Chapter 1
Separating primary and secondary accent

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1.1 Introduction

This chapter offers a theory of word accentuation that differs from standard metrical theory in proposing a non-rhythmic account of primary accentuation. Rhythmic structure (or non-primary accentuation) is assigned independently (possibly post-lexically), respecting the location of primary accent. The theory is called Primary Accent First (PAF) theory. In the terminology of Hayes (1995: 116), PAF pushes a "less obvious procedure" (viz. what he calls "top-down parsing") for accent assignment to its limits.

1.2 Primary accent first theory

Metrical phonology (Vergnaud & Halle 1978, Hayes 1980, Halle & Vergnaud 1987, Hayes 1995) embodies the following view on the relation between primary and non-primary accent at the word level. The full accentual organization is derived by first directionally constructing a layer of left- or right-headed feet and then selecting a peripheral, or near-peripheral foot to bear primary accent. The other feet express non-primary accents. This view has been challenged in van der Hulst (1984), who proposes a "primary accent first" approach. In this approach primary accent assignment and non-primary accent assignment are regarded as separate algorithms that apply independently (possibly creating representations in two different planes).

The claim that primary accent comes 'first' can be taken in a derivational sense. In that case, primary accent is assigned *before* non-primary accents are assigned. The derivational priority of primary accent will hold even in constraint-based approaches such as Optimality Theory (Prince & Smolensky 1993) if it turns out that non-primary accents are assigned at a later level of the grammar. If, however, both primary and non-primary accent apply at the same level, 'first' will mean that constraints governing primary accent dominate constraints that govern non-primary accents (Kenstowicz 1994).

The initial observation which led to the formulation of the primary accent first theory was that in by far the majority of cases of bounded systems, we can compute the location of primary accent with reference to just a single foot on the right or left edge. Thus the assignment of primary accent is, in these cases, not dependent on prior *exhaustive* footing. In van der Hulst (1984), I argue that the pattern of non-primary accents can in fact be seen as subordinate to primary accent in that the non-primary accent 'wave' either moves away from the primary accents or towards it, from the opposite edge, in both cases respecting the primary accent in the sense that clashes are typically avoided by suppressing *non*-primary accents.

Rhythm that moves away from primary accent has been referred to as *echo rhythm* by Garde (1968). For the 'opposite case', I used the term *polar rhythm* in van der Hulst (1984). We can see the difference between both types if the number of syllables is odd. In (1) both types are illustrated with an example using a bracketed-grid metrical notation (Hayes 1995: 62-64; 202-203):

(1) a. *Pintupi* (echo)

Word (LH)	x	2
Foot (LH,LR)	(x x x)	1
	[(σ σ) (σ σ) (σ σ) σ]	0

b. *Garawa* (polar)

Word (LH)	x	2
Foot (LH,RL)	(x x x)	1
	[(σ σ) σ (σ σ) (σ σ)]	0

In systems of this type, placing *one* peripheral foot could be considered sufficient to represent primary accent.

Only in one type of system does primary accent crucially depend on prior *iterative* footing. In van der Hulst (1992, forthcoming a) I introduced the term *count system* for this type. An example of a count system is the Australian language MalakMalak which has accent on the first syllable if the word is even numbered and on the second if the word is odd numbered (Goldsmith 1990: 173ff.). I illustrate the case of MalakMalak in (2):

(2) *MalakMalak*

a.

Word (LH)	x
Foot (LH,RL)	(x x x)
even	[(σ σ) (σ σ) (σ σ)]

b. Word (LH) x
Foot (LH,RL) (x x)
odd [σ (σ σ) (σ σ)]

If we assume the non-primary accent first mode of the standard theory, count systems are those in which primary accent falls on the *last* foot that is assigned, i.e. the rightmost in a left-to-right system and the leftmost in a right-to-left system. Non-count systems have a primary accent on the *first* foot that is assigned, this is the rightmost or the leftmost foot, depending on whether the direction of footing is right-to-left or left-to-right. The fact that count systems seem to form a minority group remains a complete accident. In van der Hulst (forthcoming c) I examine count systems more closely and suggest that they can perhaps be treated as systems that lack the notion primary accent at the word level.

The statement that primary accent assignment does not crucially require exhaustive footing (except in count systems) also applies to unbounded systems. Unbounded systems differ from bounded systems in that the location of primary accent is not limited to the well-know three-syllable window. In traditional metrical accounts (cf. Hayes 1980, Halle & Vergnaud 1987) such systems are derived by assigning unbounded feet throughout the word and then selecting a peripheral foot to carry primary accent. The procedure, then, is analogous to that employed for bounded system, differing only in the choice of the unbounded foot type. In van der Hulst (1992, forthcoming a,b) I suggest a non-foot based account for unbounded systems. In this account primary accent is assigned directly to the rightmost or leftmost heavy syllable and, in the absence of a heavy syllable, to a peripheral syllable. A similar approach is suggested in Goldsmith (1990: 180ff.). Hayes (1995: 296ff.) adopts a non-foot based approach for certain types of unbounded systems only. I refer to van der Hulst (forthc.a section 3.7) for further discussion. An important point to keep in mind is that unbounded systems have so far not been shown to need (unbounded) foot structure.

