A Correspondence Theory of Morpheme Order*,†

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1 Introduction

The aim of this paper is to explain how the grammar distinguishes prefixes from suffixes. More generally, a theory that accounts for the variation in direction of attachment in both affixes and bound roots is presented, set within Optimality Theory. The core of the proposal is that direction of attachment is a property of morphemes; specifically, direction of attachment is indicated in the phonological string of a morpheme by an **empty position**. More formally, I propose that phonological strings can be **partial functions** from positions to phonological features; 'empty positions' are just those positions which do not map onto phonological features.

       The formalism behind this proposal is presented in section 2. The empirical implications of this approach are examined in section 3. Two phenomena are shown to follow straightforwardly from the present approach: (1) the implicational relationship between prefixes and suffixes (if a language has prefixes it also has suffixes, but not vice-versa – Hawkins & Gilligan 1988), and (2) the Affix Ordering generalization (that class I affixes must appear closer to the root than class II affixes – Siegel 1974). The typology of morpheme types produced by this theory is also discussed.

2 The Theory

A string is a sequence of positions, and each of these positions maps onto features. For example, the string [tai] 'tie' has three positions – symbolized here as 1, 2, and 3 – and these map onto [t], [a], and [i], respectively. This is shown graphically below:

(1)   Features: t a i
                            | | |
           Positions: 1 2 3

This much is uncontroversial.

More precisely, a string is a function that maps the members of a set of totally ordered discrete elements to formatives (see Partee, ter Meulen, and Wall 1987:432 for discussion).

       'Positions' are an essential part of the definition. Strings cannot merely be specified as a set of formatives with precedence relations between them (e.g. [tai] is not just {t<a, a<i, k<i}) as this fails to distinguish different tokens of the same formative. This conception is fatal when strings such as [kik] and [kiki] need to be distinguished. The first would consist of the formatives {k, i} (note that the set {k,i,k} is logically equivalent to {k,i}), with the precedence

relations {k<i, i<k}. The second also consists of the formatives {k,i}, and has the same precedence relations {k<i, i<k} (note that the set {k<i, i<k, k<i} is logically equivalent to {k<i, i<k}). So, [kik] and [kiki] are indistinguishable under the 'formative-only' proposal (as are [kikik], [kikiki], etc.).

With positions, [kik] and [kiki] can be distinguished: [kik] contains the positions {1,2,3}, with precedence relations {1<2,2<3} and mappings {1Sk, 2Si, 3Sk} (where 'S' is the relation between positions and formatives). In comparison, [kiki] has four ordered positions with the mappings {1Sk, 2Si, 3Sk, 4Si}.

In short, nothing new has been added to the definition of 'string' here. The definition given is merely a more precise formalization of what has always been assumed in phonological theory.

Up to the present day, it has been assumed that phonological strings are total functions; in other words, every position maps onto a (set of) feature(s). I propose that this assumption is incorrect: **strings can be partial functions**. In other words, there can be 'empty' positions – positions which do not map onto phonological features. The one restriction on the placement of empty positions is that they must be peripheral in an input string (see section 3.3 for discussion).

An example of a partial-function string is represented graphically below.

(2)   Features: Λ n
                                     | |
            Positions: 1 2 3

A more compact way of representing this string is /Λn◌/, where Λ stands for a position that maps onto the formative [Λ], and similarly for n. ◌ represents a position that does not map onto any formative.

There are constraints that refer to positions and the relations that hold between them – the correspondence constraints of McCarthy & Prince (1995). The ones that are relevant to the present discussion are listed below:[1]

(3)   MAX   "Every position in the input corresponds to some position in the output."
          LINEARITY   "Preserve input precedence relations in the output."
          CONTIG   "Preserve input adjacency relations in the output."
          UNIFORMITY   "No output position corresponds to more than one input position."

Coupled with the correspondence constraints, empty positions determine the direction of affixation of a string. In the usual case, an empty position at the right of a string indicates that it must attach to the left edge of another morpheme, and vice-versa for a left-edge empty position (see sections 3.1-2 for exceptions): the only way to preserve all the underlying positions in a string such as /Λn◌/ is for the empty position to **coalesce** with another morpheme's position, so effecting left-attachment.

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[1] The definitions given below differ from McCarthy & Prince's (1995) originals in that they refer to positions. Formally speaking, though, these versions are identical to the original ones. CONTIG here is McCarthy & Prince's O-CONTIG.

