[Review]

Distributed Reduplication


Ryuji Harada
Otsuma Women’s University

Keywords: juncture insertion, no crossing constraint, readjustment rules, transcription

1. The Position of Distributed Reduplication in the History of Reduplication Theories

Reduplication has always been one of the major topics in morphology and phonology providing theoretical insights as well as theoretical challenges. There have been several turning points in the course of the studies in reduplication. Wilbur (1973) is one of the first serious attempts of accounting for the nature of reduplication and its characteristic behavior in phonology commonly known as over- and under-application. Marantz (1982) defines reduplication as affixal concatenation in the framework of autosegmental theory. McCarthy and Prince (1986) provides prosodic accounts of possible shapes of copied portions in the reduplicative construction. These are all in the generative transformational framework, which was first elaborated by Chomsky and Halle (1968). With the advent of the optimality theory (OT), after McCarthy and Prince (1995) revising Prince and Smolensky (1993), the phenomena of reduplication have been viewed as a matter of evaluating identity of the base and the reduplicant, to use the OT terms, and not as a matter of how to copy the part of the stem by means of transformational rules.

Frampton’s theory of reduplication is in the traditional line of the generative transformational framework with its predecessors, Wilbur and Marantz. It is not in the optimality theory framework. The reader will readily understand the whole nature of this work by reading its preface:

I hope to provide evidence that the model of phonological computation developed by Chomsky and Halle in The Sound Patterns of English (1968) is fundamentally correct: surface forms are produced...
by the successive modification of underlying forms. (xi)

However, Frampton departs from the predecessors by viewing reduplication as a sing/sang type of morphological modification, not as a like/liked type of affixal concatenation. He also departs from the predecessors by letting the work of copying be done between morphology and phonology, hence its name “Distributed.” As I will outline in the following sections, three main operations of reduplication are positioned or distributed over morphology and phonology. Frampton’s main interest is how a part of the stem is copied: its rules, mechanism and algorism, following his aspiration to salvage this now largely ignored area of the research:

Unfortunately, the project of understanding the autosegmental structure of the representations involved in copying was never integrated with the project of understanding the various roles that prosody can play in morphology. A close analysis of the copying process was largely abandoned in favor of prosodic analysis. In my view, this was a mistake. (p. 1)

The following quote further helps the reader understand how Frampton thinks the copying machinery is important in the grammar:

String copy is a mechanism that the language apparatus needs independently of reduplication. Strings must be copied from the lexicon to an active workplace, for example. I suppose that morphology and phonology co-opt this mechanism for reduplication. (p. 51)

It is very important for the readers to understand that the whole copying machinery of the kind proposed in this work is unnecessary or nonexistent in OT, in which all the work of copying along with other modifying operations are unseeingly undertaken in the Gen. Forms come out for evaluation as candidates; they have already been copied or modified. Yet, the advocates of the OT will also be inspired by the variety of data presented in this book (section 3.4 and chapter 7), by the new look at the controversial phenomena of over- and under-application exploiting the characteristics of the crossed-line structure and long-distance geminates (section 2.2), and by the ingenious account of reduplication with fixed segments using the algorithm of duplicant truncation (section 4.1).

2. Basic Architecture of Distributed Reduplication

In Distributed Reduplication (DR), the operations involved in copying are decomposed into three main parts. “Since the theory distributes the responsibility for reduplication over multiple suboperations, it is called Distributed
Reduplication (DR).” (p. 5) These are:

(1) a. Juncture Insertion (morphology) …xxxx… → …x[xxx]x…
    b. Transcription (phonology) segment copying
    c. No Crossing Constraint Repair (phonology) restructuring operation

Juncture insertion in morphology determines the part of the string to be copied. It inserts in the X timing slots the delimiters ([ and ]), which are called junctures or duplication junctures. This enclosed part is called a duplicant. Frampton claims that these junctures are real phonological objects and therefore subject to manipulation in phonology. More concretely, they are moved to the left or right by readjustment rules so that the duplicant meets prosodic requirements. Juncture insertion is triggered by addition of a morpheme to the structure such as PLURAL or INTENSE, for example, in the same way as addition of PAST triggers the lowering of the vowel of sing to sang in English.

