A CONSTRAINT-BASED ANALYSIS OF COMPOUND ACCENT IN JAPANESE

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ABSTRACT

This paper describes the accentuation of compound nouns in Tokyo Japanese in the framework of Optimality Theory (Prince & Smolensky 1993). This new theory assumes that output forms of language production are determined by the interaction of language-universal constraints that are ranked in a particular way for a particular grammar. In this respect it differs from previous phonological theories which held that optimal outputs are produced by (mostly language-specific) rules that apply to input structures in a derivational, i.e. step-by-step, fashion. The ultimate goal of this paper is to demonstrate that the new constraint-based approach provides a simple description of the seemingly complex system of compound noun accentuation in (Tokyo) Japanese which cannot be captured by the traditional rule-based derivational approach.

1. DERIVATION VS. COMPETITION

Since the advent of Chomsky’s generative grammar it has been taken for granted that a linguistic system is a system of linguistic rules which apply to underlying forms to yield surface linguistic forms. In this traditional ‘derivational’ model of linguistics, the rules are mostly language-specific and are ordered in a particular way in a particular grammar. Thus languages (grammars) are supposed to differ from one another in the contents of the specific rules and their ordering as well as the input structures.

These ideas were rejected by Prince and Smolensky (1993) in their new linguistic theory called ‘Optimality Theory’ (see Kager 1999 and Hammond 1999 for details of this theory). This theory claims that a linguistic system is a system of constraints that are all language-universal, i.e. that are shared by all human languages. It assumes that languages differ not in the contents of the constraints but by their relative ranking (or importance), and that the constraints are ranked in a specific way in a specific language (grammar). Thus surface linguistic forms are determined not by the serial application of ordered rules, but by the competition of possible surface forms with reference to the language-specific ranking of the universal constraints. This implies that a certain form is selected as an ‘optimal’ output for a certain input structure not because it is the ‘perfect’ output for the input but because it is the ‘relatively best’ candidate among many output candidates for the input; an ‘optimal’ output form is the one that ‘best satisfies’ the constraint hierarchy or ranking in a relative sense.

Assume here that two languages, L1 and L2, differ in the relative ranking of four constraints (C1, C2, C3 and C4) as listed below.

\[
\text{Tableau 1: Constraint interaction in Language 1}
\]

<table>
<thead>
<tr>
<th>Input</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Output A</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b. Output B</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>c. Output C</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

Tableau 2: Constraint Interaction in Language 2

<table>
<thead>
<tr>
<th>Input</th>
<th>C2</th>
<th>C4</th>
<th>C3</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Output A</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b. Output B</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>c. Output C</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

Namely, for L1, C1 is the most important constraint and C4 is the least important, whereas for L2, C2 is the most important and C3 is the least important.

Language 1: C1 >> C2 >> C3 >> C4

Language 2: C2 >> C1 >> C4 >> C3

Even if the two languages share one and the same input structure, they are expected to yield different output structures for this same input due to the different constraint rankings above. A hypothetical situation is described in Tableau 1 and Tableau 2.

Output candidate A violates C2 and C3, Output candidate B violates C2, C3 and C4, and Output candidate C violates only C1. Table 1 illustrates how the four constraints interact with each other in the constraint ranking of Language 1: * indicates that the particular output form violates a certain constraint, whereas *! denotes that the violation is fatal in the competition with other constraints (and hence the output form in question becomes a loser). In the constraint hierarchy illustrated in Tableau 1, Output candidate C loses the competition with respect to the most important constraint in the ranking because the other two output candidates satisfy the same constraint. Of the latter two candidates, Output A will finally win over Output B, because Output A, but not Output B, satisfies the low-ranking constraint, C4. Thus the constraint interaction will choose Output 1 as the most optimal candidate for the input in question although this candidate violates two of the constraints and, in this sense, is far from being ‘perfect’.

Consider how constraints interact in the grammar of Language 2, which is illustrated in Tableau 2 above. In this constraint hierarchy, Output candidate A will no longer be the winner of the competition since it violates the top constraint, C2, whereas Output C does not. Output candidate B will be a loser for the
same reason. Thus this particular grammar will choose Output C as the most optimal output form among the three output candidates. The number of output candidates for a particular input is virtually unlimited, but all the other possible candidates are evaluated in exactly the same way with respect to the same constraint hierarchy.