1.3 Additional arguments for PAF

In the preceding section I have shown that non-count systems *can* be handled without exhaustive footing, but no argument has been provided leading to the conclusion that these systems *must* be derived without (exhaustive) footing. A separation of primary and non-primary accent algorithms or constraints can, however, be motivated on several grounds.

Firstly, if non-primary accents are polar, we need a separate statement in any event (i.e. as in Garawa, cf. (1b)). Secondly, there are cases in which primary accent is weight-sensitive, whereas non-primary accent location is not; this has been claimed for English and Dutch. Thirdly, there are cases in which the location of both primary and non-primary accents are weight-sensitive, but in different ways. In Chugach, for example, both long vowels and closed syllable produce weight for primary accent, whereas only long vowels produce weight for non-primary accents (cf. Hayes 1995: 333-334).[1]

The claim that primary accent location is typically not dependent on prior footing has also been made and discussed in other works, where we find additional arguments. Perhaps, this is, in fact, the "traditional" view (cf. Hurch 1992), but even within the generative metrical tradition we find a number of clear statements of this point. Harms (1981), for example, proposes a 'backwards metrical approach to Cairo Arabic stress'. By 'backwards' he is expressing the view that "main stress receives primary attention, and that rules for non-primary stress are somehow built upon this primary structure." (Harms 1981: 444).[2]

Van der Hulst (1992) and van der Hulst & Kooij (1994), where the primary accent first theory is also discussed and supported, cite Roca (1986) who presents "empirical arguments to back the claim that non-primary stress, in languages like Spanish and Italian, is but a manifestation of phrasal rhythm". Roca writes:

> *... Harris ... unwisely intermixes the algorithms for primary and secondary accent, with the concomitant implicit lexical ordering for the latter. The fact that such ordering can be falsified and that secondary accent grids must be built on primary accented structures (precisely the contrary result to that presented in Harris 1983) suggests a dichotomy between lexical and postlexical accent which goes beyond the one embodied in metrical theory to date. Specifically, it seems to point in the direction of freeing lexical accent from the pressures of prosodic rhythm, and postlexical rhythmic accent from the idiosyncrasies of lexical determination.*

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[1] I refer to van der Hulst (forthc.c) for an additional discussion of all the cases that are problematic for a foot-based approach.

[2] Hammond (1985) notes that "the origin of iterative foot construction uniquely determines word tree dominance". Thus, he states that if footing is iterative, primary accent location is predictable. Stated in this way, however, not only count systems, but also systems that have non-iterative footing, bidirectional footing and unbounded footing are problematical. Hammond, then, does not really alter the standard metrical perspective, but rather proposes to acknowledge a dependency between the setting of two parameters.

Considerations of this type not only deny the dependence of primary accent on non-primary accent assignment, but in addition place these at different levels of the grammar. The fact that primary accent assignment applies at an earlier level adds extra force to the idea of the primary accent actually comes first.[3]

The arguments that simply attribute non-primary accent distribution to the phrasal or some larger domain (cf. Nespor forthcoming), can be supported by the fact that non-primary accent location often has properties that are diagnostic of post-lexical rules such as optionality and freedom of arbitrary exceptions. Primary accent rules, on the other hand, lack such optionality and typically have exceptions and subregularities.

Another clear formulation of views that are quite similar to those referred to so far can be found in Hurch (1992: 78) who states: "it is the primary accent which, if at all we have a dependency relation, determines (or at least influences) the location of secondary stress and not vice versa".

Hayes (1995: 116-117), who essentially adopt the classical metrical view, recognizes the possibility of a primary accent first derivation. He uses the term 'top-down parsing' in this connection. According to Hayes, however, we can usually not tell whether parsing is top-down or bottom-up and in cases of such ambiguity he prefers the bottom-up mode. He also refers to count systems claiming that these simply cannot be analysed in top-down fashion. Thus, Hayes takes top-down parsing to be the marked option for reasons that are not stated. The advantage of this is that he reveals cases where primary accent location crucially *cannot* be dependent on non-primary accent assignment. Unlike Roca, Hayes does not consider cases in which the rhythmic structure is phrasal and thus must be assigned later. Rather, he draws attention to cases in which primary accent is fixed on a specific peripheral syllable whereas non-primary accent locations shows signs of being dependent on syllable weight. Examples are Finnish and Germanic (initially in the word), Cahuilla (initially in the root), Tübatulabal (finally in the word).

