data: how polysemy is represented in bilingual dictionaries (3.1) and how it is described in bilingual dictionary databases (3.2), where the aim is to minimize redundant information and maximize relevant lexical semantic description. Some methodological notes concerning the selection of bilingual dictionary material are presented first.

1. First, the right hand sides of bilingual dictionaries are famous for being loaded with data of different pragmatic value, i.e. we often find target language synonym sets expressing a concept, lumped together with or without the specification of the exact information about the nature of the equivalence relation with the source language word. This is why it is relevant to find samples where the sides of the equivalent sets are of equal pragmatic value which means that they are, preferably, in style neutral, in frequency - neutral, in connotation - neutral, in chronology - contemporary, as to regional restrictions – general, standard, as to social group - neutral, as to subject field – non-specialized, general. Also, I will avoid items that have full synonymy relation to some other item in the same language – shortenings, abbreviations, portmanteau words, acronyms, clitics; or regional accepted versus non-accepted or official variants in spelling; and synonyms with a slight stylistic/subject group differences, as in standard language words of Latin/Greek/French/English origin with have an as commonly used native-based synonym of it, like items often used interchangeably in written texts to avoid repetition.

2. A point of clarification concerns the controversies around the notion of word as the basic unit of the lexicon, and these controversies are transferred to dictionary structures. There are theories and practices that take the word as the basic unit of bilingual translation, and there are others, that take a lexical unit, i.e. a meaning-form unit as basic. Both approaches have their pros and cons. Studying a L1 word (as a unit) and its equivalents in L2, the result would show that a word whose uses display ambiguity due to homonymy, always varies in L2. These are the cases that I exclude from my data set, and it is inexpedient to select out data in bilingual dictionaries where the word is regarded as the basic meaning unit. In case of ambiguity between related senses of a word, the L2 diverges at times, and at times it does not do so. These ambiguities form the focus in this study. The study wants to exclude the type of polysemy which is metaphor-based, arbitrary in the synchronic view, referred to as lexical polysemy; although lexically polysemic readings are usually, but not always found to display divergence in L2. This study concentrates on a selection of cases of regular polysemy. The relation between two meanings of one word is understood as being regularly polysemous if in that language there is at least one word of which two meanings bear the exactly the same relation to each other.

The lexicographic projects that claim that homonymous or lexically polysemous items are better viewed as separate lexical units, offer better data for the aims set in this paper. Differences between equivalents are viewed in terms of relations between lexical, not word units. Proceeding from this assumption, divergence in L2 is at once less frequent for homonymous or lexically polysemous L1 items, and it is easier to track the suitable data. For practical reasons, the approach of taking these form-meaning units as basic units of bilingual lexicon has pervaded some and certainly the more progressive lexicographical projects and practices, where the lexical units, and not words, of L1 are being provided with equivalence information in L2. So the WordNet-based EuroWordNet uses synonym sets as units of the multilingual lexicon. Some European bilingual lexicographical projects utilize in their representations separate lexical units that are linked to their respective word form units. However, the dictionaries hold divergent views on what they consider a lexical unit.

Being aware of the differences between the views on polysemy by semanticists versus lexicographers, the notion of lexical unit as in lexicography must be sometimes viewed carefully for the aims of this study. Dismissing words as the basic units of lexicon and concentrating without any criticism on lexical units as they are represented in bilingual dictionaries would mangle the data set. Especially, it is the status of regular polysemy that has turned out to be interesting across dictionaries, in terms of establishing what is a lexical unit. In case of lexical polysemy, there are reliable tests by which a native speaker of a language can decide whether an item is ambiguous and possesses separate senses, i.e. it should be regarded as several lexical units. Two L1 lexical units are normally realized by different words/lexical units in L2. Progressive dictionaries make use of huge numbers of corpus sentences, which are combined for ambiguity tests for each word. However, in case of regular polysemy, the tests often diagnose ambiguity, while the respective L2 translations of the item in the given L1 contexts display no variance. Subsequently, the meaning profile of the L1 I take a look into how this predicament of regular polysemy is represented in bilingual dictionaries to see which regularly polysemous readings of a word are treated as lexical units alongside with the equivalents provided.

3.1. Bilingual dictionaries.

In this subchapter I study how certain expressions (nouns, verbs) are represented in bilingual dictionaries. The main aim is to identify the structure of polysemy, and to draw conclusions as to which semantic framework is supported by the data contained in bilingual dictionary articles. Leaving aside the inconsistencies in dictionary descriptions, I try to find out, which of these theories, or which aspects of them, would explain the data about meaning variation better. I have selected a number of dictionary articles containing nouns that give rise to regular polysemy; and frequent verbs which may raise doubts as to having either vague or ambiguous meaning.

3.1.1. Nouns.

In the case of nouns I study how regular polysemy is described in dictionary articles. First of all, I address the question of which types of regular polysemy find expression in dictionaries, i.e. are considered to have anything to do with the noun's semantics in a system based on the intuitive decisions of dictionary-makers. Hereby I check how problematic cases of ambiguity and vagueness are solved and whether any of the subsenses is regarded intuitively more prominent and whether there are any regularities to be noticed.

Type A. The layered model.

These examples from the Van Dale English-Dutch dictionary[3] about *school* start with non-regular polysemic readings of the word and carry on with the concrete reading of the word we are interested in, under II. 0.1. with *school* as a physical building (21). It might be the case that two readings are blended under this sense (institution, building). However, leaving aside the figurative uses of *school* in the given

sense, the main body of the combinatorics pertaining to *school* II. 0.1. under 2.1. and 3.1. (the second number refers to the sense number that the combination is related to, the first number refers to the category of the word with which the entry word forms a combination) is interpretable not as *school* as a building but as an institution. The combinations under 6.1. expose the fixed prepositional phrases where also the building reading can be found, next to the possible place, institution or activity readings. Under II we find other conceptual variants which diverge from the Dutch regular polysemic pattern: school from inside, and activities carried out there.

(21)

school[1] [sku:l] ⟨f4⟩ ⟨zn.⟩
I ⟨telb.zn.⟩ **0.1** ***school*** ⟨v. gedachten⟩ ⇒*richting, denkwijze, volgelingen, stijl* **0.2** ***school*** ⟨v. vissen e.d.⟩ ◆ **1.1** ~ of thought *denkwijze, richting, (filosofische) school* **2.1** of the old ~ *v.d. oude stempel* **3.1** he left no ~ behind him *hij vond geen navolging* **6.2** ~ of fish *school vissen;*
II ⟨telb. en n.-telb.zn.⟩ **0.1** ***school*** ⇒*schoolgebouw;* ⟨fig.⟩ *leer-*

(Next page in the dictionary follows:)

school - scintillant

school **0.2** ***collegeruimte*** ⇒*examengebouw, gehoorzaal, aula, leslokaal* **0.3** ⟨BE⟩ ***studierichting*** ⇒*faculteit* **0.4** ⟨BE⟩ ***centrum voor archeologisch onderzoek*** **0.5** ⟨AE⟩ ***(universitair) instituut*** ⇒*faculteit, universiteit, academie, 'college'* **0.6** ⟨Austr. E, BE⟩ ***bende*** ⇒*groep* ⟨v. gokkers, dieven e.d.⟩ **0.7** ⟨muz.⟩ ***leer*** **0.8** ⟨sl.⟩ ***staatsgevangenis*** ◆ **2.1** lower ~ *onderbouw;* ⟨BE⟩ modern ~ ⟨ong.⟩ *mavo;* upper ~ *bovenbouw* **2.4** the British School at Athens/Rome *Het Britse Centrum voor Archeologisch Onderzoek in Athene/Rome* **2.5** medical ~ *faculteit (der) geneeskunde;* he's going to medical ~ *hij studeert medicijnen* **3.1** consolidated ~ *boeren/plattelands/streekschool;* go to ~ *(naar) school gaan;* ⟨fig.⟩ go to ~ to *in de leer gaan bij;* keep a ~ *een school leiden;* leave ~ *van school gaan;* ⟨BE⟩ maintained ~ *(door de staat) gesubsidieerde school;* mixed ~ *gemengde school;* quit ~ *van school gaan* **6.1** at ~ *op school;* ⟨AE⟩ in ~ *op school;*
III ⟨n.-telb.zn.⟩ **0.1** ***scholing*** ⇒*(school)opleiding* **0.2** ***schooltijd*** ⇒*lessen* ◆ **3.2** keep in after ~ *na laten blijven* **6.2** after ~ *na schooltijd;*
IV ⟨verz.n.⟩ **0.1** ***schoolgemeenschap;***
V ⟨mv.; ~s vaak the⟩ **0.1** ⟨vaak S-⟩ *(middeleeuws) universiteiten* ⇒*scholastiek en scholastiek* **0.2** ⟨BE⟩ ***examengebouw*** ⟨in Oxford⟩ **0.3** ⟨BE; inf.⟩ ***academisch examen*** ⟨voor behalen v. BA in Oxford⟩ ◆ **6.2** be in the ~s *examen doen* **6.3** be in for one's ~s *voor zijn examen zitten.*

[1] The Van Dale English Dutch dictionary, 1989.

Other related readings of *school* II. 0.1. are also recorded in the dictionary article, of which we find examples of regular polysemy in III. 0.1 which is ambiguous without having any illustration of the ambiguity in the combinatorics part (schooling, education as an activity and result of the activity carried out at school) and III. 0.2., *school* as school time; IV. 0.1. houses the translation of *school* in the reading of a plurality of persons and I. 0.1., a special way of learned thinking acquired at school and the metonymic offshoots: the movement or stream, the followers, the way of thinking, the style. The rest of the polysemic structure as represented in the dictionary is already clearly idiosyncratic as the meaning is specialized.

The the Van Dale English-Dutch dictionary dictionary article exposes a multi-layered structure, where the English entry word has mainly been translated with a similarly polysemous Dutch word. But regardless of this rough similarity, the regular polysemic pattern of the English word is retained or elaborated by equivalents covering the variation of the meaning and by translations of combinations. Perhaps because of formal constraints on dictionary articles it is not always clear which of the senses is considered central or primary by the lexicographer's intuition. It is, however, clear that the building reading is regarded as primary to the institution reading.

Type B. The sense model.

As a contrast to the Van Dale English-Dutch dictionary, where the abstract, institution reading is subsumed as a variant to the general *school* or concrete, building sense, the Van Dale Dutch-English dictionary[4] exposes the institution reading separately and as being listed primary with regard to the building one (22).

(22)

school ⟨de⟩ **0.1** [onderwijsinstelling] ***school*** **0.2** [gebouw] ***school*** **0.3** [lestijd] ***school*** **0.4** [scholieren plus leerkrachten] ***school*** **0.5** [leermethode] ***school*** **0.6** [mbt. kunst/wetenschappen/letterkunde] ***school*** **0.7** [het schoolwezen] ***education*** **=>*schooling*** **0.8** [leerschool] ***school*** **0.9** [menigte dieren] ***school*** **0.10** [⟨paardesport⟩] ***school*** **0.11** [maas] ***mesh*** ◆ **1.6** de ~ van Plato *the Platonic s.*; de ~ van Zola *Zola's s. (of thought)* **1.9** een ~ haringen *a s. of herring* **2.1** een bijzondere ~ *a denominational s.*; een christelijke/katholieke ~ *a Protestant/Catholic s.*; een gemengde ~ *a mixed/co-ed(ucational) s.*; ⟨kind.⟩ de grote ~ *the big s.*; de lagere ~ *primary/elementary/* ⟨AE ook⟩ *grade s.*; hoere ~ *college for higher education*; de middelbare ~ *[B]secondary/[A]high s.*; een neutrale ~ *a non-denominational s.*; een openbare ~ *[B]state/[A]public s.*; vrije ~ ⟨mbt. Ned.⟩ *the anthroposophic/Rudolph Steiner s.*; ⟨mbt. Belg.⟩ *free/* ⟨vnl.⟩ *denominational s.* **2.4** de hele ~ praat erover *the whole s. is*

[4] Van Dale Dutch-English dictionary, 1991.

buzzing/talking about it **3.1** de middelbare ~ niet afmaken *drop out of/leave/quit secondary s.*; (de) ~ verzuimen *be absent from/miss/skip s.* **3.3** de ~ duurt tot 12 uur *s. ends/is over at 12 o'clock;* de ~ gaat aan/uit *s. begins/ends* **3.6** ~ maken *get/gather a following* **6.1** ~ met de bijbel *Protestant s.*; naar ~ gaan *go to s.*; de kinderen zijn naar ~ *the children are at s.*; de kinderen naar ~ brengen en halen *take the children to s. and pick them up again;* voor het eerst naar (de grote) ~ gaan *start s.*; op ~ komen *arrive at/get to s.;* op de middelbare ~ zitten *go to/attend secondary/^high school;* ik heb nog met hem op ~ gezeten *I went to s. with him;* uit ~ komen *come home from s.*; een kind van ~ nemen *take a child (away) from s.*; als de kinderen van ~ zijn *when the children have left s.*; zij werd van ~ gestuurd *she was expelled from s.*; ~ voor jongens/meisjes *boys'/girls' s.*; ~ voor beeldende kunsten *s. of design/visual arts;* een ~ voor buitengewoon onderwijs *a special education/remedial s.*; een ~ voor voortgezet onderwijs *a secondary s.* **6.3** na (de) ~ *after s.* **6.**¶ uit de ~ klappen *blab.*

The Dutch-English dictionary records linearly 11 senses of the same word, of which the first 7 contain instances of regularly related senses – this conclusion is based on the fact that there are other words in Dutch that display similar relations between the senses. The structure in the Van Dale Dutch-English dictionary is less layered (the distinction provided by the Roman numbers is missing), and therefore the dependence relation among several readings is missing. Due to the user aspect the translation equivalents provided per sense are less numerous, and as a result most of them are translated with *school*, with the exception of 0.7. which represents the related abstract senses of education and schooling. The exposition of the meaning is rather realized by meaning discrimination in Dutch. The article gives a clear view of the distinct related metonymic nodes: 0.1 institution, 0.2 building, 0.3. school time, 0.4. pupils and teachers, 0.5. schooling method, and perhaps as a lexicalized sense, that of 0.6. the school in arts, science, literature. From the relevant senses, some additions are found in the combinatorics section for 0.1 institution – the activity (3.1). place (6.1) and 0.3. school time – activity readings (6.3., 3.3.).

The same type is represented by *opera* in the Van Dale Dutch-English dictionary.

Type C. The variation model.

The entry of *opera* from the Van Dale English-Dutch dictionary (23) introduces just one lexical meaning of the word, translated by *opera*. The variant translations are not raised to the status of lexical polysemy, but listed as contextual variants: opera performance, opera house, opera company, opera music. Neither the translation equivalents nor example sentences make any reference to the possible extensions of *opera* as a CD, an LP, time of performance, or place. The same word in the Van Dale Dutch-English dictionary represents the type B.

(23)

op·er·a[1] ['ɔprə]['ɑprə](fs)(telb.en n.-telb.zn.) 0.1 *opera* =*opera-uitvoering, operagebouw, operagezelschap, operamuziek* ◆ 2.1 ~ buffa *opera buffa, opéra bouffe;* comic ~ *opéra comique, komische opera;* grand ~ *grand opéra, grote opera;* ~ seria *opera seria, ernstige opera.*

Type D. The monosemic model.

This type is represented by the old type dictionary entries. For the sake of space-saving, regular polysemy is not represented in Silvet's English-Estonian dictionary (24). In this case the bilingual dictionary is silent about the fact that some shifts are not realized in Estonian (*opera* cannot be extended to the reading of an opera house, and it is questionable in its use as opera company or performance, it is strictly used to denote the type of musical art).

(24)

opera ['ɔp(ə)rɔ] **1.** *s.* ooper; **2.** *vt.* opus ◇ **grand** ~ tõsine (*või* traagiline) ooper; **comic** ~ koomiline ooper; ~ **bouffe** [bu:f] jantlik ooper, pilkeooper

Only the frequent words enjoy the recording of their regular polysemic pattern in full flavor, and the description is influenced not only by the lexicographer's whims, but also by the orientation to the user type addressed by the dictionary.

3.1.2. Verbs.

In the case of verbs in bilingual dictionaries I am interested in the question of representing ambiguity and vagueness and which types of polysemic structures are recorded about verbs. As with nouns, we make a comparison of how the two theories are supported by the bilingual dictionary data. Were the data to confirm the frame semantic approach, the polysemic meaning of a verb would turn out to be realized in equivalents according to different lexico-syntactic patterns. One would find the realization of variants in the combinatorics part of the dictionary article, or as an extremely hierarchical sense structure. Were the data to confirm the two-level approach, we would expect to find the equivalents as corresponding to the core meanings, and perhaps a relatively bulky combinatorics section with mainly illustrative example sentences with or without translation equivalents. As with nouns, I check whether any of the L2 equivalents for L1 verbs can be singled out as covering the core meaning.

Type A. Variation in argument structure and a predictable divergence in L2 equivalents.

