Reduplication as Affixation in Paiwan

排灣語之重疊現象亦為加綴現象

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Chapter 1

Introduction

This thesis investigates reduplication and affixation in the Northern dialect of Paiwan, an Austronesian language found in Southern Taiwan. The dialect under study is spoken in Sandimen (三地門) in Pingtung county (屏東縣). Most of my data came from five speakers who were interviewed over the course of two and a half years. The data I used were collected for another project funded by the Taiwan National Science Foundation (NSC 90-2411-H-194-028) issued to Henry Yung-li Chang entitled *On the semantics of noun phrases in Tsou and Paiwan*.

The main objectives of this study are two-fold. The first is to document the phonological form of and semantics of reduplication in Northern Paiwan. The second is to give evidence in support of Marantz's (1982) claim that reduplication is really just affixation.

Reduplication has long been investigated by phonologists and morphologists because of how it diverges from affixation. Unlike affixation, which is consistent in its segmental form, the form of reduplication changes with each word. Thus, it has been a challenge finding a way to represent reduplication as a morpheme.

Reduplication is quite common in Austronesian languages and is very
productive in Paiwan. From my observations and the literature (Ferrell 1982, Blust 1998, L. Chang 1998, H-C. Chang 2000) I will conclude that there are two basic types of reduplication, root (as termed by H-C. Chang 2000: 73,74) and Ca reduplication (as termed by Blust 1998: 30), which can occur separately or in combination. Root reduplication (RtRED) is a more prototypical example of reduplication since it copies all of its segments from the base. Ca reduplication (CaRED) is less prototypical since it only copies one mora, as opposed to RtRED's two moras, from the base. In addition, CaRED's vowel is invariably an $a$. These forms are not only different in terms of phonological form but also in terms of semantic function. I will show that RtRED is the most productive form and also has a large array of meanings typical for reduplication. CaRED, on the contrary, is less productive and has more specialized semantic functions than RtRED. I try to categorize all these meanings using the semantic network of Regier (1994, 1998).

This thesis will be working under the framework of Optimality Theory (OT) as formulated by Prince and Smolensky (1993). It uses OT to analyze all forms of reduplication and affixation which arise in my data. Thus, it brings to light many issues that are lost with a brief analysis of a few words from many different languages. In constructing the entire phonological and morphological grammar of reduplication and affixation, it offers a rare look at the complexity which arises when using one OT
grammar to describe many different types of phenomena. Some of these complexities lead to support for templates in morphological descriptions, as well as support for reduplication and affixation to be considered the same type of morphological category. Finally, because there are forms which require both affixation and reduplication, this language offers the wonderful opportunity to see how the two interact.

My research builds on L. Chang's (1998) research on Thao reduplication, H-C. Chang's (2000) *Paiwan Reference Grammar* and Ferrell's (1982) *Paiwan Dictionary*. I also based the writing system of this thesis on Li's (1992) phonetic alphabet. This thesis hopes to expand on their previous efforts by being the first attempt at an OT analysis of reduplication and affixation in Paiwan.

The first and second section of chapter two begin a phonological description and classification of reduplication in Paiwan. The third section demonstrates that the phonological classes RtRED and CaRED are also distinct in terms of semantic functions. The fourth section concludes that prototypical RtRED reduplication has meanings which are also more prototypical to reduplication in general. The less prototypical CaRED has a narrow range of meanings which are less prototypical to reduplication. This is evidence not only that RtRED and CaRED are two distinct classes, but also that there is a relationship between form and meaning. The more
prototypical root reduplication acts more like "pure" reduplication, while CaRED acts more like an affix.

Chapter three begins the formal analysis of reduplication and affixation using Optimality Theory. The first section analyzes the main class of reduplication, root reduplication. The second section analyzes Ca RED duplication and the third section analyzes the combination of CaRED and RtRED. The fourth and fifth sections analyze affixes and their relation to reduplication. It is in the fifth section where I test Marantz's claim that reduplication is really affixation. My study offers an opportunity to do so by showing that constraints for affixes can also be used by reduplicants.

The fourth chapter is reserved for more in-depth discussion of the theoretical issues raised in chapter three. It looks at two main areas, the first concerned with how morphology is represented within OT. I will show that affixes can also follow reduplicant constraints. In this way, affixes and reduplicants can be considered one morphological class. In addition, differences among different members of this class are differentiated by the amount of prespecification in the lexicon. I will conclude this section with a unified representation of all types of affixation along a spectrum. On one end of the spectrum is the completely unspecified template resulting in various forms of partial and full reduplication. On the other end are what we
traditionally call affixes. In between these two extremes are root reduplication, which has syllable size prespecified, and Ca reduplication, which has the segment $a$ prespecified.

The second area addresses issues which arise from using the OT framework itself. The first issue looks at word-final vs. word-internal codas and how to analyze them. Other issues are those raised by Spaelti (1999) pertaining to Max-BR and the Input/Base/Reduplicant interface. I support many of Spaelti's arguments with evidence from the OT analysis in this thesis.

Chapter six concludes the thesis.
Chapter 2

A Description of Paiwan Reduplication

This chapter is a description of the basic phonological structure and semantics of Paiwan reduplication. I demonstrate that Paiwan reduplication has many different semantic functions. However, its phonological structure is limited to only two types, which can occur separately or in combination. The first of these types is the most productive.

Part one of this chapter focuses on the phonological structure of reduplication in Paiwan. Part two is a description of the different semantic functions reduplication can have. In the conclusion, we note that the first phonological type of reduplication, when it occurs in a word with no other reduplication, has many different semantic functions. The second type of reduplication and the combination of the two types have much more specialized meanings. This semantic divide between forms further supports classifying them as separate morphemes in my OT analysis.

2.1 Phonological Structure

I propose that Paiwan only has two main types of reduplication: root reduplication (RtRED) and Ca reduplication (CaRED). The name "root reduplication" (詞根的重疊) is taken from H-C. Chang (2000: 73,74). The name
"Ca reduplication" is taken from Blust (1998: 30). These two types can occur in isolation or simultaneously within the same word. There is no controversy that I know of over the classification of Ca reduplication in Austronesian languages as prefixal in nature. However, I will be making the less widely accepted claim that root reduplication is actually suffixal in nature.

This section is divided into three parts. The first part introduces Paiwan's consonants and vowels and describes the writing system that will be used in this thesis. It also gives definitions for the terms 'base' and 'reduplicant'. The second part gives a brief description of the data for root reduplication and presents arguments for classifying it as rightward or suffixal in nature. The third part discusses the classification of Ca reduplication. The fourth and final section discusses the combination of root reduplication and Ca reduplication.

2.1.1 Phonology and Morphology Basics

Before looking at the structure of reduplication, this section first introduces the writing system I use. It then addresses the reduplication terminology adopted in this thesis.

2.1.1.1 Paiwan Writing System

Paiwan consists of twenty three consonants and four vowels. Tables of these in the International Phonetic Alphabet (IPA) system are given below. When the
writing system I use in this thesis differs from the IPA symbol, I include the IPA symbol in parenthesis next to the notation which I use.

Table 2.1 Paiwan's Consonants (taken from Li 1992: 17 and H-C. Chang 2000: 41-42)

<table>
<thead>
<tr>
<th>manner of articulation</th>
<th>labial</th>
<th>alveolar</th>
<th>palatal</th>
<th>retroflex</th>
<th>velar</th>
<th>glottal</th>
</tr>
</thead>
<tbody>
<tr>
<td>stop</td>
<td>p</td>
<td>t</td>
<td>tj (t̥)</td>
<td>k</td>
<td>q (ʔ)</td>
<td></td>
</tr>
<tr>
<td>nasal</td>
<td>m</td>
<td>n</td>
<td>dj (d̥)</td>
<td>D (d̥)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>fricative</td>
<td>voiceless</td>
<td>s</td>
<td></td>
<td></td>
<td>h</td>
<td></td>
</tr>
<tr>
<td>voiced</td>
<td>v</td>
<td>z</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>affricate</td>
<td>voiceless</td>
<td>c</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lateral</td>
<td></td>
<td>l</td>
<td>lj (l̥)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>trill</td>
<td></td>
<td>r (r̥)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>glide</td>
<td>w</td>
<td>y (j)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2.2 Paiwan's Vowels (taken from Li 1992: 17 and H-C. Chang 2000: 42)

<table>
<thead>
<tr>
<th></th>
<th>front</th>
<th>central</th>
<th>back</th>
</tr>
</thead>
<tbody>
<tr>
<td>high</td>
<td>i</td>
<td></td>
<td>u</td>
</tr>
<tr>
<td>mid</td>
<td></td>
<td>e (œ)</td>
<td>a</td>
</tr>
<tr>
<td>low</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Below are tables of the distribution of consonants and vowels in Paiwan. Note that $D$ and $h$ have a narrower distribution than the other consonants. One explanation for $h$'s low distribution is that it was borrowed into the language rather recently. Both words containing $h$ are borrowings from Japanese (H-C. Chang 2000: 42).
Table 2.3 Paiwan Consonant Distribution
(based in part on H-C. Chang 2000: 43-45 and Chuang 2002: 11, 58)

<table>
<thead>
<tr>
<th>consonant</th>
<th>word-initial</th>
<th>English/Chinese</th>
<th>word-initial</th>
<th>English/Chinese</th>
<th>word-final</th>
<th>English/Chinese</th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>pana</td>
<td>river 河</td>
<td>sapuy</td>
<td>fire 火</td>
<td>djemekep</td>
<td>grab 抓</td>
</tr>
<tr>
<td>t</td>
<td>tucu</td>
<td>now 现在</td>
<td>vatu</td>
<td>dog 狗</td>
<td>valjualjut</td>
<td>alive 活著</td>
</tr>
<tr>
<td>tj</td>
<td>tjelu</td>
<td>three 三</td>
<td>matjelu</td>
<td>three 三個</td>
<td>sunatj</td>
<td>paper; book 紙；書</td>
</tr>
<tr>
<td>k</td>
<td>kama</td>
<td>father 父親</td>
<td>saviki</td>
<td>betel nut 檳榔</td>
<td>vaik</td>
<td>leave 離開</td>
</tr>
<tr>
<td>q</td>
<td>qatjuvi</td>
<td>snake 蛇</td>
<td>ciqaw</td>
<td>fish 魚</td>
<td>nguanguaq</td>
<td>beautiful 漂亮</td>
</tr>
<tr>
<td>b</td>
<td>bibi</td>
<td>duck 鴨</td>
<td>babung</td>
<td>blister 水泡</td>
<td>qubequb</td>
<td>big frog 大青蛙</td>
</tr>
<tr>
<td>d</td>
<td>dukduk</td>
<td>hole in the ground 地洞</td>
<td>qadaw</td>
<td>day, sun 日子；太陽</td>
<td>taqed</td>
<td>sleep 睡覺</td>
</tr>
<tr>
<td>dj</td>
<td>djamay</td>
<td>vegetables 菜</td>
<td>qadjaw</td>
<td>don’t know 不知道</td>
<td>saladj</td>
<td>partner 伙伴</td>
</tr>
<tr>
<td>D</td>
<td>Dusa</td>
<td>two 二</td>
<td>kakeDian</td>
<td>child 小孩</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g</td>
<td>gadu</td>
<td>mountain 山</td>
<td>gmemegem</td>
<td>grab 抓</td>
<td>malegeleg</td>
<td>shake 摇</td>
</tr>
<tr>
<td>m</td>
<td>maljimalji</td>
<td>thank you 謝謝</td>
<td>timun</td>
<td>you (pl) 你們</td>
<td>macam</td>
<td>spicy 辣</td>
</tr>
<tr>
<td>n</td>
<td>nutiaw</td>
<td>tomorrow 明天</td>
<td>senay</td>
<td>song 歌謠</td>
<td>keman</td>
<td>eat 吃</td>
</tr>
<tr>
<td>ng</td>
<td>ngiaw</td>
<td>cat 貓</td>
<td>tqengelay</td>
<td>like 喜歡</td>
<td>vuluvulung</td>
<td>elder 老人</td>
</tr>
<tr>
<td>s</td>
<td>siva</td>
<td>nine 九</td>
<td>sasiq</td>
<td>ant 蟻</td>
<td>cemas</td>
<td>god 神</td>
</tr>
<tr>
<td>h</td>
<td>hana</td>
<td>flower 花</td>
<td>kuhugan</td>
<td>five minutes 五分鐘</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>vuvu</td>
<td>grandparent/ grandchild 祖父；祖母；孫子</td>
<td>vavayan</td>
<td>girl 女孩</td>
<td>sesevev</td>
<td>strain (water) 過濾</td>
</tr>
<tr>
<td>z</td>
<td>zalum</td>
<td>water 水</td>
<td>maza</td>
<td>here 這裏</td>
<td>mangetjez</td>
<td>return 回來</td>
</tr>
<tr>
<td>c</td>
<td>ciqaw</td>
<td>fish 魚</td>
<td>lacing</td>
<td>green vegetables 青菜</td>
<td>kemac</td>
<td>bite 咬</td>
</tr>
<tr>
<td>l</td>
<td>livu</td>
<td>pig sty 豬窩</td>
<td>lamlam</td>
<td>ginger 生薑</td>
<td>velvel</td>
<td>banana 香蕉</td>
</tr>
<tr>
<td>lj</td>
<td>ljung</td>
<td>cow 牛</td>
<td>sakulju</td>
<td>(boy's name) 男子名</td>
<td>qungalj</td>
<td>lily 百合花</td>
</tr>
<tr>
<td>r</td>
<td>rucuru</td>
<td>stupid 笨</td>
<td>kirimu</td>
<td>quickly! 趕快！</td>
<td>temlar</td>
<td>light 光亮</td>
</tr>
<tr>
<td>w</td>
<td>wui</td>
<td>yes 是；好的</td>
<td>kasawni</td>
<td>just now 剛才</td>
<td>liaw</td>
<td>a lot 很多</td>
</tr>
<tr>
<td>y</td>
<td>yuku</td>
<td>(name) 人名</td>
<td>vavayan</td>
<td>girl 女孩</td>
<td>qacilay</td>
<td>rock 石頭</td>
</tr>
</tbody>
</table>

1 H-C. Chang notes that some people pronounce this word with a word-final glottal stop, panaq.
2 According to H-C. Chang, word-initial /y/ only occurs in language borrowings, this word having a Japanese origin.
2.1.1.2 Definition of Reduplicant and Base

In discussing reduplication it is important to first define the terms which will be used in the analysis. I will be using the terms 'reduplicant' and 'base' as defined by McCarthy and Prince (1994a).

(1) Definition of Base and Reduplicant

The Reduplicant \( R \) is the actual phonological projection of some reduplicative morpheme \( \text{RED} \) which has a phonologically unspecified lexical entry. The Base \( B \) is the phonological material to which the reduplicant is attached – for reduplicative prefixes, the following structure, and for reduplicative suffixes, the preceding structure. (McCarthy and Prince 1994a: 6)

As defined above, the reduplicant (R) is the surface representation of the RED morpheme, which has no specified lexical entry. Thus, RED surfaces as R by copying from the base (B). In addition, RED is considered to be a prefix or a suffix.

Note also that a base is defined phonologically, not morphologically, that is relative to the surface position of the reduplicant. Thus, if the reduplicant is a suffix then everything preceding it, whether it be the stem or various infixes and prefixes, are all a part of its base (B).

When presenting my analysis, I will indicate the reduplicant through
underlining (i.e. for a RED suffix I would underline as follows: *vatu*-vatu*).

2.1.2 Root Reduplication (RtRED)

This section will justify the claim that most reduplication in Paiwan belongs to a class which H-C. Chang calls root reduplication. I will be using the abbreviation RtRED to represent the root reduplication morpheme. Some examples of this category of reduplication are given below (affixes are bold and set off from the word with hyphens, and note that some affixes are infixed into the stem). Unless otherwise noted, all of the data was collected through my fieldwork. In addition, unless otherwise noted, data which I have cited from other sources has also been reconfirmed by my informants and thus are consistent with the dialect under study.
The affixes -em-, m- and -en- signify actor focus for dynamic verbs, si- is a prefix signifying instrument focus and ma- signifies actor focus for stative verbs (H-C. Chang 2000: 94). For now, I will be ignoring affix allomorphy, which I will discuss in more detail in the next chapter.

2.1.2.1 Previous Classifications

I believe RtRED is a suffix. In this section I will be showing what other scholars have thought of this pattern in Paiwan, Thao and Nakanai. H-C. Chang

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1 There are two data items here since I have different pronunciation by different speakers. Two speakers use b'', and one speaker uses b'.
2 ind is short for individual state predicate. This will be discussed further in the following section on semantics.
3 Two informants said ma-ljialjia is "just before dawn", whereas one informant said "dawn".
4 This example is different from H-C. Chang’s (2000: 75) data, where her word has word-internal codas and does not follow the same pattern: kinemnem "think" and kinemenemenem "thinking".
Method of Reduplication: "root reduplication" has the three following characteristics: (1) Only reduplicate the root word, which means no affixes (including prefixes, infixes and suffixes) are reduplicated. (2) At most two syllables are reduplicated. For this reason, if the stem consists of more than two syllables, then at most only the last and penultimate syllable are reduplicated. (3) Word-final codas are not reduplicated.  

H-C. Chang's first characteristic is that reduplication will not copy affixes. This can be seen most clearly in (2a): k-em-akan. The unreduplicated form, k-em-an, has an infix. When reduplication occurs, k and a are reduplicated, even though the k and the a are separated by the infix. Thus, in a sense, reduplication ignores the infix in order to reduplicate the stem. This observation is expected since, cross-linguistically, morphological processes are usually applied to stems (McCarthy and Prince 1990: 225, 239).

Skipping her second property for now, H-C. Chang's third property is that reduplicants do not copy the word-final coda. This is apparent in examples where words have word-final codas like in (2a), (2b'') and (2c), to name a few.

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7 This is my translation.
8 I have one example that seems to have affix copying, that of c-em-ek-e-m-eke-l which means "to be a family" formed from cekel meaning "spouse". The form c-em-eke1 doesn't seem to exist, so the form doesn't seem to be reduplicated from an affixed lexical form.
Her second characteristic is that reduplicants will reduplicate at most two syllables. In the data above, all the words reduplicate two syllables except for those given below.

(4) One Syllable Root Reduplication
a. k-em-an "to eat" a'. k-em-akan "eating"
b. kalidjkidj "to flash" b'. kalidjkidjkidj "flashing, blinking"
c. pacun "to look" c'. pacucun "looking"
d. macam "spicy" d'. macacam "spicy(ind)"

In (4a), there is only one syllable to copy from, since affixes cannot be copied, so, (4.a') k-em-akan is not an exception to the two-syllable copying principle.

In example (4.b') kalidjkidjkidj, there are two possible reduplicants. One is kidj (kalidj-kidj-kidj) and the other is djki (kali-djki-djki-dj). The first possibility arises from comparison with forms ending in vowels (i.e. ki-vata-vata "asking"). The second possibility arises from comparisons with words ending with a consonant (i.e. a-peda-peda-ng "salty (ind)"), where the reduplicant does not copy the word-final coda. The reduplicant in kalidjkidjkidj is not two syllables, but it does consist of two moras. Thus, to be as comprehensive as possible, I adopt a dimoraic description of root reduplication. In this way, if we say that every reduplicant must be minimally dimoraic, instead of disyllabic, then kidj or djki and all the other disyllabic reduplicants are included.

There is evidence supporting the moraic status of word-internal codas in Paiwan.
There is also evidence against considering word-final codas to have moraic status in Paiwan. First, Paiwan invariably has penultimate stress. This is demonstrated by a process of vowel lengthening given below.

(5) Vowel lengthening to mark emphasis
keDikeDi    "small (ind)"  keDike::Di    "really really big"
macacam     "spicy (ind)"  maca::cam     "really really spicy"
djamudjamu::q-an  "blood"  djamudjamu::q-an  "really really bloody"

One can see that it is always the penultimate syllable that is lengthened. This is irrespective of whether the word has a word-final coda or not. I use this vowel lengthening evidence to conclude that words always have penultimate stress. In light of this fact, it can be concluded that the word-final coda has no weight. If the coda had moraic status, then stress would be on the final syllable if that syllable has a coda consonant. Invariable penultimate stress is also evidence in support of considering the word-final coda as extrametrical. Hayes (1982) previously noted cases of extrametricality in English, where in many cases the word-final codas also do not count toward stress assignment.

Another fact which supports the hypothesis that word-final codas are not moraic and word-internal codas are is that Paiwan has many word-final codas and almost no word-internal codas (i.e. *kalidjkidj* is the only example I have in my data, and it is also an example of onomatopoeia). In order to prevent the language from having
word internal codas, there must be a constraint in the language preventing heavy syllables. If they weren't, there would be no reason to prevent them from surfacing word-internally. Thus, word-internal codas would be moraic, and forbidden from Paiwan. However, since word-final codas are extraprosodic, they are allowed to surface.

Finally, from the data I have collected I find that there are no monosyllabic content words in the language. Those words which have monosyllabic roots (i.e. *kan* "to eat") never appear in actual use without an affix attached (i.e. *k-em-an* "eat(AP)"). Thus, the minimal word in Paiwan seems to consist of two syllables. One-syllable with a coda does not count as a minimal word.

From these three facts, it can be concluded that word-internal codas have moraic weight and word-final codas do not. With this fact in mind, our example (4.b') *kalidjki* *kidjjidj* "flashing" is quite odd since it has two word-internal codas. Its oddness may be explained by the fact that it is an example of onomatopoeia. In any case, if I consider the reduplicant to consist of two moras then *kalidjki* *kidjjidj* can still be predicted from the phonology.

The other two exceptions to disyllabic reduplication are (4.c') *pacucu* "to see" and (4.d') *macac* "spicy(ind)". I have no explanation to offer as to why they are not *pacupacu* and *macamac*. For this study, I will consider them to be lexical
exceptions.

Thus, I agree with H-C. Chang's observation regarding the size of the reduplicant. However, I modify her claim by stating that reduplicants are at most two moras, as opposed to two syllables. Note that though the data contains monomoraic and dimoraic reduplicants, there are never reduplicants which consist of over two moras. This is true even in words where the stem contains more than two moras (i.e. (2f) *kivata "ask" having the reduplicated form *kivatavata "asking" and not *kivatakivata).

I also agree with H-C Chang's observation that in words over two syllables long, it is the penultimate and final syllable which is copied. Though this observation would make it seem likely that the reduplicant is a suffix, H-C. Chang doesn't make a direct claim in her section on reduplication as to whether the reduplicant is to the right or the left of the base. She only has two examples where, on the contrary, she notes that the italicized portion of the word, the portion on the left, is the reduplicant (重疊的部分) (p. 75, i.e. 'a-tjuvi-tjuvi, ceme-cemel). However, due to her marking system in other sections of her text, I will assume that she feels root reduplication is a suffix. For example, in the words below she underlines a portion of the word and states that she's underlining the root of the reduplicated verb (重疊的動詞詞幹).
H-C. Chang's Reduplication Notation: Suffixal

a. (2000: 102)

m-\text{apu-apu-sun}

[\text{吃槟榔-重疊-you}]

‘你吃槟榔嗎？’ (\text{Do you eat betel nut?})

‘你吃槟榔嗎？’ (\text{Do you eat betel nut? I want to treat you to some!})

‘你正在吃槟榔嗎？’ (\text{Seeing that your mouth is moving, I thought I'd ask.})

b. (2000: 102)

t-\text{em-ektekeL ti palang t(ua) vava}

[\text{drink-AF RED NOM Palang OBL alcohol}]

‘Palang is drinking alcohol.’

‘Palang 會喝酒 (有喝酒的習慣)’

‘Palang drinks alcohol.’ (has a drinking habit)

c. (2000: 102)

\text{teke-tekeL-in ni palang a za vava}

[\text{drink-RED-NAF GEN Palang NOM that CL alcohol}]

‘Palang is drinking/(often) drinks that kind of alcohol.’

d. (2000: 103)

\text{si-teke-tekeL ni palang ta vava ti kalulu}

[\text{NAF-drink-RED GEN Palang OBL alcohol NOM Kalulu}]

‘Palang is drinking/often drinks Kalulu's drink for her.’

e. (2000: 114)

\text{maya t-em-ektekeL}

[\text{NEG drink-AF-重疊}]

‘不要喝酒！’ (\text{possibly an order from a doctor to a patient})

Her underlining and translation of the data above would indicate that she feels
the reduplicant is placed to the right of the base. However, since she states in her
section on reduplication that codas are not reduplicated, it is still unclear why she
does not underline the coda as well. In any case, since her marking system for the

\text{9 The English is my translation.}

\text{10 CL stands for classifier.}
most part seems to indicate that the reduplicant is on the right, I will assume that H-C. Chang also believes that Paiwan's root reduplication is suffixal in nature.