Transcription in phonology performs actual copying of the duplicant [xxx]. This operation necessarily creates a situation where the linking lines between timing slots and segments cross multiple times, which is taken to be malign (No Crossing Constrain) and must be remedied in some way (Sagey (1988)).

No Crossing Constraint Repair (NCC Repair) is the restructuring operation which untwines the crossed lines so that each single timing slot is linked to the segment which sits straight below the slot. The example (2) illustrates the core operation of DR, in which addition of PURAL morpheme is omitted in order to enhance the visibility of the structure below the x timing slots.
3. Interpolation of Phonological Rules

As an illustration of how DR works with more complex data, let us look at the case of Malay intensive/plural morphology. It is realized by total stem reduplication, and it interacts with nasalization. Frampton’s data below are from Onn (1976).

Malay has a process of progressive nasalization which successively spreads nasal quality to the following vowels such that aŋan changes to aŋãn and mewah changes to mẽwãh. When the stem containing a nasal consonant is reduplicated, Malay exhibits overapplication, so that aŋãn reduplicates into aŋãnãŋãn. In this case, even though the initial vowel is not in the environment of progressive nasalization, it is nasalized due to the overapplication of the rule, or in the OT parlance, due to the identity effect of the base and the reduplicant.

Frampton explains this as illustrated in (3). The intensive/plural morpheme triggers the juncture insertion, and since this is a total reduplication, the junctures enclose the whole stem. Transcription is immediately performed without any readjustment. Then the nasalization applies between Transcription and NCC Repair. This means that the nasalization works on the crossed-line structure (Frampton’s (9) and (10)). One of the characteristics of DR is the positive use of this structure. It uses this stage externally.

(Compiled from Frampton’s (3) and (10))
for the rule ordering purposes: ordering the nasalization rule before or after the crossed-line structure gives different result as we will see below. It also uses this stage internally exploiting the two-to-one linking lines, i.e. two timing slots to one segments, as an intermediate state, which is subsumed under the term Long-Distant Geminate (section 2.2).

(3) Malay overapplication of nasalization:

\[ aŋän \, \text{‘reverie’} \rightarrow âŋâŋâŋân \, \text{‘ambition’} \]

In (3), nasalization is ordered before NCC Repair and it is subject to the conditions on nasalization (an instance of feature sharing) as shown in (4) and (5).

(4) Conditions on nasalization in geminate structure

a. \[ \begin{array}{c}
\text{JuncIns} \\
\text{Loose condition}
\end{array} \]

\[ \begin{array}{c}
\text{Transcription} \\
\rightarrow
\end{array} \]

\[ \begin{array}{c}
\text{NCC Repair} \\
\rightarrow
\end{array} \]

b. \[ \begin{array}{c}
\rightarrow
\end{array} \]

(5) a. Loose condition: ANY of the timing slots associated with the geminate vowel follow the timing slot associated with nasals.

b. Strict condition: ALL of the timing slots associated with the geminate vowel follow the timing slot associated with nasals.

In (4), each vowel is associated to two x timing slots. Under the loose condition, only one of them needs to satisfy the adjacency requirement for nasalization (5a). Under the strict condition, both of them need to satisfy the adjacency requirement for nasalization (5b). The short rightward arrows in (4) mark this difference. The Malay example word in (3) satisfies the loose condition only, but nevertheless, the nasal vowels prevail over the entire word proving that adopting the loose condition results in overapplication.

Instances of underapplication would emerge if the nasalization applied un-
der the strict condition and before NCC Repair. Instances of normal application would emerge irrespective of the loose or the strict condition if the nasalization were ordered after NCC Repair. Each case is summarized in (6).