The English-Estonian dictionary article of the verb *open* shows how a difference in L1 argument structural variance is lexically realized in L2 (25). The semicolon separates the argument structural variants of it under sense number 2., the transitive *avama* and the unaccusative *avanema.*

(25)

open ['oup(ə)n] **1.** *a.* (**~er, ~est**) avatud, lahtine, avali, ava-; katmata; avalik, varjamata; aval, avameelne; juurdepääsetav, vaba, kättesaadav (*kellelegi, millelegi* **to**); **2.** *v. t. & i.* avama, lahti tegema; avanema (*kuhugi, millegi suunas* **to, into, on, on to**) ◇ **~ air** väljas (*või* vabas õhus) asetsev koht (*vrd.* **~-air**); **~ country** lagendik, lage maa; **to force an ~ door** lahtisest uksest sisse murdma; **the ~ door principle** lahtiste uste põhimõte (*kaubanduses*); **~ hand** heldekäelisus; **~ letter** avalik kiri; **~ mind** valmisolek erapooletult otsustada; **~ order** *mil.* harvrivi; **~ to argument** (*or* **conviction**) valmis ennast veenda laskma; **~ to doubt** (**question**) kaheldav (küsitav); **~ verdict** *jur.* (eeluurimiskohtu) otsus toima toimepaneku kohta ilma süüdlase kindlakstegemiseta; **~ weather** (**winter**) pehme ilm (talv); **~ work** = **~-work**; **in the ~** lahtise taeva all, vabas õhus, lagedal (*ka piltl.*); **to come into the ~** lagedale tulema; *piltl.* avalikult ära rääkima, avameelne olema; **to ~ fire** tuld avama; **to ~ ground** *piltl.* tegevust alustama; **to ~ out** avama, lahti tegema *või* lööma, laiali laotama; avanema; jutukamaks (*või* seltsivamaks) muutuma; **to ~ the case** (*kohtuprotsessis*) asjaolusid esitama (*enne tunnistajate ülekuulamist*); **to ~ up** kättesaadavaks tegema, esile tooma; hõlvama; (*tegevust*) algama (*millegagi* **with**); ust avama; kiirust suurendama, gaasi andma *või* lisama (*sõidul*)

This alternation has a regularly divergent realization, and the same is true for the translation of the equivalent Dutch verb *openen* into Estonian. The Dutch-English dictionary is consulted on this entry for another type of variation in equivalence.

For verbs, dictionaries offer abundant examples of cases where L1 argument structural alternations are lexicalized separately in L2. Quoting dictionary articles in this respect would be space-

consuming. Suffice it to bring at least some examples: cases like *open,* of theme/agent subjects' alternation in transitive/unaccusative verbs pairs are numerous: *break – murdma/murduma, change – muutma/muutuma,* etc. display a regular divergence in translation equivalents in English on the one hand and Estonian on the other.

Type B. Regular lexicalization of certain meaning components in L2.

A number of Estonian and English motion verbs are ambiguous as to the direction or goal of the movement and the relevant information has to be filled in from the context, while the Dutch and Hungarian verbs regularly specify these meaning components: *astuma* and *step* do not contain a meaning component of direction, but they require an argument (e.g. the Goal), the Hungarian, German and Dutch equivalents necessarily contain a meaning component of direction: *belép/kilép/visszalép, instappen/uitstappen/terugstappen* , cf. the entries in an Estonian-Hungarian pocket dictionary (*astuma 'step'*) and in an Estonian-German dictionary. In the lexicalized concept of adding, the manner or location of adding is underspecified in Estonian or English, but specified in Dutch, German or Hungarian, e.g. the *lisandama* 'to add'. These differences are regular, they are part of the structure of the specific languages. The argument structure of the equivalent items in question differs as to the optionality of the arguments.

Similarly, the vagueness of an Estonian verb is often realized by lexicalized meaning component in Dutch, e.g. *verspreiden, spreiden, uitspreiden* are all equivalents to the English *spread* or the Estonian *levima.* This type of realization is not unique to one case either. There is a number of examples that regularly display the similar pattern.

Another type of systematic divergence in verb equivalence is encountered if one meaning component of a L1 lexical unit is systematically lexicalized in other languages; e.g. as it is the case with German *hören,* where the distinction between willing/unwilling auditory perception is not lexically made, while these components of meaning are lexicalized in Dutch, Estonian and English show, in *luisteren/kuulama/listen* (component of willingness), *horen/kuulma/hear* (underspecified as to willingness) respectively.

Type C. Unpredictable variation equivalents in L2.

There is another type of variation in verbs' meaning that is revealed in bilingual dictionaries, where equivalence seems unpredictable and subject to arbitrary conceptual factors. In contrast to nouns, where the regular polysemic patterns of one language do not differ radically from that of another language, verbs' meaning is in this respect vague and allows for a variety of equivalents, where several aspects of the verb meaning are lexicalized. Frame semantics has worked a lot on the description and offers more possibilities to explain systematically the grounds for the variation in translation equivalents, as the distance between the several readings a verb can assume in context is relative, which is exactly something represented in the frame semantic lexicon.

(26)

open[3] ⟨f4⟩⟨ww.⟩ →opening ⟨→sprw.740⟩
I ⟨onov.ww.⟩ **0.1** *opengaan* ⇒*(zich) openen, geopend worden* **0.2** *zichtbaar worden* ⇒*in het gezicht komen, zich vertonen/ontrollen;* ⟨fig.⟩ *zich openbaren* **0.3** *openen* ⇒*beginnen, starten, een aanvang nemen, van wal steken* ⟨v.spreker⟩ **0.4** *tot inzicht komen* ⇒*ontvankelijk/vatbaar worden, zijn gemoed openstellen* **0.5** *openlijk/vrijuit spreken* ⇒*voor zijn mening uitkomen, zijn plannen toelichten, zijn hart openleggen* **0.6** *opendoen* ⇒*de deur openen* **0.7** *een boek openslaan* **0.8** *aanslaan* ⟨v.jachthond⟩ ◆ **1.1** the shop does not ~ on Mondays *de zaak/winkel is 's maandags niet open* **1.2** a lovely vista ~ed (out) before our eyes/us *een prachtig vergezicht ontrolde zich voor onze ogen* **5.1** the gate ~s **outwards** *het hek gaat naar buiten open* **5.¶** →open out; →open up **6.1** the back door ~s **into** a blind alley *de achterdeur komt uit op/in een blinde steeg;* ~ **onto** the garden *uitkomen op de tuin* **6.3** ⟨muz.⟩ ~ **for** *in het voorprogramma staan/spelen bij;* the opera season ~ed **with** Peter Grimes by Britten *het operaseizoen begon/werd geopend met Peter Grimes v. Britten* **6.7** I ~ed at page 58 *ik deed/sloeg het boek open op bladzijde 58;*
II ⟨ov.ww.⟩ **0.1** ⟨ben.voor⟩ *openen* ⇒*opendoen, openmaken, ontsluiten, losmaken, openleggen, openstellen, openzetten, openvouwen, toegankelijk/vrij maken;* ⟨inf.⟩ *opereren* **0.2** *openen* ⇒*voor geopend verklaren, inleiden, beginnen, starten, in exploitatie brengen* **0.3** *openleggen* ⇒*blootleggen, verduidelijken, toelichten, openlijk meedelen* **0.4** *openstellen* ⇒*ontvankelijk/vatbaar maken, verruimen* **0.5** ⟨scheep.⟩ *in het gezicht komen (te liggen) v.* ⟨door koerswijziging⟩ ⇒*in het gezicht krijgen* **0.6** ⟨sl.⟩ *beroven* ◆ **1.1** ~ a bottle *een fles ontkurken/aanbreken;* ~ a can *een blik opendraaien;* a cathartic to ~ the bowels *een purgatief om de stoelgang te bevorderen;* ~ a credit *een krediet openen;* ~ ground *de grond omploegen/losploegen;* ~ a passage *een doorgang vrij maken;* ⟨mil.⟩ ~ ranks *de gelederen openen, in open gelid gaan staan;* ~ a new road through the jungle *een nieuwe weg aanleggen door de rimboe;* ~ a well *een bron aanboren* **1.2** ~ the bidding *als eerste bieden* ⟨op veiling, bij kaartspel⟩; ~ the card game *bij het kaarten als eerste bieden/inzetten, uitkomen* **1.3** ~ one's heart/mind to s.o. *zijn hart voor iem. openleggen, bij iem. zijn hart uitstorten/luchten* **1.4** ~ one's heart to *zijn gemoed openstellen voor, zich laten vermurwen door* **5.¶** →open out; →open up **6.1** ~ the paper at the sports page *de krant op de sportpagina openvouwen/openleggen;* ~ the door to s.o. *voor iem. opendoen* **6.2** ~ fire **at/on** *het vuur openen, onder vuur nemen.*

This entry from the Van Dale Dutch-English dictionary on the verb *openen* introduces the transitive/intransitive realizations of the verb as separate subentries (26). Within the subentries, several contextual variant translation equivalents are presented, provided with Dutch indications about the context. Specifications for the meaning are also to be found in the combinatorics part of the article. The

structure is envisaged in accordance with the arguments, and the qualities and selection restrictions of arguments. It is interesting to take a look into the variant translation section of *open* II 0.1. *openen* and its combinatorics section. The variant translation section offers a long list of equivalents, but in the combinatorics section it becomes clear that the naming of acts of opening in Dutch, an additional component of the manner of action has to be lexicalized (see the equivalents in 1.1.: *to open a bottle, a can, a new road, a well; 6.1. the paper*).

3.2. Databases.

Dictionary-making strives for better reusability of a ready dictionary and thus for a better lexical description of the data. The notion of a lexical knowledge base has gained more attention in practical lexicography.

Naturally, not all frame-based lexicographical projects find it efficient to give a meticulous description or fancy visual schemata and they attempt to constrain the number of frames and elements. However, they do use several elements like case frames in a different form, attributive, spatial and cognitive primitive features. For instance Deville (1989) distinguishes 23 caseframes for Dutch verbs. These frames contain selectional restrictions and caseroles (e.g the theme of '*vermorzelen*' (*to crush*) is *CONCRETE* and the agent has the restriction *ANIMATE*). The principle underlying the basis of equivalence, however, is similar to that described in the works of Fillmore and Atkins.

In this frame-based lexicographical practice, in a system based on Deville (1989) shifts are employed as devices to describe the related aspects of a meaning without registering the "shifting" expression as lexically polysemous. A shift predicts a possible extension of one semantic type to one or more semantic types, i.e., *DYNAMIC (process) --> NONDYNAMIC (result)*. Shifts start from one lexical unit, which is established by the lexicographers on the basis of frequency, psychological relevance, or some conventions (shifts are possible as *Artifact --> Place*, not *Place --> Artifact*). The Dutch nouns, for example, are described by 29 main shifts.

The Dutch-Estonian database records the polysemy of *school* 'school' as follows in example (27):

(27)

> ***school 1. onderwijsinstelling*** *(Dutch: 'educational institution')* **kool** *(Estonian: 'educational institution')*< ***asutus; koolimaja; kollektiiv***> *(Estonian: 'institution; school building; collective')* ***2. groep vissen****(Dutch: group of fish')* **parv** *(Estonian: 'group (of fish)'* ***3. richting in kunst of wetenschap*** *(Dutch: 'school in art or science')* **koolkond** *(Estonian: school in art or science')*, **kool** <***kirjanduses, kunstis, teaduses vm***>*(Estonian: 'school in literature, art or science').*

Three units, set in bold italics, represent lexical polysemy, the institution sense 1 in taken as primary in the shift chain type 4: *inst>pl>art*, that type describes the meaning shift from an institution to a plurality of persons and to an artifact. The sense of the school in arts, science, literature enjoys independence as a lexical meaning, giving rise to a shift chain number 14: *nondyn>hum*, that of nondynamic entities to human individuals. A comparison of Dutch regular shifts with the Estonian ones is

carried out by Tamm (1996). The character of the shifts in Estonian differs from the Dutch ones, mainly for morphological reasons.

This framework has found it necessary to change the otherwise frame-based policy for a two-level type of description of nouns. The shifts have a general range of application, but they are still attached to separate lexical units. Deviations from the shift pattern are considered idiosyncrasies that also call for recording. Thus, shifts are part of a lexicon, but not so strictly speaking: the fact that a shift does not realize, is also an idiosyncrasy, and part of the lexicon – inherently it means the postulation of at least two levels of representation.

4. Discussion.

4.1. Verbs.

In the case of verbs, there are types of meaning variation that are systematically regarded polysemous even without exact evidence from ambiguity tests. These are the cases where the argument structure of L1 varies and these alternations are realized separately in L2 (example from English-Estonian *open: avama* transitive, *avanema* intransitive). The tests do not yield here any results since they are not applicable due to the different syntactic environments required by the items: *this door opened – this door opened a new world to him* are not combinable for an ambiguity test. The intuitive decision of a lexicographer to regard the item as polysemous is supported by our bilingual contrast hypothesis. However, it is not a case of arbitrary polysemy: the transitive/unaccusative polysemy of English is regularly, morphologically realized in Estonian. The working hypothesis confirms the intuitions about meaning.

A new sense is created in bilingual dictionaries even if it is intuitively clear that the meaning is common in two items, but it is necessary to group the different uses of the word according to a principle. The ambiguity tests can be applied and a certain hierarchy of senses is attained for the representation. In the example of *open*, basically all senses can be covered with the word *open* in Dutch, but certain semantic features, restrictions (e.g., the Agent must be HUMAN and the Theme must be CONCRETE) on the L1 arguments or complements are lexically realized in L2. The L2 equivalents vary along unpredictable lines, but it is clear that the semantic type of the object (or subject for intransitives) determines the results in ambiguity tests. If the working hypothesis confirms the intuitions about polysemy, verbal polysemy is heavily dependent on the semantic content of the complements of the verb.

Variation and a difference in equivalents are also found within the dictionary senses. Example sentences and their equivalents are resorted to when there is a further conceptual subdivision in the restrictions (as in *open*, Theme CONCRETE: *bottle, can, paper, road*, etc.). Again, the L2 equivalents vary along unpredictable lines. If the working hypothesis confirms the intuitions about polysemy, verbal polysemy is heavily dependent on the complements and perhaps even adjuncts.

A comparison of the English verb *open* as represented in two bilingual dictionaries, the English-Dutch and English-Estonian general language dictionary presents us an important conclusion. Even if we have the same type of target group (decoders, passive dictionary), the semantics of the same word is opened in

a radically different way. There is one unanimously agreed point where the two dictionaries meet: argument structural variation is regarded as lexical polysemy, since the transitive and intransitive variants of *open* are treated as separate lexical entities by both. Both dictionaries find it necessary to illustrate the meaning with translated example sentences. From this point on the policy diverges. The Estonian dictionary states with merely two equivalents the basic meaning of the transitive (these are stylistic variants : *avama* is a slightly more formal word, *lahti tegema* a slightly more colloquial variant), the same range is covered by four subsenses, offering numbers of equivalents for different readings of *open.* Evidently it is the semantic content of the theme object of the transitive verb that serves as the basis for this quadripartition: the first, open something concrete by a partitioning, or a cut, perhaps to open the concrete inside of a concrete entity; second, to start something or to make something dynamic accessible via opening it by starting off (the card game, the bidding); third, to open or reveal some abstract entity (e.g. a theory); fourth, to let some figuratively understood static concrete entity (e.g. one's heart) be accessible. However, we can give as good partitioning on the basis of the MANNER of opening, or the INSTRUMENT of opening, or perhaps even the RESULT of it – but the aim here is not to suggest another basis for dividing the senses, but rather to point out the impossibility of offering one single natural partitioning of the meaning for verbs. The meaning of verbs is general, vague and in bilingual dictionaries, one finds or just one roughly equivalent lexical expression as an equivalent for them, or a huge number of contextual meanings that are arranged according to one or another principle. The numerous L2 equivalents represent contextual concepts of L1, out of the context, the equivalenty pairs do not really seem to make sense for a bilingual dictionary user*: open (a passage) – (een doorgang) vrij maken 'free'; open (a bottle) – (een fles) ontkurken 'remove the cork of'*. The basis of variation in equivalents is lexically unpredictable, but provided with encyclopedic knowledge and context, predictable. The traditional lexicographical devices of representing meaning are at times downright misleading in cases where lexical as well as contextual concepts are presented in linear order, reflecting a system which usually is based on ambiguity tests. There are scholars (Bosch 1993) who claim that ambiguity tests are based on contrasts on the conceptual level only, so this is how it happens that different contextual uses are assigned the status of a separate dictionary sense at a par with lexical polysemy since they test equally for ambiguity. Indeed, the SEM-s constructed by Bosch – the relevant difference in their theme is whether it is a boundary or a bounded space - differ from the basically frame semantic representation of the English-Dutch entry *open,* and one reading is missing in the structure of the English-Estonian dictionary entry, although the distinction is recorded in in the combinatorics part.

On the one hand, it is possible to more systematically arrange the verbal equivalents according to frame semantic principles. Contextual and encyclopedic knowledge is abundantly contained in frame structures, and one frame element is not given the priority over another one. The bilingual search can be carried out in an easier way if verbal polysemy, based on the variations of the full meanings that only can be encountered in contexts, is described in a more systematic way – this is exactly what frame semantics strives and offers possibilities for. Two-level semantics offers better grounds for singling out the purely lexical contrasts, the different SEM-s, from mere instantiations of them in different contexts. However, if

there were two related SEM-s attached to a word in two level semantics, the relation between them would be spelled out in frame semantics.

The other problem, then, that called for clarification in the course of studying the translation equivalents of verbs is that of SEM, the core meaning and its relation to the conceptual structure. The meaning in the case of verbs could be on the one hand similar to the type of underspecification in the kinship terms (e.g. maternal and paternal grandmothers) in several languages – characterized by possible divergence in target language. On the other hand, contrary to nouns, ambiguity tests classify the readings that give divergence in L2 as ambiguous. In this case, it is true to say that L1 is vague with respect to some conceptual distinctions that are lexicalized in L2. But in contrast to the nominal distinctions, the nature of the conceptual distinctions of the verb does not emerge from the meaning of the verb itself, but from the meanings of arguments. But we don't know how to account for the results of ambiguity tests on the conceptual level. As a solution to this predicament, the frame semantic approach with no explicitly stated difference between lexical polysemy, conceptual polysemy or vagueness, rather than a two-level semantic approach, would offer a better explanatory ground for explaining that type of verbal vagueness as polysemy on conceptual level. This is merely due to the fact that the frames also contain systematized extralinguistic inheritance information about nouns.

4.2.Nouns.