Another researcher, L. Chang (1998: 278-281), finds a similar pattern to root reduplication in Thao, another Austronesian language spoken in Taiwan. Unlike H-C. Chang's (2000) single classification of root reduplication in Paiwan, L. Chang (1998) posits that this pattern in Thao is divided into two different classes, full (leftward) reduplication for bases of two or fewer syllables and rightward reduplication for bases of more than two syllables or of disyllabic bases containing complex onsets or word-internal codas.

In her analysis, full reduplication means that the entire stem is copied and placed to the left of the base. However, contrary to its label as "full" reduplication, codas are not copied. Examples of Thao reduplication of this class are listed below.

(7) Thao Full Reduplication (L. Chang 1998: 280)\textsuperscript{11}

\begin{tabular}{ll}
\text{/cpiq/} & \text{cpi-cpiq} & \text{to whip repeatedly}\text{'} \\
\text{/farwi/} & \text{fari-fariw} & \text{to go shopping; to shop around}\text{'} \\
\text{/kan/} & \text{pa-ka-kan} & \text{to feed repeatedly}\text{'} \\
\text{/kari/} & \text{k-m-ari-kari} & \text{to dig up repeatedly/habitually}\text{'}
\end{tabular}

This pattern is similar to root reduplication found in Paiwan. The reduplicant copies two moras from the stem except in monomoraic stems, and does not reduplicate the word-final coda. In addition to this class, L. Chang posits that

\textsuperscript{11} I have re-written her data here in the notation of this thesis. Thus, dashes represent morpheme boundaries and underlining indicates the reduplicant.
rightward reduplication is another category where members can contain complex onsets or complex codas or are over two syllables in length. Her data is listed below.

(8) Rightward Reduplication (L. Chang 1998: 284)\textsuperscript{12}

a. /lhqi.zi/ 'to look after, protect'  \textbf{lh-ug-qizi-qizi} 'to protect, watch over'

b. /qri.u'/ 'to steal' \textbf{q-un-riu-riu} 'to steal constantly, habitually'

c. /shna.ra/ 'to ignite, catch fire' \textbf{pa-shnara-nara} 'to burn s.t. repeatedly'

d. m-/ig.kmir/ 'to grasp in one hand' \textbf{igkmi-kmi-r-in} 'to be rolled into a ball in one hand'

e. m-/ar.faz/ 'to fly, be flying' \textbf{m-arfa-rfa-z} 'to keep flying around'

f. m-/ar.muz/ 'to dive' \textbf{m-armu-mu-z} 'to dive repeatedly'

g. /pa.ti.ha.ul/ 'a spell, a curse' \textbf{matihau-hau-l} 'to cast a spell on s.o.'

The data above show how Thao is different from Paiwan. Belonging to L. Chang's rightward reduplication class these words, have word-internal codas and complex consonant clusters, both of which are lacking in Paiwan. However, I believe that this type of rightward reduplication is the same as full reduplication. In other words, L. Chang’s two classes of reduplication should be combined under one class, namely root reduplication. For a more detailed argument, the reader is referred to Appendix B.

I will now re-list the examples I gave previously of L. Chang's full reduplication. This time I will underline the reduplicant as being a suffix instead of a prefix.

\textsuperscript{12} I have re-written her data here in the notation of this thesis. Note that \textit{lh} is a segment and not a complex consonant cluster.
As one can see, this pattern matches the pattern in rightward reduplication seen in (8). Even though it seems that the reduplicant is copying from the front of the word in cpiq and fariw above, from looking at words over three syllables long it is clear that the reduplicant copies from the penultimate and final syllable. Thus, I feel positing full reduplication and rightward reduplication to be one class is a simpler analysis than one that splits this category into two different classes.

McCarthy and Broselow (1984) find a similar pattern to root reduplication in Nakanai, an Austronesian language spoken in Papua New Guinea. Their data, obtained from Johnston (1980), is given below.

(10) Nakanai Reduplication13
(Johnston 1980: 148)

| a. ligi | a'. ligi-ligi | 'hurting' |
| voro | voro-voro | 'pounding' |
| rutu | rutu-ratu | 'gathering food for feast' |
| mila | mila-mila | 'salty' |
| b. abiri | b'. a-biri-biri | 'washing' |
| karusu | ka-rusu-rusu | 'ribs; battens' |
| sekela | se-kela-kela | 'one at a time' |
| kuruve | ku-ruve-ruve | 'many sweet potatoes' |

In Nakanai, the penultimate syllable has main stress. Thus, McCarthy and
Broselow propose that the reduplicant, as indicated by the underlining above, in these words is actually a disyllabic prefix attached to the front of the foot containing main stress. Thus, the word-final foot is the base for the reduplicant.

If this explanation is correct, it will undermine the hypothesis that reduplication is actually affixation. This is because no other prefixes in Paiwan infix in this way. In the next section, I show that regarding RtRED to be a suffix is actually a very plausible analysis. I show all of the different possible analyses that could be made and then, through the process of elimination, demonstrate why I decide that Paiwan root reduplication is suffixing.

2.1.2.2 Classifying Root Reduplication as Suffixing

In this section I will offer my arguments as to why root reduplication is suffixing. When looking at reduplication, many different patterns may emerge, depending on where you think you see the reduplicant. For example, in words with similar segments a type of symmetry may occur which would allow many different types of reduplication to seem possible. An example of this can be seen in the word si-sevesevesevesev "used for straining water". If we limit ourselves to bimoraic reduplicants, then there are many possible patterns of reduplication. For instance, if we assume a prefixing pattern, then we could have patterns such as si-sevesevesevesev, si-s-eve-sevesevese, si-seve-sevesevese, si-seve-seve-seve. 
Of course, in comparing this word to words that are not composed of similar segments, it becomes obvious that certain patterns can be eliminated. Take the word *s-em-utjiratjiray for instance. If we tried the same prefixal patterns above for this word, we would get *s-em-utji-sutjiray, *s-em-utji-rutjiray, s-em-u-tjira-tjiray, and *s-em-utj-iray-iray. Since only one of these patterns is grammatically correct, three patterns out of four are eliminated, giving us only one possible prefixing pattern.

Below is a list of data organized into classes of all possible patterns of reduplication. I have listed words of different syllable length, words with and without word-final codas, and words involving affixation. I have also divided the data into two classes of reduplication: reduplication where nothing is deleted from the base ("Preservation of the Base") and reduplication where segments are deleted ("Non-preservation of the Base"). The "base", again, is defined as anything to the right of a reduplicative prefix and anything to the left of a reduplicative suffix. For example, in the case of salasaladj "partners, classmates, co-workers", it is possible that this word is actually sala-saladj. The first dj of the base does not appear in surface form (sala[dj]-saladj), due to requirements that words cannot have word-internal codas. This would be considered an example of non-preservation of the base.
(11) Preservation of the Base

1. Consistent Left or Right Reduplication

**LEFT REDUPLICATION**

<table>
<thead>
<tr>
<th></th>
<th>LEFT REDUPLICATION</th>
<th>RIGHT REDUPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>k-em-akan</td>
<td>a'. k-em-a-ka-n</td>
</tr>
<tr>
<td>b.</td>
<td>m-utja-utjak</td>
<td>b'. m-utja-utja-k</td>
</tr>
<tr>
<td>c.</td>
<td>s-em-utiira-tjiray</td>
<td>c'. s-em-utiira-tjira-y</td>
</tr>
<tr>
<td>d.</td>
<td>si-seve-sevesev</td>
<td>d'. si-sevese-v</td>
</tr>
<tr>
<td>e.</td>
<td>salja-saljadj</td>
<td>e'. salja-salja-dj</td>
</tr>
<tr>
<td>f.</td>
<td>bibi-bibi</td>
<td>f'. bibi-bibi</td>
</tr>
<tr>
<td>g.</td>
<td>kasi-kasiv-en</td>
<td>g'. kasi-kasi-v-en</td>
</tr>
<tr>
<td>h.</td>
<td>a-rava-ravan</td>
<td>h'. arava-rava-n</td>
</tr>
</tbody>
</table>

**2. Other**

**LEFT REDUPLICATION**

<table>
<thead>
<tr>
<th></th>
<th>LEFT REDUPLICATION</th>
<th>RIGHT REDUPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>d''.</td>
<td>si-seve-sevev</td>
<td>d''' si-seve-sevev</td>
</tr>
<tr>
<td>d''''</td>
<td>si-s-eyes-eyesev</td>
<td>d''''' si-eyes-eyesev</td>
</tr>
<tr>
<td>h''.</td>
<td>arava-aravan</td>
<td></td>
</tr>
</tbody>
</table>

(12) Non-preservation of the Base

1. Affix and Base Deletion (The affix is copied and then the base's affix is deleted)

**LEFT REDUPLICATION**

<table>
<thead>
<tr>
<th></th>
<th>LEFT REDUPLICATION</th>
<th>RIGHT REDUPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>k-em-a-kan</td>
<td>gg. kasi-kasiv-en</td>
</tr>
<tr>
<td>b.</td>
<td>m-utja-utjak</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>s-em-utiira-tjiray</td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>si-seve-sevesev</td>
<td></td>
</tr>
</tbody>
</table>

2. Base Segment Deletion

**LEFT REDUPLICATION**

<table>
<thead>
<tr>
<th></th>
<th>LEFT REDUPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>cc''.</td>
<td>s-em-utiira-tjiray</td>
</tr>
<tr>
<td>hh''.</td>
<td>arava-ravan</td>
</tr>
</tbody>
</table>

3. Coda Deletion

**RIGHT REDUPLICATION**

<table>
<thead>
<tr>
<th></th>
<th>RIGHT REDUPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>aa'.</td>
<td>k-em-a-kan</td>
</tr>
<tr>
<td>bb'.</td>
<td>m-utja-utjak</td>
</tr>
<tr>
<td>cc'.</td>
<td>s-em-utiira-tjiray</td>
</tr>
<tr>
<td>dd'.</td>
<td>si-sevese-v</td>
</tr>
<tr>
<td>ee'.</td>
<td>salja-saljadj</td>
</tr>
<tr>
<td>gg'.</td>
<td>kasi-kasiv-en</td>
</tr>
<tr>
<td>hh'.</td>
<td>arava-ravan</td>
</tr>
</tbody>
</table>

I will first concentrate on eliminating the most unlikely types of reduplication listed in (11) and (12). The possible reduplicative patterns seen in (11.2), reproduced below, arise purely because of symmetry within the word.
As I already noted in the beginning of this section, patterns (d''), (d''') and (d'''''') can be eliminated upon comparison with the word *s-em-utjiratjiray*. Looking at (d''') and (d'''''') and (d''''''') we see that these patterns of suffixal reduplication can also be eliminated, (i.e. (d'') *s-em-utji-suji-ray, (d''') *s-em-utjir-utjir-ray and (d'''''') *s-em-utjiray-ray). The incorrect forms would also be predicted for (h'') (i.e. *alem-alemeqem, cf. the grammatical alemeqemegem) above. This then eliminates consideration of all candidates in (11.2).

Now I will eliminate the class of affix reduplication and deletion in (12.1), given again below.

(12) Non-preservation of the Base
1. Affix and Base Deletion (The affix is copied and then the base's affix is deleted)

<table>
<thead>
<tr>
<th>LEFT REDUPLICATION</th>
<th>RIGHT REDUPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. k-\text{em}-a-kan</td>
<td>gg. kasi-\text{kasiv-en}</td>
</tr>
<tr>
<td>b. m-utja-utjak</td>
<td></td>
</tr>
<tr>
<td>c. s-\text{em}-utjira-tjiray</td>
<td></td>
</tr>
<tr>
<td>d. si-seve-sevesev</td>
<td></td>
</tr>
</tbody>
</table>

This type of reduplication entails that there is first complete copying of both the affix and the base without the coda (i.e. *k-em-a-k-em-an*). Then, the affix in the base does not surface (i.e. *k-em-a-k-{em}-an*), perhaps due to a constraint forbidding an
infix to occur more than once within a word. Thus the prefix (in examples 12(aa), (bb), (cc), (dd)) and the suffix (in example 12(gg)) are copied into the reduplicant and then deleted from the base. This seems like an unlikely scenario for two reasons. The first is that even though affix reduplication exists in other Austronesian languages like Tagalog (Carrier-Duncan 1984: 273, i.e. *sund* + *in* reduplicates to form *sundin-sundin*), the affix in Tagalog always surfaces in the base. The second reason is found when we look at the form *s-em-utjira-tjiray*. Why is it that both the *em* infix and the two initial segments of the stem, *su*, don't surface (i.e. *s-em-utjira-[s-em-u]tjiray*)? This deletion of *su* from the base is hard to justify. Thus, since *s-em-utjira-tjiray* poses such a large problem, I conclude that this analysis is highly unlikely to be correct for reduplication in Paiwan.

I will posit that the base deletion forms from (12.2), reproduced below, are also unlikely for the same reason that the affix reduplication and deletion set is unlikely. Namely, it is hard to justify why elements in the base would be deleted.

(12) 2. Base Segment Deletion
LEFT REDUPLICATION
cc": *s-em-utjira-tjiray*
hh": *arava-ravan*

In example (cc") above, the *su* of the base in *s-em-utjira-utjiray* does not appear in the surface form (*s-em-utjira* + *[su]tjiray*). In (hh") the *a* of the base does not
appear in the surface form *arava-ravan (arava-[ə]ravan). Again, since explaining why these base segments do not surface would be difficult, this analysis is also unlikely to be correct.

The Coda deletion grouping in (12.3) at first seems justifiable. It is given again below.

(12) 3. Coda Deletion
RIGHT REDUPLICATION
aa'. k-em-a-kan
bb'. m-utja-utjak
cc'. s-em-utjira-tjiray
dd'. si-sevese-yesev
ee'. salja-saliadi
gg'. kasi-kasiv-en
hh'. arava-ravan

According to this analysis, supported by Blust (2002), the entire root is reduplicated and placed to the right of the base (i.e. k-em-an-kan). We could then posit that word-internal codas are prohibited, and thus do not appear in the word's surface form (k-em-an-kan). We would have to justify why the word-internal coda is deleted and not the word-final coda, which could be done with certain rules or constraints dictating extraprosody of the word-final coda, as is well motivated from many languages including Austronesian ones. However, there is one case that cannot be explained, that of m-utja-utjak. If it is word-internal codas which are not permitted, then the k should be allowed to remain in *m-u.tja.k-u.tjak, since it will be
resyllabified as an onset. On the basis of this example, I posit that this coda deletion grouping can also be eliminated.

We are now left with the two patterns considered in the previous section, consistent left and right reduplication, reproduced below.

(11) Preservation of the Base
1. Consistent Left or Far Right Reduplication

<table>
<thead>
<tr>
<th>LEFT REDUPLICATION</th>
<th>RIGHT REDUPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. k-em-akan</td>
<td>a'. k-em-a-ka-n</td>
</tr>
<tr>
<td>b. m-utja-utjak</td>
<td>b'. m-utja-utja-k</td>
</tr>
<tr>
<td>c. s-em-u-tjira-tjiray</td>
<td>c'. s-em-utjira-tjira-y</td>
</tr>
<tr>
<td>d. si-se-vese-vesev</td>
<td>d'. si-sevese-vese-v</td>
</tr>
<tr>
<td>e. salja-saljadj</td>
<td>e'. salja-salja-dj</td>
</tr>
<tr>
<td>f. bibi-bibi</td>
<td>f'. bibi-bibi</td>
</tr>
<tr>
<td>g. kasi-kasiv-en</td>
<td>g'. kasi-kasi-v-en</td>
</tr>
<tr>
<td>h. a-rava-ravan</td>
<td>h'. arava-rava-n</td>
</tr>
</tbody>
</table>

A prefixal account would have to align the prefix to the left of the foot containing main stress. A suffixal account would align the reduplicant to the end of the word. Both would require infixation of some kind.

In addition, if I consider the reduplicant to be a prefix, then the reduplicant does not always align to the stressed foot (i.e. dja.mu.-dja.(mu.q-an.) not *dja.-mu.qa.-.(mu.q-an.)). If I consider the reduplicant to be a suffix, then the reduplicant does not always align to the end of the word (i.e. sala-sala-dj).

In my analysis I will choose a suffixing account based on two pieces of evidence. The first is that the reduplicant always copies from the right end of the word.

According to Marantz (1982: 447), in unmarked cases, prefixes copy from the left
edge of the word whereas suffixes copy from the right edge of the word. He gives examples from various languages including Dakota (Marantz 1982: 450), where the reduplicant is a suffix (i.e. *haska* reduplicates to form *haska-ska* and not *haska-has*). Thus, the simplest solution would be to posit that this class of reduplication is copying from the right of the word to the left (i.e. *kivata-vata*). It is simpler than assuming that the reduplicant is located within the word and copies from left to right (i.e. *ki-vata-vata*). The second reason I feel it is a suffix is that RtRED's infixation in front of the word-final coda can be explained by the fact that the word-final coda is extraprosodic.

Thus, I'm going to conclude that RtRED is suffixal. The prefixal account, of course, is plausible as well. Paiwan's root reduplication could be a marked case, where the reduplicant happens to copy from the right edge but is a prefix. However, if RtRED is a prefix, then it acts nothing like other prefixes in the language. If it is a suffix, then the OT analysis in this thesis can show that it follows the same constraints as suffixes.

2.1.2.3 Summary

Root reduplication can be characterized as having the following properties: 1) the reduplicant copies its phonological material from the stem, 2) the reduplicant is a suffix (thus aligns to the right of the word), 3) the reduplicant copies from the right
The reduplicant doesn’t copy codas and 4) the reduplicant is maximally two moras.

The following listing includes some examples of RtRED reduplication. They are listed with the reduplicant to the right of the base. This list is far from exhaustive, with many more words belonging to the RtRED category that are not included here.

(13) Root Reduplication

<table>
<thead>
<tr>
<th>Primary</th>
<th>Reduplicant</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>k-em-an</td>
<td>&quot;to eat&quot;</td>
</tr>
<tr>
<td>b.</td>
<td>bem-mar</td>
<td>&quot;to flash&quot;</td>
</tr>
<tr>
<td>c.</td>
<td>eme-dji</td>
<td>&quot;to flash&quot;</td>
</tr>
<tr>
<td>d.</td>
<td>maca</td>
<td>&quot;spicy&quot;</td>
</tr>
<tr>
<td>e.</td>
<td>ivi-emu</td>
<td>&quot;to talk&quot;</td>
</tr>
<tr>
<td>f.</td>
<td>l-em-umay</td>
<td>&quot;to ask&quot;</td>
</tr>
<tr>
<td>g.</td>
<td>t-em-ekel</td>
<td>&quot;to drink&quot;</td>
</tr>
<tr>
<td>h.</td>
<td>p-en-atjez</td>
<td>&quot;to chisel&quot;</td>
</tr>
<tr>
<td>i.</td>
<td>m-utja</td>
<td>&quot;to throw up&quot;</td>
</tr>
<tr>
<td>j.</td>
<td>s-em-utjiray</td>
<td>&quot;to spit&quot;</td>
</tr>
<tr>
<td>k.</td>
<td>kalava</td>
<td>&quot;to wait&quot;</td>
</tr>
<tr>
<td>l.</td>
<td>paderua</td>
<td>&quot;to hiccup&quot;</td>
</tr>
<tr>
<td>m.</td>
<td>ma-ljia</td>
<td>&quot;to become light&quot;</td>
</tr>
<tr>
<td>n.</td>
<td>kinemenem</td>
<td>&quot;think&quot;</td>
</tr>
<tr>
<td>o.</td>
<td>mikerekel</td>
<td>&quot;shake&quot;</td>
</tr>
<tr>
<td>p.</td>
<td>ljaqeljaq</td>
<td>&quot;to tickle&quot;</td>
</tr>
<tr>
<td>q.</td>
<td>apedang</td>
<td>&quot;salty&quot;</td>
</tr>
<tr>
<td>r.</td>
<td>vavayan</td>
<td>&quot;woman&quot;</td>
</tr>
<tr>
<td>s.</td>
<td>s-em-evesev</td>
<td>&quot;to strain water&quot;</td>
</tr>
<tr>
<td>t.</td>
<td>djamuq</td>
<td>&quot;blood&quot;</td>
</tr>
<tr>
<td>u.</td>
<td>alemeqem</td>
<td>&quot;sweet&quot;</td>
</tr>
<tr>
<td>v.</td>
<td>saladj</td>
<td>&quot;partner, classmate, co-worker&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary</th>
<th>Reduplicant</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>a'.</td>
<td>k-em-a-ka-n</td>
<td>&quot;eating&quot;</td>
</tr>
<tr>
<td>b'.</td>
<td>kalidjidi-kidi</td>
<td>&quot;flashing, blinking&quot;</td>
</tr>
<tr>
<td>b''.</td>
<td>kalidjiki-djikidj</td>
<td>&quot;flashing, blinking&quot;</td>
</tr>
<tr>
<td>c'.</td>
<td>pacu-ca-n</td>
<td>&quot;looking&quot;</td>
</tr>
<tr>
<td>d'.</td>
<td>maca-ca-m</td>
<td>&quot;spicy(ind)&quot;</td>
</tr>
<tr>
<td>d''.</td>
<td>ivu-ivu</td>
<td>&quot;talking&quot;</td>
</tr>
<tr>
<td>e'.</td>
<td>kivata-yata</td>
<td>&quot;asking&quot;</td>
</tr>
<tr>
<td>f'.</td>
<td>l-em-uma-luma-y</td>
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<td>g'.</td>
<td>t-em-ek-teke-l</td>
<td>&quot;drinking&quot;</td>
</tr>
<tr>
<td>h'.</td>
<td>p-en-atje-patje-z</td>
<td>&quot;chiseling&quot;</td>
</tr>
<tr>
<td>i'.</td>
<td>m-utja-utja-k</td>
<td>&quot;throwing up&quot;</td>
</tr>
<tr>
<td>j'.</td>
<td>s-em-utjira-tjira-y</td>
<td>&quot;spitting&quot;</td>
</tr>
<tr>
<td>k'.</td>
<td>k-em-alava-lava</td>
<td>&quot;waiting&quot;</td>
</tr>
<tr>
<td>l'.</td>
<td>paderua-rua</td>
<td>&quot;hiccupping&quot;</td>
</tr>
<tr>
<td>m'.</td>
<td>ma-ljia-lija</td>
<td>&quot;just before dawn&quot;</td>
</tr>
<tr>
<td>n'.</td>
<td>kinemenem-mene-m</td>
<td>&quot;thinking&quot;</td>
</tr>
<tr>
<td>o'.</td>
<td>mikereke-reke-l</td>
<td>&quot;shaking&quot;</td>
</tr>
<tr>
<td>p'.</td>
<td>ljaqeljaq-selja-q</td>
<td>&quot;tickling&quot;</td>
</tr>
<tr>
<td>q'.</td>
<td>apedang-peda-ng</td>
<td>&quot;salty(ind)&quot;</td>
</tr>
<tr>
<td>r'.</td>
<td>vavaya-vaya-n</td>
<td>&quot;women&quot;</td>
</tr>
<tr>
<td>s'.</td>
<td>si-sevese-vese-v</td>
<td>&quot;used for straining water&quot;</td>
</tr>
<tr>
<td>t'.</td>
<td>djamu-djamu-q-an</td>
<td>&quot;bloodied&quot;</td>
</tr>
<tr>
<td>u'.</td>
<td>alemeqem-memeq-m</td>
<td>&quot;sweet(ind)&quot;</td>
</tr>
<tr>
<td>v'.</td>
<td>sala-sala-dj</td>
<td>&quot;partners, classmates, co-workers&quot;</td>
</tr>
</tbody>
</table>

2.1.3 Ca Reduplication (CaRED)

The other class of reduplication in Paiwan is Ca reduplication (Blust 1998), which is also found in other Formosan languages such as Thao (L. Chang 1998)
and Rukai (Li 1973: 281, Zeitoun 2000: 77). This class was also previously identified in Paiwan by Ferrell (1982: 28) and H-C. Chang (2000: 77). It is considered by Blust (1998) to be a part of Proto-Austronesian morphology.

In Paiwan, this type of reduplication is mostly limited to certain specialized meanings which must also be accompanied by an affix. Examples are given below.

