

Conditions on metrical adjunction

The treatment of rhythmic stress phenomena is a major issue of current metrical phonology, the debate focusing specifically on the question whether metrical tree structure is independently needed in addition to grid structure (cf. grid-only theories such as Prince (1983), Selkirk (1984) and tree-cum-grid theories such as Hayes (1984), Halle & Vergnaud (forthcoming)).

In our opinion, Hayes (1984) argues convincingly for a well-defined assignment of functions over grids and trees by showing, for English, that cases with identical grids, but different possibilities of rhythmic adjustment can only be handled in a theory that employs trees. Kager & Visch (1985) arrive at the same conclusion by analyzing Dutch examples which are problematic for a theory that only allows grids. For these reasons, we will take as a point of departure in this paper a theory that (minimally) contains trees (i.e. Hayes (1984)). Here, grids are the representations of rhythm in which the rhythmic targets of adjustment, i.e. the improvements toward 'eurhythmicity', can be checked. Rhythmic adjustment itself is applied to the tree and is conditioned only indirectly by the demands of optimal eurhythmicity in the grid. Here we leave aside the grid-based aspects of the analysis and concentrate on the tree-based operation and the way it is constrained.

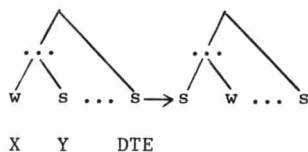
In the literature, two types of rhythmic adjustments are distinguished, viz. rhythmic strengthening ('Beat Addition') and rhythmic shift ('Iambic Reversal' or 'Rhythm Rule'). One of the main advantages of Hayes' analysis is that both types of adjustment are treated as one and the same operation, i.e. as a simple adjunction of a node in the tree. This operation, Rhythmic Adjustment (=RA), is formulated in (1), where the adjoined node Y is by convention weak with respect to X.

(1) Rhythmic Adjustment (Hayes, 1984)

In the configuration ...X Y ...DTE..., adjoin Y to X.

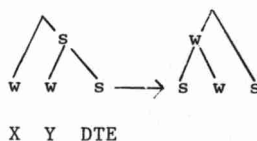
The two typical configurations to which RA applies are represented schematically in (2), cases of shift in (a), cases of strengthening in (b).

(2) (a)



(=Rhythm Rule)

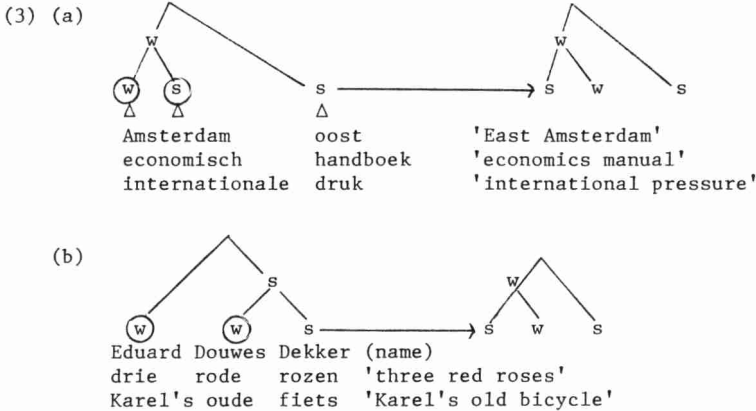
(b)



(=Beat Addition)

The application of RA can be illustrated with Dutch examples. (3a) contains cases of shift, where adjunction amounts to relabelling since X and Y are sister-nodes from the outset. (3b) gives cases of strengthening, where adjunc-

tion changes the original constituent structure.



As the formulation of RA in (1) is relatively unconstrained with respect to to choice of X and Y, Hayes introduces a principle of Maximality as in (4).

(4) Maximality Principle (Hayes, 1984)

Rules that manipulate tree structure must analyze maximal terms.

Maximality:

Let R be a rule whose SD contains the terms t_1, t_2, \dots, t_n .

Let T be a tree containing the constituents c_1, c_2, \dots, c_m ($m \leq n$) matched up to the appropriate terms of R.

c_i of T is maximal iff there is no node c'_i that

a. satisfies R

b. dominates c_i

c. does not dominate any other member of the sequence c_1, c_2, \dots, c_m .