There are types of nominal meaning variation that are recorded in the microstructure of bilingual dictionaries and there are types that are never recorded there. Dictionaries do not display any consensus about nominal variation of meaning. Bilingual dictionaries present shifts of meaning of nouns as polysemy of various rank, as variation of meaning on different levels of representation or they do not consider them at all. The choice between the options is not so much dependent on the variability in L2 equivalent set than on the general policy and perhaps simply the quality of the dictionary in question. In high-quality dictionaries, the sense structure is based on ambiguity tests. Most bilingual dictionaries, however, are of the opinion that the regular aspects of meaning are understood or guessed by the user. There is at least one bilingual database model, where nominal shifts of meaning are in principle systematically treated as general, but lexically dependent systems that can be realized in contexts, and which can therefore be different cross-linguistically; but which do not give rise to lexical polysemy proper.

In the examples from the dictionaries, the nominal polysemic patterns belonging to expressions that are generally equivalent are indeed found not identical. This suggests that the realization of the shifts is at least partly arbitrary, language-dependent. There is a general range of polysemic possibilities available for lexical items from the same semantic class or field cross-linguistically, but not all of these possibilities are realized. The source for these discrepancies cannot be the conceptual system, since extralinguistic knowledge about the items under discussion is by and large the same. The lack of consequently described data in dictionaries does not allow me to draw conclusions whether the discrepancy in the lexical realization of the variation is just an unpredictable, lexical phenomenon or it is a regular and grammatical

phenomenon. For the latter option, I did not find evidence about nouns that are described in the given dictionaries. However, Estonian regularly realizes some Dutch meaning shifts by different words. These regularities can be divided in two: a) the ones where the L1 ambiguity tests correspond with the divergence in the L2 items, and b) the ones where the ambiguity test classifies the L1 item as vague, but the L2 has divergent words for the readings. The type a) can be illustrated by the regular polysemy of Dutch words denoting both fruits/berries and their respective trees or bushes – peer *(pear tree; a fruit)* are in Estonian *pirnipuu, pirn* respectively. One example of a systematic difference of type b) is the case of DYNAMIC → NONDYNAMIC Dutch shift. For instance the item *'spreiding' ("spreading")* in the Dutch database is DYNAMIC as well as NONDYNAMIC, and for the Dutch native speakers the expression expresses two different related aspects of one meaning, not a case of lexical polysemy, while Estonian realizes these aspects separately: DYNAMIC *levimine* and NONDYNAMIC *levik*.

Sporadic 'blockings' of a shift are more abundant. As another example, the English equivalents of the Dutch *school*, - e.g., the conceptually related notion of the inside of the school is not lexicalized in English; and the English *opera,* which misses the lexical realization of the conceptually related *building* reading in Estonian. In several languages, the word *opera* denotes the two metonymically interrelated entities, but in some languages, for lexical or world knowledge reasons, one of the shifts is not realized. In Estonia, the building reading seems at first sight to be missing since the building itself is missing, in Dutch, the opera house exists, but since it is housed together with a town hall, the physical fusion has resulted in a new coinage for the whole building *Stadhuis+Opera=Stopera.* But while referring to the opera building in Munich, a Dutch would still use the word *opera*, and Estonian rather *ooperihoone* or *ooperimaja (opera house*).

There is a shift possible in English from POLITICAL/IDEOLOGICAL SYSTEM to the STATE/COUNTRY and from there on, to representatives of a STATE/COUNTRY to which the system is applied. Words like *dictatorship, monarchy, democracy, communism* undergo this shift (the possibility of pluralization marks the shift), but here are other members of the field that do not undergo the shift. These international terms ought to have identical shift spectrum across languages were it that encyclopedic knowledge is directly expressed in language, however, the realization of the shifts is varying. The phrase

The Asian monarchies/the dictatorships of South America/ the Western democracies have decided to ...

would translate into Estonian as follows:

Aasia monarhistlikud/Lõuna-Ameerika diktaatorlikud/Lääne demokraatlikud riigid on otsustanud ...

('The Asian monarchist states/countries, South American dictatorial states/countries, Western democratic states/countries have decided to ...').

The shifts seem to be directed : name of state/country (France) does not necessarily shift into political system (but: *finlandization*).

How do different semantic theories tackle the problem of nominal polysemy? The frame semantic approach does not have much literature about this problem; moreover, frame-based systems of bilingual lexicons depart from the frame approach and give special treatment for metonymy-based shifts, which are, however, extended to some frequent cases of metaphoric extension as well. It is a problem for the frame

semantics, how exactly are contextual metonymies, transfers of meaning (like *I am parked in the second row, I wrote a letter to X*) to be distinguished from lexicalized metonymy (container-containee, building-institution, etc). Nominal meaning variation is complicated since it is strongly based on the nature of the polysemy system in question.

The possibility of identical versus divergent polysemy patterns across languages shows that the basis for nominal polysemy is the semantic structure on the one hand, and the conceptual structure on the other. The dictionary entries confirm the expediency of regarding nominal regular polysemy as a layered phenomenon. However, the mapping of one level to another and the relations within these levels poses problems: the mapping has to follow certain rules and restrictions, which is a separate topic of study. What do the blocking-like data show is that a conceptual shift, which is lexically and conceptually available in one language must be blocked on a non-conceptual level in the other language. Where this blocking works, cannot be the conceptual level, but only the semantic level of representation.

Thus a contradiction within the general outline of the two level semantics framework occurs, since the Bierwisch notion of variation of meaning 'belongs' to the conceptual level, being the instantiation of one basic, core meaning SEM. There are basically two possibilities: first, whether the meaning of a regularly polysemous noun must have more than one SEM-representations. The question is how many. Perhaps it can be established on the basis of the ambiguity tests, perhaps it makes sense to resort to bilingual contrast cases. Or, second, one conceptual concept, one reading is more prominent, salient than others on the conceptual level. This option would necessitate a special mechanism on the conceptual level which has repercussions on the semantic level. Bilingual contrast, as shown above, argues for the first option. The encyclopedically contiguity-based relations, the interdependency and refential nature of the nominal polysemies, the grouping of items according to the type of the referent in the results of ambiguity tests, argues for the second. In any case, the notion of basic core meaning has to be revised in the case of nominal regular polysemy.

As a summary, in case of nouns, ambiguity that emerges in tests is referential, conceptual in nature. The basis for the nominal polysemy is metonymy, contiguity, which is missed in Bierwisch's work, where it is assumed that on the semantic level, there is no regular, predictable variation of meaning. We have evidence that the shifts are regular even with no direct evidence from any encyclopedic knowledge. The nominal polysemy, corresponding to shifts, is sometimes language-specific. A shift can be blocked language-specifically. This questions the necessity of two levels of representation for the meaning. In the treatment of polysemy, however, even in such opportunistic structures as bilingual dictionaries happen to be, it is clear that assuming one level of meaning representation would not do to account for the variation on the one hand and 'senses' on the other. In order to distinguish metaphorical and nonmetaphorical, motivated and unmotivated types of polysemy, and to curb the influx of all the uses of the word as separate senses of it, lexicographers would learn much from the two level semanticists.

However, equivalence, and it is especially evident in the case of verbs, is more systematically represented by frame semantics, as are cases where the traditional primitives fall short of the description

task. On the one hand, it is possible to arrange the verbal equivalents more systematically according to frame semantic principles. The bilingual search can then be carried out in a more efficient way if verbal polysemy, based on the variations of the full meanings that only can be encountered in contexts, is described in a more systematic way – this is exactly what frame semantics strives and offers possibilities for. Shortly, two level semantics offers better grounds for singling out the purely lexical contrasts, the different SEM-s, from mere instantiations of them in different contexs. However, if there were two related SEM-s attached to a word in two level semantics, the relation between them would be spelled out in frame semantics.

5. Conclusion.

The article studied the representations of polysemy in bilingual dictionaries, and established that the phenomenon finds divergent recording, according to the general policy of the dictionary. No dictionaries, however, assume each time a new sense in L1 if a different target language equivalent occurs. The difference in the policy is reflected in some sources in trying to achieve one most suitable equivalent in L2, this policy reflects the belief that one-to-one equivalence can be established between languages, other sources record the several contextual readings arranged according to ambiguity tests.

What is the essence, then, of the bilingual lexical contrasts that are found so abundantly in dictioanries? Cross-linguistic lexical contrasts can be ascribed to differences of both encyclopedic and linguistic knowledge, to conceptual and lexical factors. So if a L1 lexical item is realized by several L2 items, which is rather a rule than an exception, it signals possible ambiguity, and there is evidence for L1 polysemy. Whether this polysemy happens to be of the lexical polysemy type, is rather language-specific, dependent on the characteristics of other lexical entities in L1. Assuming the possibility of polysemy on a conceptual level, bilingual divergence offers first of all evidence for polysemy on that level. The different lexicalizations in L2 reflect a contrast between L1 concepts. Ambiguity of items is thus partly a matter of the lexical structure, partly of the conceptual structure.

Given certain restrictions on the data set, bilingual dictionary entries provide ample material for the conceptual diversity and a study of polysemy in L1, especially in sources where equivalence relation is structurally recorded (electronic databases). The research into two semantic theories shows that there are points that should be taken into consideration by lexicographers in their work if they want to diminish subjectivity and achieve more uniformity in their treatment of meaning.

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Logic-Based Learning of Linguistic Constraints

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1 Introduction

According to Daelemans, van den Bosch and Weijters in (Daelemans, van den Bosch, and Weijters, 1997, p. 1), "language learning has thus far not been a hot application for machine-learning research." This neglect, however, seems totally unjustified, they continue, for at least the following reasons.[1] First, solving the problem known as "the knowledge-acquisition bottleneck" for Natural Language Processing would exert a beneficial influence on the whole field of NLP; second, the results could be transferred to other poorly understood domains of Artificial Intelligence research; and third, there already are large linguistic datasets available to the researcher, which is not true of most other fields investigated in AI.

Daelemans *et al.* distinguish between *lazy* and *greedy* learning techniques. In lazy learning (also known as *similarity-based, example-based,* or *case-based* learning) the information implicit in a set of examples is not abstracted from the set; when an unseen test example is presented to the system, it simply computes its similarity to all examples in the memory with the help of a predefined *similarity metric*, then uses the most similar example(s) as a basis for predicting the unknown properties, e.g., the category, of the test instance.

Systems that use greedy techniques learn by abstracting information during their training phase. This abstraction can assume a *symbolic format*, as in *decision-tree learning* and *inductive logic programming*, but this is not necessary: the connection strengths in a *connectionist network* can also be regarded as representing such an abstraction in spite of the fact that it is not in a symbolic format.

In this paper I sketch the outlines of a simple, greedy, symbolic machine learning system which has the potential to *discover* and *apply* knowledge concerning various linguistic objects. To put it more precisely, the linguistic objects in question are certain *pairs of representations*; and, generally speaking, the system conducts its operation through *analyzing* and *synthesizing* such representations, applying the theory it has formed of the relationship between them.

[1] I would like to thank László Kálmán and an anonymous reviewer for their valuable advice on how to improve the content and the form of this paper.

Learning, seen from this point of view, is equivalent to a three-step pocedure in which first the behaviour of a black box (the "learner") is observed, then, on the basis of the observations, a theory predicting its possible operations is formulated; finally, in the last step, the theory thus developed is put to use to simulate the behaviour of the black-box.

At least the following points should be mentioned in relation to the proposed system.

The basic insights and motivations for developing at least the rough outlines of this learning system come from research into the possible computational linguistic applications of *Construction Grammar,* conducted by László Kálmán at ELTE University (see (Kálmán, 1994) and (Kálmán, 1997)). Construction grammar is a *declarative* (non-transformational) approach to language, which sees language as a set of correspondences between different types of entities, e.g., between form and meaning. Such correspondences are best seen as *associated constraints* on the two types of entities because they claim that if one entity satisfies a certain constraint, then the associated entity has to satisfy another, associated constraint. This means that according to the constructionist approach, a natural language has more than one inventory of constraints, coupled with a system of correspondences between them. For example, if a language imposes some specific constraint on the *syntactic* structure of a phrase, then it is possible that this syntactic constraint is invariably accompanied by a corresponding *semantic* constraint imposed on the same phrase. Such regular correspondences comprise the *phrasicon* of the language (see (Goldberg, 1995) and (Kálmán, 1994) for further details of the constructionist view). Further, the tradition of the *constraint-based* approach to the theory of grammar (see, for example, (Shieber, 1986) and (Shieber, 1992)) also played an important role in developing the key ideas. Both paradigms share the conviction that a linguistic object is best seen as the simultaneous realization of several independent constraints. The view according to which an object can be characterized by the set of constraints (or conditions) it satisfies plays a crucial role in the design of the system, as we will see later on. As a matter of fact, *this paper is nothing but an attempt to show that it should be possible to apply the principles of the constructionist approach to language learning,* and, as we will see, this "preconception" strongly influences the overall design of the system.

The paper is divided into two parts. The first part is devoted to outlining the system in general, while in the second part an illustration will be worked out together with considerations as to the place of the system among other general approaches to learning.

2 General Overview

The part of the system that stores the "raw data" is the *training corpus.* The training corpus consists of a finite set of ordered pairs whose first components are "problems" and the respective second components are the "solutions" of the problems in question. In the remainder of this paper I will use a more neutral language and I will say that the training corpus consists of pairs of *representa-*

tions of *input objects* and *output objects*, respectively. The objects themselves are, in turn, to be found in the *input domain* and *output domain* of the reality outside the system. For example, as we will see later, finding the semantic interpretation of a natural language phrase promises to be an important application of the system. In that case, the input domain is the set of phrases whose meaning we want to find, and the output domain consists of the meanings to be found.

The training corpus enables the system to generate theorems of a *theory* that concern the relationship between the two domains of objects.
As to the details of how the learning module can generate theorems of a theory concerning the data observed in the training corpus, suffice it to say for the time being that the learning module has access to another module that contains specific "principles" constraining its theorizing. In other words, the learning module has access to something that we can call *metatheory* deliniating the class of possible theories for the training corpus under examination.

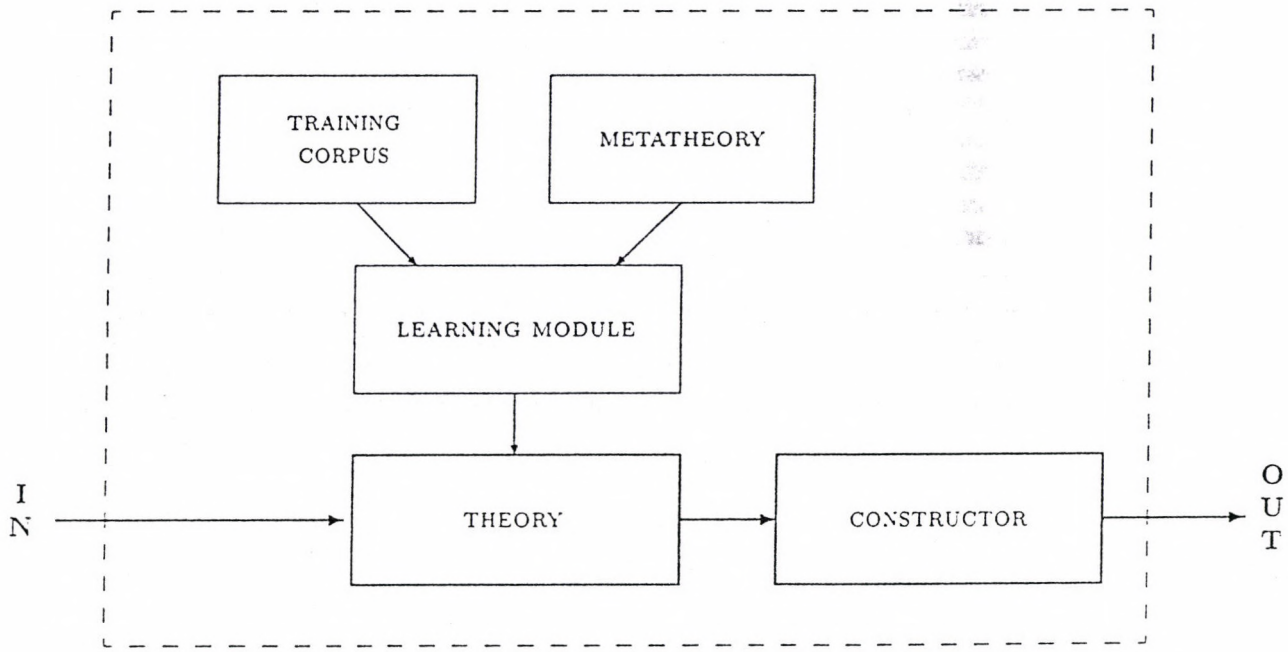


Figure 1: The modules of the system.

Figure 1 depicts all the modules of the system. As can be seen, in Figure 1 one more module called "Constructor" has been included. The specific task that this module performs is the construction of the output representations on the basis of their description.
The next section is devoted to the detailed analysis of the modules.

3 The Modules

3.1 Overview

In the following sections we will take a closer look at the modules that comprise the system.

The simplest of the modules is that of the TRAINING CORPUS. As it has already been mentioned, the training corpus consists of the "raw empirical data" obtained by observing that certain pairs of representations "go together." The TRAINING CORPUS is essentially a record of such correlations. But here an important note is in order concerning ontology. The pairs in the TRAINING CORPUS contain *representations* of certain objects in the outside world (flows of sound, meanings, etc.), rather than the objects themselves. The module THEORY is a theory of the relationship between the correlated objects *in the training corpus*, so what the theory module is concerned with is the relationship between the representation of certain objects in the outside world, rather than an immediate theory of any relationship between those objects themselves. The module METATHEORY contains constraints on the possible theories of the representations of certain objects in the outside reality. Altogether then the following four ontological levels are involved (here "→" should be read as "concerns," or "is about"):

$$\textbf{Metatheory} \rightarrow \textbf{Theory} \rightarrow \textbf{Descriptions} \rightarrow \textbf{Reality}$$

To keep these distinctions clear as much as possible, I will adopt the following convention: I will use capital letters when I am talking about OBJECTS in the real world, but use **boldface** fonts when I am talking about **objects** that the system has immediate access to. In view of this convention, we can say that OBJECTS exist in the outside reality, but the **objects** that the system directly deals with are only representations of the OBJECTS which the system has no direct access to.

