Beyond Output Correspondence: Tone Sandhi in Southern Min Reduplication

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1. Tone Sandhi—the modification of a tone in certain linguistic contexts
2. This paper is about tone sandhi in Southern Min, a dialect of Chinese spoken in Taiwan, and in the southern provinces of China including Southern Fujian, part of Guangdong, and Hainan. (a.k.a. Xiamen, Amoy, Hoklo, Hokkian, & Taiwanese)

3. Two major issues:
   a. Southern Min tone sandhi in a constraint-based account.
      o How do tones change?
   b. Tonal patterns in Southern Min reduplications.
      o The tones of certain reduplicants do not follow sandhi patterns.
      o I will propose an Extended Model of Correspondence as a supplement to McCarthy & Prince’s (1995) Full Model of Correspondence.

   Extended Model of Correspondence:
   Input: /Af RED2 + AfRED1 + Stem/
   Output: Reduplicant2 Reduplicant1 Base

4. Organization of this talk:
   a. Tones and tone sandhi in Southern Min
   b. Sandhi patterns in the reduplication of monosyllables
   c. A constraint-based OT account
   d. Theoretical implications

I. Tones and Tone Sandhi in Southern Min

5. There are 7 base tones in Southern Min:
   a. 5 non-entering tones: HH, MM, ML, HM, LM (open syllables)
   b. 2 entering tones: H, M (closed syllables)

6. Tone Sandhi in Southern Min
   a. Every tone has a corresponding sandhi tone that they change into.
   b. Tone sandhi takes place at all but the last syllable in a tone group.

Taiwanese tone sandhi rule (Chen 1987: 113; Chung 1996: 5):
T → T’ / __T within a tone group (T = citation tone; T’ = sandhi tone)

7. Data:

   (A) Citation form Sandhi form
   a. pH’uŋ ‘fragrant’ pH’uŋ tsui ‘fragrant water (perfume)’
      HH MM HM
   b. à: ‘red’ à: siet ‘red color’
      LM MM M
   c. tua: ‘big’ tua: tsui ‘big water (flood)’
      MM ML HM
   d. ts’u: ‘house’ ts’u: ka: ‘house foot (landlord)’
      ML HM HH
   e. ts’i: ‘hand’ ts’i sim ‘hand heart (palm)’
      HM HH HH

   (B) Citation form Sandhi form
   a. tzit ‘one’ tzit kà: ‘one day’
      H M HH
   b. bat ‘know’ bat li: ‘know words (literate)’
      M H MM

8. Tone circle for non-entering tone sandhi in Taiwanese (Chen 1987):

   Tone flipping for entering tones in Taiwanese: H → M
   M → H

9. The question remains:
   What’s the relation between the base tone and its sandhi tone?

II. Sandhi Patterns in the Reduplication of Monosyllabic Words

10. mono-reduplication (AA):
    RED as a morpheme carrying a diminutive meaning to the stem.
    – la’MM ‘old’; la’ML-la’MM ‘a bit old’.
    – k’waML ‘to look’; k’waHM-k’waML ‘try to take a look’.

11. double reduplication (AAA):
    Double REDs as an intensifier
    – la’MH-la’ML-la’MM ‘very very old’
12. Tonal patterns in reduplication:

<table>
<thead>
<tr>
<th>Root</th>
<th>mono-RED</th>
<th>double RED</th>
<th>glossary</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>kʰaʔ</td>
<td>kʰaʔ</td>
<td>kʰaʔ</td>
</tr>
<tr>
<td></td>
<td>HH</td>
<td>MM</td>
<td>HH</td>
</tr>
<tr>
<td>b.</td>
<td>kaʔ</td>
<td>kaʔ</td>
<td>kaʔ</td>
</tr>
<tr>
<td></td>
<td>MM</td>
<td>LM</td>
<td>MM</td>
</tr>
<tr>
<td>c.</td>
<td>la”</td>
<td>la”</td>
<td>la”</td>
</tr>
<tr>
<td></td>
<td>MM</td>
<td>MM</td>
<td>MH</td>
</tr>
<tr>
<td>d.</td>
<td>se</td>
<td>se</td>
<td>se</td>
</tr>
<tr>
<td></td>
<td>ML</td>
<td>HM</td>
<td>ML</td>
</tr>
<tr>
<td>e.</td>
<td>soŋ</td>
<td>soŋ</td>
<td>soŋ</td>
</tr>
<tr>
<td></td>
<td>HH</td>
<td>HM</td>
<td>HH</td>
</tr>
<tr>
<td>f.</td>
<td>tit</td>
<td>tit</td>
<td>tit</td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>g.</td>
<td>sip</td>
<td>sip</td>
<td>sip</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

13. Question:
How do we determine the tone of the second reduplicant in a double reduplication?

III. A Constraint-Based Account & Extended Model of Correspondence

   a. Pitch height—H, M, L
   b. Tone shape—level, contour (rising, falling), etc.