(6) Order of the rules:
Nasalization > NCC Repair: overapplication $\tilde{a}g\tilde{a}n\tilde{a}g\tilde{a}n$
(Loose condition)
or underapplication $^*a\tilde{g}\tilde{a}n\tilde{a}g\tilde{a}n$
(Strict condition)
NCC Repair > Nasalization: normal application $^*a\tilde{g}\tilde{a}n\tilde{a}g\tilde{a}n$
(No geminate)

4. Copying Algorithm and Truncation—A Fixed Segment as an Affix

In the actual copying algorithm, Frampton introduces another set of junctures called truncation junctures (< and >). This is one of the novel ideas proposed in DR. In the default case, these sit at the edge of the stem enclosing nothing as in the second row in (1. Init) in (7). In this initial state, the truncation junctures are set at the left edge, meaning that nothing has yet been copied. Once the copying starts, one of the junctures moves step-by-step enclosing the already copied segment. This operation is called CopyShift. This operation takes the role of bookkeeping the copying.

(7)

1. Init $[\langle X \; X \; X \rangle]$ kat

2. CopyShift $X \; [\langle X \rangle \; X \; X]$ kkat

3. CopyShift $X \; X \; [\langle X \rangle \; X \; X]$ kakat

4. CopyShift $X \; X \; X \; [\langle X \rangle \; X \; X]$ katkat

(Frampton’s (70))
The subtlety of this idea is that the enclosed part is never again copied. This means that if any morpheme has a segment in the lexicon which is specified to be enclosed by these truncation junctures from the beginning, it is immune to copying. In other words, the enclosed part is left out. Hence, the symbols < and > are called truncation junctures.

This idea works ingeniously in an analysis of reduplication with fixed segment. Observe the following Yoruba example.

(8) Yoruba nominalizing affix:

<table>
<thead>
<tr>
<th>Root Nominal form</th>
</tr>
</thead>
<tbody>
<tr>
<td>lọd li-lọd ‘to go’</td>
</tr>
<tr>
<td>Dun di-dun ‘to be tasty, sweet’</td>
</tr>
</tbody>
</table>

CV- reduplication with V fixed to i. (Frampton’s (76))

Yoruba nominalizing reduplication copies the initial consonant with the fixed vowel i following it. DR treats this as a prefix with the enclosed vowel i as shown in (9).

(9) Prefix shape: [<i>]

Prefix | Juncture Ins | Transcription
-------|-------------|-----------------

\[\text{d u n} \quad \text{i d u n} \quad \text{i d u n}\]

NCC Repair

\[\text{d-u-n} \quad \text{d-i-dun}\]

(Frampton’s (77))

Note that when the prefix is added to the structure, it induces Juncture insertion of both [ ] and < >. Since i has already been enclosed by the truncation junctures < and >, CopyShift in Transcription takes place only once duplicating d to the left. Frampton claims that Juncture insertion is a type of readjustment rule as in the case where the PAST tense morpheme triggers certain alternations of verb forms in English.

5. Juncture Insertion as One Type of Readjustment Rules

Another novelty of DR is interpolation of readjustment rules between the components of the copying operation. The readjustment rules are morphologically conditioned phonological rules. In the case of the English morphology and phonology, the sing/sang alternation is lexically conditioned by
the morphemes involved. Likewise, the readjustment rules in reduplication are morphologically conditioned. The following derivation illustrates how the readjustment works. The notation \([\text{[SELL]}]\) symbolizes a morpheme, i.e. a bundle of morphological features. It is realized as the vocabulary item with the phonological exponent \([s\varepsilon l]\). It was inserted in the step before (a). Inserting the past tense -\(d\) triggers the readjustment rule of backing the vowel. That means a particular readjustment rule is associated with a particular vocabulary item.