3.2 The Training Corpus

Let us suppose that there are two *domains* of representation, A and B; for example, A can be a set of representations of SOUND-SEQUENCES constituting sentences, and B a set of representations of MEANINGS. Then let Γ denote a relation between A and B:

Definition 1
(1) $$\Gamma \subseteq \mathbf{A} \times \mathbf{B}$$

Γ relates the elements of A to the elements of B, and if we knew this relation, then we would be able to assign any "problem" in A its "solution(s)" in B. Unfortunately, we do not have access to the entire Γ; we have only a subset γ of Γ at our disposal, and it is this relation γ which the system will develop the theory of. The relation γ is stored in the TRAINING CORPUS.

Let us define the set of the first and the second components of γ, respectively, as in

Definition 2

(2) $$Inp(\gamma) = \{ a \in \mathrm{A} \mid \bigvee_{b \in \mathrm{B}} \gamma(a,b)) \}$$

(3) $$Outp(\gamma) = \{ b \in \mathrm{B} \mid \bigvee_{a \in \mathrm{A}} \gamma(a,b)) \}$$

Finally, let f_γ be the following function from $\mathcal{P}(Inp(\gamma))$ to $\mathcal{P}(Outp(\gamma))$:

Definition 3

(4) $$H \subseteq Inp(\gamma) \Rightarrow f_\gamma(H) = \{ b \in Outp(\gamma) \mid \bigvee_{a \in H} \gamma(a,b) \}$$

This function takes a subset of $Inp(\gamma)$ and returns the set of those elements in $Outp(\gamma)$ that are related by γ to the elements of the first set[2].

3.3 The Theory Module

3.3.1 The concept of a theory

Before going into the details of the module THEORY, it might be useful to consider in quite general terms what a theory of any part of reality should be like.

First, a theory should consist of *statements* that refer to the objects of the theory, that is, the objects the theory is supposed to be about. This implies the existence of a language $\mathcal{L}_t$ used in stating the theory in question.

Second, the statements of the theory should be *true* of the objects they are about. This means, in effect, that there exists a subset Θ of the sentences of $\mathcal{L}_t$ such that the sentences in Θ are *verified by* the objects that the theory is about.

Third, the theory should be sufficiently *general* so that it can be applied to "new" data beyond the observed ones. This is the main difference between a theory and a set of random observations.

To describe the THEORY module formally, we will have to re-interpret the module TRAINING CORPUS first.

3.3.2 The model-theoretic interpretation of TRAINING CORPUS

As it has already been stressed, the components of the ordered pairs in the TRAINING CORPUS are not only representations of OBJECTS in the outside reality but, at the same time, are objects analysed by the learning module. The learning module aims at establishing in what way observations concerning $a \in Inp(\gamma)$ can be of help to predict the properties of the elements in $f_\gamma(a)$. To put it a little more formally, what we want to know is this. Let a be an arbitrary element of $Inp(\gamma)$, and let φ be a formula that is true of a. Then what formula

[2] I will follow the convention that when H only contains one element, that is, when $H = \{a\}$, then I simply write $f_\gamma(a)$ instead of $f_\gamma(\{a\})$.

ψ will characterize the elements of $f_\gamma(a)$? Here, by "characterize" is meant a formula that *totally describes* what is common to all of the elements[3] in $f_\gamma(a)$. To put it yet another way, what formulas φ and ψ are such that whenever φ is true of some element a in $Inp(\gamma)$, then ψ is true of the correlated elements in $f_\gamma(a)$?

Collecting such formula pairs would make it possible to *generalize* beyond the limits of γ. And, as was mentioned in the section on the concept of a theory, it is precisely the possibility of generalization that makes it worthwhile to abstract theories from plain data.

Putting the question in this way suggests the idea of treating a and the elements of $f_\gamma(a)$ as *first order models* that may verify some formulas φ and ψ, respectively. Then the original question can be re-phrased as: If a verifies φ, then what ψ do the elements of $f_\gamma(a)$ verify[4]?

Let us fix on two languages, $\mathcal{L}_t^{(\mathrm{A})}$ and $\mathcal{L}_t^{(\mathrm{B})}$, that consist of formulas that can describe the elements of A and B, respectively. These are then the languages of the THEORY MODULE, and we will take a closer look at their properties in the section on METATHEORY.

A certain analogy can be drawn here between Intensional Logic (see, for example (Montague, 1974)) and the way we treat the data in the TRAINING CORPUS. In Intensional Logic (and in general, in Modal Logic) the notion of *possible worlds* plays a crucial role. Possible worlds stand for the different possible states of affairs of the real world, and they are represented by ordinary first-order models. The analogy I mentioned can be drawn between possible worlds, on one hand, and the components of the pairs in the TRAINING CORPUS, on the other. Put simply, $Inp(\gamma)$ and $Outp(\gamma)$ can be interpreted as two co-indexed arrays of possible worlds (i.e., first-order models), related by the relation γ. This immediately raises two questions: First, what elements does the particular universe associated with a certain model have? And second, how do the non-logical constants of $\mathcal{L}_t^{(\mathrm{A})}$ and $\mathcal{L}_t^{(\mathrm{B})}$ become interpreted?

The answer is that both factors should be specified by the user. Using the parlance of Modal Logic, we can say that the user is expected to provide the system with information in the matter of both the *quantificational universe* assigned to the particular possible worlds (models) and the *intensions* of the non-logical constants. To put it informally, the user should equip the system with knowledge as to what kind of elements and what kind of structures to look for. For example, if the input objects are written sentences, then the universe (related to the sentence being examined) might contain the token-words that occur in the sentence; and there might be a relation "precedes" which is true of two to-

[3] In an arbitrary language it is not necessary that there exists a finite formula that can do the characterization. However, as we will see later in the section on metatheory, the languages that the system uses have extremely severe restrictions placed on them, and these restrictions ensure that it is always possible to find a finite formula that totally describes any set of elements either in A or B.

[4] My use of the word "verify" is rather imprecise as it stands. Its content will be further specified as the discussion proceeds.

kens w_1 and w_2 only if w_1 physically precedes w_2 in the sentence. Programming intensions or concepts is clearly possible. Obviously, most text-editors can be said to have the notion of a "word" in-built because they can do several operations the performance of which would require a human being to possess the notion of a word. By the same token we can say that text-editors also possess the intension of the precedence relation between words because they can execute operations that would require a human being to know the meaning of the precedence relation. And because text-editors can decide whether two tokens are in that relation or not *in any possible text* and, since intensions are by definition those entities (functions, to be exact) that enable one to identify extensions in any possible world, it would be hard to argue against the statement that they do possess the intension of the precedence relation.

Before turning to the formal details, let me call attention to the fact that since $Inp(\gamma)$ provides models for the formulas in $\mathcal{L}_t^{(A)}$ (whereas $Outp(\gamma)$ does so for the ones in $\mathcal{L}_t^{(B)}$), the subsets of $Inp(\gamma)$ (the subsets of $Outp(\gamma)$) can play the role of the propositions (and thus: the intensions) associated with the formulas in $\mathcal{L}_t^{(A)}$ (the formulas in $\mathcal{L}_t^{(B)}$).

Let us now elaborate on the analogy in a formal way. First of all, let us introduce an important concept, that of the proposition expressed by a formula with respect to a training corpus. If $\varphi \in \mathcal{L}_t^{(A)}$, then

Definition 4

$$\Pi_\gamma^{(A)}(\varphi) = \{\, a \in Inp(\gamma) \mid [\![\varphi]\!]^a = 1 \,\} \tag{5}$$

defines the *proposition* expressed by φ with respect to training corpus γ. (Here $[\![\cdot]\!]^a$ gives the semantic value of an expression in the model a.)
A similar concept can also be defined for $\psi \in \mathcal{L}_t^{(B)}$:

Definition 5

$$\Pi_\gamma^{(B)}(\psi) = \{\, b \in Outp(\gamma) \mid [\![\psi]\!]^b = 1 \,\} \tag{6}$$

Let $\varphi \in \mathcal{L}_t^{(A)}$ and $\psi \in \mathcal{L}_t^{(B)}$. Then the following set of ordered pairs of formulas

Definition 6

$$\Theta_\gamma = \{\, \langle \varphi, \psi \rangle \in \mathcal{L}_t^{(A)} \times \mathcal{L}_t^{(B)} \mid \Pi_\gamma^{(B)}(\psi) = f_\gamma(\Pi_\gamma^{(A)}(\varphi)) \,\} \tag{7}$$

would contain the *theorems* of the complete theory of γ.
In other words, Θ_γ could tell us *what* ψ the elements of $f_\gamma(a)$ verify, supposed we know that a verifies φ. However, Θ_γ defined as in (7) would miss many important correspondences, for the following reason. (7) requires that there should exist at least one formula $\psi \in \mathcal{L}_t^{(B)}$ such that $\Pi_\gamma^{(B)}(\psi) = f_\gamma(\Pi_\gamma^{(A)}(\varphi))$ holds. However, there is no guarantee whatsoever for such a ψ to exist in $\mathcal{L}_t^{(B)}$ because in the general case it is completely unwarranted to suppose that for every proposition there should exist a formula in the language that expresses exactly that proposition. Still, even in such a case it would be useful to establish some kind of "approximately true" correspondence. Later I will suggest a procedure that outputs a formula which "covers" the proposition even when

there is no formula that would express it in an exact manner.

But before that let us define two auxiliary concepts. The first is the function κ, which is the *composition* of $\Pi_\gamma^{(\mathbf{A})}$ and f_γ:

Definition 7

$$\kappa = f_\gamma \circ \Pi_\gamma^{(\mathbf{A})} \tag{8}$$

κ assigns a subset in $Outp(\gamma)$ to a formula in $\mathcal{L}_t^{(\mathbf{A})}$. The function κ, similarly to $\Pi_\gamma^{(\mathbf{A})}$ and $\Pi_\gamma^{(\mathbf{B})}$, assigns a proposition to a formula but, *unlike* $\Pi_\gamma^{(\mathbf{A})}$ or $\Pi_\gamma^{(\mathbf{B})}$, it assigns the proposition "in an indirect manner" to $\varphi \in \mathcal{L}_t^{(\mathbf{A})}$ from $Outp(\gamma)$, and not from $Inp(\gamma)$.
The second concept to be defined is that of the *total description* of a $b \in \mathbf{B}$. But before defining it we need to consider the module METATHEORY.

3.4 The Metatheory

The role of the module METATHEORY is to put constraints on the possible content of the module THEORY. Having such constraints is unavoidable for theoretical as well as practical reasons. Theoretically, the researcher approaching some domain should have some kind of preliminary grasp of what can and what cannot be a relevant fact in the domain; otherwise he cannot even start theorizing. From the practical point of view, the system should avoid combinatorial explosion, which can only be ensured by having severe restrictions on the possibilities it has to consider.

So, let the *metatheory* $\mathcal{L}_m^{(\mathbf{A})}$ of $\mathcal{L}_t^{(\mathbf{A})}$ ($\mathcal{L}_m^{(\mathbf{B})}$ of $\mathcal{L}_t^{(\mathbf{B})}$) be a *finite* subset of an arbitrary (but fixed) first order language $\mathcal{L}_M^{(\mathbf{A})}$ ($\mathcal{L}_M^{(\mathbf{B})}$).

Definition 8

$$\mathcal{L}_m^{(\mathbf{A})} = \{\Phi_1, \Phi_2, \cdots, \Phi_k\} \subseteq \mathcal{L}_M^{(\mathbf{A})} \tag{9}$$

$$\mathcal{L}_m^{(\mathbf{B})} = \{\Psi_1, \Psi_2, \cdots, \Psi_l\} \subseteq \mathcal{L}_M^{(\mathbf{B})} \tag{10}$$

Further, let us suppose that these subsets contain k *open sentences* from $\mathcal{L}_M^{(\mathbf{A})}$ (and l *open sentences* from $\mathcal{L}_M^{(\mathbf{B})}$). Open sentences can be true (or false) in a model only under certain *assignments* of the elements of the universe of the model to the variables in them. The open sentences (or *templates*) in $\mathcal{L}_m^{(\mathbf{A})}$ and $\mathcal{L}_m^{(\mathbf{B})}$ are pre-defined by the linguist operating the system, and they are meant to "match" certain patterns that the **object** under investigation might show. Furthermore, they are *conjunctions* of some *atomic formulas* of $\mathcal{L}_M^{(\mathbf{A})}$ (or $\mathcal{L}_M^{(\mathbf{B})}$). For the sake of simplicity, we will represent a conjunction by the set of its conjuncts. For example:

$$\Phi_1 =_{\text{def}} \{P_1(x), P_2(y), R_1(x,y), R_2(x,z), R_3(y,z)\} \tag{11}$$

Assigning actual values to the variables in (11), we obtain atomic formulas that can have either of the two truth-values[5]. The open sentence represented by the

[5]This is a simplification because in Modal Logic the possibility of *semantic value-gaps* is also to be considered. However, as will be clear from our discussion, this possibility plays no role in the system being described.

set of formulas in (11) is considered to be true if and only if all of its atomic formulas are true (in accordance with the truth-functional definition of conjunctions in general).

Let $Val^{(\mathrm{A})}(a, \Phi_i)$ and $Val^{(\mathrm{B})}(b, \Psi_i)$ be respectively the sets of assignments that satisfy all the atomic formulas in Φ_i (in Ψ_i) at world a (at world b). Formally, the definition is as follows[6] (here $[\![\cdot]\!]_g^a$ gives the semantic value of an expression in the model a under assignment g):

Definition 9

$$Val^{(\mathrm{A})}(a, \Phi_i) = \{\, g \mid [\![\Phi_i]\!]_g^a = 1 \,\} \tag{12}$$

$$Val^{(\mathrm{B})}(b, \Psi_i) = \{\, g \mid [\![\Psi_i]\!]_g^b = 1 \,\} \tag{13}$$

where

$$[\![\Phi_i]\!]_g^a = 1 \iff_{\text{def}} \bigwedge_{\varphi \in \Phi_i} ([\![\varphi]\!]_g^a = 1)$$

(and similarly for Ψ_i.) Now we are ready to define the concept of a total description. The *total description of* $a \in \mathbf{A}$ and, similarly, of $b \in \mathbf{B}$ *with respect to* Φ_i and Ψ_i is

Definition 10

$$\delta^{(\mathrm{A})}(a, \Phi_i) = \{\, \langle \Phi_i, g \rangle \mid g \in Val^{(\mathrm{A})}(a, \Phi_i) \,\} \tag{14}$$

$$\delta^{(\mathrm{B})}(b, \Psi_i) = \{\, \langle \Psi_i, g \rangle \mid g \in Val^{(\mathrm{B})}(b, \Psi_i) \,\} \tag{15}$$

The elements of $\delta^{(\mathrm{A})}(a, \Phi_i)$ are ordered pairs consisting of an open sentence Φ_i and an assignment g such that Φ_i is true in a under g. Note that such an ordered pair is equivalent to a formula $\varphi \in \mathcal{L}_t^{(\mathrm{A})}$ that has no variables whatsoever.

The *total description of* $a \in \mathbf{A}$ and $b \in \mathbf{B}$ is defined as follows:

Definition 11

$$\Delta^{(\mathrm{A})}(a) = \bigcup_{1 \le i \le k} \delta^{(\mathrm{A})}(a, \Phi_i) \tag{16}$$

$$\Delta^{(\mathrm{B})}(b) = \bigcup_{1 \le i \le l} \delta^{(\mathrm{B})}(b, \Psi_i) \tag{17}$$

where k and l are the number of the formulas in $\mathcal{L}_m^{(\mathrm{A})}$ and $\mathcal{L}_m^{(\mathrm{B})}$, respectively.

Now it is possible to describe a procedure to generate $\Sigma(\varphi)$, the set of formulas that together "cover" $\kappa(\varphi)$ in the best possible way for any $\varphi \in \mathcal{L}_t^{(\mathrm{A})}$ as follows:

[6] In the definitions so far we have not considered *assignments*: we had the tacit assumption that we were dealing with formulas with no free variables (containing only individual constants). Although working on the basis of this assumption is not warranted from a purely theoretical point of view since in the general case the universe of discourse might contain individuals that have no name in the language, in the framework being described this possibility is not relevant. Therefore, as the *metatheory* consists of formulas with free variables, it would be impractical not to deal with them in an explicit manner.

beginproc
  $\Sigma(\varphi) := \emptyset$
  Choose a random element b_0 from $\kappa(\varphi)$
  Compute b_0's total description $\Delta^{(\mathbf{B})}(b_0)$
  Forall $\langle \Psi_i, g \rangle \in \Delta^{(\mathbf{B})}(b_0)$ do:
    Forall $m \in \kappa(\varphi)$ do:
      if $[\![\Psi_i]\!]_g^m = 1$ then $\Sigma(\varphi) := \Sigma(\varphi) \cup \{\langle \Psi_i, g \rangle\}$
    Endfor
  Endfor
endproc

The utilizability of this procedure depends on the possiblity of giving a total description of an object in $\kappa(\varphi)$. If this can be done, then the procedure is bound to produce the common description for the elements of $\kappa(\varphi)$ because, first, $\Sigma(\varphi) \subseteq \Delta^{(\mathbf{B})}(b_0)$ is obviously true and, second, the procedure proceeds in such a way that it eliminates from (or rather, does not include in) $\Sigma(\varphi)$ those elements of $\Delta^{(\mathbf{B})}(b_0)$ that are not verified by all elements in $\kappa(\varphi)$.