Finally, proponents of Optimality Theory have taken what they call top-down-effects, i.e. the dependence of non-primary accents on primary accent, as an argument in favour on non-derivational approaches (Prince & Smolensky 1993, chapter 1, section 3.2: The failure of bottom-up constructionism). The basic idea is that in systems of this type, constraints that bear upon the location of primary accent dominate those that bear on non-primary accents. A noteworthy characteristic of the OT

[3] This point must be borne in mind when one discusses the separation of statements about primary and non-primary accent in non-derivational theories.

approach, made explicit in Kenstowicz (1994), is that constraints on primary accent are *in principle* independent of the grouping established for foot structure. In the spirit of primary accent first theory, Kenstowicz also suggests that constraints pertaining to primary accent *generally rank higher* than those pertaining to non-primary accent. This implies a recognition of the central idea of the theory defended here, albeit formulated in a non-derivational manner. The ordering of the algorithms for primary and non-primary accent is substituted by the ordering of the relevant constraints.

Kenstowicz illustrates the dominance of primary accent constraints by pointing to Garawa and Indonesian which both have a foot on the first two syllables to the expense of leaving the third syllable unparsed; the so-called initial dactyl effect. We illustrate the Indonesian pattern (cf. Cohn 1989, Odé & van Heuven 1994):

(3)
```
                    x
  (x        x       x   )
[(σ σ)σ(σ σ)(σ σ)]
```

In trisyllabic words this initial dactyl effect, which is seen as a consequence of foot level constraints, is blocked since primary accent *must* be pre-final:

(4) a.
```
* x
  x
[(σ σ)σ]
```
b.
```
  x
  x
[σ(σ σ)]
```

What this example shows is that the initial dactyl effect cannot override the location of primary accent and thus that the constraint bearing on primary accent is ranked higher than the foot level constraint that leads to the initial dactyl effect.

However, top-down effects do not *necessarily* entail an argument against derivational theories if one adopts a theory in which primary accent and non-primary accents are represented on different planes, because then one *could* construct the primary accent plane first. A multiplanar approach is thus compatible with a derivational view on the primacy of primary accent, although it does not require it.

Also, we must not forget that even in an OT account derivation plays a role, since use is made of different levels. Hence, if we follow Roca's idea and locate primary and non-primary accent at the lexical and postlexical level, respectively, primary accent comes first, derivationally speaking, also in the OT model (cf. fn 3).

In the next sections, I propose a theory of accent which assumes the separation of primary accent assignment and non-primary or rhythmic structure assignment. Again, I wish to quote Roca at this point. Roca suggests that one might take the separation so far that one adopts an algorithm for primary accent which is formally distinct from foot assignment, but he hastens to add that this course "while worthy of exploration ... cannot be embarked upon unguardedly" because it may lead to the "loss of locus predictability for primary accent, the apparently universal three syllable window..."

The proposal that I discuss in the next section does indeed make use of slightly different formal means for primary and non-primary accent, but I think it is on the 'safe side' in that it offers an approach to primary accent location which does preserve the three-syllable window generalization, at least for the systems for which it is meant to be valid, i.e. so-called bounded systems.

1.4 Primary accent assignment

The key idea is that primary accent is always assigned to a left- or rightmost *special* syllable. Following Prince (1983) I refer to the relevant rule as the *End rule*. Special syllables are projected at level 1 of the grid. I will distinguish three kinds of special syllables:

(5) a. Heavy syllables
b. Marked syllables (i.e. lexical/diacritic "weight")
c. Strong syllables (due to foot structure)

If there is no special syllable, level 1 will be provided with a mark by a *default* rule. Hence the general scheme for primary accentuation is:

(6) a. *Projection*
Project special syllables of type X to level 1
(X = heavy, marked, strong)
b. *Default rule*
Assign a mark to the leftmost/rightmost syllable in case level 1 is empty
c. *End Rule*
Assign primary accent to the leftmost/rightmost level 1 mark

To differentiate between bounded and unbounded systems, I propose a *domain parameter*. The accentual schema in (6) may apply within a two-

syllable domain on the left or right side of the word, modulo extrametricality, or within the word as a whole (also modulo extrametricality):

(7) *Domain setting*
The domain of accent assignment is: left/right

I assume that *not setting* the domain parameter implies that the whole word forms the accentual domain.

The three factors that determine accentability vis-a-vis (6c), may occur by themselves, in combination, or not at all. In the latter case the system shows sensitivity to edges only. Formally such systems always invoke the default accent rule (6b). The End Rule can in such cases do no more than reinforce the work of the Default rule. We will see below that such systems may either be bounded or unbounded depending on what the accentual domain is.

1.4.1 Bounded systems

The first step in deriving bounded system is to delimit on the right or left side of the word a domain for primary accentuation of two syllables (modulo extrametricality).[4] If relevant, special syllables are then projected to level 1. The third step is to apply the default accent rule to provide this domain with a mark just in case no other special syllable is available for projection to level 1. The account is made complete by setting the value for the *End rule*. Ignoring extrametricality, this approach allows four types of bounded weight-sensitive systems:

(8) a. *Rotuman : final in case of σh], otherwise penultimate*

x	x	x	x
x)	x)	x x)	x)
(h l)]	(l h)]	(h h)]	(l l)]

→ rightmost heavy, otherwise leftmost
Domain: right
Project X: X = heavy syllable
Default: left
End rule: right