(10) Readjustment rule in English past tense:

\[
\begin{align*}
\text{a. } & \quad \text{[[SELL]] PAST} \\
\text{b. } & \quad \text{[[SELL]] PAST} \xrightarrow{\text{LexIns}} \text{[[SELL]] PAST} \\
\text{c. } & \quad \text{[[SELL]] PAST} \xrightarrow{\text{Readjust}} \text{[[SELL]] PAST}
\end{align*}
\]

(Frampton’s (48))

(11) \(sell/ sold\) alternation: both concatenative and nonconcatenative
\(\text{sing/sang}\) alternation: nonconcatenative

It is worth noting that in the case of the \(sell/sold\) alternation, morphology involves both the concatenative processes, i.e. the addition of \(d\) and the nonconcatenative process, i.e. the backing of \([\varepsilon]\) to \([o]\).

DR views Juncture insertion as one type of readjustment rule and it triggers the insertion of junctures. DR does not view reduplication to be specifically concatenative as opposed to Marantz (1982) and McCarthy and Prince (1986). They view reduplication as the concatenative affixation of timing slots or prosodic categories.

6. Goal-driven Rules and Their Ordering

As an elaboration of how the readjustment rules actually work, Frampton, in line with Sommerstein (1974), introduces a rule application schema using disjunctively ordered lists of goal-driven rules. Goal driven rules (GDRs) are defined as:

\[
(12) \quad \alpha \rightarrow^r \beta \quad \quad \text{(Frampton’s (154))}
\]

\[
(13) \quad \alpha \rightarrow^g \beta \text{ if } \alpha \text{ does not satisfy } g, \quad \alpha \rightarrow^r \beta, \quad \text{and } \beta \text{ does satisfy } g \quad \quad \text{(Frampton’s (156))}
\]

In (12), \(r\) is a simple rule of the SPE type meaning \(r\) can apply to \(\alpha\) to
produce $\beta$. (13) defines the GDR. In this schema, “The condition $g$, the goal, plays a dual role as a rule trigger and an output constraint” (p. 91). In other words, when Goal$_{i}$ is not satisfied, Rule$_{i}$ applies so that Goal$_{i}$ is satisfied. Frampton further proposes that GDRs are disjunctively ordered. This works such that when more than one GDRs are applicable, the higher-ranked GRD applies to attain the goal. (14) graphically shows a list of disjunctively ordered GDRs.

\[
\begin{align*}
G_1 & : \text{Polysyllabic [...x...]} \quad \text{::} \quad R_1 \\
\vdots & \\
G_n & : \text{Well-formed syllable structure in [...x...]} \quad \text{::} \quad R_m
\end{align*}
\] (Frampton’s (157))

The following examples of intensive reduplication in Ashenina Campa illustrate the workings of the ordered GDRs. In Ashenina Campa reduplication, the duplicant must be polysyllabic and at the same time, each syllable must be a well-formed syllable, which requires a coda consonant. For easier illustration, I formalized the two rules as shown in (15). Schematically, they are disjunctively ordered as in (16).

\[
\begin{align*}
(15) & \quad a. \quad G_i: \quad \text{Polysyllabic [...x...]} \quad \text{::} \quad R_i \\
& \quad b. \quad G_{i+1}: \quad \text{Well-formed syllable structure in [...x...]} \quad \text{::} \quad R_{i+1}
\end{align*}
\]

Move [ to Right
Move [ to Left

\[
(16) \quad \text{Polysyllabic first conjunct} \quad \text{::} \quad \text{Move [ to Right}
\text{Well-formed syllable structure} \quad \text{::} \quad \text{Move [ to Left}
\] (Frampton’s (158))

Since in DR, the reduplicative junctures ([and]) are morphological entities, they are subject to the manipulation of readjustment rules. In this example, the rules move the junctures leftward or rightward. The following tables summarize the different applicability of the two adjustment rules listed above. I indicate the satisfaction of each goal using a check mark, and the selected GDR and the form using an arrow.