(14) Ca- Reduplication with suffix –an/-en
   a. keDi “small”       a’. ka-keDi-an\(^{14}\) “child”
   b. kan “eat”          b’. ka-kan-en “food”
   c. kesa “cook”        c’. ka-kes(a)-an “kitchen”

(15) CaRED with prefix ma\(^{15}\)
   a. k-em-im “to search” a’. ma-ka-kim “to search for each other”
   b. l-em-umay “to hit” b’. ma-la-lumay “to hit each other”

There is no controversy over Ca reduplication being leftward in alignment. Other properties of Ca reduplication are that it copies one mora and also does not copy affixes or codas. The special characteristic of Ca reduplication is how it changes the vowel it copies into an \(a\).

In summary, the properties of Ca Reduplication are: 1) copies the consonant from the stem and the vowel is always \(a\), 2) copies from the left edge (the first consonant of the stem), 3) aligns to the left of the word, like a prefix and 4) is always leftward.

\(^{14}\) I don't know why sometimes the pivot marker is LP (-an) and sometimes UP (-en).

\(^{15}\) Special thanks go to Wu Jun-ming (吳俊明), who helped me gather this data in the field. Original data was taken from Ferrell (1982: 28).
2.1.4 Combination of CaRED and RtRED

There are also words which have both CaRED and RtRED occurring simultaneously. This type of reduplication was previously identified in Paiwan by H-C. Chang (2000), as shown in the examples given below. It must also appear with the suffix –an.

(16) Third Class of Reduplication: RtRED and CaRED
(adapted from H-C. Chang 2000: 77)

a. liljuas "green"  a'. la-liljua-lju-s-an "green things"
b. saqetju "sick"  b'. ga-saqetju-jeju-an "ind. sick people"
c. keDI "small, short"  c'. ka-keDi-keDI-an "little ones (children)"
    "ind. short people"

I have now completed my discussion of the different phonological classes of reduplication in Paiwan. Now I'm going to look at the semantics of reduplication. I will show that RtRED and CaRED are different morphemes in terms of semantics as well as phonological form.

2.2 The Semantics of Reduplication

In order to further differentiate between types of reduplication, it is helpful to look at semantics. Morphemes are differentiated by the different semantic roles in which they play. Thus, if I am to posit that root reduplication is all one class, there must also be a semantic basis for that. In this section, I will detail the kinds of
semantics that reduplication in Paiwan can have. It will become apparent that RtRED is very productive while Ca reduplication fewer meanings associated with it.

The first section of my discussion of semantics will first give the theories which have been applied to understand the meanings of reduplicated forms. I will introduce the semantic network of Regier (1994, 1998) as the organizing framework for my study. The second section will present the types of meanings that occur in the data which I have from Paiwan. The third section will conclude my discussion on semantics.

2.2.1 Theoretical Framework

Reduplication is known for having a relatively predictable range of meanings across languages. The most common of these is augmentation. According to Sapir (1921: 76) reduplication can show distribution, plurality, repetition, customary activity, increase in size, added intensity and continuance. These are all instances of increased quantity or intensity. Moravcsik (1978: 317) also notes that a meaning commonly conveyed through reduplication is that of increased quantity. She divides this notion into two categories: quantity of referents and amount of emphasis.

However, in addition to increased quantity, Moravcsik (1978: 316) notes that there are also other meanings which recur across languages. In her survey of reduplication, she finds that languages can have some reduplicated forms which have
Moravesik concludes her study with two universal principles of reduplication. The first is that reduplication always seems to always take on meanings related to some aspect of quantity. Thus, she calls it an "onomatopoeic use of a form device (p. 330)", which takes its meaning directly from its form. In other words, increased quantity is represented in a word by increasing the quantity of its segments through reduplication. She compares this to onomatopoeic sequencing of clauses such as in "John went home and had dinner (p. 330)." In this clause, the temporal sequencing of phrases reflects the actual temporal sequencing of events in real life.

The second observation she makes is that reduplicative constructions always express meanings which are more specific than their unreduplicated forms. This is consistent with markedness theory, which states that forms that are the simplest in the language are unmarked. These unmarked forms are the basic meaning units. Adding things to this unmarked form, i.e. affixes and reduplication, will make it
marked, and give it a more specialized meaning (Croft 1990: 64, Greenberg 1966: 26-27).

A plausible account for the types of meanings reduplication can represent can be found in Regier (1994, 1998). Unlike Moravcsik, who posits that the semantics of reduplication are inherently connected to the form of reduplication itself, Regier posits that reduplication taps into an already existent and possible universal semantic network. Thus, reduplication starts from iconic beginnings, where the central meaning is inherently connected to the notion of repetition. However, after that, reduplication can semantically extend from the meaning of repetition to many other meanings. Regier uses the following figure to clarify this claim.

![Figure 2.1 The interaction of iconicity and semantic extension (Regier 1998: 2)](image)

In the diagram above, dotted lines are those which cross the boundary between
sound and meaning. Dotted lines are connected to words which are "sound-symbolically related to the form itself (Regier 1998: 2)". The circles represent meanings which are interconnected. In Regier's study, he finds the meanings in the circled areas to also be shared by non-reduplicative morphemes. For instance, one morpheme will also have all of the meanings in the baby circle and so on.

One link that may need explaining is that of baby. Regier justifies this link by the fact that babies inherently repeat what they say. Not only this, adults speaking to babies often talk in a baby register which includes a lot of reduplication of words. Thus many languages use a reduplicated word to represent the notion of baby.

Regier's network is based on examples from many different languages. Thus, in a sense, this network is a very general overview of the primary semantic functions which reduplication has in the literature. It is not a network of any specific language, since some languages may not have the links shown above and some may have more links than those shown above.

Regier admits that the network could be improved after more data has been examined and after theoretical tests have been performed on the network’s links. However, the basic idea seems to be a very plausible way of explaining how so many different meanings can be connected with reduplication. In addition, another
advantage of this network analysis is that it is falsifiable. Since there is supposed to be a network already present in the language, other non-reduplicative morphemes and words will also undergo the same processes of semantic extension. Thus, we can test the connections by seeing if other words have similar links. For instance, the use of baby in English can also mean small (a baby plane), immature (Don't be a baby) and a term of affection. Another test would be to make certain that if a link such as contempt exists, then a parent link such as baby must also exist in the language (Regier 1998: 2).

In the following section I will be using Regier’s framework in organizing my data on reduplication. Since the validity of a network is contingent on finding other evidence within the language to justify its links, my network is only a preliminary framework. However, I will be using it to categorize the various types of meanings which I found for reduplication in Paiwan. It will become clear that RtRED is the main reduplicative class, where CaRED only occurs with certain specialized meanings. Below is a possible network for Paiwan reduplication.
Figure 2.2 The interaction of iconicity and semantic extension in Paiwan Reduplication

In the above network, I did not include baby since I couldn't find evidence for it in Paiwan. Instead, I have replaced this link with facsimile, which is one of the meanings of reduplication in the language. As one can see, there are meanings in the network which weren't present in Regier's original network. Please note that this network is just a framework for organizing the patterns of reduplication which I find in Paiwan. I did not do any other independent testing to see if these links exist in non-reduplicative morphemes in Paiwan.

2.2.2 Data

This section introduces data for the different categories of meaning which I have for Paiwan reduplication. Again, all data was collected through my own field notes.

---

16 The word for baby in Paiwan is *rumamad* which seems to have reduplication. However, there is no *rumad* or *rumama-mama-d*. Thus, I do not consider the word to be a product of synchronic reduplication.
unless otherwise indicated. I have organized this section in accordance to the preliminary semantic network which I presented in the previous section.

### 2.2.2.1 Facsimile

The facsimile portion of the network, reproduced below, is discussed in this section.

![Facsimile Diagram]

Figure 2.3 The facsimile node

The facsimile meaning occurs with noun reduplication. H-C. Chang states that noun reduplication has a miniaturization meaning. Her only example was that of *qatjuvi* "snake", which has the reduplicated form *qatjuvi-tjuvi* "worm" (2000: 75). From my data, I conclude that reduplication of nouns will take on a facsimile or likeness meaning, except in a few forms where reduplication takes on a plurality meaning. These plural forms are discussed in a later section. This facsimile meaning can be paraphrased as "something like X" or "another version of X". It is manifested as having meanings which include but are not limited to "small X", "toy
Looking at examples such as (a') *gade-gade*, meaning "man-made mountain", (c') *vava-vava*, meaning "fake alcohol" and (j') *uma-uma-q*, meaning "miniature house (which you couldn’t live in)"*, we can see that the meaning "like X (but not really X)" is actually more appropriate. Then, depending on the word's semantics and the
objects found in the culture, a facsimile of an object can take the meaning of a smaller version, a fake version, a candy version or a toy version.

This noun reduplication is productive in the language, as shown by the many examples readily found of this type of reduplication. Second, it can be used on new words. For example, the word *angalj* "mouth" can be reduplicated, even though this reduplicated form doesn't exist in the language. However, according to my speaker, *anga-anga-lj* would mean "candy shaped like a mouth", formed from analogy from *calinda* meaning "ear".

Note that if proper names are reduplicated, the prefix *ti-* must be included (i.e. *ti-gitja-gitja-n* "doll of Gitjan"). This could be related to a human/nonhuman distinction in the language (Tang et al. 1998). Although, we see in (d) and will see later that terms referring to humans can be reduplicated without *ti-. As a note, I found one example of a stative verb that may also be in this category: *ma-ljia* "to become light" has a reduplicated form *ma-ljia-ljia* "just before dawn". It could be that *ma-ljia-ljia* is the equivalent of the English "almost light".

2.2.2.1.1 Gradually

As noted previously in H-C. Chang (2002), stative verbs prefixed with *me-* take on the meaning "gradually X" when reduplicated. Examples include the following.
(18) Stative Verbs with the meaning "slowly or gradually X": me- + RtRED
a. me-apedang become salty a'. me-apeda-peda-ng gradually become saltier
b. me-kuDal become big b'. me-kuDal-kuDal-l gradually become bigger

(H-C. Chang 2000: 75)
c. me-liaw become many c'. me-liaw-liaw gradually become many
d. me-nguaq get better d'. me-nguaq-nguaq gradually recover/get better
e. me-keDi become few e'. me-keDi-keDi gradually become fewer

My informants do not reduplicate the coda, forming me- lia-liaw and

me-nua-nua-q. This is important for my phonological analysis since RtRED never

reduplicates the word-final coda.

2.2.2.1.2 Mitigating Commands

H-C. Chang (2000: 76) also has a category where a verb command is

reduplicated and the resulting effect is to lighten the tone of the command.

Examples are shown below.

(19) Mitigated Commands: RtRED + -u

(H-C. Chang 2000: 76)
a. teke-teke-l-u drink IMP
"You drink first!"20
'喝一喝'
'你先喝'
b. tekel-u drink IMP
"Drink!"
'喝'

20 This gloss seems to have more meaning than just "please drink". However, this is the definition
given by H-C. Chang and it is also the definition given independently by my informants. James
Myers notes that this command is very common in discourse and so has undergone semantic extension,
just as many common greeting phrases in other languages mean more than just their literal meanings
(i.e. "What's up?" means "Hello", "What are you up to?" and "What's the problem?").
2.2.2.2 Repetition

The next major node on our network after facsimile is repetition. Repetition is a common semantic interpretation of reduplication. Repetition is often equated with augmentation, which can mean an increase in size, intensity, time, cycles and so on. The node is shown again below.

![Figure 2.4 The repetition node](image)

2.2.2.2.1 Continuation, Progressive and Habitual

How you augment a word's meaning is inherently dependent on the meaning and characteristics of the word. Yeh (2001: 10) draws from sources such as Moravesik (1978: 319), Katamba (1993) and Vendler (1967) to discuss the difference between continuity and totality. She notes that action verbs inherently consist of an action taking place in time. In order to augment the meaning of an action verb, one may invoke the meaning of continuous action or repeated action. Thus, you may have the progressive meaning "I was singing" or the "I am hitting him", or verbs with a
continual meaning "I keep singing" or "I keep hitting him". In addition, reduplicated verbs may also take on a customary or habitual action meaning. For instance, you may get the meaning "I sing everyday" or "I hit him all the time".

Paiwan has many verbs that take on the progressive, continual and habitual action meaning after reduplication. Since I will now be addressing verbal morphology, I first give a brief background of Paiwan's verbal aspect system before giving these examples.

According to Ross (1995: 735), Paiwan has a marking system where various types of affixes, which he calls pivot markers, are affixed to the verb.21 These pivot markers show what the pivot or subject of the sentence is. The examples he gives are shown below. Note that the following examples have these abbreviations: construction marker (CM), undergoer pivot marker (UG), genitive CM or pronoun (GEN), pivot CM or pronoun (PV), actor pivot marker (AP), non-pivot CM or pronoun (NPV) and locative pivot marker (LP).

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21 Instead of pivot markers, Y. L. Chang (1997) believes these are voice markers. Ferrell (1982) and H-C. Chang (2000) believe they are focus markers.
(20) Ross's Paiwan verbal system of pivot marking
(Ross 1995: 731, 732)
a. tekel-en nua qala a vaua
   drink-UG GEN stranger PV wine
   "the wine will be drunk by a/the stranger" ("a/the stranger will drink the wine")
b. tem>ekel a qal a tua vaua
   <AP>drink PV stranger NPV wine
   "the stranger will drink wine" ("the stranger will drink the wine")
c. tekel-an nua qal a kakesan
   drink-LP GEN stranger PV kitchen
   "the kitchen will be drunk in by a/the stranger" ("a/the stranger will drink it/them in the kitchen")
d. tekel-an a kakesan tua vaua
   drink-LP PV kitchen NPV wine
   "the kitchen will have wine drunk in it" ("someone will drink in the kitchen")

Thus, in the above sentences, -em- makes the actor the pivot, -en makes the patient the pivot and -an makes the location the pivot. The NP following the PV a is the pivot of the sentence, whose syntactic category corresponds to that indicated by the verbal marker (Ross 1995: 733). Another way to think of this process is in terms of the English passive voice. When English verbs are in the form was V-en they take a patient subject.22

Another pivot marker in Paiwan is si-, the instrument or benefactor pivot which I label IP (Ross 1995: 733-34, H-C. Chang 2000: 94). An example is given below.

---
22 However, this pivot/voice system in Paiwan is different from the voicing system in English in a number of ways. While in English, the active voice is the most basic for discourse purposes, in Paiwan the patient voice is more basic. In addition, the actors, patients, benefactors, instruments and locations, will not be suppressed from the sentence when they aren't marked as pivot. For a more detailed discussion refer to Ross (1995).
In the sentence above, \textit{si}- marks the verb as instrument pivot. The pivot marker \textit{a} is then placed in front of the instrument.

In my analysis, I will be using the abbreviations AP for actor pivot, UP for undergoer pivot, LP for locative pivot and IP for instrumental pivot. In addition, I will be using nominative (NOM) for Ross's PV and oblique (OBL) for non-nominative and non-genitive pronouns.

Returning back to the topic at hand, reduplication of action verbs will give a progressive, continual or habitual reading. Many of the verbs below also have pivot markers attached.

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\footnote{NAF is H-C. Chang's abbreviation for "non-actor focus", which includes patient and instrument focus (2000: 99).}
As one can see in the examples above, all the meanings of the reduplicated verbs are glossed as having progressive aspect. However, they can also take on a continual reading, as in *l-em-uma-luma-y* "keep fighting", or a habitual reading, as in "fights all the time".

In addition, the nature of the progressive is linked to the internal semantics of the word itself. Thus, in example (o), since *ma-sa-sevalit* is an achievement verb, its progressive meaning can involve continuity of achievements. Thus, you would be "taking turns" rather than "taking one long turn".

Note that in the examples in (22), verbs in progressive tense are often marked with AP. Reduplication of nouns with the *-en* marker also take on a progressive meaning. Let’s look at one example from my data.

---

24 *-en* is an allomorph of *-em*- (H-C. Chang 2000: 94), for more information see Appendix C.
25 *m*- is an allomorph of *-em*- (H-C. Chang 2000: 94).
26 I assume that *ma-* is the actor focus marker used with stative verbs which is described in other contexts by H-C. Chang (2000: 94) and Zeitoun and Huang (2000: 398). *sa-* is an example of CaRED to be discussed later.
27 AP can surface as Ø as well as the markers *m-, em-, en-* and *ma-* (H-C. Chang 2000: 94).
(23) "Water" becomes a progressive verb: RtRED + -en
a. zaljum "water" a. zalju-zalju-m-en "flooding"

b. zalju-zalju-m-en a. umaq
water.RtRED.UP NOM house
"The house is letting in water." OR "The house is flooding."

Thus, as we can see from the example above, the verb marked for UP can be progressive in meaning. This is not always the case, however, as I will point out in the section on individuation.

2.2.2.2.2 Intensity

Stative verbs denote a property or state which is continuous in nature, and thus when augmented will not mean "continuous" or "repeated state". They could instead imply a more intense state, or totality. This would yield a meaning such as "to love very much" or "to love completely".

One occasion where the intensity meaning will arise can be seen in the following example, where the reduplicated form of the stative verb cuay "a while/time" is cua-cua-y "a long while/time".
(24) Stative verbs increase in intensity: RtRED
(Chuang 2002: 59)
cua\text{-}cua\text{-}y\quad a\quad v\text{-}en\text{-}uak\quad a\quad qungalj\quad ini\text{-}ka\text{-}tjen\quad a\quad k\text{-}em\text{-}eljang\quad tu\quad
\quad[\text{久(AV)-Red}\quad A\quad \text{開花-AV}\quad \text{主格}\quad \text{百合花}\quad \text{不-咱們(主格)}\quad A\quad \text{知道-AV}\quad \text{補語標記}]
\quad a\quad \text{while.RtRED}\quad \text{A}\quad \text{blossom.AP}\quad \text{NOM}\quad \text{lily}\quad \text{NEG.us(incl.)}\quad \text{NOM}\quad A\quad \text{know.AP}\quad \text{CMP}\text{29}

nu\text{-}ngida\quad ki\text{-}v\text{-}en\text{-}engalj\quad a\quad icu\quad a\quad qungalj?\quad
\quad[\text{未來-時候}\quad \text{自己-結果子-AV}\quad \text{主格}\quad \text{這}\quad A\quad \text{百合花}]
\quad \text{future.time}\quad \text{self.make.fruit.AP}\quad \text{NOM}\quad \text{this}\quad A\quad \text{lily}

"The lily has bloomed for a long while, we(inclusive) don't know when this lily will bear fruit?"
百合花開花開了很久，咱們不知道何時這百合花會結果？

Another stative verb which will take this more intense reading is liaw meaning
"lots" becoming lia-\text{lia-}w meaning "lots and lots".

(25) a. liaw\quad a\quad paysu\quad ni\quad matju
\quad \text{lots}\quad \text{NOM}\quad \text{money}\quad \text{GEN}\quad \text{he}
\quad "He has lots of money."

b. lia\text{-}lia\text{-}w\quad a\quad paysu\quad ni\quad matju
\quad \text{lots.RtRED}\quad \text{NOM}\quad \text{money}\quad \text{GEN}\quad \text{he}
\quad "He has lots and lots of money"

2.2.2.2.3 Intrinsic\textsuperscript{30}

H-C. Chang finds a type of stative verb reduplication which has the meaning
"the state of X" and "a person with the quality of X". Her examples are given again
below.

\textsuperscript{28} According to Chuang (2002), \textit{A} is a non-nominative \textit{a} case marker (非主格格位標記的 'a'). Y. L. Chang says these \textit{a} markers are actually linkers, such as the English \textit{and}.
\textsuperscript{29} See Tang (1999) for details about complementizers.
\textsuperscript{30} Y. L. Chang has suggested that this category is more accurately labeled as "Generic".
Her examples have a large variety of meanings and syntactic roles, with keDi-keDi becoming a stative verb and a noun and saqetu-getju which can be a verb in progressive tense, a stative verb and a noun.\textsuperscript{31} I will argue in this section that examples such as "child" and "sick person" have an "intrinsically small" or "intrinsically sick" meaning. In addition, I feel the stative verb "having lots of sicknesses" also has an intrinsic meaning, something like "a person who is always sick". Before I begin a more thorough discussion of what it means to be intrinsic, it is interesting to note that saqetu-getju can also act as an activity verb and take the progressive meaning. In addition, its stative verb meaning, "having lots of sicknesses", seems to be plural. I will talk more about the plural in later sections.

In the previous section I discussed how a reduplicated stative verb can mean "more intense". In addition to this, an augmented stative verb may change from a transient state becoming a permanent or intrinsic state. This is what is described by Carlson (1977) and Chierchia (1995) to be the difference between stage-level predicates and individual-level predicates. For example, if someone is tired, then

\textsuperscript{31} James Myers says the various meanings are the result of semantic shift, which occurs on high frequency forms in the language.
they have the transient property of being tired. This is a stage-level predicate. However, if they are tall, they have the property of tallness. This is their individual property, which will not change easily, and is thus an individual-level predicate.

Sometimes reduplicated stative verbs take an intensity meaning but most often they take an individual-state reading. The individual-level meaning can be stated as "intrinsically X" or "to be X kind". For example, you might be eating a fish and think there is too much salt on it. In Paiwan, you would say apedang a ciqaw, which means "The fish is salty." However, if you want to tell a friend that you are eating a fish that is naturally salty, you would say apeda-peda-ng a ciqaw, which means "This is a salty fish."

Another example is if you are trying on clothes with a friend. After your friend asks you "How does it fit?" you might answer keDi, which means "small." In other words, it's small for you because you're too big for it, not because it is intrinsically small. However, if you want to describe your car to a friend, you could say keDi-keDi ti tusia, which means "a small car." This is because your car has the unchanging quality of being small, compared to other cars.

Here are some examples of words which take on this meaning. I have noted the individual-level meaning with the abbreviation ind.
(27) Stage-level becomes individual-level in stative verbs: RtRED

a. aravan "greedy" a'. arava-rava-n "greedy (ind)"
b. apedang "salty" b'. apeda-peda-ng "salty (ind)"
c. ateliv "sour" c'. ateli-teli-v "sour (ind)"
d. qadid "bitter" d'. qadi-qadi-d "bitter (ind)"
e. macam "spicy" e'. maca-ca-m "spicy (ind)"
f. alemeqem "sweet" f'. alemeq-m-eq-m "sweet (ind)"
g. keDi "small" g'. keDi-keDi "small (ind)"
h. kuDal "big" h'. kuDa-kuDa-l "big (ind)"
i. kulay "fat" i'. kula-kula-y "fat (ind)"
j. qudjerel "red, blemish" j'. qudjere-djere-l "red (ind)"
k. no form k'. qucenge-cenge-l "black (ind)"
l. no form l'. vura-vura-v-an "yellow (ind)"
m. no form m'. matja-matja-k-an "green (ind)"
n. no form n'. lilua-lua-s "green (ind)"

Note that in the examples above, many of the colors seem to be always used in their reduplicated form, or at least it wasn't obvious to speakers how to use the unreduplicated form. For my example "red" in (j) above, the unreduplicated form is used to describe blemishes, red eyes or blood spots. These are things which are temporarily red. For example, the sentences below show how the Paiwan form for "red" is used.

(28) Temporary vs. intrinsic statives

a. udjerel a su maca.
   red NOM your eye
   "Your eye is red."

b. m-uri v-en-il mua udjere-djere-l a kun.
   AP.want buy.AP NOM.1 OBL red.RtRED REL skirt
   "I want to buy a red skirt."

32 H-C. Chang (2000: 75) has the example liluas "green" and its reduplicated form lilua-lua-s "very green", where the color term "green" takes an intensity meaning in the reduplicated form. The following example from my data differs in that lilua-lua-s "green (ind)" has an intrinsic state meaning.

izua nia tjirum a lilua-lua-s.
has our pot NOM green.RtRED
"Our pot is green (ind)."
Since red is a very common transient color of the human body, perhaps this is why speakers can more readily think of examples of *udjerel* than the unreduplicated forms of the other colors.

I have had informants tell me that this type of reduplication can carry a more intense meaning such as "really greedy". However, I also had informants tell me that to form the emphatic meaning, one must add the word *aravac* as in *apedang aravac*, which means "very salty". It is not clear to me why words such as *lia-lia-w" lots and lots" have an intense meaning and most other stative verbs take on the individual-level meaning.

2.2.2.2.4 Most

Under circumstances of extreme intensity, the meaning of "most X" can arise. For certain directional verbs, root reduplication and the locational suffix -*an* creates the meaning "X-most" or "furthest to the X". See the examples below.

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33 I'm informed that *apeda-peda-ng aravac* is ungrammatical since you can't be "very intrinsically salty". However, *ngua-ngua-q aravac" very beautiful", *kuya-kuya aravac" very ugly" and *kDa-kDa-l aravac" extremely big" are grammatical. Another interesting case is where the sentence below reduplicates *ngua-ngua-q* but doesn't reduplicate *liyaw*. Here, they both seem to indicate intrinsic properties.