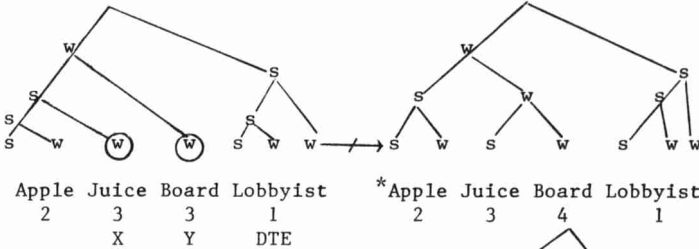
That is, the node immediately dominating c_i must also dominate one of the other terms contained in the SD of R. Therefore, X is maximal iff it c-commands Y and/or DTE, and Y is maximal iff it c-commands X and/or DTE. Now, there are two cases in which all terms of RA (X, Y, DTE) are maximal:

a. X and Y are sister nodes (c-commanding each other), as shown in (2a)

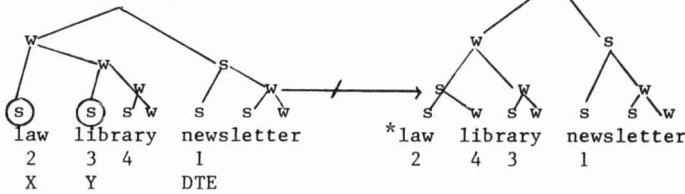
b. Y and DTE are sister nodes (c-commanding each other) and are both c-commanded by X, as shown in (2b)

The constraining effects of (4) become clear in (5), where the unconstrained version of RA would allow adjunction of Board (=Y) to Juice (=X) in (5a), resulting in the ungrammatical contour 2-3-4-1. (No theoretical status should be attributed to the numbers in the examples; they are only a shorthand notation for prominence rank.) Comparable cases lead Hayes to the observation that right branches generally cannot be analyzed as X. The Maximality Principle correctly excludes RA in (5a), as X and Y are not sister nodes, nor is Y a sister of DTE and c-commanded by X. In (5b) the unconstrained version of RA would, incorrectly, permit the choice of law as X and li as Y, leading to the ungrammatical output contour 2-4-3-1. Again, Maximality correctly blocks RA, as X and Y are not sisters, nor is Y a sister of DTE.

(5) (a)

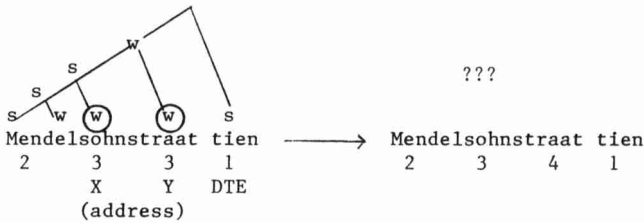


(b)

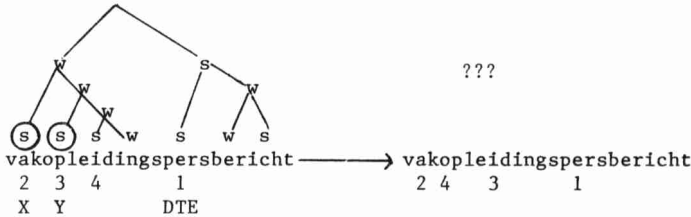


Turning our attention to Dutch, Maximality appears to be violated consistently in analogous examples. In (6a) and (6b), analogues of (5a) and (5b) respectively, adjustment applies happily as indicated by the contours 2-3-4-1 and 2-4-3-1.

(6) (a)



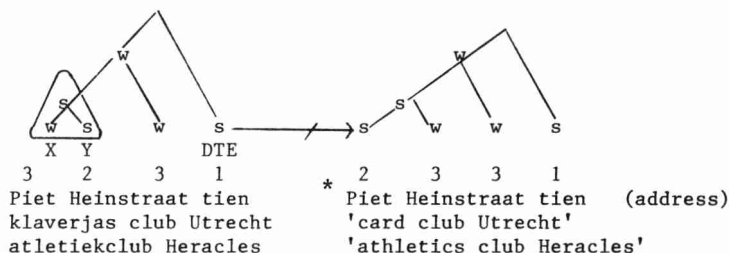
(b)



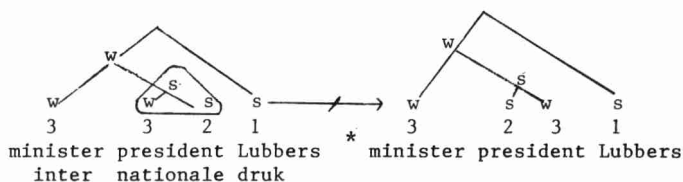
We are now confronted with an interesting puzzle, seemingly caused by the more extensive possibilities of RA in Dutch, as compared to English. To be more precise, Dutch differs from English in allowing rightward as well as leftward RA. For this reason it is as yet unclear whether the examples in (6) are derived by leftward RA, rightward RA or an interaction of both.