The prefix *un* /ʌnǪ/ and root *do* /du/ will serve as an example. The phonological strings of morphemes are assumed to be unordered with respect to each other in the input (obviously, otherwise the empty slot proposal is redundant) and GEN freely generates different concatenations of these strings.[2] The candidates that are of present interest are shown below. Each is presented as an input-output pairing with lines indicating correspondence relations:

(4)

(a) /ʌ n Ǫ/, /d u/	(b) /ʌ n Ǫ/, /d u/	(c) /ʌ n Ǫ/, /d u/	(d) /ʌ n Ǫ/, /d u/
[ʌ n d u]	[d u ʌ n]	[d ʌ n u]	[d u ʌ n]
UNIFORMITY violation	LINEARITY violation UNIFORMITY violation	CONTIG violation UNIFORMITY violation	MAX violation

Candidates with empty slots such as [ʌnǪdu] are excluded; I assume that an output empty position is uninterpretable since it is a timing unit without any phonetic content.

The diagrams above show that some candidates will never emerge as the most harmonic form under any ranking (in terms of the constraints given above – see section 3.2). This is the case for candidates (b) and (c). Both candidates violate UNIFORMITY since they contain an output position with more than one input correspondent (i.e. [u]). In addition, (b) violates LINEARITY since /Ǫ/ follows /n/ in the input, but the order of their correspondents is reversed in the output, and (c) violates CONTIG because /d/ and /u/ are adjacent in the input, but this is not the case for their output correspondents. What makes these violations perennially fatal for (b) and (c) is that there is another candidate that incurs a subset of their violations: (a). Since (a) incurs a proper subset of (c) and (d)'s violations (because it only violates UNIFORMITY), there is no ranking which would allow (b) and (c) to emerge as more harmonic than (a).

This leaves candidates (a) and (d); since these incur complementary violations, either may emerge as the most harmonic form, depending on the ranking. When MAX outranks UNIFORMITY, candidate (a) will be the most harmonic. This is the usual ranking in languages with concatenative morphology. As shown in (a) above, an underlying form with a right-peripheral empty position has to attach to the left edge of another morpheme; conversely, an underlying form with a left-peripheral empty position must attach to the right edge of another morpheme. In this way, underlying empty positions determine direction of attachment.

When UNIFORMITY outranks MAX, a form without coalescence such as (d) wins. Under this ranking, empty positions do not have any affect on direction of attachment. In fact, in terms of correspondence constraints, both the prefixed form [ʌndu] and the suffixed [duʌn] incur identical violations: both violate MAX since the input empty position has no output correspondent, and no other correspondence constraints are violated. So, direction of attachment must be determined by other factors – i.e. markedness constraints. For a case where markedness constraints determine direction of attachment, see section 3.3 (also see Urbanczyk 1996:66ff).

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[2] The **adjacency** relations between phonological strings are determined by morphological constituency. For example, a word with three morphemes M_1, M_2, and M_3 with morphological constituency $[M_1[M_2M_3]]$ is restricted in terms of its possible orderings: morphemes in the same constituent must be adjacent (i.e. $[M_2M_1M_3]$ is not a possible output ordering). The relation between constituency and adjacency is violable: see §3.1 and McCarthy & Prince (1995:§3.8).

Since this paper is about the influence of empty slots on direction of attachment, cases where the ranking ‖MAX » UNIFORMITY‖ holds will be discussed in the remainder of this paper.

This account shows that direction of attachment is a property of individual morphemes, not of constraints. Certainly, constraints do determine which candidate is chosen, but they are not morpheme-specific: they are highly general, not referring to morphemes at all.

3 Empirical Results

The aim of this section is to explore some of the empirical implications of the partial function proposal. Two ordering phenomena will be shown to follow straightforwardly from the present proposal. The Affix Ordering Generalization (that class I affixes must appear closer to the root than class II affixes – Siegel 1974) is discussed in section 3.1, and the prefix-suffix asymmetry (if a language has prefixes, it also has suffixes, but not vice-versa – Hawkins & Gilligan 1988) is examined in section 3.2. More general predictions of the partial function theory are examined in section 3.3.