[4] Domain delimitation (and extraprosodicity) can be regarded as forms of *prosodic circumscription* (McCarthy & Prince 1990). This would explain why the small accent domain has the *form* of a prototypical foot without implying that it *is* a foot.

b. *Yapese : penultimate in case of hl], otherwise final*

x	x	x	x
x)	x)	x x)	x)
(h l)]	(l h)]	(h h)]	(l l)]

→ rightmost heavy, otherwise rightmost
Domain: right
Project X: X = heavy syllable
Default: right
End rule: right

c. *Aklan: penultimate in case of hσ], otherwise final*

x	x	x	x
x)	x)	x x)	x)
(h l)]	(l h)]	(h h)]	(l l)]

→ leftmost heavy, otherwise rightmost
Domain: right
Project X: X = heavy syllable
Default: right
End rule: left

d. *Awadhi: penultimate except in case of lh]*

x	x	x	x
x)	x)	x x)	x)
(h l)]	(l h)]	(h h)]	(l l)]

→ leftmost heavy, otherwise leftmost
Domain: right
Project X: X = heavy syllable
Default: left
End rule: left

(9) a. *Ossetic: initial in case of [hσ, postinitial otherwise*

x	x	x	x
(x x	(x	(x x	(x)
[(h l)	[(l h)	[(h h)	[(l l)

→ leftmost heavy, else rightmost

Domain: left
Project X: X = heavy syllable
Default: right
End rule: left

b. *Malayalam: postinitial in case of [lh], initial otherwise*

x	x	x	x
(x	(x x	(x x	(x)
[(h l)	[(l h)	[(h h)	[(l l)

→ leftmost heavy, else leftmost
Domain: left
Project X: X = heavy syllable
Default: left
End rule: left

c. *Capanahua: peninitial in case of [σh, otherwise initial*

x	x	x	x
(x x	(x	(x x	(x)
[(h l)	[(l h)	[(h h)	[(l l)

→ rightmost heavy, else leftmost
Domain: left
Project X: X = heavy syllable
Default: left
End rule: right

d. → rightmost heavy, else rightmost: unattested
Domain: left
Project X: X = heavy syllable
Default: right
End rule: right

The theory proposed here is almost completely instantiated for bounded systems. On the left side we miss one example, i.e. (9d).

Weight-insensitive systems differ from the systems in (8) and (9) in that no special syllables are available for projection to level 1. Most systems of this type have exceptions, however. Exceptions are marked in two ways in the majority of cases. Either words are marked for extrametricality or syllables are marked with *diacritic weight* (cf. van der Hulst forthcoming: section 3.8).

The algorithm for Polish, a weight-insensitive penultimate system

allowing words to have exceptional final accent, goes as follows:

(10) *Polish primary accent*
a. Extrametricality: no
b. Domain: right
c. Project: mark
d. Default: left
e. End Rule: –

Polish: penultimate except in case the final syllables is marked

x	x
x	x
(s s)]	(s s)]

→ marked syllable, otherwise leftmost

(10c) projects lexical marks to level 1. If there is no lexically marked syllable, (10d) inserts a level 1 mark on the leftmost syllable. It stands to reason that no accentual domain will contain more than one lexically marked syllable. Therefore the *End Rule* cannot be fixed on a value for a system like that of Polish, since it can only reinforce the gridmark of level 1, of which there is never more than one.

Weight-sensitive systems may combine heavy syllables with lexically marked syllables. Thus in a system like that of Rotuman a final light syllable, if exceptionally bearing primary accent, could be lexically marked. By the End rule (right) it would receive a level 2 mark even if it is preceded by a heavy syllable.

(10b) and (10d) together produce the effect of non-iterative trochaic footing on the right side of the word. This raises the question why an approach like this is to be preferred over assigning a single foot on the left or right side. After all, the idea that primary accent is assigned first could also be implemented by assuming non-iterative footing.

I adopt the domain approach. Firstly because no foot inventory can deal with all the cases in (8) and (9) and, secondly, to be able to give a uniform characterization of bounded and unbounded systems. Such uniformity in treatment was in fact present in the standard metrical theory, but due to later developments the parallels were obscured. In the next section I show how unbounded systems can be treated using the scheme in (6).

A consequence of the approach I propose is that 'rhythm' (i.e. strong syllables) does not play a role in primary accentuation in bounded

systems. As we will see in the next section, this does not mean that rhythmically based primary accentuation is impossible. If the domain of accentuation is the whole word, syllables can be special by being rhythmically strong. I will suggest that this produces the so called *count systems*. The two syllable domain, however, is too small to see the effect of rhythmic footing.

1.4.2 Unbounded systems

In unbounded systems, accent locations are not restricted to a syllable near the left or right edge of the word. Rather primary accent is assigned to the left- or rightmost special syllable *taking into account the whole word* (modulo extrametricality). Syllables can be special by virtue of being heavy, by being diacritically marked or by being rhythmically strong. The latter option applies to count systems.