2. COMPOUND ACCENT RULES

Compound nouns in Japanese are traditionally classified into two types according to the phonological length of the second member (N2). A LONG N2 consists of three or more moras whereas a SHORT N2 is either monomoraic or bimoraic. These two types of N2 are reported to exhibit different accent patterns in compound nouns (McCawley 1968, 1978; Poser 1984, 1990). For compounds with a long N2, I have proposed a foot-based analysis (Kubozono 1995, Kubozono and Mester 1995), which is less complicated than previous analyses including Tsujimura & Davis (1987) and Poser (1990). This analysis is summarized in (1) and exemplified in (2), where accent is denoted by an apostrophe placed immediately after the accented mora or, equivalently, the nuclear vowel of the accented syllable. As I shall show later, the generalization summarized in (1) can be extended to compound nouns with a short N2.

(1) Compound nouns with a `long' N2
   a. N2 accent is retained in compounds except when it is on the final syllable.
   b. A default COMPOUND ACCENT (CA) emerges on the rightmost nonfinal foot, when the N2 is lexically unaccented or accented on its final syllable.

(2) a. oo + ka'makiri oo-(ka'ma)(kiri) `big mantis'
    ya'mato + nade'siko yamato-(nade')(siko)
    `Japanese lady'
    saki + oto'o i saki-(oto)(o)i `three days ago'
    b. ne + syo'o gatu ne-(syo'o)(gatu)
    `the New Year holidays one spends lazily'
    sya'kai + zyo'ke'n syakai-(zyo'o)(ken)
    `social condition'
    minami + amerika minami-(a'me)(rika)
    `South America'

In contrast to the fairly simple behavior of long N2s, their short counterparts are reported to exhibit quite complicated behavior. This is the second type of compound accent that I analyze primarily in this paper. Previous studies (e.g. McCawley 1968, Poser 1990) assume that short N2s fall into the three prosodic types in (3) according to their accentual behavior in compounds. The first type, described in (3a), is called a DEACCENTING MORPHEME. This yields unaccented compounds, in which no abrupt pitch drop, a major manifestation of lexical accent, occurs in the phonetic output. PREACCENTING MORPHEMES in (3b) attract the CA on the last syllable of the first member. Finally, INITIAL- ACCENTING MORPHEMES in (3c) attract a CA on their initial syllable or, more precisely, keep their nonfinal accent in compound nouns.

(3) Three kinds of compound noun with a short N2
   a. N2=deaccenting morpheme
      ore'nzi + iro' orenzi-iro
      `orange+color; orange (color)'
      nezumi + iro' nezumi-iro
      `rat+color; grey (color)'
      sya'kai + to'o syakai-too
      `society+party; Socialist Party'
      o'gino + siki' ogin-ko-siki
      `Ogino+method; Ogino method'
   b. N2=preaccenting morpheme
      abare + uma' abare'-uma
      `to riot+horse; restive horse'
      sotugyo'o + siki' sotugyo-o-siki
      `graduation ceremony'
      ne'bada + syu'u nebada'-syuu
      `Nevada+state; the State of Nevada'
      huransu + pa'n huransu'-pan
      `France+bread; French bread'
      ne'kutai + p'in nekutai'-pin
      `necktie-pin; necktie pin'
      ka'buto + musi kabuto'-musi
      `helmet+bug; beetle'
      ne'bada + syu'u nebada'-syuu
      `Persia+cat; Persian cat'
      ni'waka + a'me niwaka-a'me
      `sudden+rain; shower'
      syo'o to + pa'su syooto-pa'su
      `short+pass; short pass'
      siihu'udo + pi'za siihuudo- pi'za
      `sea food+pizza; seafood pizza'

Previous analyses such as McCawley (1968) and Poser (1984, 1990) generally agree that the three types of short morphemes described in (3) are all marked in the lexicon, that is, that they are all lexically specified with respect to their accentual behavior in compound nouns. However, my statistical study reveals that this traditional analysis is inappropriate. In this study I made a fairly exhaustive list of bimoraic nouns and examined the accentual behavior they exhibit when they form the second member of compound nouns. This analysis has shown that the CA patterns in (3b) and (3c) are largely predictable if the pattern in (3a) is treated as marked. More specifically, it has revealed two independent rules exemplified in (4) and (5).

The PARSABILITY rule in (4) defines the relationship between the lexical accent and compound accent, stating specifically that N2 accent is preserved except when it is on the final syllable. This generalization is actually based on the three facts exemplified in (4), namely, (a) that N2 accent is never retained in compounds if it is on the final LIGHT SYLLABLE, (b) that N2 accent is seldom kept if it is on the final HEAVY SYLLABLE, and (c) that N2 accent is usually retained if it is on the nonfinal syllable (see Kubozono 1997 for exceptions to this generalization).