3.1 The Affix Ordering Generalization

The Affix Ordering Generalization is a descriptive statement about the ordering of classes of affixes (Siegel 1974): class I affixes must appear closer to the root than class II affixes.[3] This is why, for example, *non-il-legible* is possible, but *in-non-legible is not. In both cases, *in/il* and *non* satisfy their subcategorisation requirements. The only difference is that the first has the ordering [Affix II + Affix I + Root] while the second is [Affix I + Affix II + Root].[4]

Benua (1997b) has argued that there are separate sets of correspondence constraints for each affix class. Importantly, correspondence constraints that refer to class II affixes always dominate those that refer to class I constraints (see Benua 1997a,b for details). This proposal can be extended to the constraint MORPHDIS, which militates against inter-morphemic coalescence (McCarthy & Prince 1995):[5]

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[3] There are actually two aspects to the AOG: (1) it bans [Affix I + Affix II + Root] and [Root + Affix II + Affix I] orderings – this aspect is the focus of this section, and (2) it bans [Affix I + [Root + Affix II]] and [[Affix II + Root] + Affix I] structures. This latter aspect will not be discussed here. For discussion about the validity of the Affix Ordering generalization (including discussion of 'ordering paradoxes' – where class II affixes appear closer to the root than class I affixes), see Sproat (1985) and Fabb (1988).

[4] Of course, the AOG is not the only restriction on ordering: subcategorisation restrictions also prevent certain types of order (e.g. *brother-ish-hood). Subcategorisation restrictions seem to be inviolable, whereas the AOG does seem to be compromised in some cases (see e.g. Fabb 1988). I do not claim that the present approach can account for all ordering restrictions – it simply accounts for cases of ordering where the AOG is crucial.

[5] UNIFORMITY also militates against coalescence. However, UNIFORMITY cannot be used here since in Benua's (1997a) theory correspondence constraints that refer to morpheme class do not simply hold over the relevant affix, but over the entire form that the affix c-commands. Reference to the classhood of specific affixes within a form is crucial to the present account.

(5) MORPHDIS-I "If an output segment *x* belongs to a class I affix, then *x* does not belong to any other class of morpheme (i.e. root, class II affix)."

MORPHDIS-II "If an output segment *x* belongs to a class II affix, then *x* does not belong to any other class of morpheme (i.e. root, class I affix)."

These constraints ban the coalescence of positions that belong to two different morpheme classes (see fn.8 for the reasons for this formulation). As with other class-specific constraints, MORPHDIS-II always outranks MORPHDIS-I.

Consider the two relevant output candidates generated from the input *legible*, *non*, and *in* {/lɛdʒəbl/, /nɒnɒ/, /ɪnɒ/}. For the sake of clarity, only correspondence relations relevant to MORPHDIS violations are shown below and the alternation between *in* and *il* is ignored:

(6) (a) /nɒnɒ/, /ɪnɒ/, /lɛdʒəbl/   (b) /ɪnɒ/, /nɒnɒ/, /lɛdʒəbl/

nɒnɪnlɛdʒəbl   ɪnɒnlɛdʒəbl

In candidate (a) – the AOG-obeying form – MORPHDIS-I is violated twice: the output position [ɪ] belongs both to a class I affix (*in-*) and to a non-class I morpheme (*non-*), as does [l].[6] UNIFORMITY-II is violated only once: [ɪ] belongs to both a class II affix and to another morpheme type.

The AOG-violating candidate (b) fares poorly in comparison: it violates the high-ranked MORPHDIS-II twice since there are two output positions which belong to a class II affix and also belong to other morpheme types (i.e. the two [n]'s in [nɒn]). So, candidate (a) is more harmonic than (b).

More generally, this shows that candidates with class II affixes closer to the root than class I affixes will incur more violations of MORPHDIS-II than other candidates.[7] Due to the fact that MORPHDIS-II outranks MORPHDIS-I, this result is true in every possible grammar: candidates with class I affixes closer to the root than class II affixes will **always** win. Hence, the Affix Ordering Generalization is reduced to an epiphenomenon of constraint ranking.[8]

3.2 The Prefix-Suffix Asymmetry

There is an implicational relationship between prefixes and suffixes: if a language has prefixes, it also has suffixes, but not vice-versa (Greenberg 1957, 1966, Hawkins & Gilligan 1988, Bybee,

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[6] By Consistency of Exponence (McCarthy & Prince 1993a), if output position *x* corresponds to input *y* and *y* is a member of morpheme M, then *x* is a member of morpheme M. Hence output ɪ in candidate (1) is a member of both a class I and a class II affix.