3.5 The System at Work

Now suppose that we have presented an **object** $a \in \mathbf{A}$ to the system such that $a \notin Inp(\gamma)$, and we want it to produce a set of formulas in $\mathcal{L}_t^{(\mathbf{B})}$ so that the formulas in the set should provide the description of the corresponding **objects** $b_1, b_2, \cdots b_j \in \mathbf{B}$. The following procedure describes a possible way to accomplish this task.

beginproc
  Compute $\Delta^{(\mathbf{A})}(a)$
  Compute $\bigcup_{\varphi \in \Delta^{(\mathbf{A})}(a)} \Sigma(\varphi)$
endproc

The set $\bigcup_{\varphi \in \Delta^{(\mathbf{A})}(a)} \Sigma(\varphi)$ will be then given to the module CONSTRUCTOR to construct one or more $b \in \mathbf{B}$ on the basis of.

Let us suppose that the system stores those $\langle \varphi, \Sigma(\varphi) \rangle$ pairs that it has ever computed in the module THEORY. In this case the following algorithm provides D, the set of descriptions to be given to the constructor module.

beginproc
D := ∅
Compute $\Delta^{(\mathbf{A})}(a)$
Forall $\varphi \in \Delta^{(\mathbf{A})}(a)$ do:
If $\langle \varphi, \Psi \rangle \in$ THEORY then $D := D \bigcup \Psi$
else $D := D \bigcup \Sigma(\varphi)$ and THEORY := THEORY $\bigcup \{\langle \varphi, \Sigma(\varphi) \rangle\}$
Endif
Endfor
endproc

As can be seen, the system first turns to its theory module to look up the needed piece of theory, and only when it cannot find any information that it could use does it instigate the time consuming analytical procedure described in the previous section.

3.6 The Constructor Module

After analyzing an **object** a from the domain **A**, the system of modules seen so far outputs a set of formulas which are supposed to be true of those **objects** in domain **B** that are related to a by Γ. It is the task of the CONSTRUCTOR module to effectively build **objects** that make all the formulas (that is, constraints) in the set satisfied.

The problem of building one or more objects that satisfy a certain set of descriptions is closely related to the question of descriptions in general. If a particular set of descriptions contains only one-place predicates, e.g. `is_red`, `is_circular`, etc., then there can be no serious complications in the process of building the object that satisfies all the predicates in the set. In more complicated cases, however, a very peculiar type of problem can arise, that of specifying the *relations* between pieces of information concerning the target object(s). To put it briefly, the system needs to possess some information as to the "logical place" of a substructure in an embedding one.

3.6.1 The problem of unifying partial information

When we have a set of descriptions, we try to interpret it as a set of partial descriptions of the *same* **object**. Such partial descriptions may be about the actual parts of the desired **object**, in which case it becomes necessary to find a way to *connect* those parts. For example, in linguistics researchers often use directed acyclic graphs (DAGs) to describe linguistic objects (see e.g. (Shieber, 1992)). Such DAGs have the property of connectedness, i.e., there are no "lonely" (isolated) nodes. Now, if we have a set of formulas describing the sub-graphs of a DAG, but we have no information whatsoever concerning the relationships between these sub-graphs, then we can connect those parts in many different ways to make a connected graph. This will lead to an unnecessarily huge set of graphs, most of which will be completely useless. This overgeneration is an artifact, which is due to the weakness of the description language used. In a stronger language it should be possible to express constraints among stuctures themselves to prevent the constructor module from overgeneration.

Let us now consider three possible strategies to solve the above problem in the case of Attribute-Value Structures (AVSs), that are in effect special DAGs.

First, we could try to have descriptions of *complete paths* as information. In this case, descriptions would fully specify the paths starting from the root-node of the desired representation (i.e., the desired AVS), and the operation that the construction module would have to perform is the familiar *unification* operation among AVSs.

Second, it might be possible to collect "conditional information," that is, formulas stating that *if* a certain structure is known to be found in the desired representation, *then* another structure should be attached to it in a specified way. Such formulas, together with "axioms" saying that some particular pieces of structure can *indeed* be found in the representation to be built would make it possible to "grow" the desired AVS as the result of applying all conditional information first to the "seeds" ("axioms"), then to the result of this application, repeating this procedure again and again, until it fails to yield new information. In this case, the constructor module would make *the logical closure* of the initial set of formulas ("axioms").

Third, we may try the following reasoning.
When the system applies its theory to a new input **object**, it produces a set of formulas. The elements of this set should then be regarded as simultaneously true of the **object(s)** sought for. As formulas are, in effect, sets of models (**objects**), their conjunctive interpretation places the sought-for **object** in the intersection of those sets. Now it seems reasonable to look at those **objects** that, beside satisfying all the produced formulas, can *already* be found in the TRAINING CORPUS in order to establish what further formulas are satisfied by them. Then it is not unreasonable to suppose that the sought-for **object** satisfies these formulas too (beside the originally produced set of formulas). In this way we might also gain the information we need to further specify the structure of the sought-for **object(s)**.

4 Comparison with Other Approaches

4.1 Connectionist Networks

As it was mentioned in the Introduction, this paper is an attempt to outline a possible implementation of a language learning system based on the principles of the Construction Grammar tradition. According to Construction Grammar, the lexicon and the grammar of a language are of similar form, that is, both are repositories of idiosyncrasies. Such homogeneous grammars give up the distinction between syntax and lexicon; they postulate a *phrasicon* (of a certain language) instead. The entries of the phrasicon are called *constructions*. Constructions are ordered pairs of the form "syntactic entity – semantic entity." Universal grammar then describes the possible ways constructions can be combined with each other (for details see (Goldberg, 1995) and (Kálmán, 1994)).

Since the above description seems to call for something that can recognise and

match various patterns (e.g., a syntactic and a semantic one), it may be asked why not use a simple connectionist network to do the required pattern association (for details on Connectionist Networks see (McClelland and Rumelhart, 1986)). The answer is twofold. First, connectionist pattern associators cannot handle information which is not expressible by unary predicates, that is, they do not know in general how to deal with data expressing *relational* information. This is because the possibilities to represent information in such networks are very poor: they can only work on vectors of predefined features, and that is just not flexible enough to cope with information expressed by (binary or higher order) relations. Second, even if there was a way to represent relations for such networks, it is not clear how the user could elicitate from the network what it has learnt. Connectionist networks work at a "subsymbolic level," which outright excludes the possibility to gain from them symbolic information as to the way the two spaces of patterns are related.

That the knowledge discovered by a learning system used for linguistic purposes should be in symbolic format can hardly be overstressed. Beside using such information to solve the task of learning proper, it can be of interest to the linguist desiring to state linguistic generalizations that are comprehensible by human beings. Also, this feature makes the system especially suited for investigation into discovering correspondences between two types of data. And since the classical view on language takes as fundamental the relation between "form" and "meaning," the system described in the paper can be a very useful auxiliary tool in the linguist's hand. A further obvious advantage of the methods that induce and use symbolic representations is that the "theories" thus formed can lead the researcher to novel insights concerning the field of investigation. Indeed, theories formed by systems working efficiently should be "true" in the sense that only the discovery of real regularities can guarantee good performance. This point is especially important in the case of such domains where there are no widely accepted theories at the moment (such as in dialogue-act–tagging tasks, for example) because in these domains machine learning can provide at least some rudimentary theory to start from. But such "machine-generated theories" can also draw attention to new and unusual points, making it possible for the researcher to have a different look at an already well-understood domain.

4.2 Inductive Logic Programming

In light of the foregoing, some kinship can be expected between the system and Inductive Logic Programming (ILP) (on ILP see e.g., (Muggleton, 1992)). As Dehaspe, Blockeel and De Raedt put it in ((Luc Dehaspe, 1993, p. 2-3)) describing the general features of ILP,

> [t]he generic inductive logic programming task is to search a predefined subspace of clausal logic for a set of logical formulae that in some respect *explain* the data available in a clausal knowledge base. This knowledge base is traditionally subdivided into background knowledge and examples that represent positive and negative evidence of some concept to be learnt.

Inductive Logic Programming is part of Logic Programming (LP) in general. In LP, running a program is equivalent to proving a theorem, which, beside making possible a very high level approach to an extremely wide range of problems, has its own "in-built" limitations concerning decidability and effectiveness. As a result, in practice, only formulas of a restricted form are used: they are either an atomic formula, or an implication with the antecedent being a conjunction and the consequent being a single atomic formula. Such formulas are called *definite clauses,* (they are called "definite" precisely because the consequent of the implication consists of exactly one, definite, atomic formula) and there indeed are effective procedures of theorem proving for this class of formulas.

The kinship can be found in the fact that both in ILP and in the system I described the task of the machine is to discover rules in a database, but beyond this, the approaches have little in common. For example, the system described does not use theorem proving methods, therefore its rules are not subject to the restrictions mentioned above; that is, their consequent can be a conjunction of many formulas. These rules describe correspondences (mappings) between relational structures, and their function is to constrain the synthesis of a representation, whereas the rules in ILP are used in drawing inferences. As the notion of proof does not play any role in the system described in this paper, while it is of central importance in Inductive Logic Programming, it is clear that the two approaches are independent of each other.

There are at least the following points of advantage of the system being described over ILP systems:

1. Robustness. This is the result of the simplicity of the system, and it means that it can be expected to work even if the input is fairly ill-defined.
2. Flexibility in possible developments. This means that, if needed, it would be relatively easy to equip the system with various heuristics.
3. Linguistic orientation. While Logic Programming aims at being as general an approach as possible, the system described directly embodies the basic structuralist view of language according to which the linguistic sign is essentially a relationship.

5 Illustration: Parsing

In this section I work out an example to some extent to show how the principles mentioned in the paper can be put to work in practical terms. The illustration to be worked out is that of *parsing a string.* Parsing is a very important area in computational linguistics, regarding that the input of the semantic module in any reasonable system should represent not only the individual words in the string but also the abstract constituent structure of the string. There are very good parsing methods already, so our goal here is only to show how the approach described in this paper could work in practice.

Let us suppose that the database consists of entries of the form "sentence—parse-tree-of-sentence." In other words, the items look like the following:

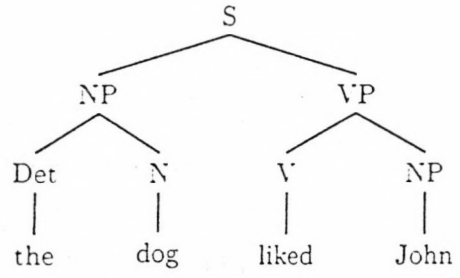
$$\langle \text{Mary liked John.}, [_S[_{NP}Mary][_{VP}[_V liked][_{NP}John]]]\rangle$$
$$\langle \text{The dog liked John.}, [_S[_{NP}[_{Det}the][_N dog]][_{VP}[_V liked][_{NP}John]]]\rangle$$
$$\langle \text{A dog hated the cat.}, [_S[_{NP}[_{Det}a][_N dog]][_{VP}[_V hated][_{NP}[_{Det}the][_N cat]]]]\rangle$$
$$\vdots$$

Here the vertical dots symbolize the fact that the database contains many more parsed sentences beside those listed above. Since it would be completely pointless to try and include hundreds of such sentences in this illustration in what follows we will tacitly rely on the reader's knowledge of the English grammar.

Let us now turn to the question of the metatheory. $\mathcal{L}_t^{(A)}$, the language of the theory of the unparsed sentences, should be capable of expressing such facts as "the word *dog* is contained by the sentence" or "the word *dog* is (immediately) preceded by the word *a*," so the metatheory $\mathcal{L}_m^{(A)}$ should contain such templates as $\{\text{contains}(x)\}$ and $\{\text{precedes}(x,y)\}$, expressing, respectively, that a sentence contains a word and that a word follows another.

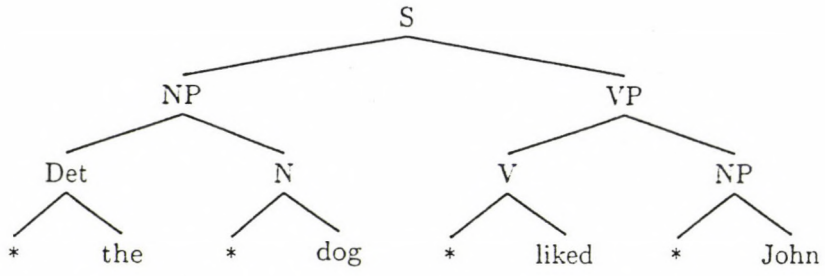
As for $\mathcal{L}_t^{(B)}$, we could regard the categories V, NP, etc. as one-place predicates over the set of points of the tree, coupled with some partial ordering (precedence and dominance) among the points. Although this seems to be the obvious way to represent a tree in a first-order language, it eventually leads to the problem of finding the isomorphic subgraphs of different graphs, and this problem is known to be NP-complete. So, we will choose a different approach.

Let us confine the set of trees we deal with to *binary trees,* that is, to trees in which all non-terminal nodes have exactly two daughters (and terminal nodes have none). In order to comply with this requirement, we have to "binarify" the trees in the above database. Since the only nodes that contradict binarity are the ones dominating the terminal nodes, we introduce the auxiliary symbol $*$, together with the convention that it must *always* precede the terminal node[7]. So, for example, the tree



will assume the form

[7]Actually, this statement is true in *this* particular database only. But the method of binarifying can be generalized to cases where, e.g., we have intransitive verbs such as "slept," whose dominating node is a V that is in turn dominated by a VP but has no sister nodes at all; in this case we have to insert the $*$ as a virtual sister before the V-node.



The latter tree is a binary tree.

Now we define the metatheory $\mathcal{L}_m^{(\mathrm{B})}$ as consisting of a single template:

(18) $$\mathcal{L}_m^{(\mathrm{B})} =_{def} \{\Phi\}$$

where

(19) $$\Phi =_{def} \{\ \mathrm{ld}(x,y),\ \mathrm{rd}(x,z)\ \}$$

Here $\mathrm{ld}(x,y)$ and $\mathrm{rd}(x,y)$ are interpreted respectively as "x's left daughter is y," and "x's right daughter is z."
As to the question of individuals, they are members of the following set:

(20) $$\mathrm{Con}_{ind} = \mathrm{Nonterminals} \cup \mathrm{Terminals}$$

where Nonterminals is the set $\{N, V, Det, NP, VP, S\}$, and Terminals is the set of symbols that hang on the terminal nodes in the trees in the database (Terminals = {dog, the, cat, John, ...} $\cup$ {$*$}).

Clearly, Φ schematically describes the typical patterns that occur in the trees in question (and as such it should be supplied by the linguist). Φ, together with particular assignments, is capable of describing any particular parse tree in the database. For example, the tree of "The dog liked John" will be described as

(21) $$\{\langle S, NP, VP\rangle, \langle NP, Det, N\rangle, \langle Det, *, \mathrm{the}\rangle, \langle N, *, \mathrm{dog}\rangle,$$
$$\langle VP, V, NP\rangle, \langle V, *, \mathrm{liked}\rangle, \langle NP, *, \mathrm{John}\rangle\}$$

(Here I follow the convention that the assignments give the individuals in the order $\langle x, y, z\rangle$, where x is the mother node, y is its left daughter, and z is its right daughter.)

It is easy to verify that the set of assignments that verify Φ *both* in the trees of "The dog liked John" *and* "Mary liked John" is

(22) $$\{\langle S, NP, VP\rangle, \langle VP, V, NP\rangle, \langle V, *, \mathrm{liked}\rangle\}$$

which is the set computed for the formula of $\mathcal{L}_t^{(\mathrm{A})}$ "contains(liked)." If we want to get the description of the string "liked a dog," then we should compute the union of the above set with

(23) $$\{\langle NP, Det, N\rangle, \langle Det, *, a\rangle, \langle N, *, \mathrm{dog}\rangle\}$$

the common description of the sentences containing the string "a dog." The resulting set is

(24) $$\{\langle S, NP, VP\rangle, \langle VP, V, NP\rangle, \langle V, *, \text{liked}\rangle \\ \langle NP, Det, N\rangle, \langle Det, *, a\rangle, \langle N, *, \text{dog}\rangle\}$$

which indeed encodes the description of the string "liked a dog."

Parse trees can contain the same structure in more than one place. For example, the structure of an NP dominating a Det and an N can occur in the same sentence both as the subject of the sentence and as the direct object of the verb. Such copies of the same structure should be handled distinctly, otherwise important structural information can get lost. What this means is, in effect, that the we have to keep record of multiple occurences of the same structure, that is, we have to use *multisets* instead of classical sets. In a multiset the same element can occur more than once (which makes multisets different from ordinary sets) but the order of the elements is irrelevant (this feature makes them similar to normal sets). It is such multisets that play the role of the input for the constructor module.

The constructor module works according to a simple procedure: it chooses a triple from the multiset, then it creates triple of nodes and a pair of arcs such that the created structure is labelled according to the triple in the multiset; finally, it tries to attach the created structure to some proper node in the tree already constructed. A proper node for attachment is one that is a left or a right daughter of some node, and whose label is the same as that of the mother node of the triple to be attached. In view of what was said about multisets above, it is important that copies of the same triple in the multiset should be incorporated into the final tree as different nodes.

This procedure might give rise to certain indeterminacy because it is always possible that a triple of nodes can be attached to different nodes in a tree under construction. For example, an NP can be the left daughter of the S (subject), or the right daughter of a VP (direct object). In such a case, the constructor module has to attach the nodes in all possible consistent ways to construct the possible parse trees.

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A few remarks on adjectival participles and their adverbial adjuncts. Argument structure.

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ABSTRACT

The characteristics of adjectival participles will be explored in the discussion, with special regard to the argument structure of adjectival participles. Some conclusions will be drawn from this structure related to the argument structure of participles and infinitives in general. The aim is to point out to the features of adjectival participles that are different from those of the other participles and infinitives and seek solutions for the treatment in a general framework.