Chuang (2002: 57) (COS means change of state, AV is AP, A is probably a linker)

me-liyaw-anga a qungal nguangua-anga a icu a kadjunangan.

變-多(AV)-COS 主格 百合花 美麗-COS 主格 這 A 山坡
become.lots.COS NOM lily beautiful.COS NOM this A mountain side

“The lilies have become numerous, this mountain side has turned beautiful.”

百合花變多了, 這山坡地變美了’
(29) Directional Verbs "X-most": RiRED + -an
a. ivavau "upper, high" a'. ivava-yava-v-an\textsuperscript{34} "uppermost, highest"

b. iteku "lower" b'. iteku-tek-an "lowermost"

c. kanavalj "right" c'. kanavana-ana-lj-an "rightmost"

d. kavilj "left" d'. kavilj-vili-an "leftmost"

2.2.2.3 Plural

The next node we will be addressing is the plural node given again below.

\[\text{plural} \rightarrow \text{reciprocit} \leftarrow \text{collective} \rightarrow \text{individuated}\]

Figure 2.5 The plural node

Previously, I showed that noun reduplication has a facsimile meaning. Countable nouns, when augmented, can also take on a plural meaning. Examples of this type of reduplication are given below.

\textsuperscript{34} According to my data, word-finally if there is a vowel pair ending in u, the u will become a v when a vowel-initial suffix is added after it.
Examples of reduplicated nouns becoming plural are very few. I could only find these ten, all of which refer to people and questions. With the possible exceptions of (c), (d), and (e), these words are all rather common. Thus, they could be the result of lexicalization. Diachronically speaking, words which tend to be more common are used more frequently and less apt to change, whereas words which are used less frequently are more subject to language change. Thus, there may have been a process in the past where reduplicated nouns had a plural meaning, and only certain more commonly used words have kept the meaning. This is especially true when, as is the case of the plural in Paiwan, the process is no longer productive.

### 2.2.2.3.1 Reciprocity

When a verb X has a prefix ma- and CaRED affixed to it, it takes on the

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35 Chuang (2002: 42) shows this word can also have a different meaning:  
\[ \text{k-em-uda-kuda-sun} \]  
“做什么.AV-Red.you(NOM)  
“Do what.”  
36 Thanks to James Myers for suggesting this hypothesis to me.
meaning "X (for) each other". This type of reduplication was previously noted by Ferrell (1982: 28) who states that the ma- is a verb prefix. Though H-C. Chang does not address this type of reduplication, as I have mentioned previously, she does note that ma- is the AP marker for stative verbs (2000: 94). Thus, I will assume that ma- is the actor pivot for stative verbs.

(31) Reciprocal verbs: ma- + CaRED

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>a.</td>
<td>k-em-im</td>
<td>&quot;to search for(AP)&quot;</td>
</tr>
<tr>
<td>b.</td>
<td>l-em-umay</td>
<td>&quot;to hit(AP)&quot;</td>
</tr>
<tr>
<td>c.</td>
<td>ma-vetu</td>
<td>&quot;to feed (full)(AP)&quot;</td>
</tr>
<tr>
<td>d.</td>
<td>ma-peteq</td>
<td>&quot;to break(AP)&quot;</td>
</tr>
<tr>
<td>e.</td>
<td>k-em-ak</td>
<td>&quot;to bite(AP)&quot;</td>
</tr>
<tr>
<td>f.</td>
<td>m-utjak</td>
<td>&quot;to throw up(AP)&quot;</td>
</tr>
<tr>
<td>g.</td>
<td>r-em-akac</td>
<td>&quot;to pull(AP)&quot;</td>
</tr>
<tr>
<td>h.</td>
<td>q-em-iciqic</td>
<td>&quot;to crowd(AP)&quot;</td>
</tr>
<tr>
<td>i.</td>
<td>q-em-izing</td>
<td>&quot;to push(AP)&quot;</td>
</tr>
<tr>
<td>j.</td>
<td>sevalit</td>
<td>&quot;to change or switch&quot;</td>
</tr>
<tr>
<td>k.</td>
<td>m-asik</td>
<td>&quot;to weed(AP)&quot;</td>
</tr>
<tr>
<td>l.</td>
<td>m-alim</td>
<td>&quot;to forget(AP)&quot;</td>
</tr>
</tbody>
</table>

Sentences illustrating these words are given below.

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37 Y. L. Chang also concurs with this conclusion.
38 There are forms which have the prefixes ma- and ka- added to them to create an "X all over" meaning. Thus, ma-ka-kim has a meaning "search all over." Thus, this form has two meanings, depending on whether one is using CaRED or whether one is using ka-.
39 Lumay also occurs with the actor focus prefix em-, as in l-em-uma-lumay "hitting (AP)". It is unclear why in ma-la-lumay the AP prefix is ma- instead of em-. Perhaps it is due to the fact that CaRED creates a stative verb, which must have the ma- prefix.
40 This meaning does not mean to really "throw up". In Taiwan, if someone says a bad joke, people will pretend they are throwing up in response to it. So in this case, the meaning is to pretend to throw up.
(32) Sentences with reciprocal meaning: \textit{ma-} + \textit{CaRED}

\begin{itemize}
  \item[a.] maulau manasika \textit{ma-ka-ki-ki-m}.

\begin{verbatim}
lost so AP.CaRED.RtRED.search
"They are lost so they are searching for each other."
\end{verbatim}

\item[b.] \textit{ma-ra-rakac a vatu tua vutjulj}.

\begin{verbatim}
AP.CaRED.pull NOM dog OBL meat
"The two dogs each pull on the meat."
\end{verbatim}

\item[c.] \textit{ma-ra-rakac a mareka vatu tua vutjulj}.

\begin{verbatim}
AP.CaRED.pull NOM those dog OBL meat
"Those dogs each pull on the meat."
\end{verbatim}

\item[d.] ivavau a men busu \textit{ma-ga-qizi-qizi-ng ang(a)} a men

\begin{verbatim}
sit NOM we bus AP.CaRED.push.RtRED already NOM we
"Us sitting on the bus is a lot of pushing and getting pushed."
\end{verbatim}
\end{itemize}

Note that, as can be seen from (a) and (d), these verbs can also add \textit{RtRED} to obtain a progressive meaning.

Sentence (a) can also have root reduplication occur twice, forming

\textit{ma-ka-ki-ki-ki-m}. This form is used in story-telling and not in ordinary speech.

(33) maulau manasika \textit{ma-ka-ki-ki-ki-m}.

\begin{verbatim}
lost so AP.CaRED.RtRED.search
"They are lost so they are searching for each other."
\end{verbatim}

Other monomoraic root words can also have this double root reduplication in story-telling situations, i.e. \textit{ma-ka-ka-ka-ka-c} "biting each other". This is support for my dimoraic analysis of reduplication since the reduplicant can be maximally two moras. Since monomoraic stems only reduplicate one mora, there seems to be some freedom which allows reduplication to occur twice, creating a total of two moras.
2.2.2.3.2 Individuated

There is a type of Ca reduplication in Paiwan which has the form CaRED + verb + LP/UP. H-C. Chang lists this type of reduplication as meaning "a place where you do X". However, looking at her own example (34c) below, this definition isn’t always applicable.

(34) H-C. Chang’s (2000: 77) examples of RtRED + -an
a. pacun "to see" a’. pa-pacun-an "place for looking, lookout platform"
看
b. djemukul "(use a stick) to hit” b’. dia-djukul-an "place for hitting people"
（用棍子）打
(panmian)
c. qaivu "to speak” c’. qa-qaivu-an "spokesman"
說話

The meaning in (a’) above can be paraphrased as a "place looked at" or "a place for looking", probably depending on the context. Similarly, example (b’) can be paraphrased as a "place for hitting". Example (c’), however, adds a new meaning paraphrased as "a person who speaks". This could be due to the fact that, people can "speak" or "look", and they can also be "spoken to" or "looked at". Thus, I would predict that there are also instances in the language when qa-qaivu-an means "person spoken to", "auditorium" or "platform for speaking".

Examples which I have found of this type of reduplication are shown below.
(35) Examples of CaRED + LP/UP

a. keDi "small" \(\Rightarrow\) a'. ka-keDi-an\(^{41}\) "child"

b. kan "eat" \(\Rightarrow\) b'. ka-kan-en "food"

c. kesa "cook" \(\Rightarrow\) c'. ka-kes(a)-an "kitchen"

In (35a) above, the reduplicated form has a meaning "a person/thing which is X".

In (35b), the reduplicated form has a meaning "a thing which is X-ed". Finally, (35c) has a meaning "place where one X-s". Thus, it seems that this type of reduplication and affixation results in different meanings depending on context.

Another example which I have is given below.

\[(36)\] vai-u a pa-pacun-an tua kuisan
go.IMP LK CaRED.look.LP OBL doctor
"Go and get looked at by a doctor."

In the example above, \(\text{pa-pacun-an} \) "get looked at" takes on one of the roles of predicate in the sentence. Thus, this type of affixation seems to sometimes act as a noun and sometimes act as a predicate.

I will classify this type of affixation as "individuated" because it can be thought of as "an individuated instance of X (whether as a place, person or thing)". However, I acknowledge that this categorization isn't the most ideal due to the fact that the meanings of forms are context dependent and unpredictable. I assume that this type of affixation is more archaic, with many words having their own special lexicalized

\(^{41}\) I don't know why sometimes the focus marker is LP and sometimes UF.
meanings (i.e. *ka-keDi-an* "child").

One of the reasons I choose this "individuated" interpretation can be seen when this form combines with RtRED. Forms with RtRED take on a plural or quantified "all X" meaning. In order for something to be plural or quantified, it must first be singular, or individuated.

H-C. Chang (2000: 77,78) lists the CaRED + X + RtRED + -an form as stative verb reduplication that takes the meaning "some X things/people". Examples are shown below.

(37) H-C. Chang's "some X things/people" reduplication: CaRED + RtRED + -an
(2000: 77,78)

a. liluas "green"   la-liljua-ljua-s-an\(^{42}\) "some green things" 一些綠綠的東西
b. saqetju "sick"   sa-saqetju-getju-an  "some sick people" 一些病人
    "a very painful place"  "很痛的地方"
c. keDi "small, short"  ka-keDi-keDi-an  "some children"  "some short people"
    "some small people"  "一些矮的人"

I agree with H-C. Chang's observations for the most part, but would eliminate the "some" since, as can be seen in my examples below, *liawa* "a lot" can be placed in front of the CaRED + RtRED + -an form. Since it is impossible to have "a lot" and "some" together, I conclude that this type of reduplication, instead, has the meaning

\(^{42}\) Using a different notation, H-C. Chang transcribed this word as *LaLilualuasan*. 
"lots of X things". Examples are given below (LOC stands for location marker).

(38) RtRED + -an Examples
a. liawa la-liljuia-liua-s-an i ceme-ceme-r
   a lot CaRED.green.RtRED.LP LOC grass.RtRED
   "The field has lots of green."

b. liawa sa-saqetju-getju-an i biuing
   a lot CaRED.sick.RtRED.LP LOC hospital
   "The hospital has lots of sick ones (people)."

c. ka-keDi-keDi-an a kava ni gitjan
   CaRED.small.RtRED.LP NOM clothes GEN gitjan
   "Gitjan's clothes are all small ones."

d. a-apedang-an a ciqaw
   CaRED.salty.LP NOM fish
   "The fish are all salty." OR "There are lots of salty fish."

d'. a-apeda-peda-ang-an a ciqaw
   CaRED.salty.RtRED.LP NOM fish
   "The fish are all salty." OR "There are lots of salty fish."

e. ka-kuDal-an a kasiv
   CaRED.big.LP NOM tree
   "The trees are all big." OR "There are lots of big trees."

e'. ka-kuDa-kuDal-l-an a kasiv
   CaRED.big.RtRED.LP NOM tree
   "The trees are all big." OR "There are lots of big trees."

As one can see in examples (d), (d'), (e) and (e'), some forms have the same
ting both with and without RtRED. In addition, the forms above are all
predicates which create a plural meaning. Thus "clothes" is the subject of a
predicate meaning "individuated small things". I noted earlier in section 2.2.4 that
adding RtRED to nouns to create plural nouns is not productive in the language.
This makes this "individuated" form even more exceptional.

Another interpretation is that this predicate acts as the quantifier "all". As can
be seen, except in sentences (38a) and (38b), all sentences have an "all X" meaning. The reason this meaning is not present in (38a) and (38b) could be because of the presence of liawa "a lot". If you have "a lot" of something then you don't have "all". If this is the case then, the meaning "all" isn't built into the form but arises from context.

I have other data which also seem to have this quantification meaning. The following is a sentence using the word djamuq "blood" in its reduplicated form djamu-djamu-q-an "bloodied".

(39) Noun becoming a dynamic verb: RtRED + -an
na kikalivu-an ti paljang manasika djamu-djamu-q-an a kava.
Pf fight.LP NOM Paljang so blood.RED.LP NOM shirt
"Paljang got in a fight so his shirt was bloodied."

In the example above, ti is the nominative marker used before nouns referring to people. The noun for "blood" turns into a dynamic verb meaning "bloodied". It can be ascertained that djamu-djamu-q-an is a verb because it acts as the predicate of the second clause. It takes a verbal particle, -an, and is followed by a nominative marker indicating the location of the action in the predicate. In other words, the bloodied object is the shirt. This could show quantification if we interpret the shirt

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43 This interpretation arose from discussion with Y.L. Chang, who suggests there is universal quantification in some noun reduplication forms of the form RtRED + -an. In addition, my classmate Wu Jun-ming 吳俊明 also thinks there might be a quantification meaning as well.
as being "all bloody".

Another example is given below.

(40) Quantification of nouns: RtRED + -an
a. zalju-zalju-m-an  "water everywhere ...maybe lots of lakes, flooded

a'. zalju-zalju-m-an a bu-han(a)-an44
water.RtRED.LP NOM bu.flower.LP
"The garden is flooded." OR "The garden is filled with water."

In the above example, water in the form RtRED + -an takes a meaning "water everywhere". In the following examples there also seems to be quantification.

(41) Nouns become dynamic verbs: RtRED + -an, -en
a. kasiv  "tree"  a'. kasi-kasi-v-en  "lots of wood"
b. puniq  "mud"  b'. puni-puni-q-an  "muddy"
c. sasiq  "ant"  c'. sasi-sasi-q-an  "anty, ant-infested"

a'. kasi-kasi-v-en a ceme-ceme-r
   tree.RtRED.UP NOM grass.RtRED
"The field outside is full of wood." OR "The field is heavily wooded."

b'. puni-puni-q-an a izua
   mud.RtRED.LP NOM there
"It's muddy there."

c'. sasi-sasi-q-an a ljualju
   ant.RtRED.LP NOM candy
"The candy has ants all over it."45

The above examples have reduplicated nouns as predicates which sometimes have meanings such as "filled with" and "covered all over with".

Thus, I will preliminarily conclude that RtRED + -an can have a plural or

44 When a is contiguous to another a, it combines with the other a to form one short a. I have shown this notationally with the parenthesis. I noticed this characteristic from my own data.
45 Y. L. Chang notes that this form may have universal quantification involved in the meaning.
2.2.2.3 Collective

A collective is closely related to the plural in that you need more than one member to form a collective. However, these words still have subtle differences in meaning from plurals.

(42) Collectivity
a. aljak "child"
   a'. mar(a)-aljak "to have a parent/child relationship"
   a". mar(a)-alja-la-k "to be a nuclear family"
   a"'. mar(a)-aljalja-la-la-k "to be an extended family"

   b. mar(a)-aljak amen
      mar(a).child we
      "This is my child" OR "We have a parent/child relationship."

Thus, in terms of relationships, this is an example of one relationship (parent child) becoming more relationships (family) and then becoming even more relationships (extended family). Another example of a collective, which H-C. Chang lists as plural, is listed below.

(43) a. cemer "grass, grass bugs, herbs" a'. cema-cema-r "field"
   (H-C. Chang 2000: 75)
   b. cemel "grass, tree" b'. ceme-ceme-l "place with many trees, field, hunting grounds"
      草；樹  很多樹的地方；草原；打猎地的總稱

Another example of reduplication with a collective meaning is what H-C. Chang
describes as an action verb that reduplicates to form an abstract noun. It also seems that the reduplication is creating a collective meaning.

(44) Examples from H-C. Chang (2000: 76): RtRED

a. pa-kiananan ti palang tua s-emena-sena-y
   [使加入 主格 Palang 斜格 合唱團（一群唱歌的人）]
   let.join NOM Palang OBL chorus (a singing group)
   'Let Palang join a chorus!'

b. s-em-anay ti palang
   [唱歌 主格 Palang]
   sing.AP NOM palang
   'Palang 唱歌'
   Palang sings.

In (44a) a reduplicated action verb is acting as an argument of *pa-kiananan*. Thus, *s-em-ena-sena-y* is like an English gerund with an added collective meaning.

### 2.2.2.4 Other

Aside from augmentation and diminutive reduplication, there are other meanings which have been previously associated with reduplication in Paiwan and Thao (H-C. Chang 2000, L. Chang 1998). I will show in this section that, in Paiwan, these meanings do not arise from reduplication. Instead, they are the product of other affixation processes. The two meanings which I will be looking at are instruments and smells.
2.2.2.4.1 Instrument

Looking at the forms below from H-C. Chang (2000), it seems that adding the prefix \(si\)- and RtRED to a reduplicated verb creates a tool meaning.

(45) Chang's examples of tools: RtRED
(2000: 67)
a. \(si\)-qereng-qereng  "tool used for sleeping"
   睡覺用具
b. \(si\)-ka-ka-n  "tool used for eating (i.e. spoon, chopsticks)"
   吃飯的用具（如湯匙、筷子）

Note that in example (a), H-C. Chang has the word-internal coda copied. In my data the word-internal coda is missing, i.e. \(si\)-qere-qere-ng, thus conforming to the normal RtRED form.

H-C. Chang classifies the above forms as nouns, which is possible if they act like gerunds. However, since they are affixed with the instrument pivot marker \(si\)-, it is more likely that they are verbs with the instrument meaning arising from the instrument pivot, not from reduplication. See the following examples from my data.

(46) "used for V-ing": \(si\) + RED
a. v-en-ecik  "to write(AP)"
a'. \(si\)-veci-veci-k  "used for writing(IP)"
b. g-em-elegel  "to cut(AP)"
b'. \(si\)-gelege-lege-l  "used for cutting(IP)"
c. s-em-evesev  "to strain(AP)"
c'. \(si\)-sevese-seve-v  "used for straining(IP)"
d. s-em-enaw  "to wash(AP)"
d'. \(si\)-sena-sena-w  "used for washing(IP)"
e. qereng  "to sleep"
e'. \(si\)-qere-qere-ng  "used for sleeping(IP)"

The above examples list the reduplicated forms as predicates. In the sentences
below, the unreduplicated and reduplicated forms both act as predicates and both have an instrument meaning.

(47) a. si-vecik aken tua kava ni madju
   IP.stitch NOM.I OBL clothes GEN he
   "He helps me stitch the clothes."

   b. k-em-i-ki-m aken tua si-veci-veci-k tua kava a calis
      search.AP.RtRED NOM.I OBL IP.stitch.RtRED OBL clothes REL thread
      "I'm looking for the thread used for stitching."

Thus, from the examples above, it seems clear that the instrument meaning is arising from the instrument pivot marker si- and not reduplication. Reduplication, instead gives the predicate an "intrinsic" or individual-level state meaning. This is the meaning created when stative verbs are reduplicated.

In the example above the unreduplicated form, has the meaning "helps to V", which is different from the reduplicated form's meaning "used for V". The difference is that the unreduplicated form has a stage-level state meaning whereas the reduplicated form has an individual-level state meaning. In the sentence above, "he" is not a "person who is used for stitching", but a "person who can help with stitching" at that particular time. When discussing what something is used for intrinsically, reduplication is used. Another example is given below.
(48) Instrument voice:  

a. sekam "bamboo sleeping mat"  
   a'. si-seka-seka-m "used for sleeping"

b. si-seka-seka-m tua qereng-an  
   IP.mat.RtRED OBL sleep.LP  
   "The bed is used for sleeping."

c. aicu a sekam si-qere-qere-ng  
   this NOM mat IP .sleep.RtRED  
   "This mat is used for sleeping."

Note that in the examples above, the individual-level state meaning is used to describe the intrinsic functions of the bed and mat. Thus, reduplication's role here is the role of "intrinsic" property, and not "instrument".

2.2.2.4.2 Smells/Likeness

From data in H-C. Chang (2000: 64,65) it would also seem that the form sa + N has the meaning "like N" and sa + N + RtRED has the meaning "having the smell of N". Her data is given below.

(49) Likeness and Smells  
(H-C. Chang 2000: 64,65)

a. vavayan "woman"  
   a'. sa-vavayan "like a woman"  
   女人 有女人味
b. kina "mother"  
   b'. sa-kina-kina "having mother's smell"  
   媽媽 有媽媽的味道
c. cemer "herbs, medicine"  
   c'. sa-ceme-ceme-r "having a medicine smell"  
   藥 有藥味

However, according to one of my informants, there are actually two different forms here. The first form in (50a) above is (na- +) sa- + N (+ RtRED), which means "like N (RtRED)". In some cases when the noun is referring to people, the
prefix na- can be left out of the word, though my informant said the word will not be complete. Inanimate objects and animals are required to have the na- prefix. If the noun is reduplicated, then the form will mean "like the reduplicated form of the noun". As you may recall, the meanings of reduplicated nouns are listed in 2.2.2.1, the section on facsimile. Examples of this na- + sa- class are given below.

(50) Stative verbs indicate likeness
a. vatu "dog" a'. na-sa-vatu "like a dog"
   a". na-sa-vatu-vatu "like a toy dog"
b. qiu "goat" b'. na-sa-qiu "like a goat"
   b". na-sa-qiu-qiu "like a toy goat"
c. ciqaw "fish" c'. na-sa-ciqaw "like a fish"
   c". na-sa-ciqaw-ciqa-w "like a toy fish"
d. vavayan "woman" d'. (na-)sa-vavayan "like a woman"
   d". (na-)sa-vavaya-vaya-n "like women"
e. uqaljay "man" e'. (na-)sa-uqaljay "like a man"
   e". (na-)sa-uqalja-galja-y "like men"
f. tukey "desk" f'. na-sa-tukuy "like a desk"
   f". na-sa-tuku-tuku-y "like a toy desk"
g. kava "clothes" g'. na-sa-kava "like clothes"
   g". na-sa-kava-kava "like toy clothes"
h. cemer "grass, trees…” h'. na-sa-cemer "prey, hunted animal"
   h". na-sa-ceme-ceme-r "like a wild field/forest"

(51) a. na-sa-kava anga a su s-in-a-n(e)-kava
   PF.like.clothes already NOM your like.UP.made.clothes
   "That clothes-like thing looks like clothes that was made."
   (said when looking at someone making clothes and commenting on how the clothes they are making looks like clothes.)

   (H-C. Chang 2000: 65)
b. sa-vavayan timadju
   [有女人味 他]
   like.woman NOM.he
   "He is like a woman."
   ‘他有女人味'

Aside from the more unpredictable meaning in (50h’) above, all forms follow a regular pattern.
The other forms listed in Chang's data, (49b) and (49c) are the form \textit{sa-} + N (+ RtRED). This form is only used with animal words, in which the unreduplicated form and reduplicated form have the same meaning. The following are some examples.

(52) Stative verbs indicate smells
\begin{itemize}
\item[a.] vatu "dog" \textit{sa-vatu, sa-vatu-vatu} "having dog odor"
\item[b.] qiu "goat" \textit{sa-qiu, sa-qiu-qiu} "having goat odor"
\item[c.] ciqaw "fish" \textit{sa-ciqaw, sa-ciqa-ciqa-w} "having fish odor"
\end{itemize}

Some example sentences using these forms are given below.

(53) a. \textit{sa-vatu-vatu-an} a umaq
\textit{sa.dog.RtRED.LP NOM house} "The house smells like dog."

b. \textit{sa-vatu-vatu} a umaq
\textit{sa.dog.RtRED NOM house} "The house smells like dog."

Note that in the sentences above the LP can be used optionally to get the same meaning, however \textit{sa-} and \textit{RtRED} are always required. My informant tells me that the second sentence is also acceptable though speakers understand that it's a shortened version of the first.

Thus, the \textit{na-} + \textit{sa-} + (RtRED) forms have a "likeness" meaning that is not attributed to reduplication. Instead, this meaning arises from the affixes \textit{na-} and \textit{sa-}.