[7] The reason for the formulation of MORPHDIS-I/II given in (5) is found in longer forms. With three affixes – one class I and two class II – the most harmonic ordering is Root+I+II+II. This incurs one MORPHDIS-II violation (at the overlap of I and II). There is no violation at the overlap of II and II since MORPHDIS-II simply requires all morphemes associated with a position to be from the same class. Other candidates (e.g. Root+II+II+I, Root+II+I+II, Root+II+II+I) incur at least two MORPHDIS-II violations.

[8] MORPHDIS-II must outrank the constraints responsible for translating morphological constituency into adjacency. In cases where MORPHDIS-II and -I are equally violated by the constraints (e.g. in words with two affixes of the same class– e.g. anti-pro-democracy, pro-anti-democracy), morphological constituency decides the ordering.

Pagliuca, and Perkins 1990, Hall 1992).

This asymmetry can be explained straightforwardly in the present theory by using positional faithfulness constraints (Beckman 1998 and references cited therein). Positional faithfulness constraints are correspondence constraints that refer to specific positions, namely stressed syllables and the left edges of constituents. Crucially, correspondence constraints cannot refer to the right edges of constituents. This asymmetry in edge-reference explains why contrast is typically preserved at left edges, and never at the right edge. It also predicts the existence of the following constraint:

(7)   UNIFORMITY-L "A root-initial segment cannot have more than one input correspondent."[9]

UNIFORMITY-L militates against prefixes, but not suffixes. This is shown in the diagram below:

(8)   (a) <u>Prefix</u>: /t a Q/ *affix*, /p a k i/ *root*   (b) <u>Suffix</u>: /p a k i/ *root*, /Q t a/ *affix*

[t a p a k i]   [p a k i t a]

In the prefixal case, UNIFORMITY-L is violated since the root-initial output segment [p] corresponds to two input segments – /p/ and /Q/. This is not so for the suffixal case, though, since it is the root-**final** segment that has multiple input correspondents.

This asymmetry in constraint violation means that morphemes with final empty slots will not necessarily be realized as prefixes. With UNIFORMITY-L outranking LINEARITY or CONTIG, a candidate with a suffix will be the most harmonic:

(9)

	/taQ$_1$/ *affix*, /p$_2$aki$_3$/ *root*	UNIFORMITY-L	LINEARITY
	(a) tap$_{1,2}$aki	x!	
☞	(b) paki$_{1,3}$ta		x

Candidate (a) is the prefixed form, so fatally violates UNIFORMITY-1 since the root-initial segment [p] has two input correspondents (/p/ and /Q/). This means that the suffixed candidate (b) wins as it only violates the low-ranked LINEARITY (due to the fact that input /Q/ follows /a/ but the ordering of their output correspondents is reversed). So, if a language has the ranking ‖UNIFORMITY-L » ℂ‖, where ℂ is a relevant constraint (e.g. LINEARITY, CONTIG) no prefixes will be realized.

Significantly, the ranking given above does not force forms with underlying **initial** empty positions (e.g. /Qta/) to be realized as output **prefixes** since UNIFORMITY-L does not affect such morphemes, as shown in figure (8b). In fact, there is no ranking that bans morphemes with underlying initial empty positions from surfacing as suffixes.

In short, the prefix-suffix asymmetry results from the asymmetries inherent in positional faithfulness. Every non-isolating language has suffixes since there is no ranking that prohibits them. However, whether a language has prefixes or not depends on the ranking of UNIFORMITY-

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[9]   There are a number of other possible instantiations of this constraint in terms of prosodic constituents. Unfortunately, exploration of the empirical effects of these constraints is precluded due to space limitations here.

L.   With UNIFORMITY-L ranked above antagonistic constraints, the language will only have suffixes; with the opposite ranking, the language will allow prefixes as well as suffixes.

> As an aside, affixes without underlying empty slots seem to present a problem for the solution given to the prefix-suffix asymmetry given above. If an affix has no empty slots, it is up to other constraints (i.e. markedness constraints) to determine its order. These other constraints could cause the morpheme to end up as a prefix. So, it seems that in a suffixing-only language, affixes without any empty positions must be independently ruled out to guarantee a lack of prefixes.
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> However, there is a solution to this problem: sharing a position could be seen as a necessary condition on being part of the same word (or 'syntactic terminal element'). This condition explains why affixes without empty-slots cannot end up as prefixes: they simply cannot form part of a word. Affixes with empty slots may in fact be clitics – affix-like elements that do not cohere with stems as closely as prefixes and suffixes.
>
> This proposal also accounts for the difference between isolating languages (those that prohibit affixation) and concatenating languages (those which allow affixation). If UNIFORMITY outranks MAX, underlying empty positions are deleted. This means that output morphemes never share positions, so no two morphemes can ever form part of the same word. In effect, this prevents affixation – every morpheme must form its own word. With the opposite ranking, though, words with more than one morpheme are allowed since position-sharing is permitted.