(4) Parsability rule: parsability of N2 lexical accent
   a. abare + uma' abare'-uma
      ore'nzi + iro' orenzi-iro
      `Persian cat+coat; Persian cat coat'
   b. ne'bada + syu'u nebada'-syuu
      sya'kai + to'o syakai-too
      `Persian cat+coat; Persian cat coat'
   c. pe'rusya + ne'ko perusya-ne'ko
      `Persian cat+coat; Persian cat coat'

By contrast, the default accent rule in (5) illustrates the
emergence of the unmarked; A default CA appears on the rightmost, nonfinal foot in two cases, (a) where N2 accent cannot be retained, and (b) where the N2 is lexically unaccented.

(5) Default accent rule
   a. abare + uma’ abare’)-(uma)
   b. kabuto + musi kabuto’)-(musi)

Interestingly, the two rules exemplified in (4) and (5) are identical to those given in (1), which were proposed for compound nouns with a long N2. This suggests that compound nouns with a long N2 and those with a short N2 can be attributed to essentially the same accent rule. In fact, the only significant difference between long and short N2s with respect to their accentual behavior in compounds is that short N2s admit a class of exceptions to the default rule in (5), namely, the deaccenting morphemes described in (3a). Virtually all the morphemes exerting a deaccenting effect on compounds are accentuated on the final syllable when pronounced in isolation. As expected from the parsability condition illustrated in (4), these finally-accented words do not keep their accents in compounds. However, they crucially differ from the default accent pattern in (3b) in that they do not attract a default accent (or any accent whatsoever). It is thus impossible to predict whether a given finally-accented morpheme behaves as a deaccenting morpheme as in (3a) or as a preaccenting morpheme as in (3b). This suggests that deaccenting morphemes must be marked in the lexicon with respect to their accentual behavior in compounds. The other two types of morphemes then need not be marked in the lexicon since their accentual behavior can largely be predicted by the combination of the two rules exemplified in (4) and (5).

The exceptional behavior of the deaccenting morphemes in (3a) remains difficult to derive in a theoretical framework. For this reason I simply assume here that they are marked in the lexicon with respect to their accentual behavior in compounds and put them beyond the scope of this paper. Investigating how this lexical markedness can be expressed in the nonderivational framework of Optimality Theory is certainly an interesting subject for future research.

3. A DERIVATIONAL ACCOUNT

Putting the lexically-marked morphemes aside, it is now necessary to account for the two functionally related but independent rules summarized in (4) and (5): that only nonfinal accents of the second member are retained as a CA and that a default CA emerges on the rightmost, nonfinal foot.

The two rules governing CA patterns are difficult to account for under the traditional rule-based, derivational approach. Poser (1990), for example, proposed the notion of FOOT EXTRAMETRICALITY for Japanese compounds with a long N2. His analysis posits a final bimoraic foot as extrametrical or invisible. Although Poser did not propose a similar foot-based analysis for compound nouns with a short N2, his derivational approach would not work for such forms. We cannot, for example, mark the final bimoraic foot as invisible since a lexical accent on the nonfinal syllable in the final foot is readily retained, e.g. perusya-ne’ko. Further, we cannot mark the final syllable as extrametrical since this analysis would not be compatible with the generalization in (5), namely, that the default CA falls on the rightmost, nonfinal foot. In order for this default rule to work, the final syllable must be properly incorporated into foot structure which, in turn, requires that this syllable be visible to the CA rule.

4. A NONDERIVATIONAL ACCOUNT

The dilemma outlined in the previous section is eliminated if the traditional derivational approach is abandoned in favor of a constraint-based, non-derivational approach. Under this new analysis, the two rules behind the compound accentuation can both be accounted for as a result of constraint interaction: interaction between MAX and NONFINALITY, on the one hand, and interaction between Nonfinality and EDGEMOSTNESS, on the other. The relevant constraints are defined in (6) (cf. Prince & Smolensky 1993).

(6) Relevant Constraints
   a. OCP: No more than one prominence peak (i.e. word accent) is allowed in a single prosodic word (PrWd).
   b. Max-accent: Retain the lexical accent of the N2 in compound nouns.
   c. Nonfinality (’): The head mora, i.e. the accented mora, is not final in the PrWd.
   d. Nonfinality (’): The head syllable, i.e. the accented syllable, is not final in PrWd.
   e. Nonfinality (Ft’): The head foot, i.e. the accented foot, is not final in the PrWd.
   f. Edgemostness/Rightmostness: A peak of prominence, or word accent, lies at the right edge of the Word.

Among the six constraints in (6), the violation of the constraint in (6f) is measured in a gradient way such that the number of syllables between the accented syllable and the word edge is counted. Violation of all the other constraints is calculated in an all-or-nothing manner: the constraint is either violated or satisfied.