The second group of words in the form \textit{sa-} + (RtRED) have their "smell" meaning
arise from the prefix $sa$-, and not from reduplication.

2.2.3 Conclusion

The listing of the semantics of reduplication is complete. Given again below is the network which this section was organized by. I have labeled the phonological form that each meaning has in parenthesis (Rt stands for RtRED, Ca stands for CaRED).

![Diagram of reduplication meanings]

Figure 2.6 The interaction of iconicity and semantic extension in Paiwan Reduplication, form and meaning

Thus, the semantics of reduplication, though varied, can be seen as arising from a common iconic source. In the end, it isn't quite as difficult to understand how the meanings of reduplication arose in the lexicon.
2.3 The Relationship Between Form and Meaning

From the classification and description of reduplication, one can see that though the semantics of reduplication are varied, the phonological structure is only limited to two basic forms. Most reduplication in Paiwan is RtRED which encompasses multiple semantic functions. CaRED seems to have more specialized meanings. Thus, Paiwan resembles languages like Thao (L. Chang, 1998: 285) and Tagalog (Carrier-Duncan, 1984: 260) which do not show a one to one relationship between form and meaning.46

In the diagram in 2.2.3, only reciprocity and individuated are CaRED. All other reduplicative meanings have the RtRED structure. Remember that RtRED is a more prototypical reduplicant since it copies all of its segments from the base. Thus, it is not surprising that most meanings prototypical to reduplication are in the form of RtRED. CaRED, on the other hand, only has one meaning which seems related to reduplication, that of reciprocity. It's other meaning, individuated, is difficult to categorize. From this section it can be concluded that RtRED and CaRED are different morphemes, not only in terms of phonological form, but also in terms of semantic distribution.

46 For a look at Austronesian languages which may have meanings related to form, the reader is referred to Zeitoun's (2000) study of Rukai and Yeh's (2001) study of Bunan.
Chapter 3

An Optimality Theory Analysis of Paiwan Reduplication

This chapter presents an Optimality Theory analysis of reduplication and affixation in Paiwan. In addition to analyzing the structure of reduplication, I also address the issue of whether reduplication acts like other affixes in the language. I demonstrate that an OT analysis of CaRED as prefixation and RtRED as suffixation is the most ideal. My analysis predicts the position of affixes, reduplicative and non-reduplicative, through interactions of alignment and faithfulness constraints. Words with both types of reduplication occurring simultaneously are also successfully analyzed.

My analysis begins with RtRED. The second section then analyzes CaRED. The third section analyzes words that have both RtRED and CaRED. The fourth section concentrates on predicting affixal positioning. The final section addresses how my OT analysis is consistent with the claim made in Chapter 2 that CaRED is a prefix and RtRED is a suffix.

3.1 Root Reduplication

This section provides an Optimality Theory analysis of root reduplication (RtRED). I analyze RtRED as a suffix. I address the properties that have been
discussed in the previous chapter in terms of Optimality Theory constraints. These properties are listed again here.

(54) Properties of RtRED reduplication

a. Copies from the stem: The reduplicant copies its phonological material from the stem.
b. Reduplicant aligns to the right: The reduplicant is a suffix (thus aligns to the right of the word).
c. Copies from the right edge: The reduplicant copies from the right edge of the stem.
d. Doesn't copy codas: The reduplicant does not copy codas.
e. Maximally two moras: The reduplicant is maximally two moras.

3.1.1 Copies from the stem

Reduplication, by its very nature, has in whole or part, the same phonological material as its base. This relationship between reduplicant and base can be captured in Optimality Theory through correspondence theory. McCarthy and Prince (1995a) formalize correspondence as follows.

(55) Correspondence (McCarthy and Prince 1995a: 262)

Given two strings S1 and S2, correspondence is a relation \( \mathcal{R} \) from the elements of S1 to those of S2. Elements \( \alpha \in S1 \) and \( \beta \in S2 \) are referred to as correspondents of one another when \( \alpha \mathcal{R} \beta \).

From this general definition they define certain correspondence constraints important for our analysis. These constraints are listed below.
(56) Correspondence Constraints MAX, DEP and IDENT(F)
(McCarthy and Prince, 1995a: 264)

a. The MAX Constraint Family
   General Schema
   Every segment of S1 has a correspondent in S2.
   Specific Instantiations
   MAX-BR
   Every segment of the base has a correspondent in the reduplicant.
   (Reduplication is total.)
   MAX-IO
   Every segment of the input has a correspondent in the output.
   (No phonological deletion)

b. The DEP Constraint Family
   General Schema
   Every segment of S2 has a correspondent in S1.
   (S2 is "dependent on" S1.)
   Specific Instantiations
   DEP-BR
   Every segment of the reduplicant has a correspondent in the base.
   (Prohibits fixed default segmentism in the reduplicant.) 47
   DEP-IO
   Every segment of the output has a correspondent in the input.
   (Prohibits phonological epenthesis.)

c. The IDENT(F) Constraint Family
   General Schema
   IDENT(F)
   Let $\alpha$ be a segment in S1 and $\beta$ be any correspondent of $\alpha$ in S2.
   If $\alpha$ is [ $\gamma$ F], then $\beta$ is [ $\gamma$ F].
   (Correspondent segments are identical in feature F.)
   Specific Instantiations
   IDENT-BR(F)
   Reduplicant correspondents of a base [ $\gamma$ F] segment are also [ $\gamma$ F].
   IDENT-IO(F)
   Output correspondents of an input [ $\gamma$ F] segment are also [ $\gamma$ F].

Looking at the following example from Paiwan we can see how these constraints work to regulate the reduplicative output. I choose the word *vatu* "dog" to illustrate these constraints because it does not have affixation or word-final codas. These issues will be addressed in later sections and are not relevant for merely demonstrating Ident(F), Dep and Max correspondence constraints.

47 McCarthy and Prince (1990) use a system of melodic overwriting to explain fixed segmentism, an example of which is the *a* in Ca reduplication. Thus in their analysis fixed segmentism will incur violations of Dep.
Tableau 3.1 Correspondence constraints \(\text{Ident}(F), \text{Dep}, \text{Max}: \text{"dog" + RtRED = "toy dog"}\)

<table>
<thead>
<tr>
<th>Input: vatui + RtRED</th>
<th>Ident-BR</th>
<th>Dep-BR</th>
<th>Max-BR</th>
<th>Ident-IO</th>
<th>Dep-IO</th>
<th>Max-IO</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. \text{vatui-vatu}</td>
<td></td>
<td></td>
<td></td>
<td>u</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. \text{vat-vat}</td>
<td></td>
<td></td>
<td></td>
<td>i</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. \text{vatui-vatui}</td>
<td></td>
<td></td>
<td>a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. \text{vata-vat}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. \text{vatui-vat}</td>
<td></td>
<td></td>
<td>u</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. \text{vatui-vatu}</td>
<td></td>
<td></td>
<td>a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. \text{vatui-vata}</td>
<td></td>
<td></td>
<td>a</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As one can see, all of the constraints can play a role to preserve the correct form.

In the figure above the dotted lines show that these constraints are unranked with respect to one another.

McCarthy and Prince (1995a) propose three faithfulness relations: Input-Output (IO), Base-Reduplicant (BR) and Input-Reduplicant (IR). Instead of this three-way relationship, I will be following Spaelti (1999) in assuming that the reduplicant is also a part of the output, and thus is under the jurisdiction of IO faithfulness. Thus, I will not be using IR constraints. Instead of using the terminology Input versus Output, Spaelti uses Lexical form versus Surface form, or LS for short. Further discussion of this issue will be made in section 4.2. My analysis will be using this LS relationship in place of IO, though LS constraints have basically the same function as IO constraints. The reason I use LS instead of IO is that I want to clarify that, by using LS constraints, I will not be using the IR interface.

I have already mentioned in Chapter 2 that McCarthy and Prince (1994a) define
the base as whatever is to the left of a reduplicant suffix and anything to the right of a reduplicant prefix. One of the reasons for this definition of the base lies in the fact that other languages, such as Tagalog, will in some instances copy not only the stem but also the affixes in the word. However, it has already been shown that in Paiwan, the reduplicant copies from the stem only. The constraints I have introduced are not sufficient to prevent the reduplicant from copying the affix, as can be seen in the tableau below. Note that the asterisks is used to show that a form is ungrammatical and not the true surface form of the language.

Tableau 3.2 Max-BR cannot prevent affix copying: AP + "drink" + RtRED = "drinking(AP)"

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. t-em-eke-teke-l</td>
<td>em</td>
</tr>
<tr>
<td>b. *t-em-eke-meke-l</td>
<td>te</td>
</tr>
</tbody>
</table>

In the tableau above, the grammatical candidate (a) and the ungrammatical candidate (b) differ in that (a) only copies from the stem while (b) copies a segment from the affix. To prevent candidate (b) from winning, I use a *Repeat constraint to prohibit copying of affixes.

(57) *Repeat(af) (based on *Repeat from Yip 1995: 5)
Output must not contain two identical affixal elements.

A tableau showing this constraint at work is given below.
Since affixes are never reduplicated in Paiwan, this constraint will be ranked high in the grammar.

In addition to the ranking above, Dep-LS and Max-LS must be ranked higher than Onset. This is due to the fact that onsetless syllables are allowed in Paiwan.

Onset is defined below.

(58) Onset (Kager 1999: 93)
*[[σV ('Syllables must have onsets.')]}

The Onset constraint is violated every time a syllables does not have an onset.

See the tableau below.

Tableau 3.4 Dep-LS, Max-LS >> Onset: "salty" + RtRED = "salty(ind)"

<table>
<thead>
<tr>
<th>Lexical: apedang + RtRED</th>
<th>Dep-LS</th>
<th>Max-LS</th>
<th>Onset</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [a.pe.da.-pe.da.-ng]ø</td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>b. [pe.da.-pe.da.-ng]ø</td>
<td></td>
<td>a</td>
<td></td>
</tr>
<tr>
<td>c. [ta.pe.da.-pe.da.-ng]ø</td>
<td>t</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, candidate (b) deletes the word-initial vowel, thus violating Max-LS. Candidate (c) epenthesizes a t before the word-initial vowel, thus violating Dep-LS. Thus, Dep-LS and Max-LS must be ranked higher than Onset.
3.1.2 Aligns to the Right

Since I posit that RtRED is actually a suffix, it must follow the same alignment constraints as other suffixes in the language. I will look more into this issue in section 3.5. when I compare reduplication to affixation. For now, I will use the alignment constraint below.

(59) Align-RtRED-R or Align(RtRED,R,PrWd,R) (based on McCarthy and Prince 1993: 80)

Align the right side of RtRED to the right side of the prosodic word.

I illustrate the use of this constraint with a trimoraic stem, *kivata* "to ask", below.

The brackets represent prosodic word boundaries.

| Tableau 3.5 Alignment of RtRED at the end of a prosodic word: "to ask" + RtRED = "asking" |
|---|---|
| Lexical: kivata + RtRED | Align-RtRED-R |
| a. [kivata-vata] | |
| b. [vata-kivata] | kivata |
| c. [ki-vata-vata] | vata |

Align-RtRED-R must be ranked higher than Max-BR and lower than Max-LS. This is because our reduplicant can only be maximally two syllables. Thus, in words longer than two syllables, Max-BR will favor minimalizing the base. This could be done by deleting segments from the lexical entry, thus violating Max-LS. Another way to minimalize the size of the base is to infix the reduplicant into the
word. See the tableau below.

Tableau 3.6 Max-LS >> Align-RtRED-R >> Max-BR for trisyllabic stem: “to ask” + RtRED = “asking”

<table>
<thead>
<tr>
<th>Lexical: kivata + RtRED</th>
<th>Max-LS</th>
<th>Align-RtRED-R</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [kivata-vata]</td>
<td></td>
<td></td>
<td>ki</td>
</tr>
<tr>
<td>b. [kiva-kiva-ta]</td>
<td></td>
<td>ta</td>
<td></td>
</tr>
<tr>
<td>c. [kiva-kiva]</td>
<td>ta</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Max-BR requires full copying of the base and the base is defined as anything located to the left of the reduplicant if the reduplicant is a suffix. Thus, to eliminate candidate (b) above, Align-RtRED-R must be ranked above Max-BR. To eliminate candidate (c), Max-LS must be ranked higher than Align-RtRED-R. For more discussion of the properties of Max-BR, see section 4.2.2.

3.1.3 Copies from the Right Edge

RtRED copies from the last two syllables of the stem. In order to represent this using Optimality Theory, I need to use anchoring constraints.

(60) Anch(oring)-BR (McCarthy and Prince 1995a: 336)
In R + B, the initial element in R is identical to the initial element in B.
In B + R, the final element in R is identical to the final element in B.

Here I will remind the reader that the base (B) is phonologically and not morphologically defined. For example, in the word *paderuarua* "throwing up", if I
consider the reduplicant (R) to be a prefix to the final foot \((pade-rua-(rua))\), then the base for the reduplicant will be \(rua\). If I consider it to be a suffix to the entire word \((paderua-rua)\), then the base would be \(paderua\). In my analysis I consider the reduplicant to be a suffix. Thus, the final element of the base must correspond to the final element in the reduplicant. This constraint is illustrated in the tableau below, using a six-syllable word to show how the reduplicant needs Anch-BR to dictate which edge to copy.

<table>
<thead>
<tr>
<th>Tableau 3.7 Demonstrating Anch-BR in a six-syllable word: &quot;to hiccup&quot; + RtRED = &quot;hiccupping&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexical: paderua + RtRED</td>
</tr>
<tr>
<td>Anch-BR</td>
</tr>
<tr>
<td>a. (\text{paderua-rua})</td>
</tr>
<tr>
<td>b. (\text{paderua-pade})</td>
</tr>
<tr>
<td>c. (\text{paderua-deru})</td>
</tr>
</tbody>
</table>

\[\text{3.1.4 Doesn't Copy Codas}\]

As noted earlier, root reduplication does not copy codas. Thus, there is motivation for using the No-Coda constraint given below.

(61) No-Coda (McCarthy and Prince, 1994a: 11; Kager, 1999: 94)
*\[C\] \(\text{\('Syllables may not have codas'\; 'Syllables are open.'\)}\)

This constraint will disallow all codas in the language. The tableau below illustrates how No-Coda will keep the reduplicant from copying the coda. Brackets
represent the prosodic word boundary and periods indicate syllable boundaries.

Tableau 3.8 Reduplicants don’t copy the coda: No-Coda >> Align-RtRED-R:

<table>
<thead>
<tr>
<th>Lexical: em- + kan + RtRED</th>
<th>No-Coda</th>
<th>Align-RtRED-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.  [k-em-a-ka.n.]</td>
<td>n</td>
<td>n</td>
</tr>
<tr>
<td>b.  [k-em-an-kan.]</td>
<td>n,n</td>
<td></td>
</tr>
</tbody>
</table>

Thus, in the tableau above, No-Coda is violated twice by candidate b. Since the constraint Align-RtRED-R is ranked lower than No-Coda, this will cause candidate a to win in the end.\(^{48}\) However, we are posed with a problem when considering vowel-initial words. This can be seen in the tableau below.

Tableau 3.9 Vowel-initial word, Reduplicants don't copy the coda, No-Coda >> Align-RtRED-R:

<table>
<thead>
<tr>
<th>Lexical: m- + utjak + RtRED</th>
<th>No-Coda</th>
<th>Align-RtRED-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.  [m-u.tja.-u.tja-k.]</td>
<td>k</td>
<td>k</td>
</tr>
<tr>
<td>b.  [<em>m-u.tja.k-u.tja.k</em>]</td>
<td>k</td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, candidates a and b have equal violations of No-Coda. This is due to the fact that the word is vowel-initial. Thus, if the reduplicant, which is also vowel-initial, attaches to the right of a word-final consonant, that final consonant will be resyllabified as an onset. To avoid this problem I could consider the word-final coda to be extraprosodic, and thus inaccessible to copying. There are

\(^{48}\) Note that the candidate \(k-em-an-ka\), though it does not copy the coda, violates Anch-BR.
three facts about the language, mentioned in section 2.1.2.1, that would motivate this
type of analysis. First, stress is invariably on the penultimate syllable, whether the
word has a coda or not. Second, words in Paiwan do not have word-internal codas
but have many word-final codas. Finally, the minimal word cannot be only one
syllable with a coda, but must instead be minimally two syllables. These facts all
lead to the conclusion that the word-final coda does not have a role in the prosodic
structure of the word, making it likely to be extraprosodic.

The approach I will be using to represent the extraprosodic status of the
word-final coda can be found in Harris and Gussman (1998). They hypothesize that
the word-final coda is actually an onset to a "dull syllable". They note how many
eastern languages use syllabic alphabets: Sanskrit, Hindi, Bengali, Gujarati, Telugu,
Sinhalese, Japanese and Korean. These languages represent word-final codas
notationally the same as syllables. In addition to writing systems, Harris and
Gussmann also point out that Hayes (1982) finds many cases where the word-final
coda does not count toward stress assignment. Thus, the word-final coda has often
been described as being "extraprosodic". Harris and Gussman believe that an
"extraprosodic" word-final coda is really an onset to a dull syllable.

Word-final codas are also extraprosodic to vowel lengthening rules in English
and Icelandic. If these codas are considered to be onsets, then vowel lengthening
rules become surprisingly regular. In addition, word-final coda clusters in roots will also always occur as word-internal coda-onset pairs. Thus, Harris and Gussmann conclude that the word-final consonant is actually an onset.

If we assume Harris and Gussmann to be correct and that word-final codas are actually onsets, then word-final codas will not violate No-Coda. See the tableau below. In the tableau, I have represented the dull syllable with the Ø symbol.

<table>
<thead>
<tr>
<th>Tableau 3.10 Word-final coda is an onset, No-Coda &gt;&gt; Align-RtRED-R:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexical: em + kan + RtRED</td>
</tr>
<tr>
<td>a. [k-e.(m-a.-ka.)-n]Ø</td>
</tr>
<tr>
<td>b. [k-e.(m-an.-ka.)n]Ø</td>
</tr>
</tbody>
</table>

I assume that the dull syllable will not count as a real syllable in the prosodic structure, and thus cannot be parsed into feet. With this dull syllable, the word-final consonant will be considered to be an onset. Thus, candidate (b) is less optimal because it has a violation of No-Coda.

Since Paiwan has no word-internal codas, No-Coda must be ranked very high. Thus, if a word underlyingly has word-internal codas, perhaps a borrowing from a foreign language, the grammar will force the word-internal codas to somehow be re-analyzed to form onsets. There are many methods of doing this, and the only clue that I have for what may occur in Paiwan is from the word kalidjkidjkidj "flashing".
I have a speaker who uses *kalidjikidjikidj* and two different speakers who use *kalidjikidjikidj*. Note that these two forms differ in that the second form has epenthized the vowel *i*, which makes the segment *dj* into an onset. Thus, I will propose that for the majority of speakers, if there are words which underlyingly have word-internal codas, they undergo vowel epenthesis in the surface form. In addition, the reason the vowel is *i* instead of some other vowel is due to vowel spreading. I will be using the No-Spread constraint below.

\[(62) \text{No-Spread}_{S_1,S_2}(\tau,\varsigma) \quad (\text{McCarthy 1997: 9})\]

Let \(\tau_i\) and \(\varsigma_j\) stand for elements on distinct autosegmental tiers in two related phonological representations \(S_1\) and \(S_2\), where

- \(\tau_1 \in S_1\),
- \(\tau_2 \in S_2\),
- \(\tau_1 \Rightarrow \tau_2\), and
- \(\varsigma_1 \Rightarrow \varsigma_2\),

if \(\tau_2\) is associated with \(\varsigma_2\),

then \(\tau_1\) is associated with \(\varsigma_1\).

I use the constraint No-Spread, which is violated when there is vowel spreading.

I will also use an autosegmental constraint, No-Cross, which prevents crossing of autosegmental association lines, such as those shown in the figure below.
Notice in the diagrams above that only epenthesizing $i$ will satisfy No-Cross. Thus, in (c), epenthesizing $a$ will cause crossing of association lines. This is also true if we used a completely new vowel, not already present in the word, to epenthesize after $dj$. This is shown in the figure below.

Thus, epenthesizing an $e$ will, in (b), incur violations of No-Cross and, in (c), incur extra violations of Dep-LS. I will not attempt a formal definition of the No-Cross constraint in this thesis. Those interested in attempts at representing autosegmental associations in OT are referred to McCarthy (1997: 9). The tableau below shows how this constraint will interact with Dep-LS.
Tableau 3.11 Vowel epenthesis, No-Cross >> No-Coda >> Dep-LS >> No-Spread:
"flash" + RtRED = "flashing"

<table>
<thead>
<tr>
<th>Lexical: kalidjkidj + RtRED</th>
<th>No-Cross</th>
<th>No-Coda</th>
<th>Dep-LS</th>
<th>No-Spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.  [ka.li.dji.ki.-di.ki.-dji]ø</td>
<td>i</td>
<td>i,i,i,i</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.  [ka.li.dji.ki.-ki.-dji]ø</td>
<td>**</td>
<td></td>
<td>i,l</td>
<td></td>
</tr>
<tr>
<td>c.  [ka.li.dja.ki.-dja.ki.-dji]ø (as in 3.1c)</td>
<td>*</td>
<td>a</td>
<td>a,a,i,i</td>
<td></td>
</tr>
<tr>
<td>d.  [ka.li.dje.ki.-dje.ki.-dji]ø (as in 3.2b)</td>
<td>*</td>
<td>e</td>
<td>i,i,e</td>
<td></td>
</tr>
<tr>
<td>e.  [ka.li.dje.ki.-dje.ki.-dji]ø (as in 3.2c)</td>
<td></td>
<td>e,i</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, candidates (c) and (d) violate No-Cross. Underlyingly, they are represented by figure 3.1 (c) and figure 3.2 (b), respectively. Candidate (e) inserts too many new vowels, thus fatally violating Dep-LS. I could also add a constraint No-Delink (McCarthy 1997: 9) which would disallow delinking of the i.

For candidate (d), as represented in figure 3.2 (c), delinking occurs.

One ranking of importance pertaining to No-Coda is that of Ident-LS(f) and Max-LS being ranked equal or higher than No-Coda.

Tableau 3.12 Eliminates word-internal codas, Max-LS, Ident-LS(f) = or >> No-Coda:
"flash" + RtRED = "flashing"

<table>
<thead>
<tr>
<th>Lexical: kalidjkidj + RtRED</th>
<th>Ident-LS(f)</th>
<th>Max-LS</th>
<th>No-Coda</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.  [ka.lidji.ki.-dji.ki.-dji]ø</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.  [ka.lidji.kidj.-kidj]ø</td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>c.  [ka.li.ki.-li.ki.]ø</td>
<td></td>
<td></td>
<td>dj,dj</td>
</tr>
<tr>
<td>d.  [ka.lia.kia.-kia.]ø</td>
<td>a,a</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above deleting consonants and changing consonants to vowels are not acceptable ways of eliminating word-internal codas. Thus, Max-BR and Ident-LS(f) must be ranked equal to or higher than No-Coda.

In dialects where kalidjkidj is the optimal form, Dep-LS must be ranked higher
than No-Coda. The tableau below shows this analysis.

Tableau 3.13 Allowing word-internal codas Dep-LS >> No-Coda: "flash" + RtRED = "flashing"

<table>
<thead>
<tr>
<th>Lexical: kalidj[kidj] + RtRED</th>
<th>Dep-LS</th>
<th>No-Coda</th>
<th>Align-RtRED-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.   [ka.lidj.kidj.-kidj]Ø</td>
<td></td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>b.   [ka.lidj.kidj.-kidj.kidj]Ø</td>
<td></td>
<td>****</td>
<td></td>
</tr>
<tr>
<td>c.   [ka.li.dji.-dji.ki.-dj]Ø</td>
<td>i</td>
<td></td>
<td>dj</td>
</tr>
</tbody>
</table>

Thus, in order for word-internal codas to surface, Dep-LS must be ranked higher than No-Coda. Issues pertaining to analyses which allow word-internal codas are taken up in Appendix B, where I look at Thao reduplication.

In addition to the rankings above, Ident-LS(f), Dep-LS and Max-LS must be ranked higher than Align-RtRED-R. This is demonstrated in the tableau below.