3.3 Typology

As shown above, the empty position theory can distinguish between prefixes and suffixes. A number of other morpheme types are also predicted to exist.

For example, roots may also have empty slots. Such roots must attach to other phonological material. For example, the English root *quire* must have an element attached at its left edge (e.g. *inquire*, *require*, **quire*, **quirement*), and so must have a left-peripheral empty slot.   The root *loc* (e.g. *local*, *locate*) has a right-peripheral empty slot, and *agger* (e.g. *exaggerate*) has empty slots at both left and right edges. In short, empty positions distinguish between bound and free roots.

Apart from prefixes and suffixes, there are affixes with no empty slots – i.e. function words. Such forms are not required to cohere to a lexical word (and in some environments may form phonological constituents on their own), but they still have affixal properties (see Selkirk 1995). Affixes with empty slots at both left and right edges include 'interfixes' – morphemes that only appear when flanked by other morphemes (Allen 1976); these include English -o- (e.g. parallel-o-gram, politic-o-social). 'True' infixes – affixes that must appear inside a stem and not alternate between prefixed/suffixed and infixed positions – also have empty slots at both ends of their phonological string (although the conditions for their realization are obviously different from interfixes). For a discussion of true infixes, see Stemberger & Bernhardt (1999).

Another type of morpheme predicted is one whose direction of attachment changes depending on context. Such 'variable-direction' affixes are found in Afar (Fulmer 1997), Huave (Noyer 1993), and Alabama (Montler & Hardy 1991). The example below is the Afar third person feminine morpheme *t*:

(10)   (a) nak   -t -e   (b) t -okm-e
                     drink milk-3f-perf/pl/focus   3f-eat -perf
                     They drank milk   She drank milk.

In these cases, a markedness constraint (e.g. ONSET) compels unfaithfulness to the usual direction of attachment. For example, suppose that Afar *t* is underlyingly a suffix /Ɂt/. With ONSET outranking LINEARITY, it will appear as a prefix so as to form an onset:

(11)

	/okm/, /Ɂ$_1$t/, /Ɂe/	ONSET	LINEARITY
☞	to$_1$kme		x
	okm$_1$te	x!	

This theory covers almost all cases of direction of attachment in morphemes. There is a residue of cases, though, involving empty morphemes. In the present approach, direction of attachment is a property of the morpheme's phonological string. So, if a morpheme does not have any phonological material underlyingly, empty positions cannot be used to determine its direction of attachment. This means that reduplicants cannot be ordered, since they are underlyingly devoid of phonological material (see McCarthy & Prince 1995). The present approach predicts that however reduplicants are ordered, empty positions have nothing to do with it.

This is by no means an undesirable result. As shown in section 3.2, empty positions predict that suffixes are unmarked and prefixes marked. However, the opposite holds for reduplication: affix-sized reduplicative prefixes are common while reduplicative suffixes are very rare (Harvey 1997). The fact that the facts are reversed for reduplicants – that reduplicative **prefixes** are unmarked – suggests that reduplicants are ordered by an entirely different mechanism.

What is this mechanism? I suggest that it is the interaction of positional faithfulness constraints with constraints on Base-Reduplicant Contiguity. Two of the most relevant constraints are given below:

BR-MAX-σ$_1$ "Every segment in σ$_1$ of the Base must have a correspondent in the reduplicant."
BR-MAX-σ́   "Every segment in the stressed syllable of the Base must have a correspondent in the reduplicant."

Corresponding DEP-σ$_1$/σ́ constraints may also be relevant.

To satisfy BR-MAX-σ$_1$, for example, the best position for a reduplicant is to be a prefix. This way it not only satisfies BR-MAX-σ$_1$, but BR-CONTIGUITY – which requires the Reduplicant's segments and their correspondents to be contiguous – as well. For example, the input {RED, pataka} yields [pataka<u>ka</u>], [pataka<u>pa</u>], [<u>pa</u>pataka]. The first candidate violates BR-MAX-σ$_1$ since the first syllable of the Base is not copied, the second violates CONTIGUITY since the reduplicant string is not adjacent to its corresponding string. This leaves the final option, which satisfies both constraints.