In our system, the four types of unbounded systems quite simply arise from cross-classifying the options of the primary accent rule and the default rule (again, extrametricality is ignored):

(11) *a.* *Classical Arabic, Huasteco, Eastern Cheremis*

```
                    x          x
(     x       x     )   (x         )
l l l h   l l l h l l      l l l l l
```

→ rightmost heavy, otherwise leftmost
Domain: -
Project: heavy syllable
Default: left
End Rule: right

b. *Komi, Kwak'wala*

```
                    x                x
(     x       x     )   (          x)
l l l h   l l l h l l      l l l l l
```

→ rightmost heavy, otherwise rightmost
Domain: -
Project: heavy syllable
Default: right
End Rule: right

c. *Aguacatec, Golin, Western Cheremis*

```
        x                       x
(       x       x   )   (       x)
l l l h l l l h l l      l l l l l
```

→ leftmost heavy, otherwise rightmost
Domain: -
Project: heavy syllable
Default: right
End Rule: left

d. *Khalkha Mongolian, Indo-European accent, Murik*

```
        x                   x
(       x       x   )   (x      )
l l l h l l l h l l      l l l l l
```

→ leftmost heavy, otherwise leftmost
Domain: -
Project: heavy syllable
Default: left
End Rule: left

If no two-syllable domain is delimited the whole word counts as the domain, i.e. the domain is unbounded. Within that domain accent is assigned in precisely the same way as it is assigned in bounded domains. We can see this by comparing (8) with (11).

In most of the examples in (11) special syllables are heavy. There are also so called *lexical accent systems* (like Russian) in which morphemes may contain lexically marked syllables. If morphemes are put together to form words, primary accent is placed in accordance with the schemes that we find in (12):

(12) a. right/left: (vacancy)
b. right/right: Modern Hebrew
c. left/right: Turkish
d. left/left: Russian

I am not aware of an unbounded system in which lexical marking and syllable weight are combined.

1.4.3 Count systems

Since in count systems the whole word necessarily forms the domain for accent assignment, we could analyze such systems as a variety of unbounded systems. An unbounded system then is a count system if primary accent assignment is based on rhythmically strong syllables (possibly combined with heavy syllables), i.e. if primary accent is foot-based. Since each word will be footed, the default rule remains unemployed.

A diachronic argument for regarding count systems as unbounded can be derived from the fact that Classical Arabic had a last/first unbounded system, whereas a number of the modern dialects (such as Cairene Arabic) have a left-to-right count system.

The 'counting' that leads to the location of primary accent does not always produce the correct pattern of non-primary accents, however. This has been argued for Cairene Arabic in Harms (1981). If this is true, such systems use counting (by means of footing) purely as a computational device for primary accent assignment. To derive the actual rhythmic pattern post-lexical footing would still be necessary. As an example I formalize a trochaic count system. In this case the 'count' feet *are* relevant to the surface rhythmic structure; cf. (13):

(13) *Malakmalak primary accent*
- a. Domain: -
- b. Project: strong (LH,RL)
- c. Default rule: -
- d. End Rule: left

The fact that primary accent is peripheral (i.e. limited to the three syllable window) is a result of the foot-basedness of the End Rule, not because the accentual domain is limited.[5]

As mentioned before, van der Hulst (forthc.c) suggests that count systems may be very similar to languages that are said to lack primary accent at the word level. If this is indeed the case, option (5c) can be eliminated.

1.4.4 Summary of the theory

The central point of the theory is that all primary accent systems have an *End Rule*, a quite simple rule that promotes a peripheral line 1 grid mark

[5] There are no count systems which make use of a ternary alternation.

to level 2, i.e. primary accent status.

Accentual systems differ along two parameters, i.e. *domain* and *projection*. The domain parameter is set to decide whether the whole word or a two-syllable window (at the right or left side of the word) is the domain for accentuation. The projection parameter specifies the way in which the End Rule is 'fed'. The domain parameter provides an alternative to the standard view that bounded accent systems are foot-based. Finally syllable extrametricality is a parametric choice that may misalign the accent with the (morphological) word.

The projection parameter has values that are not mutually exclusive. Syllables can project to level 1 due to their inherent weight, due to bearing a lexical diacritic mark or due to being rhythmically strong. In this theory, the latter option is rather untypical if at all necessary. We can only see the effect of rhythmic sensitivity if the domain is the word, the disyllabic domain not being big enough for footing to produce a pattern that could be said to be distinct from the pattern that the default rule can create. Only count systems are truly rhythm-sensitive and such systems are perhaps irrelevant to the theory of primary accent location at the word level. Weight-sensitivity and lexical marking can co-occur, although I have not seen a clear example of this if the domain is the word. Both factors can also be absent, either in a particular word or because the system does not project anything to level 1.

If the accentual domain does not contain a mark at level 1, a default rule will provide one on the right or left side of the domain. The default rule is not regarded as the rule that produces primary accent, however. Primary accent is assigned by the End Rule, which assigns a level 2 mark to the rightmost or leftmost mark on level 1.