As an illustration:

(1) *[[$_{DP}$ A [$_{VP}$ lányt$_j$ [$_{VP}$ berúgva PRO$_{ij}$] haza kísérő PRO$_i$] fiút]$_i$ [$_{VP}$ nem hatották meg*
the girl-acc get drunk-VA home-accompany-O boy-acc not moved-3pl VM

a lány anyjának szemrehányó szavai]].
the girl mother-poss-dat reproaching words
'the boy seeing the girl home drunk was not moved by the reproachful words of the girl's mother'

The following issues motivate the external arguments to be filled up with PRO:
1. Participial and infinitival constructions can uniformly be considered clauses themselves, preserving the entire argument structure.
2. As participles and infinitives are non finite, untensed forms, their external (or externalized) arguments can not be overtly represented. This is why – as some analyses suggest – the argument position is filled with PRO-s that can be controlled by some of the arguments of the matrix verb or can have a general interpretation.

However, filling the external argument with PRO raises the following problems:
– What is the controller of PRO which has the same referent as the entire NP? If the entire NP is taken as the controller of PRO, then the i within i filter constraint is violated. If N' or N'' is regarded as a controller then units with different references are co-indexed. The reason for the problem is that adjectival participles – in contrast with other participles or infinitives – function as attributes and their external arguments are represented by the NP which they are attached to as attributes.

Another proposed solution (Alberti–Medve, in press) is that adjectival participles would lose their external arguments; thus, they would not be represented as PRO in their argument structure. It is the syntactic relation expressed in the attribute-head construction that informs about the owner of the missing thematic role.

This solution, however, does not account for sentence (1) where the thematic role of the subject of VP '*berúgva*', 'drunk' has to be assigned. On the one hand, it is not in an attribute-head relation defined above; on the other hand, it can not be claimed that adverbial participles would also lose one of their arguments as exactly the opposite solution seemed plausible in another structure.

A new proposal is outlined in this paper: participles and infinitives search for their external arguments either in their own clause or in the immediate superordinate clause and find them in the NP/NPs which correspond/s to the semantic features expected by the regent, or in the ones to which the thematic roles to be assigned by the regent can actually be assigned.

1. The topic

In the current discussion the properties of adjectival participles will be explored with special attention paid to their argument structures. I will draw conclusions from the latter related to the argument structures of participles and infinitives in general. In my explorations I will rely on works by István Kenesei, T. Laczkó, A. Komlósy, K. É. Kiss, and G. Alberti, among others, which examine the syntactic features of participial and infinitival constructions and other verbal derivatives (in particular: the deverbal nominals formed with the *-ás/és* suffix). In the domain of adjectival participles I will focus on the ones suffixed with *-ó/ő*, and *-t/tt*. The aim is to point out to the properties of adjectival participles that distinguish it from other participles and infinitives, and to find solutions for handling these in a general framework.

2. On participial and infinitival constructions in general

Each author I have consulted proposes that the entire argument structure is retained in participial and infinitival constructions, as well as the possibility to construct the entire field of operators (topic, quantifier, focus). As É. Kiss claims, the participial and infinitival suffix, while attaching to the verbal head, in fact relates to the whole verb phrase, so it only alters the syntactic function of the VP, but not its internal structure.

2.1 The infinitive.

The preceding claims can suit the infinitives:

(1) *Péter$_j$ [$_{VP}$ meg$_i$ szeretné [$_{VP}$ t$_i$ hívni PRO$_j$ Marit vacsorára]].*
Peter VM would-like invite-INF PRO Mary-acc dinner-for
'Peter would like to invite Mary for dinner.'

In this sentence we have two VPs:

szeretne 'would-like' <<NP, experiencer: *'Péter'*; S or VP, proposition: *'meghív'*>
meghív 'invite' <<NP, agent: *'Péter'*; NP, theme: *'Mari'*; (NP, locative): *'vacsorára'*>

It is clear that the verb 'meghív' has not been deprived of its arguments by the infinitival suffix, in fact its complement taking ability has remained the same as that of the verb, and even its operator field can be shaped like that of V, cf. (4):

(2) *Péter$_i$ [$_{FP}$ levélben [$_{VP}$ szeretné [$_{VP}$ meghívni PRO$_i$ Marit vacsorára]].*
Peter letter-in would-like invite-INF Mary-acc dinner-for
'Peter would like to invite Mary for dinner by letter.'

(3) *Péter$_i$ [$_{FP}$ nagyon udvariasan [$_{VP}$ szeretné [$_{VP}$ meghívni PRO$_i$ Marit vacsorára]].*
Peter very politely would like invite-INF Mary-acc dinner for
'Peter would like to invite Mary for dinner very politely.'

(4) *Péter$_i$ [$_{VP}$ szeretné [$_{FP}$ egy különösen exkluzív vacsorára [$_{VP}$ meghívni PRO$_i$ Marit]]].*
Peter would-like an especially exclusive dinner-for VM invite-INF Mary-acc
'Peter would like to invite Mary for an especially exclusive dinner.'

It is a property of the verb *'szeretne'* – 'would-like' – that it raises the verbal modifier that serves as its argument; and that it agrees with the object of its infinitival complement to its immediate left. An argument of the embedded VP can move to the operator field of the matrix clause either via extraposition (by extraposition, following É. Kiss and Alberti, I mean that arguments of the embedded verbal predicate move to argument positions of the superordinate verbal predicate, and can move further subsequently), or, as É. Kiss suggests, the two subjacent VPs can be treated as one unit for syntactic processes (this is called VP-conflation). This latter case is relevant here as this way the PRO in the lower VP disappears, the two VPs being conflated into a single one. Under such VP-conflation we in fact face problems with theta-roles, but this problem is very similar to the one to be seen later with adverbial participles adjoined to adjectival participles. When discussing the latter case, we will seek some solution for handling these structures.

But VP-conflation is not really necessary for being able to represent the structure of sentences. However, it can explain why the verbal modifier may not be extracted from an embedded VP expanded by operators.

The subject of *'meghív'* / 'invite' cannot appear overtly because of the non-finite base of the infinitive, therefore in a GB-framework a PRO (unpronounced pronominal) must be posited in the underlying structure in the subject position, which gets the agent role, and its reference is determined by control relations (in this particular case it is coindexed with *'Péter'*). With inflected infinitives, the subject can be overt, and is represented by dative case (*-nak/nek*):

(5) *Péternek$_i$ fontos [$_{VP}$ t$_i$ meghívnia Marit vacsorára].*
Peter-dat important VPinvite-INF-3sg Mary-acc dinner-for
'It is important for Peter to invite Mary for dinner.'

In this case *'Péter'* moves out of the argument structure of the infinitive, which É. Kiss takes to be an effect of the Impersonal Predicate Constraint (Impersonal verbs or verbal-nominal predicates raise the subject of their VP-complements to themselves). The example can be seen as an argument for infinitival phrases to have their own subjects, and when the base is untensed, this subject must surface as PRO.

2.2 Adverbial participles

The adverbial participle can be some adverbial adjunct of the VP (most frequently a state, manner, or time adverbial), or an argument of the main verb (primarily in constructions of the pattern *'x V-zve van/volt'* / 'x is/was V-ed/-ing'). In very rough terms, state adverbials relate to an entity, while manner adverbials refer to a predicative element in the sentence. In this latter case the activity modified by the manner adverbial is a subtype of the activity in general. Witness: *eszik* 'eats' – *habzsolva eszik* 'eats greedily'.

(6) *Péter$_i$ [$_{VP}$ Marit átkozva PRO$_i$ / feldühödve PRO$_i$ [$_{VP}$ ment el a buliba]].*
Peter Mary-acc curse-VA PRO / enrage-VA PRO went away the party-into
'Peter went to the party cursing Mary / enraged.'

elmegy 'go' <<NP, agent: *'Péter'*; NP goal: *'buliba'*>
átkoz 'curse' <<NP, agent: *'Péter'*; NP, theme: *'Mari'*>

As can be seen from the example, the adverbial participial phrase retains its full argument structure, too, and since the base is untensed here, too, the agent theta-role is carried by a covert (unpronounced) pronoun:PRO.

Adverbial participles can be formed of both the active and the passive form of the verb (assuming, of course, that passivization is a lexical process), but there are constraints as to which base form of which verb can host the affix.

For example, an adverbial participle can be formed on the passive base

– in the case of anterior action:

(7) *A kabát$_j$ [$_{VP}$ kivasalva PRO$_j$ [$_{VP}$ t$_j$ lóg a fogason]].*
the coat out-iron-VA hangs the rack-on
'the coat is hanging on the rack ironed'

– in the case of simultaneous action (in these cases presumably only in idioms, lexicalized expressions):

(8) *(Pénz számolva,)... asszony$_i$ [$_{FP}$ [$_{VP}$ verve PRO$_i$ [$_{VP}$ ~~(van)~~ jó]]].*
(money count-VA), woman beat-VA PRO (is) good
'Money is best counted and women are best beaten.'

A participle can be formed on the active base

– in the case of anterior action:

(9) *Péter$_i$ [$_{VP}$ pénzt számolva PRO$_i$ / levelet írva PRO$_i$ [$_{VP}$ üldögélt a*
Peter money-acc count-VA PRO / letter-acc write-VA PRO sat-DURATIVE the

szobájában]].
room-his-in
'Peter was sitting in his room counting money / writing a letter.'

(10) *Péter a kulcsát csörgetve ment el otthonról.*
Peter the key-his-acc rattle-VA went away home-from
'Peter left home rattling his keys.'

– in the case of simultaneous action:

(11) *Péter$_i$ [$_{VP}$ a levelet megírva PRO$_i$ [$_{VP}$ el ment otthonról]].*
Peter the letter-acc write-VA PRO away-went home-from
'Peter left home having written the letter.'

(12) *Péter egy levelet megírva, két könyvet elolvasva és 28 terítőt beszegve*
Peter a letter-acc write-VA two book-acc read-VA and 28 tablecloth-acc hem-VA

kissé fáradtan üldögélt a szobájában.
slightly tired sat-DURATIVE the room-his-in
'Peter was sitting in his room, having written a letter, read two books, and hemmed 28 tablecloths.'

According to the definitions of state and manner adverbials outlined above, a general conclusion results from the examples in (7) – (12): namely, that an adverbial participle functioning as a state adverbial can be formed of the active form of the verb for a transitive verb and for simultaneous action, and of the passive form of the verb for anterior action.

When the participle is formed of the passive form of V, as seen in the examples, the subject promoted from the object of the original verb appears as the internal argument of the participial construction in the form of PRO.

It is widely assumed that PRO can exclusively be controlled by the subject of the main verb when functioning as a manner adverbial, while the controller can be either the subject or the object of the main verb, when it is a state adverbial. As the following examples show, this distiction is far less clear.
The indices 'i' and 'j' indicate which argument of the main verb controls the PRO posited in participial constructions. The question-mark by the index means that not all informants have found it acceptable.

(13) *Péter$_i$ [$_{VP}$ szemüveget viselve PRO$_{ij}$ [$_{VP}$ sem ismeri fel Marit$_j$]].*
Peter glasses-acc wear-VA PRO not-even know up Mary-acc
'Peter does not even recognize Mary wearing glasses.'

(14) *Péter$_i$ [$_{FP/VP}$ berúgva PRO$_{ij}$] [$_{VP}$ kisérte haza Marit$_j$].*
Peter get-drunk-VA PRO accompanied home Mary-acc
'Peter took Mary home drunk.'

(15) *Péter$_i$ [$_{VP}$ sírva PRO$_{ij?}$] [$_{VP}$ kisérte haza Marit$_j$].*
Peter cry-VA PRO accompanied home Mary-acc
'Peter took Mary home crying.'

(16) *Péter$_i$ [$_{VP}$ sírva PRO$_i$ [$_{VP}$ látogatta meg Marit$_j$].*
Peter cry-VA PRO visited Mary-acc
'Peter visited Mary crying.'

(17) *Péter$_i$ [$_{VP}$ énekelve PRO$_i$] [$_{VP}$ látogatta meg Marit$_j$].*
Peter sing-VA PRO visited Mary-acc
'Peter visited Mary singing.'

(18) *Péter$_i$ [$_{VP}$ sírva PRO$_i$] [$_{VP}$ pofozta meg Marit$_j$].*
Peter cry-VA PRO face-slapped PREV Mary-acc
'Peter slapped Mary in the face crying.'

(19) *Péter$_i$ [$_{VP}$ sírva PRO$_{ij?}$] [$_{VP}$ lőtte le Marit].*
Peter cry-VA PRO shot down Mary-acc
'Peter shot down Mary crying.'

(20) *Péternek$_i$ [$_{VP}$ levelet írva PRO$_j$] [$_{VP}$ tetszik Mari$_j$].*
Peter-dat letter-acc write-VA pleases Mary
'Peter likes Mary, (as) writing letters.'

(21) *Péternek$_i$ [$_{VP}$ a szobába belépve PRO$_{j/i?}$] [$_{VP}$ tetszik Mari$_j$].*
Peter-dat the room-into enter-VA PRO pleases Mary
'Peter likes Mary entering the room.'

(22) *Péternek$_i$ [$_{VP}$ sírva PRO$_j$] [$_{VP}$ tetszik Mari$_j$].*
Peter-dat cry-VA PRO pleases Mary
'Peter likes Mary crying.'

(23) *Péternek$_i$ [$_{VP}$ berúgva PRO$_{i/j}$] [$_{VP}$ tetszik Mari$_j$].*
Peter-dat get-drunk-VA PRO pleases Mary
'Peter likes Mary drunk.'

(24) *Péter$_i$ [$_{FP}$ [$_{VP}$ pipázva PRO$_{i/j?}$] [$_{VP}$ gondol szívesen Marira$_j$]].*
Peter pipe-smoke-VA thinks with-pleasure Mary-onto
'Peter likes to think of Mary smoking a pipe.'

(25) *Péter$_i$ [$_{FP}$ [$_{VP}$ fürdőruhát viselve PRO$_{i?/j?}$] [$_{VP}$ gondol szívesen Marira$_j$]].*
Peter swimsuit-acc wear-VA PRO thinks with-pleasure Mary-onto
'Peter likes to think of Mary wearing a swimsuit.'

(26) *Péter$_i$ [$_{VP}$ pipázva PRO$_i$] [$_{VP}$ szívesen gondol Marira$_j$].*
Peter pipe-smoking PRO with-pleasure thinks Mary-onto
'Peter likes to think of Mary smoking a pipe.'

(27) *Péter$_i$ [$_{VP}$ fürdőruhát viselve PRO$_i$] [$_{VP}$ szívesen gondol Marira$_j$].*
Peter swimsuit-acc wear-VA PRO with-pleasure thinks Mary-onto
'Peter likes to think of Mary wearing a swimsuit.'

(28) *Péter$_i$ [$_{VP}$ belépve a szobába PRO$_i$] [$_{VP}$ észrevette Marit$_j$].*
Peter enter-VA the room-into PRO caught-sight Mary-acc
'Peter having entered the room caught sight of Mary.'

(29) *Péter$_i$ [$_{FP}$ [$_{VP}$ belépve a szobába PRO$_i$] [$_{VP}$ vette észre Marit$_j$].*
'Peter caught sight of Mary (on) entering the room.'

(30) *Péter$_i$ [$_{VP}$ a szobába belépve PRO$_i$] [$_{VP}$ észrevette Marit$_j$].*
'Peter caught sight of Mary, having entered the room.'

(31) *Péter$_i$ [$_{FP}$ [$_{VP}$ a szobába belépve PRO$_i$] [$_{VP}$ vette észre Marit$_j$].*
'Peter caught sight of Mary (on) entering the room.'

(32) *[$_{VP}$ Belépve a szobába PRO$_i$] [$_{VP}$ Péter$_i$ észrevette Marit$_j$].*
Enter-VA the room-into PRO Peter caught-sight Mary-acc
'Having entered the room / on entering the room, Peter caught sight of Mary.'

(33) *[$_{VP}$ A szobába belépve PRO$_i$] [$_{VP}$ Péter$_i$ észrevette Marit$_j$].*
the room-into enter-VA PRO Peter caught-sight Mary-acc
'Having entered the room / on entering the room, Peter caught sight of Mary.'

In general, the subject of the main verb is the default controller of the PRO filling the external argument place of the adverbial participle, so there is a subject>object preference order, but as the examples (13, 14, 15, 19, 21, 23, 24, 25) show, the control relations are not always unambiguous. With respect to the predicative complements, there is a well-known claim that as far as they function in the clause as adjuncts, it is underspecified in syntax which argument of the main verb they refer to. The above examples suggest that this claim can be maintained for the adjunctive use of adverbial participles as well.

For the control relations, we will seek further explanation after investigating all of the participial and infinitival constructions.

Extraposition and VP-conflation can only work for an adverbial participle phrase if it is an argument, of course.

2.3 The adjectival participle

As a null hypothesis, it may be assumed that the adjectival participles behave similarly to the other participle and infinitive types as far as their argument structure is concerned (as almost undividedly claimed by the authors referred to): so the argument structure of the original verb is retained, and the adjectival participle (as for its internal structure) actually builds into the clause as a verb phrase.

(34) *[$_{DP}$A [$_{VP}$könyvet olvasó PRO] fiú] már [$_{VP}$elment].*
the book-acc read-O PRO boy already away-went
'The boy reading the/a book has left already.'

elmegy 'leave' <<NP, agent: 'a fiú'>
olvas 'read' <<NP, agent: 'a fiú'; NP, theme: 'a könyvet'>

Since the base form of the participle phrase is untensed, the subject is realized as a PRO.
Naturally, just as with other types of participles and infinitives, adjectival participle phrases may contain an operator field, too:

(35) *[$_{DP}$A [$_{VP}$könyvet [$_{FP}$csak tegnap [], de az újságot ma is olvasó]] fiú].*
the book-acc only yesterday but the newspaper-acc today too read-O boy
'the boy reading the book only yesterday, but reading the papers today as well'

In one respect, however, the adjectival participle is unlike other participles and infinivites: the VP formed of it is neither an argument, nor an adjunct of the main verb of the sentence. It functions in the sentence much like an attribute: it modifies an NP of the sentence, just like attributive adjectives do. Presumably, this property is related to the word order constraint which requires that the participial head must follow (in fact: immediately) its complement(s) at s-structure, in contrast with the other participles and infinitives:

(36a) *[$_{VP}$ Szeretek pro$_i$ [$_{VP}$egy könyvet olvasni PRO$_i$]]. / [$_S$ [$_{VP}$Olvasni egy könyvet*
like-1sg pro a book-acc read-INF PRO / read-INF a book-acc

PRO$_i$ [$_{VP}$ nagyobb élvezet ~~van~~), mint lapozni []]]].
PRO greater fun (is) than turn-INF
'I like to read a book.'/ 'Reading a book is more fun than turning the pages.'