To satisfy BR-MAX-σ́, the best position for a reduplicant is to be adjacent to the stressed syllable of its Base. This usually leads to infixing, but could also lead to suffixation just in case the stressed syllable was final. This explains the rarity of suffixing reduplication: only if stress is final and BR-MAX-σ́ is high-ranked will a reduplicant be a suffix; in all other cases, prefixal reduplicants are preferred.

At this point, a restriction on the placement of empty positions must be noted. With unrestricted placement of empty positions, a variety of undesirable morpheme types are predicted. For example, morphemes with more than one empty slot should be possible: e.g. /ta◻◻◻/. Such morphemes would have to attach to stems with at least as many segments as they had empty slots, thus predicting the existence of morphemes that are sensitive to the number of segments in a stem. Such morphemes do not exist. To remedy this problem, the partial function proposal must be restricted in some way. I propose that this is by the following principle: empty positions must be peripheral in the string. This proposal eliminates strings with more than one empty position peripherally, and it also prohibits strings with any number of internal empty positions (e.g. */t◻◻◻a/).

4 Alternatives

Theories of morpheme order differ over whether direction of attachment is a property of morphemes or of rules/constraints. The former view was assumed in theories such as Sproat's (1985) and Lieber's (1992); it is also the view adopted here. The latter view was proposed by Anderson (1992) and McCarthy & Prince (1993b).

McCarthy & Prince's (1993b) proposal is that there are constraints of the form ALIGN(Affix, Edge, Stem, Edge). If ALIGN(Affix, Left, Stem, Left) applies to a particular affix, it is a prefix, if the right-edge version applies to it, it is a suffix. Constraints can be given instantiations for specific morphemes, as shown by ALIGN(*um*, L, Stem, L) which requires the Tagalog morpheme *um* to be a prefix (McCarthy & Prince 1993b: 23, also see pp.28-36 for other morpheme-specific constraints). This proposal effectively moves the specification of attachment away from a morpheme's (or at least an affix's) lexical entry and into the constraint component.[10]

In the present proposal, morpheme-specific constraints are not needed. Instead, affix-specificity is relegated to the lexicon – to a morpheme's lexical entry. Only a small number of constraints are needed – certainly fewer than the constraint-based proposal.[11, 12]

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[10] Further extensions of this proposal are that morphemes are not entered in the lexicon at all, but are really rules or constraints (Anderson 1992, Hammond 1995, Russell 1995?).

[11] Constraints that refer to specific morphemes do not necessarily compromise the hypothesis that constraints are universal. If specific constraints can be generated by schemas (such as ALIGN(XCat, Edge, XCat, Edge)) and the arguments of those schemas can be language-specific constructs (such as morphemes), then constraints are still universal in some sense – although the individual constraints are not universal, the general schemas are. The empty slot proposal eliminates the need for such schema-instantiations (at least for specific ALIGN constraints). In fact, it eliminates the need for the entire ALIGN(affix, Edge, MCat, Edge) set of constraints.

[12] Theories of word-internal morpheme order also differ in terms of where – i.e. in which component – ordering is assumed to take place. Some theories propose that the order of word-internal morphemes is fixed in the syntactic component (e.g. Baker 1985, Drijkoningen 1996 and references cited therein) or that it at least follows syntactic

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5 Conclusions

Essentially, the proposal presented in this work is that phonological strings can be restricted partial functions: peripheral positions need not map onto phonological features. In a certain sense, this proposal is conceptually minimal: no new constraints are needed, nor are any new formatives required. No diacritic features that serve only to mark direction of attachment are invoked (cf Sproat 1985, Lieber 1992). Instead, direction of attachment is marked in a morpheme's phonological string by positions – elements that are necessary in any case.[13]

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principles (e.g. Lieber 1992). In comparison, others assume that while the syntax may order words (or terminal syntactic elements), the order of word-internal morphemes is determined by some other mechanism (e.g. Anderson 1992: chapter 2, Lapointe 1998, Halle & Marantz 1993:115 and references cited therein). The empty slot proposal assumes that the latter approach is correct. For discussion on issues relevant to this debate (e.g. the Mirror Principle, the Right-Hand-Head Rule), see Anderson 1992: ch.2 and references cited therein.

[13] The approach that is perhaps most akin to this one is Inkelas' (1989). Inkelas proposes that independently needed subcategorisation requirements can be used to mark direction of attachment.

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