Glottal stops in Taiwanese and Japanese: An Optimality Approach

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1 The Optimality Theory

In contrast to the traditional rule-based phonology, OT does not have rules but constraints. In OT a hierarchy of mutually ranking constraints will select out from all possible outputs the optimal one as the surface representation. While the constraints are universal, the ranking of them is different from language to language.

In an OT tableau, the input is placed at the top of left cell. The candidates generated from the input by GEN appear in the leftmost column. The constraints of interests are at the top of the tableau. The leftmost constraint is highest ranked and the rightmost constraint is lowest ranked. Violations of the constraints are indicated by the symbol *, and the fatal violation is marked by the symbol !. Shaded areas in the tableau indicate constraints that should no longer be considered since a higher ranked constraint has already been violated. A pointing hand $\Rightarrow$ within the tableau marks the candidate that is predicted by the constraints as the optimal output; and a pointing hand outside the tableau, if any, indicates the candidate that that is optimal in reality but fails to be predicted by the constraints set.

2 Correspondence Theory

The constraint that requires a mapping between input and output is IO-Faith (Input-Output Faithfulness). Other constraints are listed as below.

(1) Constraints on Correspondence Elements (McCarthy and Prince 1995b: 370-371)

**MAX**: Every element of S1 has a correspondent in S2.

- Domain (R) = S1

**DEP**: Every element of S2 has a correspondent in S1.

- Range (R) = S2

**IDENT (F)**: Let $\alpha$ be a segment in S1 and $\beta$ be any correspondent of $\alpha$ in S2. If $\alpha$ is $\gamma F$, then
addition, other markedness constraints are also important in determining the optimal

In English, the relative markedness constraint in the case of Japanese analogy. In

markedness condition, coronal means *LAB and *DORS. Therefore, *DORS

markedness condition, coronal means *LAB and *COR or vowels is established by the

been ranked *LAB, *DORS >> *COR. The ranking is established by the

If we follow Clements and Hume (1997), front vowels are taken as coronal (least

3 Markedness Theory

Constraints (e.g. phonological well-formed constraints) are different and separate and they are respectively ranked with respect to the markedness

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suffix. Note that 10 correspondence and 00 correspondence constraints are

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candidate, such as NO-GEMINATE and IDENT-μ. The conception of
NO-GEMINATE comes from the conception of OCP (adjacent identical segments are
prohibited). IDENT-μ means if y stands in a relation of correspondence with x, then
the moraic value of x and y should be identical.

Segmentals change (i.e., the insertion or deletion of glottal stops) due to the
relevant rank: of the constraints on Correspondence with respect to segmental
markedness constraints.
4 The glottal stops in Japanese and Tainwanese
4.1 Japanese: epenthesis of glottal stops
◆ bases suffixed by u / ru
/ utau / -ta → utatta / doru / -ta → dotta
'sing' 'suffix' 'sang' 'take' 'suffix' 'took'
◆ bases suffixed by ku
/ iku / -ta → itta
'go' 'suffix' 'went'
4.2 Taiwanese: deletion of glottal stops
◆ bases followed by another base (syllable)
/ kwat / -ts'ay → kwa ts'ay / pek / -kiw → pe kiw
'cut' 'vegetables' 'cut vegetables' 'white' 'ball' 'whlté ball'
/ tsyok / -kā → tsyo kā
'borrow' 'mirror' 'borrow a mirror'
◆ bases followed by a suffix
/ tsyog / -a → tsyo a / lwag / -a → lwa a
'pebble' 'suffix' 'pebble' 'comb' 'suffix' 'comb'
5.1 Japanese: MAX-OO >> NO-GEMINATE
5.1.1 ANCHOR-L >> * DORS (V) >> MAX-OO >> NO-GEMINATE
When followed by -ta (the suffix for past tense), / utau / ('sing') changes to
utatta ('sang') (A glottal stop is inserted and realized as gemination).
Tableau 1: Japanese ( utau 'sing' → utatta 'sang' )

<table>
<thead>
<tr>
<th>/ utau / -- ta</th>
<th>ANCHOR-L</th>
<th>*DORS (base vowel)</th>
<th>MAX-OO</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. utatta</td>
<td></td>
<td>**</td>
<td>*</td>
</tr>
<tr>
<td>b. utauta</td>
<td></td>
<td>***!</td>
<td></td>
</tr>
<tr>
<td>c. itaita</td>
<td>*!</td>
<td>*</td>
<td>***</td>
</tr>
<tr>
<td>d. tita</td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>e. tatta</td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>f. tata</td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

269
These constraints ANCHOR-L, DORS(v), MAX-OO, and NO-GEMINATE are not able to select one of the optimal candidates in the case of domo (take, take, take).

Table 3: Japanese (take, sake, sake, sake)

<table>
<thead>
<tr>
<th>ANCHOR-L</th>
<th>MAX-OO</th>
<th>DORS(v)</th>
<th>NO-GEMINATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>i**</td>
<td>i*</td>
<td>e ina</td>
<td></td>
</tr>
<tr>
<td>d, ina</td>
<td>i*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c, ina</td>
<td>i*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>p, ina</td>
<td>i*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>q, ina</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Japanese (take, sake, sake)

<table>
<thead>
<tr>
<th>ANCHOR-L</th>
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</table>

As illustrated in Tableau 3, lowest is illustrated in Tableau 4.

More constraint M is ruled out (see Tableau 2, so no GEMINATE must be ranked. NO-GEMINATE cannot be ranked higher than DORS(v), otherwise the optimal.

As illustrated, another constraint NO-GEMINATE is also relevant in this case.

The optimal output in addition since the geminates of a glide is always taken as the optimal output, it is ruled out. As a result, candidate a Muna is selected and in as in the third violation, it is ruled out. A candidate b violates the constraint DORS(v) three times and incurs a fatal violation.

The constraints will determine which candidate is the optimal one. Because the rest ANCHOR-L is ranked highest and DORS(v) is ranked higher than MAX-OO.

As illustrated in Tableau 1, ANCHOR-L, DORS(v) (or the vowel of the base),