In the case of (17), either rule gives the satisfactory result with respect to the two goals, so the rank 1 rule applies.

\[
(17) \quad \text{Both output satisfy the goals equally, choose the higher-ranked rule.}
\]

\[
\begin{array}{cccc}
\text{Rank} & \text{Input} & \text{AdjustRule} & \text{Output} & \text{Polysyllable} \\
1 & \text{[n[osampi]} & \text{Move [ to Right} & \text{no[sampi]} & \checkmark \\
2 & \text{[nosampi]} & \text{Move [ to Left} & \text{[nosampi]} & \checkmark \\
\end{array}
\]
In the case of (18), only the second rule satisfies the both goals, and it must duly apply regardless of its ranking status.

(18) Lower-ranked rule applies and satisfies the goal.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Input</th>
<th>Adjust Rule</th>
<th>Output</th>
<th>Polysyllable</th>
<th>Well-formed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>n[asi]</td>
<td>Move [ to Right na[si]</td>
<td>*</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Move [ to Left [nasi]</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Each output form undergoes Transcription and NCC Repair subsequently, and finally appears as in (19c) and (19d) respectively.

(19) Asheninca Campa intensive reduplication

Reduplicated

a. no-kawasi-wai ‘I/we bathe’ no-kawasi-kawasi-wai
b. no-koma-wai ‘I/we paddle’ no-koma-koma-wai
c. n-osampi-wai ‘I/we ask’ n-osampi-sampi-wai
d. n-asi-wai ‘I/we cover’ n-asi-nasi-wai
e. no-na-wai ‘I/we carry’ no-na-nona-wai
f. no-naa-wai ‘I/we chew’ no-naa-nona-wai

-no- = first person subject agreement ‘I/we’
-wai = continuative suffix, which often occurs with intensive.

As the reader may have already noticed, this could easily be translated into the candidate evaluation process of the Optimality Theory. The difference is that the output forms are the products of rule application in DR, while in the OT, they are generated by the GEN. At the same time, GDR is also reminiscent of the recent development of the OT such as the candidate chain theory proposed in McCarthy (2007). This theory evaluates the candidates generated in a goal-driven fashion, so that the number of possible candidates is quite restricted.

7. Conclusion

Frampton’s DR is quite successful in shedding light on the copying procedure that is essential in derivational account of reduplication. It has a descriptive adequacy over the variety of data known through the history of this research area and those having been studied quite recently. However, the proliferation of rules and abstract entities such as the junctures is so extensive that the whole machinery can become so powerful that it could create any kind of copy. Haugen (2010: 956) expresses the same concern:
“DR seems to be so powerful that I am left wondering if there is, in fact, anything it CAN’T do.”

By distributing the operation involved in reduplication, morphology and phonology have lost their independence as components, which was once taken to be an important characteristic of the architecture of the generative transformational grammar, but was the source of the paradox found typically in instances of overapplication: phonologically altered copy was a mystery because the copy was thought to be made in morphology before phonology. In DR, this problem has disappeared because the operations of copying are distributed over morphology and phonology. This architecture of the DR gives us the impression that the distinction of morphology and phonology is no more important, and it could further lead us to reconsider the meaning of applying the rules serially.

Each theory differs whether it finds salience in the formalization of the workings of constraints, or of rule format and application. The OT puts the emphasis on the former and arrives at the extremity where individual rule application is no longer existent. DR has sought the latter, the opposite extremity, and it proves to be quite successful with respect to descriptive power. With respect to explanatory power, the DR rules must be constrained in some way, and to some extent, they are constrained by the requirement on the segments and the prosodic structures as exemplified in (16) above. The mechanism of GDR is a proposal to the execution of constraints and the rule application priority. Clearly, DR still has room for further refinement in this part. I wonder however if it might not lead to something very close to the approach practiced in the OT.

REFERENCES


[received July 27 2011, revised and accepted January 10 2012]

The School of Social Information Studies
Otsuma Women’s University
2–7–1 Karakida, Tama-shi, Tokyo 206–8540
harada@otsuma.ac.jp