(14) *Accentual parameters*
- a. Extrametricality: n/y
- b. Domain: left/right/-
- c. Project: heavy, mark, strong
- d. Default rule: left/right
- e. End Rule: left/right

Some of the parameters require *sub*parameters. If extrametricality applies, the *unit* that is extrametrical must be specified (segment, syllable, foot etc.). Likewise, if the special syllables are *heavy* syllables, it must be specified what kind of syllables count as heavy.

Systems showing no weight effect with (near-)peripheral primary accent can be bounded or unbounded, according to this theory; standard metrical theory has the same ambiguity. In a case like Polish (prefinal primary

accent), we may decide in favour of the bounded analysis because exceptional locations *outside* the three-syllable window are impossible. In Turkish on the other hand (final primary accent), we decide in favour of the unbounded analysis because in exceptional words, primary accent may lie at any distance from the right word edge; cf. van der Hulst, forthc. a. section 3.8.5 for an analysis of the Turkish system.

The parameters in (14) govern primary accent assignment. In the next section I will discuss the assignment of non-primary accent. Rhythmic structure is seen as the result of footing (in accordance with the standard theory), but, except in the case of count systems, footing is not placed in a feeding relation with primary accent assignment.

1.5 Non-primary accent

The main point of the previous section has been to argue in favour of a primary accent first approach. In this section, I will consider the treatment of non-primary accent. The proposals in this section are somewhat tentative and speculative.

1.5.1 Reducing the foot inventory to trochaic feet

Hayes (1995) argues that the syllabic iamb is unnecessary, whereas moraic iambs perhaps only operate from left to right. The directional bias of moraic iambs requires some sort of stipulation. No such stipulation would be required if we do away with iambic feet altogether. Van de Vijver (1995) makes a proposal to do this. I will also pursue this reductionistic approach, but implement it differently, referring to van de Vijver's article for the measures that he takes to achieve this goal.[6]

Syllabic iambs can be circumvented by appealing to extrametricality in

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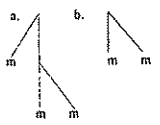
[6] To get rid of uneven iambs one could regard them as "left-specified" trochees. Van Oostendorp (1995) suggests that the even moraic trochee and the uneven iamb simply instantiate the typical X-bar schema, without and with a specifier, respectively. He also suggests that the specifiers are perhaps universally on the left. This view allows two moraic foot types in (a) and (b) only:

i.



Thus, no room is left for the uneven moraic trochee in this typology. I would like to keep the option of the uneven trochee open, however.

LR mode and to a primary accent first analysis for the RL cases. For alleged RL moraic iambic systems like that of Tübatulabal Hayes (1995) and Kager (1993) have proposed that the primary accent first approach can be adopted as well. Let us now explore whether the extrametricality approach can be used for LR moraic iambic systems. Consider the following string:

(15) (x)(x .)(x)(x .)(x .) trochaic parsing
[<l>l h l l h l l l]
(. x)(x)(. x)(x)(. x). iambic parsing

The 'traditional' iambic parsing can be matched by an *uneven* trochaic parsing that makes use of degenerate feet, which will usually be 'rescued' through 'iambic lenghtening', a process that must be renamed if the present perspective is adopted. The trochaic reanalysis appeals to initial extrametricality, but if combined with the domain approach, this move is in fact no longer necessary, because the second syllable will be selected as bearing the primary accent without appealing to extrametricality. The primary accented syllable will automatically be rhythmically strong and the rest of the string is simply parsed with a trochaic foot.

At this point we have dispensed with all iambic feet. Van der Hulst (forthc.b) proposes to recognize three trochaic foot types: the syllabic trochee, the moraic trochee and the uneven trochee. The uneven throchee has been abolished by Hayes (1995) but van der Hulst (forthc.b) and Van der Hulst & Klamer (to appear) provide arguments for its existence. Assuming, then, that we can get away with this purely trochaic theory, let us define this set and at the same time incorporate ternary patterns. I propose the following three FootForm parameters:

(16) *FootForm Parameters*
a. Unit: syllable/mora
b. SizeSyll: min/max
c. SizeUnit: min/max

The SizeSyll parameter defines the size of feet in terms of the number of syllables *irrespective of the setting of the unit parameter*. The SizeUnit parameter defines the size *with reference to the relevant unit*. The three parameters generate a set of eight possible combinations of values of which three are logically impossible:

(17)

		Unit: syllabic	moraic
SizeSyll	SizeUnit		
min	min	(σ σ)	(μ μ)
	max	----	$((\mu\ \mu)_{\sigma}\ \mu)$
max	min	----	----
	max	((σ σ) σ)	((μ μ) μ)

Combining the two 'min' values produces strictly binary feet, while combining the 'max' values produces ternary feet. Of the min/max combinations, the uneven trochee is allowed by combining mimimal bisyllabicity with maximal trimoraicity. No possible foot type corresponds to the other min/max combinations. If the size in terms of syllables is set on min, the max value for unit (if unit is syllable) produces a contradiction. Similarly, if the SizeSyll parameter allows three syllables, limiting the foot to a minimun of two units again leads to a contradiction. I will now discuss ternary systems.