Tableau 3.14 Ident-LS(f), Dep-LS, Max-LS >> Align-RtRED-R: AP + "throw up" + RtRED = "throwing up(AP)"

<table>
<thead>
<tr>
<th>Lexical: m- + utjak + RtRED</th>
<th>Ident-LS(f)</th>
<th>Max-LS</th>
<th>Dep-LS</th>
<th>Align-RtRED-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.  [m-u.ta.-u.ta.-k]Ø</td>
<td></td>
<td></td>
<td>k</td>
<td></td>
</tr>
<tr>
<td>b.  [m-u.ta.ku.-ta.ku]Ø</td>
<td></td>
<td>u</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.  [m-u.ta.-u.ta]Ø</td>
<td></td>
<td>k</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.  [m-u.ta.u.ta.u]Ø</td>
<td>a</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thus, candidates (b), (c) and (d) all completely satisfy Align-RtRED-R. In order to prevent them from being optimal, Align-RtRED-R is ranked lower than Ident-LS(f), Dep-LS and Max-LS.
3.1.5 Maximally Two Moras

The reduplicant is maximally two moras. I use the word "maximally" due to the fact that reduplicants are only one mora when the stem is only one mora (i.e. $k-em-a-ka-n$ "eating(AP)" from the stem $kan$). This type of size limit is usually represented with a template. I will now begin a discussion of the kinds of templates that can be used to represent RtRED. There have been many recent developments in how to represent templates in OT. The following discussion will look at various approaches and show which can and can't be used for RtRED. A great deal of this section was based on discussion found in Kager (1999: 216-230).

First, I will look at CV representations as found in Marantz (1982), Yip (1982), Carrier-Duncan (1984), McCarthy and Broselow (1984), among others. Second, I will look at McCarthy and Prince's (1986, 1990, 1995b) Prosodic Morphology Hypothesis, where templates should be specified as authentic units of prosody. Third, I look at Generalized Template theory approaches as developed by McCarthy and Prince (1994a, 1994b), McCarthy (1997), Gafos (1998) and Spaelti (1999). I will demonstrate that of all these approaches, the most appropriate for Paiwan is the Prosodic Morphology Hypothesis.

In the classical theory, templates were represented by C (consonant) and V (vowel) templates. These sorts of templates can be found in Marantz (1982), Yip

Thus, for Paiwan root reduplication, using the classical theory I could specify a
CV(C)V template, where the parenthesis means the C is optional.

However, the classical theory has many drawbacks, including the ability to
predict impossible templates such as a CCCCCCC template. In addition,
McCarthy and Prince (1986, 1990, 1995b) point out that reduplicants always appear
in certain prosodic shapes. CV templates will not be able to represent these
prosodic shapes. Thus, they introduce their Prosodic Morphology Hypothesis
(1995b: 318), where templates should be specified as authentic units of prosody:
mora, syllable, foot, and prosodic word. Their templates are constructed in terms of
alignment, where the reduplicant aligns to the edges of a prosodic word, foot or
syllable.

In terms of root reduplication in Paiwan, a prosodic template constraint could
be one where the reduplicant was aligned to the edges of a foot. However, this type
of analysis will not work for Paiwan. This is due to the fact that the reduplicant
doesn't always align with the edges of a foot. To see the extent of the problem,
consider the following analysis.

I will use the RtRED=Ft constraint below to ensure that the edges of the
reduplicant align with the edges of a foot.
This constraint is violated when RtRED does not align both edges with a foot.

In the following analysis I will show that though this constraint can predict the correct surface form in most cases, it still doesn’t predict the correct surface form when we have a stem over two syllables long with a non-reduplicative suffix. This is because in words with non-reduplicative suffixes, the foot will not align with RtRED.

First, let's look at how RtRED=Ft will predict the correct output in the majority of forms. In the tableaux below, I show that in stems without non-reduplicative suffixes and in disyllabic stems with reduplicative suffixes, RtRED=Ft will predict the correct surface form.

### Tableau 3.15 Predicting the correct form using RtRED=Ft: AP + "to spit" + RtRED = "spitting(AP)"

<table>
<thead>
<tr>
<th>Lexical: em- + sutjuray + RtRED</th>
<th>RtRED=Ft</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [s-e.m.-u.tji.ra-(tji.ra.)-y]ø</td>
<td>*</td>
<td>semu</td>
</tr>
<tr>
<td>b. [s-e.m.-u.tji.ra-su-(tji.ra.)-y]ø</td>
<td>*</td>
<td>em</td>
</tr>
</tbody>
</table>

In tableau 3.15, candidate (a) is optimal because it aligns with a foot.

### Tableau 3.16 Predicting the correct form using RtRED=Ft, disyllabic stem with non-reduplicative suffix: "blood" + RtRED + LP = "bloodied"

<table>
<thead>
<tr>
<th>Lexical: djamuq + RtRED + -an</th>
<th>*Repeat(a)</th>
<th>RtRED=Ft</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [dja.mu.-dja-(mu.-q-a.)n]ø</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. [dja.mu.-q-a.(mu.qa)n]ø</td>
<td>a</td>
<td>dja</td>
<td></td>
</tr>
<tr>
<td>c. [dja.mu.(mu.-q-a)n]ø</td>
<td>*</td>
<td>dja</td>
<td></td>
</tr>
</tbody>
</table>
Candidate (b), though having fewer violations of Max-BR, is not optimal since it does not align with a foot. In tableau 3.16, candidate (a) wins even though RtRED does not align with a foot. This is because candidate (b), which does align with a foot, violates *Repeat(af). Candidate (c), on the other hand, also doesn't align with a foot. However, it has more violations of Max-BR than our optimal candidate (a).

Now let's look at stems over two syllables long which also contain a non-reduplicative suffix.

Table 3.17 Unable to predict the correct form using RtRED=Ft, trisyllabic stem with non-reduplicative suffix: CaRED + "green" + RIRED + LP = "green things"

<table>
<thead>
<tr>
<th>Lexical: CaRED + lilaus + RIRED + -an</th>
<th>*Repeat(af)</th>
<th>RtRED=Ft</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [l_a-l_i.l_u.a.-l_u.(a-s-a.)n]\ø</td>
<td>*</td>
<td></td>
<td>lali</td>
</tr>
<tr>
<td>b. *l_a-l_i.l_u.a.-l_i.l_u.(a-s-a.)n</td>
<td>*</td>
<td></td>
<td>la</td>
</tr>
</tbody>
</table>

As one can see in tableau 3.17, the ungrammatical candidate (b) will be ruled most optimal because it violates Max-BR less than our grammatical candidate (a). Thus, since the stem, lilaus "green", has over two syllables, RtRED will copy more than two syllables. This is due to the influence of Max-BR, which will ensure that as much of the stem is copied as possible. This being so, there is no constraint which can control the size of RtRED.

The only way to ensure the correct output is to use a template constraint which will dictate that the reduplicant have two moras. Such a constraint is given below.
(64) \( \text{RtRED} = \mu \mu \)
\( \text{RtRED} \) aligns to the right edge of two adjacent moras.

As can be seen in the definition above, alignment for a dimoraic template isn't very easy to specify. This is because two adjacent moras are not a basic unit of prosody. Thus, this template is not the most ideal according to the specifications of the Prosodic Morphology Hypothesis. However, it does produce the correct results as illustrated in the tableaux below. These are the same examples which I used to demonstrate the \( \text{RtRED}=\text{Ft} \) constraint.

Tableau 3.18 Predicting the correct form with \( \text{RtRED} = \mu \mu \) >> Max-BR:
AP + "to spit" + \( \text{RtRED} \rightarrow "\text{spitting(AP)}" \)

<table>
<thead>
<tr>
<th>Lexical: \text{em} + \text{sutjiray} + \text{RtRED}</th>
<th>( \text{RtRED}=\mu \mu )</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ( \text{s-e.m-u.tji.ra-(tji.ra)-y})</td>
<td>( \mu )</td>
<td>semu</td>
</tr>
<tr>
<td>b. ( \text{s-e.m-u.tji.ra-su(tji.ra)-y})</td>
<td>( \mu )</td>
<td>em</td>
</tr>
</tbody>
</table>

Tableau 3.19 Predicting the correct form with \( \text{RtRED} = \mu \mu \), dimoraic stem with non-reduplicative suffix:
"blood" + \( \text{RtRED} + \text{LP} = "\text{bloodied}" \)

<table>
<thead>
<tr>
<th>Lexical: \text{djamuq} + \text{RtRED} + -\text{an}</th>
<th>*Repeat(af)</th>
<th>( \text{RtRED}=\mu \mu )</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ( \text{dja.mu.-dja.(mu.-q-a.)n})</td>
<td>( \mu )</td>
<td>( \mu )</td>
<td>( \mu )</td>
</tr>
<tr>
<td>b. ( \text{dja.mu.q-a.-a-(mu.qa)n})</td>
<td>( \mu )</td>
<td>( \mu )</td>
<td>( \mu )</td>
</tr>
<tr>
<td>c. ( \text{dja.mu.-a-(mu.-q-a.)n})</td>
<td>( \mu )</td>
<td>( \mu )</td>
<td>( \mu )</td>
</tr>
</tbody>
</table>

Tableau 3.20 Predicting the correct form with \( \text{RtRED} = \mu \mu \), trimoraic stem with non-reduplicative suffix:
\( \text{CaRED} + "\text{green}" + \text{RtRED} + \text{LP} = "\text{green things}" \)

<table>
<thead>
<tr>
<th>Lexical: \text{CaRED} + \text{liluas} + \text{RtRED} + -\text{an}</th>
<th>( \text{RtRED}=\mu \mu )</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ( \text{la-li.lu.a.-lu.(a.-s-a.)n})</td>
<td>( \mu )</td>
<td>( \mu )</td>
</tr>
<tr>
<td>b. ( \text{la-li.lu.a.-li.lu.(a.-s-a.)n})</td>
<td>( \mu )</td>
<td>( \mu )</td>
</tr>
</tbody>
</table>

In the tableaux above, the template constraint ensures that the optimal candidate
will have the required two moras. Thus, our bimoraic template will predict the correct candidate.

Currently there is a push to eliminate templates completely. This new approach, called Generalized Template theory has been developed by McCarthy and Prince (1994a, 1994b), McCarthy (1997), Gafos (1998) and Spaelti (1999), among others. In this approach, templates would be replaced by interactions between independently motivated constraints. Some approaches are more template-like than others. For instance, McCarthy and Prince (1994a) analyze Diyari reduplication by stating that RED=STEM. From this statement, it also follows that RED=PrWD, since all stems are prosodic words. Their analysis, as given in Kager (1999: 219-233), is shown below.

Tableau 3.21 RED=STEM, predicting reduplicant shape without a template: "old woman"

<table>
<thead>
<tr>
<th>Input: /RED + wilapina/</th>
<th>Max-IO</th>
<th>STEM=PrWD</th>
<th>Ft-Bin</th>
<th>Parse-Syl</th>
<th>All-Ft-Left</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. σ{[wi.la]}-{[(wi.la).(pi,na)]}</td>
<td></td>
<td></td>
<td></td>
<td>σσ</td>
<td>p,i,n,a</td>
<td></td>
</tr>
<tr>
<td>b. [(wi.la).(pi,na)]-{[(wi.la).(pi,na)]}</td>
<td></td>
<td></td>
<td></td>
<td>σσ! σ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. [(wi.la) pi ]-{[(wi.la).(pi,na)]}</td>
<td></td>
<td></td>
<td>*!</td>
<td>σσ</td>
<td>n,a</td>
<td></td>
</tr>
<tr>
<td>d. [(wi)]-{[(wi.la).(pi,na)]}</td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td>l,a,p,i,n,a</td>
<td></td>
</tr>
<tr>
<td>e. [(wi.la)]-{[(wi.la)]}</td>
<td>p!i,n,a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, since the reduplicant equals a stem and a stem must be a

---

49 The exclamation point means the candidate has made a fatal violation, and is thus no longer under consideration.
prosodic word, then the size of the reduplicant will be the size of the optimal prosodic word: one foot. Thus, candidate (a) is optimal since the reduplicant is a foot in its own prosodic word. Candidate (b) loses since it has one too many feet. Candidate (c) has an unparsed syllable and candidate (d) has a foot with only one syllable instead of the required two. Candidate (e) loses since material from the input was deleted from the output, thus violating Max-IO.

If I adopt this analysis for root reduplication in Paiwan and make RtRED=STEM, I will get incorrect results. This is due to the fact that stress is always on the penultimate syllable of the entire word, including reduplicant. In other words, we don't get main stress on both the base and reduplicant (i.e. [va.tu-(vá.tu)] as opposed to *[(vá.tu)]-[(vá.tu)]).

Another approach to analyzing reduplication without a template can be found in McCarthy (1997). The constraint which he uses in his analysis is based on the definition below.

(65) I-Anchor-PosS1-S2(Cat1, Cat2, P) (McCarthy 1997: 11)
If ι1, Cat1 ∈ S1,
ι2, Cat2 ∈ S2,
ι1ℜι2, and
ι1 stands in position P of Cat1,
then ι2 stands in position P of Cat2.

McCarthy uses the constraint I-Anchor-PosBR(Ft, Ft, F), defined as dictating
"any foot-final segment in the base must correspond to a foot-final segment in the reduplicant" (1997: 12). This constraint allows him to analyze the following pattern in Yidi reduplication. The subscripts label correspondence relations. Thus, if segments in two forms both have the same number, then they correspond to each other.

(66) Yidi Reduplication (McCarthy 1997: 13)

a. \([mula4]-[mula4]ri\) vs. \(*[mular5]-[mula]ri\)
b. \([tjukar5]-[tjukar5]pa-n\) vs. \(*[tuka4]-[tukar5]pa-n\)

In the reduplicative pattern above, the reduplicant always copies the leftmost foot and thus will sometimes also copy a coda consonant. This coda copying occurs when the leftmost foot of the base contains a coda consonant. Notice that there are coda consonants when there are two adjacent consonants. The tableau illustrating his analysis is given below.

Tableau 3.22 Predicting reduplicant shape with I-Anchor: McCarthy (1997: 14)

<table>
<thead>
<tr>
<th>Candidates</th>
<th>I-Anchor-Pos(_{in})(Ft)</th>
<th>Max(_{ir})</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ([mula2])-([mula2]ri)</td>
<td>(\ddagger)</td>
<td>** (\ddagger)</td>
</tr>
<tr>
<td>b. ([mular4])-([mula4]ri)</td>
<td>(\ddagger!)</td>
<td>* (\ddagger)</td>
</tr>
</tbody>
</table>

In the tableau above, since the final segment of the foot in the base and

50 I have replaced the original foot-marking brackets of McCarthy (1997) with parentheses to be consistent with the notation in this thesis.
reduplicant must correspond to avoid violating the I-Anchor constraint, candidate (a) is more optimal than candidate (b).

To rule out candidates such as (mula)ri-(mula)ri, McCarthy proposes using the same RED=STEM analysis as that for Diyari. I instead propose using a markedness constraint, taken from Gafos (1998), which is violated by any segment in the surface form. The tableau showing this is given below.

<table>
<thead>
<tr>
<th>Candidates</th>
<th>I-Anchor-Pos_{BR}(Ft)</th>
<th>Markedness</th>
<th>Max_{BR}</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (mula)_ri-(mula)_ri</td>
<td>**********</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>b. (mula)_ri-(mula)_ri</td>
<td>**********</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This type of analysis does not require use of a templatic constraint. This is due to the fact that the reduplicant must align with the base in terms of feet. This ensures that the reduplicant will be minimally as large as a foot. In addition, it will not be larger than a foot in order to reduce markedness.

If I try this type of analysis in Paiwan for RtRED, I will come across difficulties. This is due to the fact that, since there is only one foot per word, there is no correspondence between the base and reduplicant in terms of foot structure. In other words, there is no stress evidence (or otherwise) for the foot structure McCarthy

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51 This constraint is basically a combination of all place markedness constraints: *Phar, *Cor, etc.
52 I have replaced the original foot marking brackets of McCarthy's analysis with parenthesis to be consistent with the marking system in this thesis.
would require in Paiwan. In addition, some words have feet which don't correspond with the root or the reduplicant (i.e. \([djamu-dja(mu-q-an)]\) "bloodied").

Another example of a completely a-templatic analysis of reduplication can be found in Gafos (1998: 523-525). In that analysis he looks at the formation of the Tübatulabal telic stem from the atelic stem. The telic stem has monosyllabic reduplication. The tableau below shows his analysis.

In the tableau above there is no mention of RED specifically in any template. Instead, different correspondence, phonological and markedness constraints interact in such a way that a monosyllabic reduplicant is most optimal. Ons is the abbreviation for the Onset constraint, requiring that all syllables have onsets. The constraints Dep-BR-C and Dep-BR-V are separate Dep-BR constraints specific to consonants and vowels, respectively. *Cor and *Phar are markedness constraints prohibiting coronals and pharyngeals.

In tableau 3.24, candidate (c) is optimal since it only has one syllable, thereby invoking fewer violations of the *Phar markedness constraint. Candidate (a) loses
due to its lack of an onset. Candidate (b) is less optimal because it has a more marked consonant than candidates (c) and (d). Candidate (d) has too many markedness violations, and is thus less optimal than candidate (c).

This type of analysis will not work for RtRED in Paiwan since RtRED is dimoraic. This conflicts with the fact that markedness constraints will keep the reduplicant as small as possible. In his analysis, Gafos keeps the reduplicant monomoraic. There is no way in which we can use this analysis to predict a dimoraic RtRED.

I will now conclude this discussion of templatic and a-templatic approaches in OT. Though it would be ideal to incorporate a Generalized Template approach into my analysis, I will have to settle for the dimoraic template. This is due to the fact that those approaches which are utilized in the literature are not applicable to Paiwan's stress system.

Now I will detail how I use the dimoraic template in my analysis. Instead of using a constraint, I represent the template in the lexicon. An example of this is given below.
Tableau 3.25 Predicting the correct form with $\mu\mu$RED in a four-mora stem:

"to hiccup" + RIRED = "hiccupping"

<table>
<thead>
<tr>
<th>Lexical: paderua + $\mu\mu$RED</th>
<th>Max-LS(\mu)</th>
<th>Dep-LS(\mu)</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. \textit{pa.de.ru.a.-ru.a.}</td>
<td></td>
<td>pade</td>
<td></td>
</tr>
<tr>
<td>b. \textit{pa.de.ru.a.-a.}</td>
<td>$\mu$</td>
<td>paderu</td>
<td></td>
</tr>
<tr>
<td>c. \textit{pa.de.ru.a.-de.ru.a.}</td>
<td>$\mu$</td>
<td>pa</td>
<td></td>
</tr>
<tr>
<td>d. \textit{pa.de.ru.a.-pa.de.ru.a.}</td>
<td>$\mu\mu$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If I put the template in the lexicon, then the constraints which will enforce it are Max-LS(\mu) and Dep-LS(\mu). Max-LS(\mu) eliminates candidate (b) since the reduplicant has one fewer mora than specified by the lexical template. Dep-LS(\mu) eliminates candidates (c) and (d) since they both have more moras than indicated in the lexical template. Affixes and words are usually put in the lexicon. For the purpose of showing the similarity between reduplicants and affixes, I will also put reduplicants into the lexicon as opposed to using a templatic constraint.

Notice in the tableau below that in addition to mora violations, the template can also be violated in terms of alignment.

Tableau 3.26 Vowel-initial stem, copies the word-final coda, No-Coda $\gg$ Dep-LS $\gg$ Align-RtRED-R:

AP + "throw up" + RtRED = "throwing up(AP)"

<table>
<thead>
<tr>
<th>Lexical: \textit{m-} + utjak + $\mu\mu$RED</th>
<th>No-Coda</th>
<th>Dep-LS</th>
<th>Align-RtRED-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. \textit{[m-u.tja.-u.tja.-k]\O}</td>
<td></td>
<td>k</td>
<td></td>
</tr>
<tr>
<td>b. \textit{*[m-u.tja.k-(u.tja.k)-k]\O}</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the ungrammatical example (b) the reduplicant has two moras, thus incurring no violations of Dep-LS. However, the reduplicant does not align to the edge of the rightmost mora. Remember that the definition of the dimoraic template is in terms
of alignment as well as quantity. First, the reduplicant is aligned to the right edge of
the rightmost mora. Second, there are two moras. In the previous tableau, I looked
at violations of Max-LS and Dep-LS, which regulate quantity between lexical and
surface form. Now I will need a constraint to dictate alignment.

In his analysis, McCarthy (1997: 11-12) uses anchoring constraints to do the
work of some alignment constraints. I will be using an Anchor-Seg constraint
which requires segments in the same position in the lexicon and the surface form to
correspond. He further separates Anchor constraints into I-Anchor and O-Anchor.
The difference between I and O constraints is parallel to the difference between Max
and Dep respectively. Thus, I-Anchor sees if $S_1$ has a correspondent in $S_2$.
O-Anchor sees if $S_2$ has a correspondent in $S_1$. I use the O-Anchor-Seg constraint
below.

(67) Anch-R or O-Anchor-Seg$_{LS}(R,F)$ (based on McCarthy 1997: 12)
If the mora belongs to the lexicon,
the segment, R (reduplicant) belong to the surface form, and
the segment stands in the F (final) position of R,
then there exists a mora such that the mora corresponds to the segment.

This constraint says that the final segment of R must correspond to a mora.

This is demonstrated in the tableau below.
In the tableau above, candidate (b) does not violate Dep-LS since the $k$ has no moraic weight. However, according to Anch-R, the final segment of the reduplicant should correspond to a mora. Since $k$ is in the final position of R and it does not correspond to a mora, Anch-R is violated.

Another issue arises with monomoraic stems. In these words, the optimal candidate will not fulfill the template. Thus, there needs to be a constraint which will prevent the reduplicant from epenthesisizing to fulfill the template. See the tableau below.

In the tableau above, candidate (c) is optimal since it will epenthesize a vowel in order to satisfy the bimoraic template. To prevent this candidate from winning, I will use the Anch-P constraint defined below.
(68) Anch-P or O-Anchor-Pos(Morph, PrWd, F) (based on McCarthy 1997: 12)
If the segmentL, Morph (morpheme) belongs to the lexicon,
the segmentS, PrWd (prosodic word) belong to the surface form,
segmentL corresponds to segmentS, and
the segmentS stands in the F (final) position of PrWD,
then segmentL stands in the F position of the Morph.

Anch-P will force the surface form's final segment to correspond to the final
segment of a morpheme in the lexical form. This is shown in the tableau below.

<table>
<thead>
<tr>
<th>Lexical: em- + kan + μRED</th>
<th>*Repeat(af)</th>
<th>Anch-P</th>
<th>Max-LS</th>
<th>No-Coda</th>
<th>Dep-LS</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [k-e.(m-a.-ka)n]∅</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [k-e.m-an.(kan)]∅</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. [k-e.m-a.na.(ka.na)]∅</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. [k-e.m-a.(ke.ma)-n]∅</td>
<td>em</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thus, only candidate (c) above violates Anch-P, where a is not correspondent to
the final segment of any morpheme in the lexicon. In the tableau above notice how
Max-LS cannot be ranked higher than No-Coda, since doing so will cause candidate
(b) to be optimal.

3.1.6 Conclusion

My analysis of root reduplication without regard to affixation constraints is now
complete. The complete set of constraints is listed below (in tableaux without
affixes I leave out *Repeat(af), I have combined Anch-R and Anch-P into the
Anch-P/R constraint and have left out No-Spread since it is too lowly ranked to have
an effect on the outcome).

Tableau 3.30 Complete listing of root reduplication constraints not pertaining to affixation in six-mora stem: "to think" + RtRED = "thinking"

<table>
<thead>
<tr>
<th>Lexical: kinemenem + μRED</th>
<th>Anch+ P/R</th>
<th>Anch- BR</th>
<th>Ident-LS(F)</th>
<th>Max-LS</th>
<th>No-Coda</th>
<th>Dep-LS</th>
<th>Align-RtRED</th>
<th>Onset</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [ki.ne.-me.ne.-me.ne.-m]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [ki.ne.-ki.ne.-me.ne.m]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. [ki.ne.me.ne.-me.ne.-m]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. [ki.ne.me.nem.nem.]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. [ki.ne.me.ne.ki.ne.-m]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. [ki.ne.me.ne.me.-me.me.]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, candidate (a) is the most optimal. Though candidate (b) has no violations of Max-BR, the reduplicant moves too far left into the word. Candidates (c) is eliminated through Dep-LS. Candidate (d) has too many coda violations. Candidate (e) violates Anch-BR since the rightmost segment of the reduplicant does not correspond to the rightmost segment of the base. The last candidate (f) violates Anch-P.

In order to see the effects of *Repeat(af), the tableau below includes a candidate with an infix.