(36b) *[$_{VP}$ Szeretek pro$_i$ [$_{VP}$egy könyvet olvasva PRO$_i$ [$_{VP}$ heverészni PRO$_i$]]]. /*
like-1sg pro a book-acc read-VA lie-INF /

[$_{FP}$ [$_{VP}$ Olvasva PRO$_i$ PRO$_j$ [$_{VP}$ lehet [$_{VP}$egy könyvet$_j$ igazán megérteni PRO$_i$]]].
Read-VA can-be a book-acc really understand-INF
'I like lying around reading a book.'/ 'A book can be really understood by reading.'

(36c) *[$_S$ [$_{DP}$ A [$_{VP}$ könyvet olvasó PRO] fiút] tegnap nem láttam]. / *Az olvasó könyvet*
the book-acc read-O PRO boy-acc yesterday not saw-1sg/*the read-O

fiút tegnap nem láttam.
book-acc boy-acc yesterday not saw-1sg
'Yesterday I didn't see the boy reading books.' /

2.3.1 The two types of adjectival participles

We focus our attention on two types of adjectival participles: the one with the *-ó/ő* suffix, and the one with the *-t/tt* suffix. They behave differently as to what kind of verbs they can be derived from, and what kind of NPs they can modify. This will also influence what type of argument structure can be posited for them.

In the traditional approaches the two kinds of adjectival participles differ aspectually: the one suffixed with *-ó/ő* is termed progressive, the one suffixed with *-t/tt* is termed perfective in traditional grammars. This distinction cannot be maintained, however, because:

– the "progressive" adjectival participle can be used in temporal antecedence constructions:

(37) *a levelet megíró fiú elment a postára*
the letter-acc write-O boy away-went the post-office-to
'the boy who had written the letter went to the post office'

– the "perfective" adjectival participle can be used in simultaneous constructions:

(38) *a Péter által heteken át olvasott könyv*
the Peter by weeks-on through read-T book
'the book read by Peter for weeks'

– With this distinction, we cannot account for the reason why the "perfective" participle can be the attribute of the NP expressing its object with transitive verbs, see (38), while the "progressive" can be the attribute of the NP expressing its subject, see (37), and why, in the case of intransitive verbs, an agent-subject verb cannot be the base for deriving "perfective" participle:

(39) **a kiáltott fiú*
the shout-T boy

Modern grammars suggest taking the active/passive opposition as the main distinction between the two types of participles. This train of thoughts is also followed here, improving Komlósy's and Laczkó's ideas.

2.3.1.1 The -ó/ő adjectival participle

– What kind of stem it may attach to:
Following Komlósy, we must distinguish the suffix '*-ható*' from the *-ó/ő* suffix, that is, the *-ó/ő* suffix cannot attach to a verb with a *-hat/het* suffix:

(40) *A fiú olvas / az olvasó fiú, a fiú olvashat / *az olvasható fiú*
the boy reads / the read-O boy, the boy read-may / the read-may-O boy
'the boy is reading / the reading boy, the boy may read / the may-reading boy'

The *-ó/ő* suffix attaches to active stems that has a subject argument. No *-ó/ő*-type adjectival participle can be formed of a passive, a morphologically passive, or a subjectless verb.

– What happens to the arguments:
As we have seen in (34), the participle retained its full argument structure, including the property that the subject can be expressed by a non-overt pronoun, and it attributively modifies a noun phrase which corresponds to the subject of the base verb.

– Aspect:
The arising participial construction primarily expresses simultaneity with the main statement given in the sentence, but it can express immediate temporal antecedence, too:

(41) *az épülő házon éjjel- nappal dolgoznak*
the build-O house-on night-day work-3pl
'they work night and day on the house being built'

(42) *a kislány megpuszilta haza érkező édesapját* (Laczkó's example)
the little-girl kissed home-arrive-O father-her-acc
'the little girl kissed her father arriving home'

2.3.1.2 The -t/tt type adjectival participle

– What stem it can attach to:

The *-t/tt* suffix of the participle traditionally termed as "perfective" has a much more limited use than the *-ó/ő* suffix, traditionally termed "progressive".

1. It can definitely attach to (so-called) passive stems:

(43) *meg írt levél, fel épített ház*
VM- write-T letter, up-build-T house

2. It can attach to active stems, too, but in this case it can only be an intransitive stem with a non-agentive (more precisely: patient or theme) subject:

(44) *meg sárgult levél, felépült ház*
VM- turn yellow-T leaf, up-build-T house
'withered leaf, house built'

According to Laczkó, a more general definition of the rules governing the use of *-t/tt* can be given, e.g.: let us suppress the agent argument of the base verb, and let the remaining argument be the subject of the arising participial construction.

This way, in the case of transitive stems we get to the required result by classic passivization, while in the case of intransitive stems with an agentive argument, no grammatically expressible argument remains, so no grammatical structure can arise, and with non-agentive arguments the structures seen in (19) result.

Thus, in general, the *-t/tt* suffix can be looked upon as some kind of passivization, though not always in a clear syntactic sense.

– What happens to the arguments:

The retainment of the argument structures closely relates to passivization. This is because in each case the (newly "designated") subject of the construction will be the argument overtly inexpressible in the participial construction (due to the untensed nature of the participle), therefore this position will be filled by PRO.

1. With transitive verbs (that is, with classic passivization), the original subject of the verb cannot be expressed by an argument, only by a "by"-phrase, a separate adjunct. The object of the original verb is promoted to subject, as in passivization processes in general.

2. With participles derived from a non-agentive intransitive verb the original subject will also be the subject of the participial construction, so this is what will be expressed by PRO.

–Aspect:

One cannot deny that aspectual relations also play a role in distinguishing and using the two types of participles besides the active/passive contrast.

1. The event expressed by the *-t/tt* participle derived from a transitive verb (that is, the classic passivizing *-t/tt*) can have progressive aspect, and can be either simultaneous with or anterior to the event described in the main clause.

2. The event of the participle derived from an intransitive verb is obligatorily perfective, and can never be simultaneous with the event of the main clause.

There is a new, "active" sort of use of the *-t/tt* suffix, gaining currency primarily in the language of the media, where a *-t/tt* participle is derived from a transitive or agentive intransitive verb and it modifies the NP expressing the subject of the original verb:

(45) *A tíz kilométert gyalogolt lányok csöppet sem fáradtak el.* (Komlósy's example)
the ten kilometres-acc walk-T girls a-bit not got-tired away
'the girls who walked 10 kilometres didn't get tired a bit'

2.3.2 Distinctions

In order to be able to examine the adjectival participles or more precisely their argument structure – aiming at completeness –, they should be separated from units similar in surface form, but different in category, such as nouns or adjectives, or, for that matter, from verbal derivatives, similarly characterized by the ability to retain argument structure – such as other forms derived from verbs.

2.3.2.1 Adjectival participles and adjectives

The differences between participles and adjectives can be particularly important when the argument structure of syntactic units appearing as attributives are examined. To arrive at the main point of this discussion: it is exactly this attributive function which poses more problems in the argument structure of adjectival participles than in those of other participles and infinitives.

Following Komlósy, the following differences may be identified between participles and adjectives:

– only adjectives can occur in predicative function:

(46) **ez a férfi levelet (meg) irt (volt)*
this the man letter-acc (VM) write-T (was)
'this man is/was having written a letter'

(47) **ez a levél megírt*
this the letter write-T
'this letter is written'

(48) *ez a könyv megdöbbentő*
this the book shocking
'this book is shocking'

This also differentiates between adjectival and adverbial participles, too, as adverbial participles (the adverbial modifier of state) are possible in predicative function:

(49) *ez a levél meg van/volt írva*
this the letter VM is/was write-T
'this letter is/was written'

– the adjectives do not retain the arguments of the base verb (though of course adverbial adjuncts can occur with them, such as mindig 'always', nagyon 'very', etc.):

(50) **ez a könyv Pétert megdöbbentő*
this the book Peter-acc shock-O
'this book is shocking Peter'

– only adjectives can be subject to further adverbial derivation:

(51) *megdöbbentően szép*
shock-O-adv nice
'shockingly nice'

– only the participles admit adverbs of manner relating to the occurrence of the event, which are allowed with the base verb, such as lassan 'slowly', gyorsan 'quickly', etc.:

(52) **a lassan kopott kabát*
the slowly worn-out coat

– only the adjectives can be turned into comparative or superlative:

(53) **az olvasóbb fiú / a megdöbbentőbb könyv*
the read-O-COMP boy / the shock-O-COMP book
'the more reading boy / the more shocking book'

– only the preverb of the participle can be detached:

(54) **el is vághatatlan lemez*
VM also uncuttable plate

É. Kiss argues that the same property distinguishes adverbial participles from adverbs, that is, it is a verbal property of adverbial participles that their preverb can be separated, and can even function as the verbal modifier of the main verb of the sentence.

Thus, from our point of view, the most important difference between adjectives and adjectival participles is that the adjectives obviously lose their "verbal nature", that is, they retain neither the argument structure, nor the "event" semantic argument (insofar as they do not admit adverbs modifying the flow of the event). On the other hand, they can function as part of the predicate, the same way as the adverbial participles involving a subject argument.

2.3.2.2 Adjectival participles and lexicalized forms

Lexicalized attributive constructions can be found which contradict the rules listed above (for example: of what verbs can be formed adjectival participles, and which of their arguments can be expressed by the modified NP). Examples for such constructions are:
bontott tégla, 'split brick' (brick from a demolished building, to be recycled), *vágott virág*, 'cut flower', *sült hús*, 'fried meat', *darált dió*, 'ground walnut', *ásott kút*, 'sunk well', etc.

These differ from both adjectives and adjectival participles in the special meaning of the construction and, related to this property, no other modifier can intervene between the attribute and the head:

(55) * *a sült forró hús*
the fried hot meat

The suffix *-ó/ő* is very productive in deriving compound lexemes but, in such cases, the relation between the verb/participle and the head noun is difficult to determine grammatically; for example: *másolópapír*, 'copying paper', *olvasólámpa*, 'reading lamp', *hálószoba*, 'sleeping room', *fürdősó*, 'bathing salt', etc.

2.3.2.3 Adjectival participles and nouns. The argument structure of deverbal nouns.

2.3.2.3.1 Adjectival participles and Ó-nouns

It is important to distinguish between adjectives ending in *-ó/ő*, and nouns derived with a homophonic suffix because, at first sight, they might seem to fit into similar structures. The reason for this phenomenon is that attributive elements can be used with elided head nouns as well. Examples based on Laczkó:

(56) *Én nem szeretem a könyvet ritkán olvasókat / a nagyon kékeket /*
I not like-1sg the book-acc seldom read-O-pl-acc / the very blue-pl-acc /

az első kettőt.
the first two-acc
'I don't like those seldom reading books / those (that are) very blue / the first two.'

What accurately distinguishes nouns and adjectival participles is exactly the argument structure retained intact by the adjectival participles:

(57) *a Hírharsonát rendszeresen olvasók / a Hírharsona rendszeres olvasói*
the news-trumpet-acc regularly read-O-pl / the news-trumpet regular read-O-poss-pl
'those regularly reading the News Trumpet / the regular readers of the News Trumpet'

In the first NP no noun head can be found, just an adjectival participial phrase retaining its arguments and adjuncts with cases characteristic of verbs. In the second NP the argument structure is retained, but it is expressed in a way typical of nouns: the nominal predicate can take the original object argument as a possessor, while the original adverbial can appear by the noun as an attributive.

As far as the Ó-nouns are concerned, it can be concluded (following Laczkó Tibor), that the NP containing the Ó-noun always represents the agent (or sometimes the experiencer, or with certain transitive verbs the instrument) argument of the verb that is the input of the derivation. Two types can be distinguished here:

1. When the NP denotes an occupation, or refers to a generalized action. In this case it loses its argument structure, and the possible object argument can appear as the first member of the compound (e.g. *kazánfűtő* 'furnace heater'). In this group, in addition to the thematic roles mentioned, nouns expressing instrument, location, or maybe the event itself can occur next to the original verb.

2. The NP can denote the actors of certain actions: in these cases the whole argument structure is retained.

– subject: the whole NP
– object: Obligatory if the verb is transitive, and in this case the possessor function is assigned to it (**kiagyaló*: *think-up-O 'inventor' / *az ördögi terv kiagyalója*: the diabolical plan think-up-O-poss 'the inventor of the diabolical plan')
– the oblique arguments must be specified as attributives (unless they can be inferred from the context), but the '*való*' construction used with *-ás/és* suffixed (gerundive) nouns is not available here (*az elnök palota előtti randalírozók*: the presidential palace in-front-ADJ riot-O-pl 'those rioting in front of the presidential palace')
– the adverbial adjuncts can be dropped, of course

The significant difference between the two types is that the second type can be assumed to have retained the "event" semantic argument typical of verbs. An evidence supporting this statement is that it may have temporal and locative adjuncts, while nouns of the first type exclude these.

Thus, in the second type the whole argument structure is retained, apart from the fact that certain arguments may be expressed by the whole NP itself, so these cannot be represented separately in the structure. These are the agent, the experiencer, or the instrument. It can be concluded that these are external arguments, which can be interpreted either by stating that these are generated outside the VP, or in its specifier position (as in GB theory), or by assuming a particular [–o] feature for them, which prohibits object function (as in LFG)., Whenever an Ó-noun can denote both agent and instrument in a given context then two argument structures have to be posited for the original verb as well: one where the thematic role of the subject is the agent, and another, where it is the instrument – since it is the external argument that has to be interpreted as subject. These observations are in full compliance with what may be assumed about the argument structure of the base verb.

Comparing the second group of Ó-nouns with the adjectival participles, we find that

– they show many similarities to the adjectival participles ending in *-ó/ő*. They are alike, on the one hand, in retaining the argument structure (its realization is different, but this is due to the nominal/verbal features), and, on the other hand, in the choice of the argument which the whole NP can, and obligatorily does, express: namely, the external argument, which may be an agent, experiencer, or instrument.

– the adjectival participles ending in *-t/tt* are typical examples of lacking an external argument, in concordance with the [–o]-featured quality as defined in this section. Therefore they are not comparable to Ó-nouns.

3. The explication of the problem

3.1.Summarizing previous statements:

1. The participles and infinitives, as far as their internal structure is concerned, are uniformly verb phrases, retaining the whole argument structure

2. This is why they differ from lexicalized adjectives, nouns, adverbs; however, they are also similar in some respects to those phrases which can assume the same syntactic functions. For example, an adjective with a required complement does not necessarily differ from an adjectival participle taking internal arguments as for their internal operator fields; but here the properties relating to the way of identification of the external argument are focussed on.

3. The participles and infinitives cannot realize their external (or externalized) arguments overtly, because of their non-finite, untensed nature. Therefore this argument position is assumed to be filled with a non-overt pronoun: PRO, which can be controlled by some argument of the matrix verb, or it can have a general interpretation.
The phrases appearing as adjuncts in the sentence, or the NPs within such phrases may not act as controllers for these PROs:

(60) *Mari$_i$ [$_{VP}$ sírva PRO$_{ij}$ [$_{VP}$ rajzolta le Pétert$_j$]].*
Mary cry-VA drew-obj.conj-3sg down Peter-acc
'Mary drew a picture of Peter crying'

(61) *Mari$_i$ [$_{VP}$ sírva PRO$_i$ [$_{VP}$ rajzolt Péter$_j$ mellett]].*
Mary cry-VA drew-subj. conj-3sg Peter beside
'Mary was drawing pictures sitting near Peter crying'

At the same time, 'by'-phrases are exceptions to this rule:

(62) *[A [$_{PP}$ Péter$_i$ által] [$_{VP}$ sírva PRO$_{ij}$ [$_{VP}$ meg pofozott PRO$_j$] Mari$_j$]]...*
the Peter by cry-VA VM- slap-T Mary
'Mary, slapped in the face by Peter crying'

4. Infinitives and adverbial participles differ from adjectival participles in their sentential function, and in the realization of their external arguments:

– whereas the infinitives and the adverbial participles can function in the sentence as arguments or optional adjuncts, and their external argument is referentially identical to one of the arguments of the matrix verb,

– the adjectival participles have an attributive function in the sentence, and their external argument is represented by the NP to which they attach as attributives.

5. In this latter respect, adjectival participles are similar to Ó-nouns

Function of participial or infinitival structure	Usual type	External argument
argument	infinitive	1.External case: the subjective argument may appear in the infinitival structure 2. Other cases: the subject of the matrix verb can be referentially identical with the subject of the infinitival structure (usual control relation)
adjunct	adverbial participle	some arguments (agentive or patient) of the superordinate predicate
attribute	adjectival participle	the NP adjectivally modified by these

Table 1.