In the early days of metrical theory it was argued that ternary feet could be banned from the theory entirely. Ternary feet that occurred on either the left or right side of words could be handled with deaccenting rules and extrametricality, conspiring for initial dactyls and final dactyls, respectively. Hayes (1980), in favour of a strictly binary theory, noted that the pattern in Cayuvava (which we discuss below) is problematic if only binary feet are admitted, but he offered no solution at the time. Since then, however, more and more languages with ternary rhythmic patterns throughout the word have come to the forefront (Levin 1988, Haraguchi 1991, Rice 1992, Hayes 1995: 307-366). This necessitates a reconsideration of the ban on ternary feet. Let us consider some examples of ternary systems in order to establish how they can be treated.

In Cayuvava (Hayes 1995: 309-314) primary accent lies on the antepenultimate syllable, and preceding that syllable we find ternary rhythm. If we approach such a pattern in terms of the *syllabic dactylic foot* (assigned from right to left and ignoring foot internal brackets) we derive the representations in (18):

(18) a.
```
   x       x       x
(σ σ σ)(σ σ σ)(σ σ σ)
```

b.
```
       x       x
σ σ (σ σ σ)(σ σ σ)
```

c.
```
       x       x
σ (σ σ σ)(σ σ σ)
```

It is of interest to note that no secondary accent is reported if the available span of syllables is shorter than three, as in (18b-c), but we will not dwell on that property here.

Hayes (1995) proposes an alternative that appeals to a special parsing mode, weak local parsing. The footing algorithm is allowed to 'skip' a unit each time after having assigned a foot. In Cayuvava this mode applies in conjunction with extrametricality:[7]

(18) a. x x x
(σ σ) σ (σ σ) σ (σ σ)<σ>

b. x x
σ σ (σ σ) σ (σ σ)<σ>

c. x x
σ (σ σ) σ (σ σ)<σ>

Dresher & Lahiri (1991) analyze Germanic in terms of a *moraic dactylic foot*. Since primary accent is strictly initial, also in case an initial light syllable is followed by a heavy syllable, Dresher & Lahiri claim that heavy syllables in second position, following an initial light, carry no secondary accent; they act as light syllables and are incorporated into the foot that contains the preceding light syllable. This is what Dresher and Lahiri call *resolution*. The resolution effect is not a property of all ternary moraic systems and must thus be stated in the form of a further parameter.

There is no straightforward alternative using weak local parsing. Van der Hulst & Lahiri (1988), Halle, O'Neil & Vergnaud (1993), Kenstowicz (1994) and Hayes (1995) argue in favour of various alternatives, using the moraic trochee. If we assume that the Dresher & Lahiri analysis stands, we may conclude that next to the syllabic dactyl we also need a moraic dactyl, but more needs to be said about the fact that for both alternatives have been put forward. To more strongly support the moraic dactyl additional cases would be welcome.[8]

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[7] To order skipping *after* foot assignment is crucial, since otherwise a 'fourth from the edge' pattern can be derived if the weak local parsing mode is combined with extrametricality.

[8] The picture changes if the post-light heavy is always a closed syllable, since in that case the closed syllable can simply count as light (by contextually suppressing weight-by-position; van der Hulst & Rosenthall, in prep), so that resolution is no longer required. Another important issue is that in a 'primary accent first' approach primary accent

The syllabic amphibrach (a foot type not present in our typology) was introduced in Halle & Vergnaud (1987) to analyze Cayuvava, combined with extrametricality. The syllabic dactyl and syllabic amphibrach differ in descriptive potential at the edge where parsing starts, if extrametricality is not involved to neutralize the difference. A pure amphibrachic system would have penperipheral primary accent and a further ternary rhythmic pattern. At present I am not aware of such cases, however.

Rice (1992) proposes a typology of ternary foot types that includes the dactyls in (17) and various types of amphibrachs and anapests. He allows four moraic and four syllabic possibilities. I give all the possibilities in (20):

(20) MORAIC	foot: iamb	foot: trochee
head: trochee	x ((m m) m) "moraic amphibrach"	x ((m m) m) "moraic dactyl"
head: iamb	x (m (m m)) "moraic anapest"	x (m(m m)) "moraic amphibrach"
SYLLABIC		
head: trochee	x ((σ σ)σ) "syllabic amphibrach"	x ((σ σ) σ) "syllabic dactyl"
head: iamb	x (σ (σ σ)) "syllabic anapest"	x (σ (σ σ)) "syllabic amphibrach"

So far no appeal has been made to the anapest in either moraic or syllabic systems. The differences between the two syllabic amphibrachs will probably be hard to identify in addition to the fact that amphibrachs are already competing with the syllabic dactyl (cf. above).