Tableau 3.31 Complete listing of root reduplication constraints not pertaining to affixation in monomoraic stem: AP + "to eat" + RtRED = "eating(AP)"

<table>
<thead>
<tr>
<th>Lexical: em- + kan + μRED</th>
<th>*Repeat(af)</th>
<th>Anch+ P/R</th>
<th>Anch- BR</th>
<th>Ident-LS(F)</th>
<th>Max-LS</th>
<th>No-Coda</th>
<th>Dep-LS</th>
<th>Align-RtRED</th>
<th>Onset</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [k-e.(m-a.-ka.)-n]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [k-e.m-an.(kan.)]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. [k-e.m-a.(ka.na.)]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. [k-e.m.a.-.(ke.ma.)-n]ø</td>
<td>em</td>
<td></td>
<td>a</td>
<td></td>
<td></td>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Candidate (b) loses because it violates No-Coda twice. Candidate (c) loses due to a violation of Anch-P. Candidate (d) loses to candidate (a) because it copies the affix. This violates the high ranking *Repeat(af) constraint. This tableau thus shows why RtRED will only be one mora in words where the stem only consists of one mora.

Now I will apply this analysis to vowel-initial words. Remember that these words are tricky in that they do not copy the word-final coda even though it can be resyllabified into an onset word-internally. See the tableau below.

### Tableau 3.32 Complete listing of root reduplication constraints not pertaining to affixation in vowel-initial word: AP + "throw up" + RtRED = "throwing up(AP)"

<table>
<thead>
<tr>
<th>Lexical: m- + utjak + μµRED</th>
<th>*Repeat</th>
<th>Anch-</th>
<th>Anch-</th>
<th>Max-</th>
<th>No-</th>
<th>Dep-</th>
<th>Align-</th>
<th>Max-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P/R</td>
<td>BR</td>
<td>LS(F)</td>
<td>LS</td>
<td>Coda</td>
<td>LS</td>
<td>RRED</td>
<td>BR</td>
</tr>
<tr>
<td>a. [m-u.tja.-u.tja.-k]Ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [m-u.(tja.-tja.-k)]Ø</td>
<td></td>
<td>μ</td>
<td></td>
<td></td>
<td>k</td>
<td></td>
<td></td>
<td>k</td>
</tr>
<tr>
<td>c. [m-u.tja.k-(u.tja.)k]Ø</td>
<td>k</td>
<td>μ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*m</td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, candidate (b) is eliminated by Max-LS. The tricky candidate is (c), where the word-final coda of the base has been resyllabified as an onset. Thus, there is no violation of No-Coda. However, there is a violation of Anch-R, which requires the final segment of the reduplicant to correspond to a mora.

Finally, I will show a tableau of the only word which I have with word-internal codas.
Tableau 3.33 Complete listing of RtRED constraints not pertaining to affixation, word with word-internal codas, vowel epenthesis: "to flash" + RtRED = "flashing"

<table>
<thead>
<tr>
<th>Lexical: kalidjadidj + μ̅^RED</th>
<th>*Repeat (af)</th>
<th>Anch-P&lt;BR</th>
<th>Anch-BR&lt;BR</th>
<th>Ident-LS(f)</th>
<th>No-Cross</th>
<th>Max-LS</th>
<th>No-Coda</th>
<th>Dep-LS</th>
<th>Align-R&lt;BR</th>
<th>Onset</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [ka.li.djj.ki.-djj.ki.-djj]Ø</td>
<td>i</td>
<td>dj</td>
<td>kali</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [ka.li.djj.ki.-djj.ki.-djj]Ø</td>
<td>*</td>
<td>a</td>
<td>kali</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. [ka.li.dja.ki.-dj[a.ki.-djj]Ø</td>
<td>i</td>
<td>μ</td>
<td>kali</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. [ka.li.djj.kidj.-djj.ki.-djj]Ø</td>
<td>i</td>
<td>μ</td>
<td>kali</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, candidate (b) does not epenthesize vowels after word-internal codas, thus resulting in fatal violations of No-Coda. Candidate (b) avoids violating No-Coda but violates No-Cross by epenthesizing $a$ instead of $i$. Candidate (d) loses because it violates Anch-R.

As one can see in the tableaux above, most of the constraints are not ranked with respect to one another. The only rankings that are necessary are 1) *Repeat(af) >> Max-LS, Dep-LS >> Onset, 2) Anch-P >> No-Coda, 3) Ident-LS(f), Max-LS, Dep-LS, Anch-R >> Align-RtRED-R >> Max-BR, 4) No-Cross, Ident-LS(f), Max-LS, No-Coda >> Dep-LS >> No-Spread and 5) Max-LS = No-Coda. The equal sign (=) means equally ranked.

3.2 CaReduplication

In this section I will be analyzing CaRED using OT. Though there are similarities between this analysis and that of RtRED, there are some key differences. One is that CaRED is a prefix and has a lexically specified $a$. The other is that CaRED is monomoraic, thus not requiring a moraic template constraint.

The properties of CaRED are listed below.
(69) Properties of CaRED
a. Fixed $a$: Copies the consonant from the stem and the vowel is always $a$.
b. Copies from the left edge- copies the first consonant of the stem.
c. Aligns to the Left: Aligns to the left of the word, like a prefix.
d. Monomoraic: Is always one mora.

3.2.1 Fixed $a$

The reduplicant of CaRED always contains the vowel $a$. In this section I will address Ca reduplication's fixed vowel by investigating two alternative theoretical assumptions. The first is that both the consonant and the vowel are unspecified and that the choice of vowel is decided through constraints on vowels in the language. This would be an example of emergence of the unmarked (McCarthy and Prince 1994a, 1995b, Alderete et al. 1999). The second is that there is a template in the lexicon containing a prespecified $a$ (Marantz 1982, Gafos 1998).

3.2.1.1 Emergence of an Unmarked Vowel

L. Chang (1998: 288-289) cites McCarthy and Prince (1986) as analyzing the fixed segment as emergence of an unmarked default vowel. In her analysis of Thao reduplication she uses the constraint V/Low, which she defines as "a markedness that states low vowels are least marked (p. 289)". Her analysis is illustrated below.

53 Her analysis uses the notation V/Low(*i,u), which I have abbreviated to V/Low.
Tableau 3.34 Emergence of an unmarked vowel, Ca-Reduplication in Thao: ma- + RED + "wet soil, thick mud" = "muddy all over; covered with mud", (data from L. Chang 1998: 289)\textsuperscript{54}

<table>
<thead>
<tr>
<th>input: ma + RED + di.plhaq</th>
<th>V/Low</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ma-da-di.plhaq</td>
<td>i</td>
<td>*******55</td>
</tr>
<tr>
<td>b. ma-di-di.plhaq</td>
<td>i,i</td>
<td>****</td>
</tr>
</tbody>
</table>

In the tableau above, she shows how candidate (a) wins over candidate (b) by having a less marked vowel in the reduplicant. However, her analysis runs into two major problems. The first problem has to do with justifying that low vowels are least marked. The second pertains to the fact that Thao has more than one type of reduplication, and in the other type there is no default \textit{a} present.

Addressing the first problem, L. Chang herself notes that there is no way to prove or disprove that the default vowel is \textit{a}. She notes that the default vowel in another Formosan language, Rukai, is not \textit{a}. L. Chang's evidence for a default vowel in Rukai was taken from Li (1973). Looking more closely at Rukai, some interesting complications arise.

According to Li (1973: 51-54), Rukai has an echo vowel which is usually a copy of the preceding vowel, except in cases where the preceding vowel is \textit{a}. See the examples listed below.

\textsuperscript{54} In order to be consistent with the conventions of this thesis, I have used shading to show violations. In Chang's original analysis, she uses an exclamation point instead.

\textsuperscript{55} In L. Chang's analysis, the vowel \textit{a} is not copied from the base, thus violating Max-BR. In my analysis, the vowel \textit{a} is copying from the base, but changes its place features, thus violating Ident-BR(f) instead. Note that \textit{lh} is a segment and not a complex consonant cluster.
The \( i \) vowel above is an unrounded \( u \) described by Li (1973: 14) as [+high], [+back] and [-round]. In the first grouping, the echo vowel is inserted after the word-final coda. In the second grouping, the vowel is inserted to separate word-internal consonant clusters and inserted after the word-final coda. L. Chang posits that it is this \( i \) vowel's behavior that merits its possible classification as a default vowel. It is not clear why the vowel \( a \) conditions \( i \) echo vowel insertion rather than \( a \) echo vowel insertion. Whether this evidence is strong enough to conclude that \( i \) or \( a \) is the default vowel is not easy to determine. However, if L. Chang is correct in assuming that \( i \) is the default vowel in Rukai, then the default vowel analysis of Ca reduplication in Thao cannot be maintained. This is because, according to Li (1973: 281) and Zeitoun (2000: 77), Rukai also has Ca reduplication. See the examples below.
Ca Reduplication in Rukai

1. Li (1973: 281)
   a. cuLul  "kill"   a'. ca-cuLul  "be killing"
   b. Ditt  "sausage"   b'. muti-Da-Ditt  "is turning into a sausage"
   c. sila?  "search"   c'. ma-sa-sila?  "be searching for each other"
   d. Liw  "touch"   d'. ma-La-Liw  "be touching each other"

2. Zeitoun (2000: 77)
   a. wa-iipi  "blow"   a'. ma-a-iipi  "blow together"
   b. wa-tubi  "cry"   b'. ma-ta-tubi  "cry together"
   c. wa- papacay "to kill"   c'. ngy-a-pa-papacay  "commit suicide"
   d. wa-Deele  "to look"   d'. wa-Da-Deele  "be careful"

If Ca reduplication is the result of emergence of the default vowel, then Rukai should have Ci reduplication. This is especially apparent in example (1.b') above, which has Ca reduplication when the stem vowel is e. In order to make the emergence of the unmarked vowel claim sustainable, we must assume that a is the default vowel.

One possible way to do this can be found in Alderete et al. (1999: 335). They use the place markedness hierarchy given below to predict the i in another language's Ci reduplication.

(72) Place-markedness hierarchy (Prince and Smolensky 1993, Lombardi 1997)
*PL/LAB, *PL/DORS>>*PL/COR>>*PL/PHAR

This hierarchy applies to both consonants and vowels, though they specifically address how it influences vowels. Note that the hierarchy above has the dorsal a as the least marked vowel, followed by coronal i. In addition, they also assume that schwa is the least marked. This is due to the fact that e has no place features
(Alderete et al. 1999: 335). Thus, in order to predict $i$ they posit constraints disfavoring schwa and $a$.

In order to use this place hierarchy, I need to motivate a constraint disfavoring schwa, but I have no evidence for such a constraint in Paiwan.56

Even if I assume $a$ is the default vowel, the problem remains that Thao, like Paiwan and Rukai, has at least one other type of reduplication which does not have a fixed vowel $a$. Thus, neither the V/Low constraint nor the place markedness hierarchy can explain why in Ca reduplication the default vowel emerges but in the other types of reduplication, the vowel is copied directly from the base.

One way around this problem would be to designate two different Max-BR constraints, one which would require maximality between the base and the reduplicant $RtRED$ (Max-BR$tRED$) and one which would require maximality between the base and the Ca reduplicant $CaRED$ (Max-BCaRED). Looking at the tableaux below we can see how both types of reduplication can be handled using two separate constraints.

56 The constraint which Alderete et al. used disallowed schwa on stressed vowels. This is not relevant to our analysis of CaRED since I have no evidence supporting that the $a$ is a stressed vowel.
Tableau 3.35 Two Max constraints for Ca-Reduplication in Thao: ma- + CaRED + "wet soil, thick mud" = "muddy all over; covered with mud", (data from L. Chang 1998: 289)

<table>
<thead>
<tr>
<th>Lexical: ma- + CaRED + di.plhaq</th>
<th>Max-BRtRED</th>
<th>V/Low</th>
<th>Max-BCaRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ma-da-di.plhaq</td>
<td>i</td>
<td></td>
<td>******</td>
</tr>
<tr>
<td>b. ma-di-di.plhaq</td>
<td>i,i</td>
<td></td>
<td>****</td>
</tr>
</tbody>
</table>

Tableau 3.36 Two Max constraints for full reduplication in Thao: mash- + gloss not given + RtRED = "to pass s.t. along", (data from L. Chang 1998: 280)

<table>
<thead>
<tr>
<th>Lexical: mash- + du + RtRED</th>
<th>Max-BRtRED</th>
<th>V/Low</th>
<th>Max-BCaRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. mash-du-du</td>
<td>****</td>
<td>u,u</td>
<td></td>
</tr>
<tr>
<td>b. mash-du-da</td>
<td>*****</td>
<td>u</td>
<td></td>
</tr>
</tbody>
</table>

Thus, here we have a case for specifying separate Max constraints for each type of reduplication. In effect, these two Max constraints represent the lexicalization of the a in Ca reduplication.

Since I have no independent support that a is the default vowel in Paiwan, I will be looking at another approach in the next section. This approach requires the use of templates.

3.2.1.2 Templatic Analysis: Fixed Segments

This section will look at a templatic analysis for CaRED. As one may recall from the section on RtRED, I used the prosodic template RtRED=µµ to limit the size of RtRED. In this section, I will be looking at way previous scholars have dealt with fixed segments.

McCarthy and Prince (1995b: 339-340) believe that there is no prespecification of segments in prosodic morphology. They look at Kolami echo-word formation, taken from Emaneau (1955), illustrated below.
From the data above they argue that there is no template involved since, except for the initial segments *gi*, the entire word is always reduplicated. Thus, this type of reduplication is fully subject to Max-BR. They note that the only possible template would be the Prosodic Word (PrWd), but a PrWd template does not have slots to which segments can be pre-attached.

They propose that the PrWd is copied and then there is a "melodic echo morpheme", *gi*, which overwrites the leftmost consonant and vowel. This process is illustrated in McCarthy and Prince (1990) for the Arabic word *jundub* "locust" which is overwritten to form the plural *janaadib* "locusts". Since McCarthy and Prince (1990) are using a process of circumscription, they separate the leftmost minimal word (which in Arabic is two moras or in this case: *jun*) from the base before overwriting. Thus, the original *u* of the base is overwritten by the plural vowel *a*.

In the diagrams below, the plural form template is represented. First, the leftmost minimal word, *jun*, is separated out from the word and attached to the plural template. This can be seen in the figure below.
As one can see, the \( j \) and \( n \) are attached to the onset positions of the two syllables in the template. Then the \( u \) is attached to the moraic position of the first syllable and spreads to all following moraic positions.

Next, there is a process of overwriting where the \( u \) is detached and the \( a \) is written into the vowel slot. This is represented in the figure below.

Thus, the original vowel is overwritten in favor of the new vowel \( a \). In the figure above there is both an \( a \) and an \( i \). In their analysis, only the \( a \) can overwrite the circumscribed portion of the word, while the \( i \) overwrites the rest of the vowels in the word (\( dub \) becomes \( dib \)). This is the next step in the process of circumscriptian.
which I will be leaving out of my discussion.

This type of overwriting is considered by McCarthy and Prince (1995a) to be a violation of Dep. This is because they regard the original vowel as being de-linked, then the new vowel is linked to the base. The original vowel is then discarded since it has nowhere to link to.

McCarthy (1997) modifies this original analysis using faithfulness constraints. Though he does not formally represent his analysis in tableau form, he describes the constraints and theoretical background necessary to eliminate reliance on operational circumscription. The relevant point of how to represent melodies and melody overwriting in OT is not addressed. What McCarthy does point out is that the singular and plural vowel melodies are not in correspondence with each other (1997: 26). These vowel melodies are prescribed for their respective morphemes. Thus, they are like affixes whose affixation to the word does not violate any faithfulness constraints.

One solution to representing fixed segments in OT can be found in Gafos (1998: 517-522). He assumes, like McCarthy (1997), that the fixed segment is prescribed to a morpheme, like an affix. He analyzes the simulfactive morpheme in Temiar, one of the main Austroasiatic languages of Malaysia. I will not go into the details of his analysis, but I will mention that the simulfactive morpheme also has a fixed $a$. 
He represents this morpheme as a reduplicative morpheme in the lexicon, written as \(a^{\text{RED}}\). The tableau below illustrates how this morpheme can be represented in Paiwan.

Tableau 3.37 CaRED as a reduplicative morpheme in the lexicon:

\[ \text{CaRED} + \text{"(use a stick) to hit"} + \text{LP} = \text{"place where you hit people"} \]

<table>
<thead>
<tr>
<th>Lexical: (a^{\text{RED}} + \text{djukul} + -\text{an})</th>
<th>Ident-LS(f)</th>
<th>Ident-BR(f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ([\text{dja}.-\text{dj}\text{u.ku.l-a.n}]\emptyset)</td>
<td></td>
<td>a</td>
</tr>
<tr>
<td>b. ([\text{dj}u.-\text{dj}\text{u.ku.l-a.n}]\emptyset)</td>
<td>a</td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, CaRED is represented in the lexicon as \(a^{\text{RED}}\). Thus, candidate (b) loses to candidate (a) even though it has less violations of Ident-BR(f). This is due to the fact that it changes the lexically specified \(a\) into a \(u\), violating higher ranking Ident-LS(f).

Thus, I assume, like McCarthy (1997), that the \(a\) is an affixal element and represent this using the notation found in Gafos (1998).

### 3.2.2 Copies From the Left Edge

CaRED copies the word-initial consonant. This can be accomplished with the same anchoring constraint as in the previous section on RtRED. The only difference is that the base will be to the right of the reduplicant instead of to the left.
Tableau 3.38 Anch-BR >> Max-BR for CaRED: AP + CaRED + "to hit" = "hit each other(AP)"

<table>
<thead>
<tr>
<th>Lexical: ma + aRED + lumay</th>
<th>Anch-BR</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ma-la-lumay</td>
<td></td>
<td>may</td>
</tr>
<tr>
<td>b. ma-ya-lumay</td>
<td>*</td>
<td>1,ma</td>
</tr>
</tbody>
</table>

3.2.3 Aligns to the Left

There is no dispute over the prefixal alignment of CaReduplication. First, I will define the following alignment constraint.

(74) Align-CaRED-L or Align(CaRED,L,PrWd,L) (cf. McCarthy and Prince 1993: 80)
Align the left side of CaRED to the left side of the prosodic word.

This will make Ca reduplication align to the beginning of the word. However, CaRED often does not align to the beginning of the word since another affix, ma-
may occur in front of it as shown in the tableau below.

Tableau 3.39 Max-LS >> Align-CaRED-L >> Max-BR: AP + CaRED + "to hit" = "hit each other(AP)"

<table>
<thead>
<tr>
<th>Lexical: ma- + aRED + lumay</th>
<th>Max-LS</th>
<th>Align-CaRED-L</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [ma- la.-ma.y]o</td>
<td>ma</td>
<td>may</td>
<td></td>
</tr>
<tr>
<td>b. [ma- lu.-ma.-ma.y]o</td>
<td>malu</td>
<td>y</td>
<td></td>
</tr>
<tr>
<td>c. [la.-lu.ma.y]o</td>
<td>ma</td>
<td>may</td>
<td></td>
</tr>
</tbody>
</table>

Thus, our optimal candidate (a) has CaRED infixed after the prefix ma-.

This doesn't pose a problem for our analysis above since CaRED is positioned to obey anchoring.

Below is an example of a vowel-initial word undergoing Ca reduplication.

Notice that the a of CaRED is in correspondence to the first vowel of the base.
Tableau 3.40 Anch-BR >> Align-CaRED-L >> Max-BR: AP + CaRED + "to throw up" = "throwing up at each other(AP)"

<table>
<thead>
<tr>
<th>Lexical: ma- + aRED + utjak</th>
<th>Anch-BR</th>
<th>Align-CaRED-L</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [ma.-a.-u.tja.k]ø</td>
<td>ma</td>
<td>tjak</td>
<td></td>
</tr>
<tr>
<td>b. [ma.-u.-tja.-tja.k]ø</td>
<td>mau</td>
<td>k</td>
<td></td>
</tr>
<tr>
<td>c. [tja.-ma.-u.tja.k]ø</td>
<td>*</td>
<td>mau.k</td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, candidate (a) is more optimal than candidate (b) because it has less violations of Align-CaRED-L. Candidate (c) loses because it violates Anch-BR.

Another ranking of importance is that of Align-CaRED-L >> Ident-BR(f). This is because it is more important to align to the left of the word than to copy identical segments from the base. In the case of CaRED, sometimes the reduplicant could avoid violating Ident-BR(f) if it infixes next to an a vowel somewhere in the base. The tableau below offers an example.

Tableau 3.41 Align-CaRED-L >> Ident-BR(f): AP + CaRED + "to hit" = "to hit each other(AP)"

<table>
<thead>
<tr>
<th>Lexical: ma- + aRED + lumay</th>
<th>Align-CaRED-L</th>
<th>Ident-BR(f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [ma.-a.-lumay]ø</td>
<td>ma</td>
<td>a</td>
</tr>
<tr>
<td>b. [ma.lu.-({ma.-ma.})y]ø</td>
<td>mau</td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, candidate (b) has CaRED infixing so that its base also has an a vowel. In this way it does not violate Ident-BR(f). However, by infixing into the stem it violates Align-CaRED-L more than our optimal candidate (a).
3.2.4 Monomoraic

CaRED is always monomoraic. I will be representing this using the a-templatic approach in Gafos (1998). I previously discussed his analysis as being inapplicable to RtRED since RtRED is dimoraic. I have given his analysis again below.

Tableau 3.42 Predicting reduplicant shape without a template: "he is copulating" Gafos (1998: 524)\(^{57}\)

<table>
<thead>
<tr>
<th>Input: /RED + toyan/</th>
<th>Ons</th>
<th>Dep-BR-V</th>
<th>*COR</th>
<th>*PHAR</th>
<th>Dep-BR-C</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. o/-doyan</td>
<td>*!</td>
<td>d,y,n</td>
<td></td>
<td></td>
<td></td>
<td>d,y,a,n</td>
</tr>
<tr>
<td>b. do/-doyan</td>
<td></td>
<td></td>
<td>d!,d,y,n</td>
<td></td>
<td></td>
<td>y,a,n</td>
</tr>
<tr>
<td>c. r0/-doyan</td>
<td></td>
<td></td>
<td>d,y,n</td>
<td>?</td>
<td></td>
<td>d,y,a,n</td>
</tr>
<tr>
<td>d. r0(0)/a/-doyan</td>
<td></td>
<td></td>
<td>d,y,n</td>
<td>?,?</td>
<td></td>
<td>d,y,n</td>
</tr>
</tbody>
</table>

In the tableau above, the monosyllabic candidate wins since it has less violations of markedness constraints. The only reason candidate (c) is favored over candidate (a) is because it satisfies the high ranking onset constraint.

I will be applying his analysis to CaRED, but instead of Onset I will be using Anch-BR. In addition, I will also be using a Markedness constraint, also taken from Gafos. It is basically a cover constraint for all place markedness constraints (i.e. *Dors, *Lab, *Cor, etc.)

In the tableau below I show how to analyze CaRED.

---

\(^{57}\) Gafos has the glottal stop ? violating *PHAR. I do not know why he doesn't use the *GLOTTAL constraint instead. According to Lass (1976: 145ff), the glottal stop and h are placeless and thus inherently less marked than other consonants.
Tableau 3.43 CaRED subject to markedness, Anch-BR >> Mark >> Max-BR:
CaRED + "(use a stick) to hit" + LP = "place where you hit people"

<table>
<thead>
<tr>
<th>Lexical: a\text{RED} + djukul + -an</th>
<th>Anch-BR</th>
<th>Markedness</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [di\text{a}.-dju.ku.l-a.n]ø</td>
<td>*</td>
<td>***********</td>
<td>ukulan</td>
</tr>
<tr>
<td>b. [a.-dju.ku.l-a.n]ø</td>
<td>*</td>
<td>***********</td>
<td>djukulan</td>
</tr>
<tr>
<td>c. [di\text{a}.ku.-dju.ku.l-a.n]ø</td>
<td>***********</td>
<td>u,ilan</td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, Anch-BR ensures that CaRED will reduplicate the word-initial consonant. In addition, Markedness will ensure that CaRED is maximally monomoraic.

The introduction of the Markedness constraint brings with it complications for RtRED. RtRED prefers to copy two full syllables, including onsets. However, Markedness favors all morphemes to copy as little as possible. In addition, since it is placed before Max-BR, there is now nothing motivating RtRED to copy onsets.

The tableau below demonstrates how RtRED will be affected by the Markedness constraint.

Tableau 3.44 Complications for RtRED and markedness: "to think" + RtRED= "thinking"

<table>
<thead>
<tr>
<th>Lexical: kinemenem + µ\text{RED}</th>
<th>Markedness</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [ki.ne.me.ne.-me_ne.-m]ø</td>
<td>***********</td>
<td>kine</td>
</tr>
<tr>
<td>b. *[ki.ne.me.ne.-e_ne.-m]ø</td>
<td>***********</td>
<td>kinem</td>
</tr>
</tbody>
</table>

In the tableau above, grammatical candidate (a) loses to ungrammatical candidate (b) since it has more violations of markedness. This phenomena doesn't occur with CaRED since the leftmost segment must obey anchoring. However, in the case of RtRED, it is the rightmost, not the leftmost, segment that must obey
anchoring.