First, let us consider some simple cases of rightward RA. It will be clear that for these the formulation of RA in (1) has to be adapted into its mirror image: ...DTE...Y X..., where Y adjoins to X. In (7a) we illustrate rightward shift, in (7b) rightward strengthening.

(10) (a)

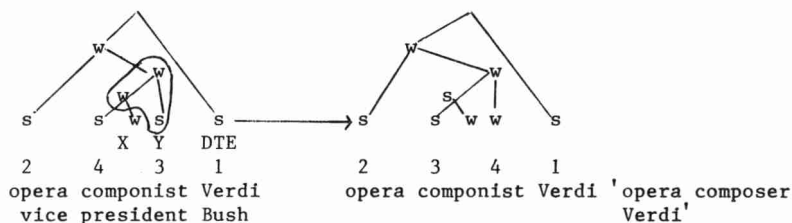


(b)



Note that RA is not allowed despite Maximality, while RA can be applied in embedded structures such as those in (10c), which are well-known cases of 'internal rhythm'.

(10) (c)



Comparing (10a/b) and (10c), we see that RA is blocked in structures/constituents dominated by a strong node. This blocking seems to be related to a condition on metrical defooting rules that was proposed in Hayes (1981):

(11) 'No foot in strong metrical position may be deleted' (Hayes, 1981:178)

The effect of this condition is that the strong or only syllable in a strong foot cannot be extracted to be adjoined elsewhere in the tree (and consequently be reduced). Both RA and defooting rules belong to the class of rules manipulating tree structure, or 'prosodic transformations'. We will propose a condition on this type of rules that will account both for the blocking of RA in (10a/b) and for the effects of the 'strong foot principle' (11). In this way, (11) becomes a subcase of the more general condition (12), which we will call the Strong Domain Principle:

(12) Strong Domain Principle (SDP)

No prosodic transformation may apply to the head of a strong domain.

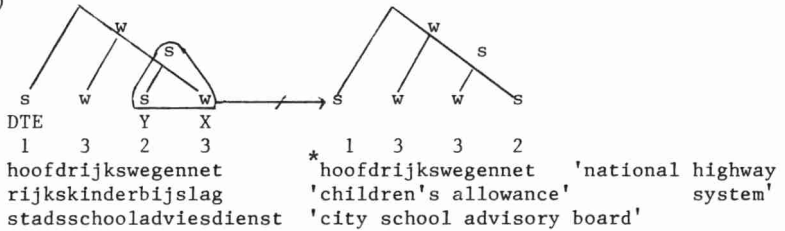
The head of a constituent is the strong or only element of that constituent.

SDP correctly blocks the application of RA in (10a/b) as well as the extraction of the head of strong feet. As far as we know, isolated instances of (10a) and

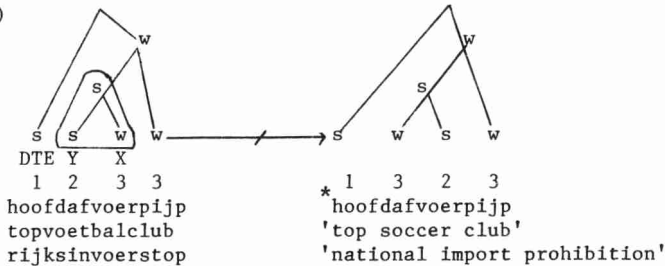
(10b) have been noted in the literature, but left unrelated either to each other or to the strong foot principle (11).

Our next examples illustrate that SDP is also relevant to right directional shifts. The structures (13a) and (13b) are the mirror images of (10a) and (10b) resp. Again, RA is not allowed to apply, and this is explained by SDP.