Rice suggests that the moraic amphibrach in the left upper corner of (20) is used for Sentani, right-to-left. A possible trochaic alternative appeals to a bisyllabic moraic trochee for primary accent and a dactyl for the remaining rhythmic structure. In that case we must accept that a

---

assignment is treated as essentially syllabic (cf. Van der Hulst & Lahiri 1988), in which case the argument in favour of a moraic dactylic foot also becomes less easier to make.

dactylic foot type that forbids heavy syllable in weak foot position, but allowing a foot to be (hll).[9]

Rice puts the other moraic amphibrachs to use in Chugach (in a LR mode). In Chugach a (primary) accent falls on the first syllable if it contains a long vowel or if it is closed. Thereafter we find a ternary alternation. As an alternative to Rice's analysis, we could again appeal to a dactylic syllabic foot that forbids heavy syllables in dependent position. The first beat corresponds to the primary accent which has been assigned first in terms of the domain approach; recall that we must allow unary feet, but note that this only applies to the right of the primary accent:

(21)

```
x   x          x   x
(h  l)(l)      (h  l l)(l)

x   x          x   x x
(h  l)(h  l)   l (l  l l)(l)(h)

x   x          x   x   x!
l (l  l l)(l)  l (l  l l)(l  l) l

x   x          x   x   x
l (h  l l)(l)  (h  l) l (l  l l)(l)
```

The third string in the right-hand column shows an additional 'constraint': a right-edge lapse is resolved by accenting the final light syllable.

Both for Sentani and Chugach I have appealed to a trochaic foot type that is essentially syllabic, yet reluctant to place bimoraic syllables in dependent position. In van der Hulst (1984: 211) I refer to such feet as 'no mismatch' feet. We probably also need 'no-mismatch' feet in the 'min' (i.e. bisyllabic) syllabic foot type. In Finnish, for example, a [σ σ l h ... string does not receive a secondary accent on the third syllable to avoid a trochaic (l h) grouping; cf. Grijzenhout (1992).

1.5.2 The domain of rhythm and direction of footing

With respect to the domain of rhythm, Roca (1986) argues that in Spanish the domain is post-lexical, possibly the *phonological phrase*. It is likely that other domains in the prosodic hierarchy can also be relevant to rhythm, such as the *intonational phrase* (cf. Nespor forthcoming), or in

[9] The alternative that Hayes (1995: 330-333) proposes appeals to the moraic trochee applied in weak local parsing mode.

fact a smaller domain such as the *clitic group*. The *phonological word* may be a domain as well, either lexically (cf. the word level of Borowski 1994) or post-lexically.[10]

With primary accent in place, foot theory is responsible for rhythmic structure only. In by far the majority of cases we find that the rhythm 'echos away' from the primary accent. I will assume here that primary and secondary accent are represented on different planes, as was originally suggested in van der Hulst (1984):

(22)
```
        x                    primary accent plane
        x
  ( σ  σ ) σ σ  σ σ
    ( x   .)(x  .)(x)        rhythm plane
```

A system as in (22), although iambic at first sight, can be represented with a trochaic pattern, as we have seen in section 2.1.[11,12]

The direction of rhythm, however, is not always 'away from the primary accent'. Another possibility appears to be that rhythm comes from the opposite edge. We may call both modes *echo* (cf. Garde 1968) and *polar*, respectively. Polar rhythm can perhaps be regarded as echoing away from a 'polar secondary accent', a strong non-primary accent that is placed on the opposite side of the word. Thus Polish, claimed to have a trochaic left-to-right rhythm (Booij & Rubach 1987) could be analyzed as having a left-edge domain *in addition* to the right-edge domain that normally houses the primary accent:

(23)
```
          x
    x     x
[ (σ  σ) .....(σ  σ) ]
```

---

[10] From an OT perspective, if rhythmic structure is post-lexical no direct ranking between primary accent constraints and rhythm constraints is at stake. Rather, the input to the post-lexical component will contain a primary accent location. Rhythmic patterns that are compatible with the location of primary accent can be considered as possible candidates and the one that meets the constraint system of a particular language will be selected for that language. Thus, as we mentioned earlier, an inviolable constraint is that rhythmic structure will respect the primary accent.

[11] The question as to whether we actually need foot brackets or can resort to a grid only theory of rhythm will not be discussed here; cf. Kenstowicz (1993).

[12] Notice that, as stated before, no appeal is made in this theory to extrametricality to achieve this result.

Dogil (to appear) claims that under focus, the initial accent is the primary accent. Gussenhoven (1991) also proposes two accent locations in his analysis of English word accent, suggesting that the actual location of primary accent is often dependent on phrasal context. If this approach is taken, it seems necessary to say that the polar accent is assigned at the word-level.

1.6 Concluding remarks

The theory proposed in this article offers a unified approach to *all* types of accentual systems. Its most salient property is separating the treatment of primary accent and non-primary, rhythmic structure. The approach to primary accent acknowledges that all accentual systems have an edge-based rule of primary accentuation. Where systems differ is in how this rule is 'fed' and within which domain it applies. Primary accent may be accompanied by a secondary accent that may, under circumstances of accent clash or special intonational context, play the role of a primary accent. Rhythmic structure is built independently, post-lexically paying respect to the primary accent location and secondary accent (if present).

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