I assume that the OCP constraint in (6a) and Nonfinality (’ ) in (6c) are undominated, i.e. very high-ranking, in Japanese compound accentuation. Reference to the OCP constraint as well output candidates that militate against this constraint is omitted in the following analysis.

An essential part of this analysis is that Nonfinality is decomposed into three independent subparts, Nonfinality (’), Nonfinality (’), and Nonfinality (Ft’). These three types of Nonfinality constraint exert different effects in constraint interaction, as we will see shortly (see Ito & Mester 1995 for other independent evidence for the separation of Nonfinality (’ ) and Nonfinality (Ft’ ) in Japanese).

I propose that the constraints in (6) are ranked as in (7), with the Max constraint flanked by the Nonfinality constraints.

(7) Nonfinality (’ , ’) Max-accent
     Nonfinality (Ft’ ) Edgemostness

How these constraints interact with each other in this constraint
hierarchy is illustrated in Tableaux 1-4, where only candidates respecting the undominated constraint in (6a) are considered. In Tableau 1, the accent of the N2, ne’ko, is readily preserved since this does not violate Nonfinality (’, ’). The first candidate, perusya-ne’ko, is thus regarded as optimal. All other candidates violate higher-ranked constraints.

Tableau 1

<table>
<thead>
<tr>
<th>perusya + ne’ko/</th>
<th>Nonfin (’.)</th>
<th>Max-A</th>
<th>Nonfin (Ft’)</th>
<th>Edgemost</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. perusya)-(ne’ko)</td>
<td>#</td>
<td>*</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>b. perusya’)-(neko)</td>
<td>*!</td>
<td></td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>c. perusya’)-(neko’)</td>
<td>’’, ’!</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

Tableau 2 illustrates the case where the N2 is an accented monosyllable. The first candidate cannot win since it violates Nonfinality (’). As the accent of the N2 cannot be retained due to this constraint, the unmarked accent pattern in (b), nebada’-syuu, becomes optimal as a consequence of the interaction of Nonfinality (Ft’) and Edgemostness.

Tableau 2

<table>
<thead>
<tr>
<th>ne’bada + syuu/u/</th>
<th>Nonfin (’.)</th>
<th>Max-A</th>
<th>Nonfin (Ft’)</th>
<th>Edgemost</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. nebada)-(syuu)</td>
<td>’!</td>
<td>*</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>b. nebada’)-(syuu)</td>
<td>*</td>
<td></td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>c. ne’bada’)-(syuu)</td>
<td>*</td>
<td></td>
<td>#!</td>
<td></td>
</tr>
</tbody>
</table>

Tableau 3 shows a similar situation, with the only difference being that the N2 is bisyllabic, not monosyllabic. Here too, the candidate with a default CA in (c), abare’-uma, is selected as a result of the interaction between Nonfinality (Ft’) and Edgemostness.

Tableau 3

<table>
<thead>
<tr>
<th>abare + uma/</th>
<th>Nonfin (’.)</th>
<th>Max-A</th>
<th>Nonfin (Ft’)</th>
<th>Edgemost</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. abare’-(uma)</td>
<td>’’, ’!</td>
<td>*</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>b. abare’)-(uma)</td>
<td>*</td>
<td>*!</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>c. abare’)-(uma)</td>
<td>*</td>
<td></td>
<td>#</td>
<td></td>
</tr>
</tbody>
</table>

Finally, Tableau 4 illustrates a case where the N2 has no lexical accent to preserve. In this form as well, the unmarked pattern, kabuto’-musi in (c), emerges as a consequence of the interaction of Nonfinality (Ft’) and Edgemostness.

Tableau 4

<table>
<thead>
<tr>
<th>ka’buto + musi/</th>
<th>Nonfin (’.)</th>
<th>Max-A</th>
<th>Nonfin (Ft’)</th>
<th>Edgemost</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. kabuto)-(mushi)</td>
<td>’’, ’!</td>
<td>*</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>b. kabuto)-(mu’si)</td>
<td>*!</td>
<td></td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>c. kabuto’)-(mushi)</td>
<td>#</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. ka’buto’)-(mushi)</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. CONCLUDING REMARKS

To summarize, I have argued for the following two points in this paper. First, it is unnecessary to assume that the three types of ‘short’ second members of compound nouns in Tokyo Japanese are all marked in the lexicon. I have rejected this traditional view and shown that only deaccenting morphemes are lexically marked. I have argued that the accentual patterns of the other two types of morphemes can largely be predicted on the basis of their syllable structure. Second, the unmarked CA patterns can be properly accounted for by a nonderivational analysis, but not by a derivational analysis.

6. REFERENCES


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