(13) (a)

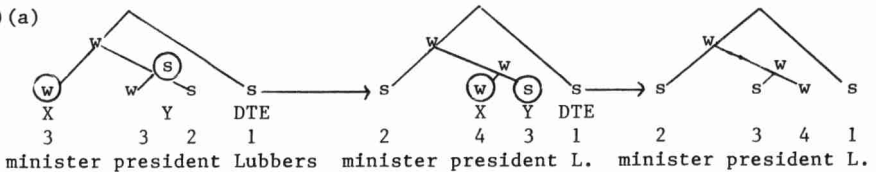


(b)

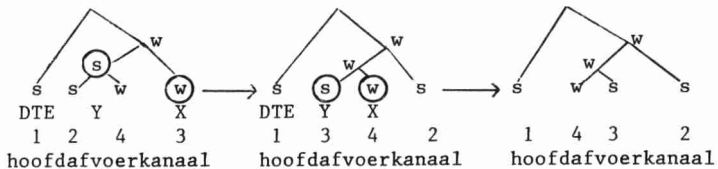


We are now able to return to our discussion of relevant types of interaction. The SDP allows us to determine the order of two rhythmic adjustments as in the examples of (8) and (9) above, repeated here as (14a) and (14b).

(14) (a)

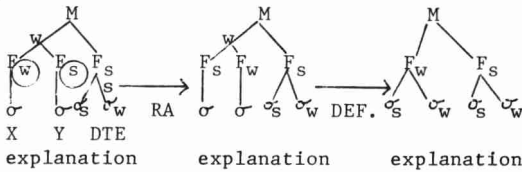


(b)



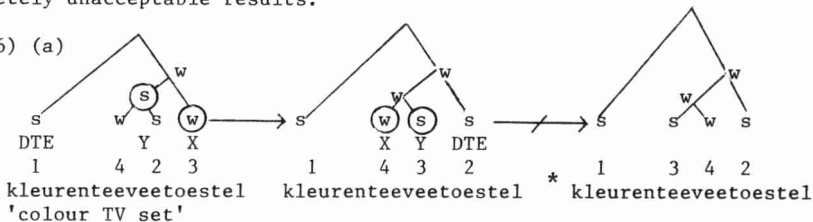
First, RA applies to the highest pair of nodes and then, internally, to the lowest pair. Internal adjustment first would violate the SDP, therefore, these derivations avoid it by rhythmic adjustment on a higher pair of nodes. We find a comparable situation for the strong feet principle (11) which can be avoided by a word-internal application of adjustment before the application of Defooting as is shown in (15).

(15)

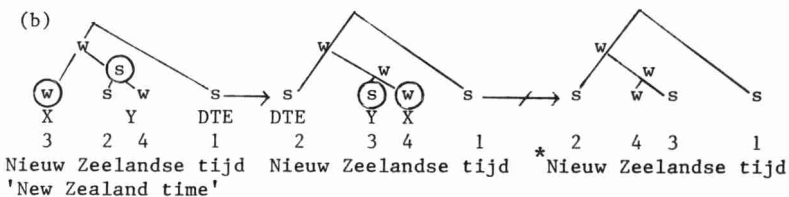


Until now we have only discussed double applications of RA in one direction. As we turn to the interaction between left and right directional adjustment, we find quite surprising facts. We have seen that the derivations in (14) could be explained by an application of RA to a higher pair of nodes before an application to a lower pair. In the examples (16), however, this leads to completely unacceptable results.

(16) (a)



(b)



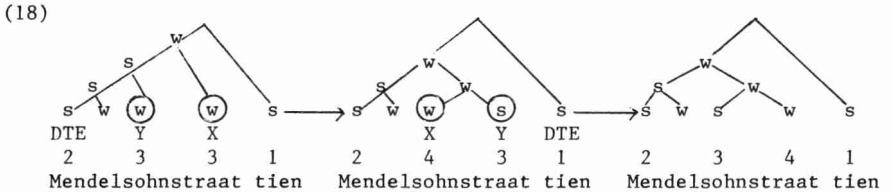
The derivations in (16) have to be blocked after the first adjunction of the highest pair of nodes, and the question arises immediately why this should be so. In this respect, we may observe an important difference between the derivations in (16) and those in (14). In (16), the DTE required for the second adjunction is derived by a previous adjunction. This means that the domain of the second adjunction which contains the nodes X, Y and DTE, is a subdomain (i.e. 'teeveetoestel') of the domain which contains the nodes X, Y and DTE of the previous adjunction (i.e. 'kleurenteeveetoestel'). Those cases in which a second adjunction is possible, on the other hand, as in (14), make use of the same DTE for both adjunctions and are thus applied in the same domain. Apparently, adjunctions apply from bottom to top in the tree, each time in a larger domain. Within one domain, however, we may apply several adjunctions, also from top to bottom. Let us state this in the following principle of rule application (17).