3.2. Data

The argument structure and thematic relations of the following sentences will be examined, and in particular, the difficulties encountered in the exploration of these structures will be described:

(63) *[[$_{DP}$ A [$_{VP}$ lányt$_j$ [$_{VP}$ berúgva PRO$_{ij}$] haza kísérő PRO$_i$] fiút]$_i$ [$_{VP}$ nem hatották meg*
the girl-acc get drunk-VA home-accompany-O boy-acc not moved-3pl VM

a lány anyjának szemrehányó szavai]].
the girl mother-poss-dat reproaching words
'the boy seeing the girl home drunk was not moved by the reproachful words of the girl's mother'

meghat 'move' <NP, stimulus: *'a szavak'*; NP, experiencer: *'a fiú'* >
hazakisér 'see home' <NP, agent: *'a fiú'*; NP, theme: *'a lány'* >
berúg 'get drunk' <NP, patient: *'a lány'/'a fiú'*>

Similar examples:

(64) $[_{DP}$ *az* $[_{IP}[_{VP}$ *inni* PRO_i *] akaró* PRO_i *] fiú]*$_i$
the drink-INF want-O boy
'the boy wanting to drink'

(65) $[_{DP}$ *a* $[_{IP}$ $[_{pred}$ *szénné* PRO_i *] égetett* PRO_i *] hús]*$_i$
the coal-into burn-T meat
'the meat burned to charcoal'

(66) $[_{DP}$ *a* $[_{IP}$ *[békává* PRO_i *] változó* PRO_i *] királyfi]*$_i$
the frog-into change-O prince
'the prince turning into a frog'

(67) $[_{DP}$ *a* $[_{IP}$ *[ketté* PRO_i *] vágott* PRO_i *] kenyér]*$_i$
the two-into cut-T bread
'the loaf cut into two'

and:

(68) $[_{DP}$ *a* $[_{VP}$*[kenyeret*$_j$ *[ketté* PRO_j*]] vágó* PRO_i *] fiú]*$_i$
the bread-acc two-into cut-O boy
'the boy cutting the loaf into two'

(69) $[_{DP}$ *a* $[_{IP}$ $[_{PP}$ *Mari*$_i$ *által] [*$_{IP}$ *sírva* PRO_i *] meg írt* PRO_j *] levél]*$_j$
the Mary by cry-VA PREV-write-T letter
'the letter written by Mary crying'

(70) $[_{DP}$ *a* $[_{IP}$ $[_{PP}$ *Péter*$_i$ *által] [*$_{VP}$ *sírva* $PRO_{i/j}$ *] megpofozott* PRO_j*] Mari]*$_j$
the Peter by cry-VA slap-T Mary
'Mary, slapped in the face by Peter crying'

(71) $[_{DP}$ *a* $[_{VP}$ $[_{PP}$ *Mari*$_i$ *által] [*$_{VP}$ *a folyós tollal küzdve* PRO_i *] megírt* PRO_j *] levél]*$_j$
the Mary by the leaking pen-with struggle-VA write-T letter
'the letter written by Mary struggling with a leaking pen'

(72) $[_{DP}$ *a* $[_{IP}$ $[_{PP}$ *Péter*$_i$ *által] [könnyek közt* PRO_i *] megírt* PRO_j *] levél]*$_j$
the Peter by tears among write-T letter
'the letter written by Peter in tears'

(73) *$[_{DP}$ *a* $[_{IP}$ $[_{PP}$ *Péter*$_i$ *által] [*$_{VP}$ *a* $[_{DP}$ *pro*$_i$ *könnyeivel] küzdve* PRO_i *] megírt* PRO_j *] levél]*$_j$
the Peter by the tears-poss-with struggle-VA VM write-T letter
'the letter written by Peter fighting his tears'

(74) $[_{DP}$ *a* $[_{IP}$ $[_{VP}$ $[_{DP}$ *pro*$_i$ *könnyeivel] küzdve* PRO_i *] sétáló* PRO_i *] asszony]*$_i$
the tears-poss-with struggle-VA walk-O woman
'the woman walking fighting her tears'

(75) $[_{DP}$ *a* $[_{IP}$ $[_{PP}$ *Péter*$_i$ *által] [*$_{VP}$ *hadarva* PRO_i *] elmondott* PRO_j *] vers]*$_j$
the Peter by jabber-VA recite-T poem
'the poem recited by Peter jabbering'

(76) $[_{DP}$ *az* $[_{IP}$ $[_{PP}$ *orvos*$_i$ *által] [*$_{VP}$ *levetkőzve* $PRO_{i/j}$ *] megvizsgált* PRO_j *] beteg]*$_j$
the doctor by undress-VA examine-T patient
'the patient examined by the doctor undressed'

3.3 Attempted analyses, explanations.The possibility of structural identification

3.3.1 É. Kiss (1998)

É. Kiss claims, with respect to the argument structure of *-t/tt* participles that if the suffix attaches to an "active" stem, PRO fills the subject argument of the base verb in the argument grid of the participle, and when the suffix attaches to a "passive" stem, PRO fills the object argument. Her examples:

(77) *az [$_{VP}$ elpusztult PRO] város*
the perish-T city
'the perished city'
(78) *az [$_{VP}$ elpusztított PRO] város*
the destroy-T city
'the destroyed city'

Assuming that the argument structure of the *-ó/ő* participles is parallel with the previous cases:
(79) *a [$_{VP}$ várost elpusztító PRO] hadsereg*
the city-acc destroy-O army
'the army destroying the city'

Here, however, two questions arise immediately:

1. How are the categorially (at most) NP '*város*' and the VP, or the PRO argument of the VP, related?

2. What controls PRO in the sentence, the reference of which is known to be identical with that of the whole DP? If the whole DP is taken as the controller of PRO then the i-within-i filter is violated. If N' or N'' is regarded as the controller then items with different reference would be coindexed. Without control relations, on the other hand, how could we capture the fact so obvious for semantics: that the DP *'a ... város'* is identical with the item to which the thematic role is assigned by the verb '*elpusztít*'?

3.3.2 Alberti and Medve (1999)

There is another way of analysis (Alberti–Medve 1999) in which the adjectival participles lose their external arguments, so they do not appear as PROs in their argument structures. This is, in some sense, similar to É. Kiss's VP-conflation, where sometimes a PRO-filled argument is mysteriously lost. In another respect, it is similar to the analysis of the argument structure of Ó-nouns, where it is the NP itself that expresses in some (not yet defined) way the external argument of the noun retaining the verbal argument structure. In the absence of PRO, the syntactic relation expressed by the attributive-head relation reveals who gets the missing thematic role.

This solution, however, fails to account for the sentence in (63), where the thematic role of the subject of the VP '*berúg*' 'gets drunk' has to be assigned but this is neither in the required attributive-head relation with anything, nor can it be claimed that adverbial participles would lose one of their arguments as exactly the opposite solution have been supported in other constructions:

(80)=(14) *Péter$_i$ [$_{FP/AP}$ berúgva PRO$_{i/j}$] [$_{VP}$ kísérte haza Mari$_j$].*
Peter get drunk-VA accompanied home Mary
'Peter saw Mary home drunk'

In this case it must be assumed that adverbial participles sometimes lose their external argument (when they attach to an adjectival participle phrase), and sometimes not (when they are manner adverbials in a finite VP).

But the loss of the external argument of the adverbial participles occurring inside adjectival participle constructions yields no solution for the examples (69) through (76), where in some sentences, as indicated, the subject of *sírva* 'crying', *hadarva* 'jabbering' is clearly the same '*Mari*' and '*Peter*' that appears in the 'by'-phrase complementing the adjectival participle interpreted as passive.

The treatment of infinitives or predicative complements (be them arguments or adjuncts) which can appear in a position within adjectival participle constructions similar to that of adverbial participles and expect their argument positions to be filled in the same way is also problematic: see (64) through (68).

This question can be answered by stating that every kind of participle, not only the adjectival participle, loses its external argument expressed by PRO when used in attributive relations. In such cases the argument-identifying method (the head of modification) is "inherited" to the external argument of the adverbial participles functioning as arguments, while the identification of the external argument of adjunctive adverbial participles is undetermined in syntax, as is the case with adjunctive predicative complements. However, if the

loss of PROs is assumed then some principles inherent in the framework used so far are contradicted, e.g. the theta-criterion, or structure preservation.

3.3.3.Kenesei (1999)

Kenesei claims that every participle or infinitive forms a clause together with its arguments and adjuncts from which the explicit subject or object arguments of the verb are missing. However, these arguments assuming the thematic role are missing only from the surface structure; actually the participle or infinitive will be represented in the main clause together with its entire argument structure. A reason for this statement is deduced from the binding principle by Kenesei: the participial or infinitival phrase must be considered a separate clause so that the identification of the antecedents: *'hozzájuk/egymáshoz'* – to them/to one another – pronoun/anaphor could be accounted for in sentence (81):

(81a)*A tanárok megbuktatták az egymáshoz át küldött diákokat.*
the teacher-Pl failed-3pl. the one another to over sent student-pl-acc
The teachers failed the students sent to one another.

(81b)*A tanárok megbuktatták a hozzájuk át küldött diákokat.*
the teacher-Pl failed-3pl. the them to over sent student-pl-acc
The teachers failed the students sent to them.

If (81b) is a clause itself then one cannot account for the fact that *'tanárok*/teachers' would be the antecedent of the pronoun *'hozzájuk*/them'. As a separate clause the participial and infinitival structures have their own subject (according to Kenesei: PRO) and in order to avoid the violation of 'i-within-i filter' the object argument is expressed by a relative pronominal operator (OP).
The problem, however, is sustained: how is permanent coreference expressed between e.g. the subject and the head noun in a participial structure with adjectival participles, or even between some of the arguments of adverbial participles in the domain of participial structures. If the relative pronominal operator mentioned above is indexed then the result is the same concerning the violation of the i-within-i filter – if not, then structural identification is incomplete. (In this case, however, the problem is treated within a more general framework as the same question arises with every relative clause.)

3.3.4 Solutions without PRO

Both participles and infinitives can be looked upon as clauses, however, participles are always untensed. If Baker's (1996) train of thoughts is followed – the Agr_S is parasitic on tense-markers and this is the node where the subject gets/checks its case – then it must be assumed that the participial or infinitival constructions may not have a subject, not even a PRO subject as this should be null case (Chomsky–Lasnik, 1993). Developing this idea, infinitives do have PRO subjects.This method, however, does not account for the identification of PRO in the infinitival structure in sentence (64), as in this sentence the infinitival phrase appears in an adjectival participial phrase.

According to Manzini–Roussou (1997) or Manzini– Savoia (1998) the example sentences could be analyzed without positing PRO-s. In such cases the lexical argument DP's (or the associated D clitics) attract aspectual roles, the ones from their own clause and the ones from the subordinated clauses. The core of the problem is the realization of this attraction under very different structural conditions: If the attractive relation is defined by c-command then different structures appear. E.g. an adverbial participial phrase appears in an adjectival participial structure as an adjunct while the infinitival phrase as a complement.

(82a).*A sírva olvasó fiú*
the cryVA readÓ boy
the boy reading crying
(82b).*A sírni akaró fiú*
the cry-INF wantÓ fiú
the boy wanting to cry

4. Proposed analysis

At present, there seem to be two possible solutions for the problem.

4.1 PROs everywhere

One is to hypothesize that every argument is represented in syntax, that is, we make use of a lot of PROs. This way the argument structure of common nouns must also be represented, which is, similarly, to be filled with a PRO without a case. In this case (83) contains PROs, too:

(83) *Az okos fiú*
the clever boy
(83)' $[_{DP}$ *Az* $[_{AP}$ *okos* PRO_i $]$ $[_{N^X}$ *fiú* $PRO_i]]$

The coindexation of the two arguments means that N^X and the AP are co-predicational (in Alberti's term), that is, they make statements about the same argument. This way we can avoid coindexing the full NP with the external argument of the adjectival participle, while all thematic roles can be assigned, and an identical structure can be attributed the different types of participles and infinitives.

We still owe a technical solution for the analysis of (82),where it is obviously not the case that something is both long and a record.

(84) *a hosszú hanglemez*
the long record

But the proper treatment of this can (possibly) be left to semantics, assuming an intelligent semantic module, capable of finding alternative interpretations, beside the default ones, for computing the meanings of different predicates. (Alberti: Lifelong DRSs)

An even more complicated question arises, namely, that the adjectival participles and adjectives which, according to this view, can be characterized by the same structure do not seem to act identically within the sentence. What is the reason for the fact that adjectival participles can have only attributive but not predicative function in contrast with adjectives?

Another solution is to absolutely exclude filling arguments with PROs, and look for other ways to identify the external argument, modifying the role of syntax in our model.

4.2 PROs nowhere

É. Kiss proposes that in (85), the objective conjugation on the matrix verb should be explained by claiming that the domain for verb-object agreement is the clause; if the verb which can be objectively inflected finds an object in this domain, they will enter into an agreement relation.

(85)=(1) *Péter meg szeretné hívni Marit vacsorára.*
Peter VM would-like invite-INF Mary-acc dinner-on
'Peter would like to invite Mary for dinner.'

Following this idea, it can be proposed that the participles/infinitives look for their external arguments within the clause, or in some other unit to be determined later, and find it/them in that NP/those NPs which correspond to the semantic features required by the head, and to which its thematic roles to be assigned can actually be assigned.

The following assumptions seem to be inevitable – for the time being these might be the hypotheses for further exploration:

– the participles/infinitives do not look for their external arguments in the structurally defined subject position, as usual in GB theory, but within a given domain (to be defined later), which may vary depending on the actual participles/infinitives

– accepting the theta-criterion formulated in É. Kiss and Szabolcsi (1992), the following statement results: since each of these participles and infinitives imports a new proposition into the sentence – always in reference to a participant of the original proposition –, the requirement that their thematic role be assigned to a participant without having one should be disregarded, at least in external thematic roles. This way the introduction of PROs to the external argument slots can be avoided, both in syntax, and in the lexicon.

Consequences of the above stated for various types of participles/infinitives:

1. For infinitives: the procedure works well, which is no surprise, considering the fact that É. Kiss's VP-conflation also worked here. It shows that there cannot be two functionally confusable arguments in the argument structures of the two VPs.

2. For adverbial participles we must distinguish participles derived from active and passive verb forms. In these two cases the external argument is different, so the procedure is applicable. At the same time, our method correctly predicts ambiguous structures.

But other aspects should also be taken into consideration in identifying the arguments, as is obvious from the examples (13)–(32).

These sentences display the adverbial participle in identical positions, under identical structural conditions. Yet, the arguments cannot be identified unambiguously. (A question mark indicates the sentences where the informants were split.)

As the question marks suggest, here the identificational possibilities depend on the language use of the speakers, and (presumably) on various pragmatic reasons, too. It is obvious that the possibility of identification is underspecified in syntax (in corcondance with previous statements), and it is left to semantics basically. The compatibility condition of thematic roles may provide some clues: as one NP gets several thematic roles, these have to be mutually compatible, which may mean the concordance of the theta-assignability conditions, or more: composable thematic roles.
In a more formal approach: Alberti defines the partial structures of argument structure variables. Within these structures he differentiates between agentive, patient, etc. poles. (Alberti 1997) Considering these sets differentiated, a more exact definition can be given about the possible domain of NPs for VPs, when assigning external thematic roles.

3. The adjectival participles and their predicative arguments:

A syntactic explanation cannot be given here to determine the external arguments of adjectival participles either – a procedure based on a stricter structural principle should be outlined, as the identification of these arguments is stricter than the identification of the arguments of the adverbial participles behaving as adjuncts.

The adjectival participle, as any other participles/infinitives, searches through a given domain for an appropriate nominal phrase. This domain is the nominal phrase of the head, the whole DP which includes the 'big' DP itself.
Naturally, the NPs appearing in 'by'-phrases (adjectival participles derived from a passive stem) are out of the question as opposed to other NPs similarly represented in PP structures. For further reference see Alberti's agentive/patient pole.

The adverbial participles occurring within adjectival participial phrases generally behave as is expected for adverbial participles and search for an external argument within the determined domain (the 'big' DP) in the way described above.

The analysis of the following sentence seems to support this second type of solution:

(86) *Péter undorodva ette meg a gilisztát.*
Peter be disgusted-VA ate PREV the earthworm-acc
'Peter ate the earthworm with disgust'(Alberti's example)

eszik 'eat' <NP, agent: '*Péter*'; NP, patient, *'a giliszta'*>
undorodik 'be disgusted' <NP, experiencer: '*Péter*'; NP, stimulus, *'a giliszta'*>

The *giliszta* 'earthworm' is the internal argument of the verb *undorodik* 'be disgusted', and as such, is not usually filled by PRO in the argument structure (government relations, etc.), or else our conditions on PRO should be substantially revised. It is clear, however, that the internal argument of *undorodik* 'be disgusted' is identical with the object of the main verb. Another piece of evidence for this solution is that the PP '*undorodva*', 'being disgusted' seem to search for the arguments that have been the obligatory arguments of the verb '*undorodik*' , 'be disgusted' (87a,e) – in contrast with the NP *'undorral'*, 'with disgust', which does not require a similar framework of arguments; and, at the same time it does not 'want' to assign the same thematic role to two arguments simultaneously.(87b):

(87a) *Péter a nyálkától undorodva ette meg a gilisztát.*
Péter the slime-from disgustVA ate up the earthworm-acc.
Peter has eaten the earthworm with disgust at the slime.
*(87b) *A nyálkától Péter undorodva ette meg a gilisztát.*
the slime-from Peter disgustVA ate up the earthworm-acc.
Peter has eaten the earthworm with disgust, beacause of the slime.
(87c) *Péter eszik.*
Péter eat-sing3
Péter is eating.
(87d) *Péter undorral eszik.*
Peter disgust-with eat-sing3.
Peter is eating with disgust.
*(87e) *Péter undorodva eszik.*
Peter disgustVA eat-sing3.
Peter is eating with disgust.

Although the current discussion is not about the identification of internal arguments, the analytic-identificational procedure can presumably be extended to them in the case of some participles/infinitives, conflating the search for different arguments into a single procedure.

4.3. Conclusion

It should be noted that the two solutions are fundamentally identical:
1. Account for the full argument structure (under the second solution this can sufficiently be done in the lexicon, under the first one it must be done in syntax, too)
2. Identify these arguments by structural (morphological and syntactic) means in the first step.
3. Treat the underspecified variants in semantics.

Thus – basically – there are merely subtle technical differences between the two solutions. However, it is different from the GB framework which has been the starting point, as it has either too few or too many arguments represented, which prevents handling theta-assignment and argument retrieval uniformly.

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