15. (Revised) representation of tones in Southern Min

<table>
<thead>
<tr>
<th></th>
<th>Falling</th>
<th>Level</th>
<th>Rising</th>
<th>Entering (short)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>HH</td>
<td>H</td>
<td>HM</td>
<td>LM</td>
</tr>
<tr>
<td>Mid</td>
<td>MM</td>
<td>M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>ML/LL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

16. Southern Min Tone Sandhi:

(A) Faithfulness constraints—
   \textbf{FAITH\textsc{TONE}\textsc{SHAPE} (FTS)}: Keep the shape of the base tone in the sandhi tone.
   \textbf{ADJACENT\textsc{LEVEL}}: Input and the output tones should be within adjacent pitch levels.
   \textbf{IDENT\textsc{-MORA}}: The numbers of moras in the input and in the output are identical.

17. pʰaŋ tsui ‘perfume’
\[
\begin{array}{|c|c|c|c|}
\hline
\text{Root} & \text{Mora} & \text{FTS} & \text{IDENT\textsc{-MORA}} & \text{ADJACENT\textsc{LEVEL}} & \text{LOWER\textsc{SANDHI}} \\
\hline
pʰaŋ & tsui & FTS & IDENT\textsc{-MORA} & ADJACENT\textsc{LEVEL} & LOWER\textsc{SANDHI} \\
\hline
a. HH-HM & & & & & \\
\hline
b. MM-HM & & & & & \\
\hline
c. ML-HM & & & & & \\
\hline
d. HM-HM & & & & & \\
\hline
e. LM-HM & & & & & \\
\hline
f. M-HM & & & & & \\
\hline
\end{array}
\]

18. tua tsui ‘flood’
\[
\begin{array}{|c|c|c|c|}
\hline
\text{Root} & \text{Mora} & \text{FTS} & \text{IDENT\textsc{-MORA}} & \text{ADJACENT\textsc{LEVEL}} & \text{LOWER\textsc{SANDHI}} \\
\hline
\text{tu} & \text{a.tsui} & FTS & IDENT\textsc{-MORA} & ADJACENT\textsc{LEVEL} & LOWER\textsc{SANDHI} \\
\hline
a. HH-HM & & & & & \\
\hline
b. MM-HM & & & & & \\
\hline
c. ML-HM & & & & & \\
\hline
d. HM-HM & & & & & \\
\hline
e. LM-HM & & & & & \\
\hline
f. M-HM & & & & & \\
\hline
\end{array}
\]

19. tsʰu kʰa ‘landlord’
\[
\begin{array}{|c|c|c|c|c|}
\hline
\text{Root} & \text{Mora} & \text{FTS} & \text{IDENT\textsc{-MORA}} & \text{ADJACENT\textsc{LEVEL}} & \text{LOWER\textsc{SANDHI}} \\
\hline
\text{tsʰu} & \text{kʰa} & FTS & IDENT\textsc{-MORA} & ADJACENT\textsc{LEVEL} & \text{HIGHER\textsc{SANDHI}} & \text{LOWER\textsc{SANDHI}} \\
\hline
a. HH-HH & & & & & \\
\hline
b. MM-HH & & & & & \\
\hline
c. ML-HH & & & & & \\
\hline
d. HM-HH & & & & & \\
\hline
e. LM-HH & & & & & \\
\hline
f. H-HH & & & & & \\
\hline
\end{array}
\]

20. tsʰi iw sim ‘palm’
\[
\begin{array}{|c|c|c|c|c|}
\hline
\text{Root} & \text{Mora} & \text{FTS} & \text{IDENT\textsc{-MORA}} & \text{ADJACENT\textsc{LEVEL}} & \text{LOWER\textsc{SANDHI}} \\
\hline
\text{tsʰi} & \text{w.sim} & FTS & IDENT\textsc{-MORA} & ADJACENT\textsc{LEVEL} & \text{LOWER\textsc{SANDHI}} \\
\hline
a. HH-HH & & & & & \\
\hline
b. MM-HH & & & & & \\
\hline
c. ML-HH & & & & & \\
\hline
d. HM-HH & & & & & \\
\hline
e. LM-HH & & & & & \\
\hline
f. H-HH & & & & & \\
\hline
\end{array}
\]

(B) Sandhi constraints--
   \textbf{SANDHI}: Non-final tones in a tone group should change.
   \textbf{LOWER\textsc{SANDHI}}: The sandhi tone should be lower than the citation tone.
   \textbf{HIGHER\textsc{SANDHI}}: The sandhi tones of contour tones (falling and rising) should be higher.