(17) Bottom-to-Top Principle (=BTP)¹

A metrical adjustment rule may not be applied to a subdomain of a domain in which a metrical adjustment rule has applied.

We can now explain the difference between (14) and (16). In (14) we have two applications of RA within one single domain. The BTP is irrelevant to the order of application in this case, being determined by the SDP. In (16), however, after the application of RA in a wider domain, returning to a subdomain is excluded by the BTP.²

At this point we are in the position to show that the violations of Maximality in Dutch are only so superficially. The derivation of 'Mendelsohnstraat tien' has two applications from bottom to top, respectively, right and left directional RA, as in (18).

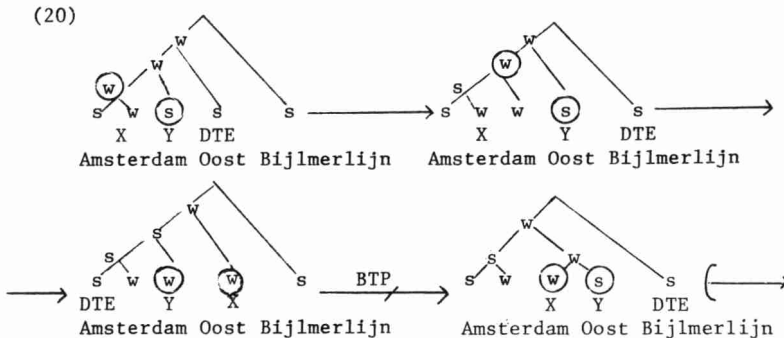


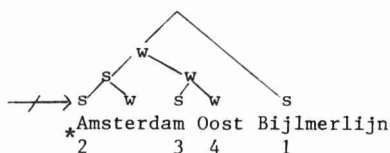
The Maximality Principle allows both applications. In the first step of the derivation X c-commands Y and in the next step, the nodes X and Y are sisters. English lacks the possibility of rightward RA and the output of (18) can only arise by a direct application of 'strengthening' to the left as in (5a), which implies a violation of Maximality.

Although Dutch differs from English with respect to the facts in (18) and (5a) (compare ²apple ³juice ⁴board ¹lobbyist), it resembles - somewhat surprisingly - English with respect to another class of examples, which Hayes gives as an illustration of Maximality (see 19).

- (19) (a) *2 3 4 1
 overdone steak blues
 (b) *2 3 4 1
 Amsterdam Oost Bijlmerlijn 'East Amsterdam-Bijlmer railroad'
 (c) * 2 3 4 1
 Waterlooplein een 'address'
 (d) * 2 3 4 1
 Watergraafsmeer polderschap 'Watergraafsmeer Polder Board'

These examples are comparable to the examples in (18) with regard to branching, but differ in sw-labelling. In Dutch (19b,c,d) with the same contour 2-3-4-1 as (19a) are also excluded. The BTP explains these facts without hesitation. In (20) the derivation proceeds correctly to the input structure of (18) (=the third step in the derivation).





Wa ter looplein een

However, if we want to go on as in (18), we will have to return to a subdomain in (20) and this is blocked by BTP. The only remaining possible application of RA would be 'strengthening' to the left – a direct conversion of the third step into the fifth step – but this would mean a violation of Maximality. Therefore, we cannot proceed beyond the third step in the derivation, just as in English.

The formulation of the BTP allows us to draw exactly the right distinctions between structures identical with respect to constituency but different with respect to labelling. The Maximality Principle of Hayes is supported also by Dutch facts, although the effects are obscured at first sight by the possibility of bi-directional adjustment. This situation became clear only after formulating two additional principles needed to constrain adjunction. The first was the Strong Domain Principle which states that the head of a strong constituent is immune to adjustment. This principle seems to be justified by Dutch as well as English facts. The second was the Bottom-to-Top Principle which constrains adjustment rules in their orders of application.

Notes

* We thank Wim Zonneveld for helping us in various ways.

1. By mentioning the notion 'domain' in (17) we assume that there is more than one DTE. Every constituent forms a domain in which one element is the strongest. This is the DTE of the domain under consideration.
2. It seems to us probable that our BTP is in fact an instance of 'strict cyclicity', but developing this idea would bring us to the highly uncertain topic of the cycle above word level. We leave this for future research.

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