Higher \textsc{SANDHI} >> FTS
21. á: siet ‘red color’

<table>
<thead>
<tr>
<th>/áे-siet/</th>
<th>Higher Sandhi</th>
<th>FTS</th>
<th>IDENT Mora</th>
<th>ADJACENT Level</th>
<th>LOWER Sandhi</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. HH-HH</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b. MM-HH</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. ML-HH</td>
<td>*!</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. HM-HH</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. LM-HH</td>
<td>*!</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. H-HH</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

22. entering tones:

a. tzit kã: ‘one day’

<table>
<thead>
<tr>
<th>/tzit.kã/</th>
<th>Higher Sandhi</th>
<th>FTS</th>
<th>IDENT Mora</th>
<th>SANDHI</th>
<th>LOWER Sandhi</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. HH-HH</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. MM-HH</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. ML-HH</td>
<td>*!</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. HM-HH</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. LM-HH</td>
<td>*!</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. H-HH</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. M-HH</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. bat li: ‘know words’

<table>
<thead>
<tr>
<th>/bat.li/</th>
<th>Higher Sandhi</th>
<th>FTS</th>
<th>IDENT Mora</th>
<th>SANDHI</th>
<th>LOWER Sandhi</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. HH-MM</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. MM-MM</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. ML-MM</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. HM-MM</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. LM-MM</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. H-MM</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. M-MM</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

23. Crucial Ranking: HigherSandhi >> FaithToneShape

24. Tones in reduplication

**Reduplication Pattern AA—mono-reduplication**

Input: /Af RED + Stem/
Output: Reduplicant Base
TONE: sandhi base

**Reduplication Pattern AAA—double reduplication**

Input: /Af RED2 + Af RED1 + Stem/
Output: Reduplicant2 Reduplicant1 Base
TONE: ? sandhi base

25. Correspondences of tones:

<table>
<thead>
<tr>
<th>tone</th>
<th>2nd RED</th>
<th>1st RED</th>
<th>BASE</th>
<th>RED</th>
<th>BASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>M</td>
<td>M</td>
<td>H</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>II</td>
<td>M</td>
<td>H</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>III</td>
<td>M</td>
<td>H</td>
<td>L</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>IV</td>
<td>H</td>
<td>M</td>
<td>M</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>V</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td>VI</td>
<td>M</td>
<td>H</td>
<td>M</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>VII</td>
<td>H</td>
<td>(H)</td>
<td>M</td>
<td>(M)</td>
<td>H</td>
</tr>
</tbody>
</table>

26. Full Model of Correspondence (M&P 95):

Input: /Af RED + Stem/
Output: Reduplicant    Base

27. Extended Model of Correspondence:

28. Accounting for tones in reduplication:

**HigherR2-B(R):** The rightmost tone in Reduplicant2 is higher than that in the base unless they are both already HIGH and therefore cannot be higher (at the moraic level).

**AdjacentLevelB-R:** The base and the reduplicant tones should be within adjacent pitch levels (at the moraic level).

**IdentTone R-R(L):** The leftmost tones in the Reduplicants are identical (at the moraic level).
29. This can account for all non-entering tones:

<table>
<thead>
<tr>
<th>Tone</th>
<th>IdentToner-R(L)</th>
<th>Higher R-B (R)</th>
<th>AdjacentLevel B-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>HH-MM-HH</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LM-MM-HH</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MM-MM-HH</td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>
| ML-MM-HH | | *! | *
| HM-MM-HH | *! | | *
| H-MM-HH | *! | | *
| MH-MM-HH | | | |

30. IDENT-MORA ranks low for entering tones:

<table>
<thead>
<tr>
<th>Tone</th>
<th>IdentToner-R(L)</th>
<th>Higher R-B (R)</th>
<th>AdjacentLevel B-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>HH-MM-HH</td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>
| HM-MM-HH | | | *
| HL-MM-HH | | | *
| M-M-H | | *! | *

33. ISSUE 2: Extended Model of Correspondence

This extended model offers parametric possibilities for multiple correspondences of a logically infinite set.

34. ISSUE 3: Factorial Typology of Sandhi Patterns

a. HigherSandhi >> FaithToneShape: Southern Min, Mandarin
b. FaithToneShape >> HigherSandhi, LowerSandhi
c. LowerSandhi >> FaithToneShape >> HigherSandhi

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Selected References