In order to remedy the situation, I will be using the Onset constraint just like in Gafos's (1998) analysis. A tableau demonstrating this is given below.

Tableau 3.45 Onset >> Markedness for RtRED: "to think" + RtRED= "thinking"

<table>
<thead>
<tr>
<th>Lexical: kinemenem + µRED</th>
<th>Onset</th>
<th>Markedness</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [ki.ne.me.ne.-me.ne.-m]ø</td>
<td>*</td>
<td>************</td>
</tr>
<tr>
<td>b. [ki.ne.me.ne.-e.ne.-m]ø</td>
<td></td>
<td>************</td>
</tr>
</tbody>
</table>

Thus, Onset will have to be ranked higher than Markedness to ensure proper copying of RtRED.

Another constraint ranking of relevance is that of Ident-BR(f) >> Markedness. Recall from the previous section that the Place Markedness hierarchy will prefer certain place features over others. Thus, in order to preserve the identity of segments, Ident-BR(f) must be ranked higher than Markedness. See the tableau below in which I have split up the Markedness constraint into its constituent constraints.

Tableau 3.46 Ident-BR(f) >> Markedness:
CaRED + "(use a stick) to hit" + LP = "place where you hit people"

<table>
<thead>
<tr>
<th>Lexical: aRED + djakul + -an</th>
<th>Ident-BR(f)</th>
<th>*Lab/Dors</th>
<th>*Cor</th>
<th>*Glottal</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [dja.-dju.ku.l-a.n]ø</td>
<td>a</td>
<td>a,u,k,u,a</td>
<td>dj,dj,l,n</td>
<td></td>
<td>kulan</td>
</tr>
<tr>
<td>b. [?a.-dju.ku.l-a.n]ø</td>
<td>?,a</td>
<td>a,u,k,u,a</td>
<td>dj,l,n</td>
<td>?</td>
<td>kulan</td>
</tr>
</tbody>
</table>

As can be seen in the tableau above, candidate (b) would be optimal if Ident-BR(f) were ranked lower than *Cor. This is because a glottal consonant is less
marked than a coronal consonant.

### 3.2.5 Conclusion

Analysis of CaRED is complete. The tableaux below show CaRED with all of the constraints of our grammar. I have left out No-Cross, Align-RtRED-R and No-Spread to save space.

Tableau 3.47: Complete listing of constraints for CaRED:

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>AP + CaRED + &quot;to hit&quot; = &quot;to hit each other(AP)&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>ma + a_RED + lumay</td>
<td></td>
</tr>
<tr>
<td><strong>Repea</strong></td>
<td><strong>Anch-</strong></td>
</tr>
<tr>
<td>t(at)</td>
<td>P/R</td>
</tr>
<tr>
<td>a.</td>
<td>[ma.-la.-lu.(ma.)y]_ø</td>
</tr>
<tr>
<td>b.</td>
<td>[ma.-la.-lu.(ma.)y]_ø</td>
</tr>
<tr>
<td>c.</td>
<td>[ma.-la.-lu.(ma.)y]_ø</td>
</tr>
<tr>
<td>d.</td>
<td>[ma.-la.-lu.(ma.)y]_ø</td>
</tr>
<tr>
<td>e.</td>
<td>[ma.-la.-lu.(ma.)y]_ø</td>
</tr>
<tr>
<td>f.</td>
<td>[ma.-ma.-la.-lu.(ma.)y]_ø</td>
</tr>
</tbody>
</table>

In the tableau above, candidate (a) is optimal. Candidate (b) violates Ident-BR(f) by changing the base's l into a glottal consonant. Candidate (c) infixes into the stem, thus excessively violating alignment to the left edge of the prosodic word. Candidate (d) has a violation of No-Coda. Candidate (e) has completely deleted the prefix ma-, which is a violation of high ranking Max-LS. Candidate (f) loses because it violates the Anch-BR constraint. Finally, candidate (g) acts as a

---

58 Mark stands for Markedness.
59 Since the Markedness constraint contains all markedness constraints, there should be nine stars here. However, for purposes of space, I show that ? is a less marked segment by showing one less violation.
suffix to the prefix, thus violating *Repeat(af) by copying an affix.

In the tableau below I look at cases relevant to vowel-initial words with CaRED.

Tableau 3.48 Complete listing of constraints for CaRED in a vowel-initial word:

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>*Repeat(af)</th>
<th>Anch-P/R</th>
<th>Anch-Id-L</th>
<th>Mx-LS</th>
<th>No-Coda</th>
<th>A-CaRED</th>
<th>Dep-LS</th>
<th>On-set</th>
<th>Id-BR</th>
<th>Mar-k</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ma- + aRED + utjak</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ma</td>
<td></td>
<td></td>
<td>**</td>
<td>a</td>
<td>7*</td>
<td>tjak</td>
</tr>
<tr>
<td>a.</td>
<td>ma-a-(u.tja.)k]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>ma-u-(tja-.tja.)k]ø</td>
<td></td>
<td></td>
<td></td>
<td>mau</td>
<td></td>
<td></td>
<td>*</td>
<td>8*</td>
<td>k</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>ma-tja-(u.tja.)k]ø</td>
<td></td>
<td></td>
<td></td>
<td>ma</td>
<td></td>
<td></td>
<td></td>
<td>8*</td>
<td>u,k</td>
<td></td>
</tr>
</tbody>
</table>

As one can see, Align-CaRED-L will eliminate candidate (b) since the reduplicant does not align to the left edge of the stem. In the case of (c), Anch-BR is violated.

The tableau below shows CaRED with the -an suffix.

Tableau 3.49 Complete listing of constraints for CaRED:

| Lexical: | *Repeat(|f) | Anch-P/R | Anch-Id-L | Mx-LS | No-Coda | A-CaRED | Dep-LS | On-set | Id-BR | Mar-k | Max-BR |
|----------|----------|----------|-----------|-------|--------|---------|--------|--------|-------|-------|--------|
| aRED + djukul + -an | | | | | | | | | | | |
| a. | [djig-dju.(ku.l-a)n]ø | | | | | | | | a | 9* | kulan |
| b. | [djak-dju.(ku.l-a)n]ø | | | | | | | | a | 10* | ulan |

In the tableau above, candidate (b) loses to candidate (a) by having an extra violation of No-Coda. As one can see, the analysis of this type of CaRED is less complicated than the ma- and CaRED examples since CaRED aligns to the left of the prosodic word.
This concludes our analysis of CaRED. CaRED specific rankings include 1) Anch-BR, Max-LS >> Align-CaRED-L >> Ident-BR(f), Max-BR and 2) Ident-LS(f) >> Ident-BR(f) >> Markedness >> Max-BR. The one RtRED specific ranking that arose in this section is that of Onset >> Markedness.

3.3 Combination of Ca Reduplication and Root Reduplication

This section shows how our analysis can also predict forms with both CaRED and RtRED. The tableau below shows how the correct candidate is predicted.

<table>
<thead>
<tr>
<th>aRED + keDi + µRED + an</th>
<th>*Rep eat(a)</th>
<th>Anc h-P</th>
<th>Anc h-B</th>
<th>Id-L</th>
<th>No-Coda</th>
<th>A-CaRED-L</th>
<th>A-RtRED-R</th>
<th>Onset</th>
<th>Id-BR(f)</th>
<th>Mark</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [ka-keDi-ke(Di-a.)n]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [ka-keDi-g(Di-a.)n]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As one can see from the tableau above, our analysis also applies to forms with both CaRED and RtRED.

3.4 Affixation

This section analyzes affixes and then, by determining the constraints governing affixes, determines whether these constraints are applicable to reduplicants. I show that the constraints governing prefixation and suffixation are ranked in different positions in the grammar. In this way, I am able to determine if the reduplicant can
also follow the same constraints as those for affixation. I first investigate prefixation and then suffixation. I end the section by showing that CaRED is subject to the same constraints as prefixes and RtRED is subject to the same constraints as suffixes. In addition, CaRED is not subject to the same constraints as suffixes and RtRED is not subject to the same constraints as prefixes.

3.4.1 Constraint Ranking for Prefixes

Below is the alignment constraint I use for prefixes in my analysis.

(75) Align-Pr-L or Align(Pr,L,PrWd,L)
The left edge of the prefix aligns with the left edge of the prosodic word. (including but not limited to prefixes such as sa-, si-, ki-, em- and in-).

Notice in the definition above that I have included examples of vowel-initial prefixes. These prefixes actually appear as infixes in consonant-initial words. For example, em- can be found in the word t-em-ekel, "to drink(AP)", and its allomorph en- can be found in the word p-en-atjez, "to chisel(AP)". In addition to the actor pivot, the perfective is marked with the prefix in-. Data from H-C. Chang (2000: 98) show that this prefix is found in words such as in-ekel-anga, "ran", and t-in-ekel, "drank".

There is a difference between the behavior of in- and the behavior of em-. The em- prefix is m- in front of vowel-initial stems, as in the word m-utjak "to throw
up(AP)”. However, in- is not n- in vowel-initial stems as already can be noted in in-ekel-anga "ran".\textsuperscript{60} Thus, there are certain em- specific properties which are not applicable to other vowel-initial affixes. An analysis of what these properties are is given in Appendix C.

I follow McCarthy and Prince (1995b) in hypothesizing that prefixes infix into words to avoid word-internal codas. In the tableau below, I use constraints similar to those used in their analysis of Tagalog -um- in gr-um-adwet.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|}
\hline
Lexical: em- + tekel & No-Coda & Align-Pr-L \\
\hline
a. \text{[em-.te.ke.l]₀} & * & \\
\hline
b. \text{[t-em-ke.l]₀} & t & \\
\hline
c. \text{[te-em-ke.l]₀} & * & te \\
\hline
d. \text{[te.k-em-e.l]₀} & & tem \\
\hline
\end{tabular}
\caption{Prefix infixes to avoid creating a coda: AP + "to drink" = "to drink(AP)", (based on McCarthy and Prince, 1995b: 360)}
\end{table}

Align-Pr-L dictates that em- should be aligned at the left edge of the word. However, due to its violations of No-Coda, em- cannot be a true prefix. Instead, it must move inside the word. However, it will only move as far as necessary to avoid violating No-Coda.

Note that the infixation above also satisfies the tendency for syllables to have onsets. Thus, the prefix em- will gain an onset when it infixes into the word (i.e.

\textsuperscript{60} The reason em- has an en- allomorph but in- does not have an im- allomorph is that Paiwan forbids adjacent labials, but not adjacent coronals. In Appendix C, I actually posit that in- is the underlying form for in- and em- is the underlying form for em-.
t-em-e.). The tableau below shows that Onset will also predict the correct candidate.

Table 3.52 Prefix infixes to create an onset: AP + "to drink" = "to drink(AP)"

<table>
<thead>
<tr>
<th>Lexical: em- + tekel</th>
<th>Onset</th>
<th>Align-Pr-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [em-te.ke.l]ø</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. [t-em-e.ke.l]ø</td>
<td>t</td>
<td></td>
</tr>
<tr>
<td>c. [te-em-ke.l]ø</td>
<td>*</td>
<td>te</td>
</tr>
<tr>
<td>d. [te.k-em-e.l]ø</td>
<td></td>
<td>tem</td>
</tr>
</tbody>
</table>

Thus, the prefix will infix as far as it needs to to fill its onset position. With vowel-initial words the prefix will not infix as can be seen in the tableau below.

Table 3.53 Prefix doesn't infix in vowel-initial stems: PF + "to run" + "already" = "ran already", (data taken from H-C. Chang 2000: 98)

<table>
<thead>
<tr>
<th>Lexical: in- + ekel + -anga</th>
<th>Onset</th>
<th>Align-Pr-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [i.n-e.ke.l-a nga.]ø</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. [e.-i.n-ke.l-a nga.]ø</td>
<td>**</td>
<td>e</td>
</tr>
<tr>
<td>c. [e.k-i.n-e.l-a nga.]ø</td>
<td>*</td>
<td>ek</td>
</tr>
</tbody>
</table>

As indicated in the tableau above, candidate (a) will be optimal since the infix gives the vowel-initial word an onset. If it infixes to acquire its own onset, it will still leave the word-initial vowel without an onset. Thus, the lowest number of violations Onset can have is one violation. With this being the case, the Align-Pr-L constraint will decide among the candidates, selecting candidate (a) as optimal.

In the case of Paiwan, since I already have Onset ranked lower than No-Coda in
the grammar, it is No-Coda which causes the prefix to infix.

An example of the alignment constraint applied with a prefix that has an onset and no coda is given below.

Tableau 3.54 CV Prefix: IP + "to strain water" + RtRED = "used to strain water(IP)"

<table>
<thead>
<tr>
<th>Lexical: si- + µµRED + sevesev</th>
<th>No-Coda</th>
<th>Onset</th>
<th>Align-Pr-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [si.-se.ve.se.-se.ve-v.]ø</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [se.-si.ve.se.-se.ve-v.]ø</td>
<td></td>
<td>se</td>
<td></td>
</tr>
</tbody>
</table>

The tableau above shows typical prefix behavior, without any infixation pattern. As one can see, if the prefix doesn't have a coda, then it doesn't need to infix into the stem. In addition, the prefix already has an onset so the Onset constraint will not cause infixation either. Since our constraints still predict the correct output for other prefixes in the language, I propose that prefixes are all subject to the same alignment constraints.

3.4.2 Constraint Ranking for Suffixes

Suffixes align to the end of a prosodic word. The constraint I use is stated below.

(76) Suffix alignment constraint
Align-Su-R or Align(Su,R,PrWd,R)
The right edge of the suffix aligns with the right edge of the prosodic word (including but not limited to suffixes -en, -an and -u).
This alignment constraint is illustrated in the tableau below.

Tableau 3.55 Suffix alignment: "drink" + imperative = "drink(imp)"

<table>
<thead>
<tr>
<th>Lexical: tekel + -u</th>
<th>Align-Su-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. tekel-u</td>
<td>Align-Su-R</td>
</tr>
<tr>
<td>b. [u-te.kel]o</td>
<td>tekel</td>
</tr>
</tbody>
</table>

In the tableau above, the suffix aligns to the right edge of the prosodic word. Below is a tableau of a consonant-final suffix.

Tableau 3.56 Consonant-final suffix and reduplication: "blood" + RtRED + LP = "bloodied"

<table>
<thead>
<tr>
<th>Lexical: djamuq + µRED + -an</th>
<th>Align-Su-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. djamuq-dja.mu-q-a.n</td>
<td>uq</td>
</tr>
<tr>
<td>b. dja.mu-dja.m-a.n-u-q</td>
<td>uivu</td>
</tr>
<tr>
<td>c. dja.vu.i.v-a.n-u</td>
<td>u</td>
</tr>
</tbody>
</table>

In the example above, infixing into the stem has no advantages for the suffix. There are no violations of either No-Coda or Onset. However, in the case of vowel-final stems, a suffix could potentially infix into the word to gain an onset. To prevent this type of suffix infixation, Align-Su-R must be ranked higher than Onset. This is shown in the tableau below.

Tableau 3.57 Infixing an onsetless suffix, Align-Su-R >> Onset: 
"to speak" + RtRED + LP = "spokesman", (data from H-C. Chang 2000: 77)

<table>
<thead>
<tr>
<th>Lexical: qaivu + µRED + -an</th>
<th>Align-Su-R</th>
<th>Onset</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. qaivu-i.vu-a.n</td>
<td>uivu</td>
<td>***</td>
</tr>
<tr>
<td>b. qa.i.v-a.n-u-i.vu</td>
<td>uivu</td>
<td>**</td>
</tr>
<tr>
<td>c. qa.i.vu.i.v-a.n-u</td>
<td>u</td>
<td>**</td>
</tr>
</tbody>
</table>
In the tableau above, candidates (b) and (c) are less optimal even though they have fewer violations of Onset. This shows that Align-Su-R is ranked higher than Onset.

### 3.4.3 Conclusion

In conclusion, it becomes apparent that the constraints required to regulate prefixes are ranked differently from those for regulating suffixes. Constraint rankings determined in this section are 1) Align-Su-R >> Onset and 2) No-Coda or Onset >> Align-Pr-L.

### 3.5 Reduplication and Affixation

As one might recall from Chapter 2, I proposed that RtRED is suffixation and CaRED is prefixation. If I want to prove Marantz's claim that reduplication is really affixation, then reduplication should be subject to the same alignment constraints as affixes.

Now that I have established OT rankings for reduplication and affixation, focus can be put on the relationship between the two. The following section focuses on root reduplication, while the section afterwards focuses on Ca reduplication. I show that RtRED is subject to suffixal constraints while CaRED is subject to prefixal constraints. In addition, RtRED is not subject to prefixal constraints and CaRED is not subject to suffixal constraints.
3.5.1 Root Reduplication as Affixation

I will now show that root reduplication cannot be considered prefixation since it cannot be subject to the same constraints as prefixes. By contrast, it is aligned in the exact same manner as suffixes. Thus, root reduplication should be considered a type of suffixation.

3.5.1.1 Root Reduplication as a Prefix

If the reduplicant is a prefix then it should be subject to the same constraints that all prefixes are subject to. Thus, if it is a prefix to the word-final foot, then it does not follow the same constraints as prefixes. This is illustrated in the tableau below.

<table>
<thead>
<tr>
<th>Tableau 3.58 Root reduplication as prefixation: RtRED + &quot;to hiccup&quot; = &quot;hiccupping&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lexical:</strong> paderua + μµRED</td>
</tr>
<tr>
<td><strong>No-Coda</strong></td>
</tr>
<tr>
<td><strong>Align-Pr-L</strong></td>
</tr>
<tr>
<td>a. [ru.a-pa.de.ru.a]ø</td>
</tr>
<tr>
<td>b. [p-ru.a-a.de.ru.a]ø</td>
</tr>
<tr>
<td>c. [pa-ru.a-de.ru.a]ø</td>
</tr>
<tr>
<td>d. [pad-ru.a-e.ru.a]ø</td>
</tr>
<tr>
<td>e. [pa.de-ru.a-ru.a]ø</td>
</tr>
</tbody>
</table>

Since root reduplicants don’t align to the left edge of the word, they are different from prefixes. In the tableau above, the grammatical candidate (e) loses to ungrammatical candidate (a). On the basis of the above evidence, I conclude that root reduplicants can’t be prefixes or that they have their own constraints.61

---

61 The prefix *em*- does seem to have its own constraints. See Appendix C for details.
3.5.1.2 Root Reduplication as a Suffix

If root reduplication is suffixation, then it must also obey the Align-Su-R constraint. Since this constraint is virtually the same as our Align-RtRED-R, we simply consider RtRED to be a type of suffix. Thus, I will assume from now on that Align-Su-R and Align-RtRED-R are the same constraint. The tableau below shows RtRED obeying the Align-Su-R constraint.

Tableau 3.59 RtRED as a suffix: "to hiccup" + RtRED = "hiccupping"

<table>
<thead>
<tr>
<th>Lexical: paderua + µµRED</th>
<th>Align-Su-R</th>
<th>Onset</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [pa.de.ru.a.-ru.a]ø</td>
<td>**</td>
<td></td>
<td>pade</td>
</tr>
<tr>
<td>b. [pa.de.ru.-de.ru.-a]ø</td>
<td>a</td>
<td>*</td>
<td>pa</td>
</tr>
</tbody>
</table>

In the tableau above RtRED can follow the same constraints as suffixes and still produce the correct surface form. In the tableau below I look at an example with both RtRED and a suffix.

Tableau 3.60 Root reduplication as suffixation, interaction with another suffix: "blood" + RtRED + LP = "bloodied"

<table>
<thead>
<tr>
<th>Lexical: djamuq + µµRED + -an</th>
<th>No-Coda</th>
<th>Align-Su-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [dja.mu.-dja.mu.q-a.n]ø</td>
<td></td>
<td>qan</td>
</tr>
<tr>
<td>b. *[dja.mu.-dja.m-a.n-u.-q]ø</td>
<td></td>
<td>uq,q</td>
</tr>
</tbody>
</table>

In the tableau above, the lack of the pointing finger indicates that there is a tie between the candidates. This is because both candidates (a) and (b) have suffixes which are aligned equally distant from the prosodic word boundary. In order to
predict our grammatical candidate (a) as optimal, I will need to introduce a contiguity constraint. The constraint definition is given below.

(77) I-Contig ("No Skipping") (McCarthy and Prince, 1995a: 371)
The portion of S₁ standing in correspondence forms a contiguous string.
Domain(ℜ) is a single contiguous string in S₁.

(78) O-Contig ("No Intrusion")
The portion of S₂ standing in correspondence forms a contiguous string.
Range(ℜ) is a single contiguous string in S₂.

McCarthy and Prince (1995a) describe violations of I-Contig as xyz mapping to xz, where the mapping skips over y. O-Contig violations would be in the form of xz mapping to xyz. Contig constraints basically ensure that morpheme parts stay contiguous to one another and don't split apart and move around within a word. Since vowel-initial prefixes and RtRED infix into the base and surface form, Contig-LS and Contig-B are ranked very low in our grammar. However, we don't have affixes infixing into reduplicants. Thus, Contig-R is ranked high in the grammar. The tableau below demonstrates this.

Tableau 3.61 Root reduplication as suffixation, interaction with another suffix, Contig-R >> Align-Su-R: "blood" + RtRED + LP = "bloodied"

<table>
<thead>
<tr>
<th>Lexical: djamuq + μµRED + -an</th>
<th>Contig-R</th>
<th>Align-Su-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [dja.mu.-dja.mu.q-an]qan</td>
<td></td>
<td>qan</td>
</tr>
<tr>
<td>b. [dja.mu.-dja.m-an-u-q]anuq</td>
<td></td>
<td>uq.q</td>
</tr>
</tbody>
</table>

In the tableau above, candidate (b) will be less optimal since it has violations of
This is the end of our discussion of RtRED as a suffix. In the next section, we will look at CaRED.

### 3.5.2 Ca Reduplication as Affixation

In this section I will show that Ca reduplication is subject to the same constraints as prefixation.

#### 3.5.2.1 Ca Reduplication as a Prefix

If I consider CaRED subject to the constraint ranking for prefixes, the behavior of CaRED is still correctly described. This is illustrated in the tableau below.

Tableau 3.62 Ca Reduplication as prefixation:

<table>
<thead>
<tr>
<th>Lexical: a\textsuperscript{RED} + djukul + -\textit{an}</th>
<th>No-Coda</th>
<th>Align-Pr-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [\textit{dja}-.dju.ku.l-\textit{a.n}]\textit{o}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [dju-.\textit{dja}-.ku.l-\textit{a.n}]\textit{o}</td>
<td></td>
<td>dju</td>
</tr>
<tr>
<td>c. [\textit{djak}-.dju.ku.l-\textit{a.n}]\textit{o}</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, CaRED is aligned to the left of the word, just like prefixes in the language. In addition, it will not reduplicate a coda since this will violate No-Coda.

#### 3.5.2.2 Ca Reduplication as a Suffix

Due to the fact that CaRED is always at the beginning of the word it is highly unlikely that it is a suffix. In addition, we have already established RtRED to be a
suffix. Positing CaRED to be a suffix as well would lead to a competition between two reduplicative suffixes in words with both RtRED and CaRED. The results of this sort analysis are given below.

Tableau 3.63 Ca Reduplication as a suffix, interaction with another reduplicative suffix:
CaRED + "small" + RtRED + LP = "small ones"

<table>
<thead>
<tr>
<th>Lexical: $a^{\text{RED}} + \text{keDi} + \mu^{\text{RED}} + -\text{an}$</th>
<th>No-Coda</th>
<th>Align-Su-R</th>
<th>Onset</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. $[\text{ka.-keDi.-keDi.-a.n}]^\circ$</td>
<td></td>
<td>keDikeDian,an</td>
<td>*</td>
</tr>
<tr>
<td>b. $^* [\text{ke.-ka.-keDi.-a.n}]^\circ$</td>
<td></td>
<td>DikeDian,an</td>
<td>*</td>
</tr>
<tr>
<td>c. $^\Rightarrow ^* [\text{ke.Di.-Da.-keDi.-a.n}]^\circ$</td>
<td></td>
<td>keDian,an</td>
<td>*</td>
</tr>
</tbody>
</table>

As one can see, this type of analysis will lead to the incorrect output, candidate (c), as winner.

In addition, looking at the case where both CaRED and RtRED are both prefixes will also lead to the incorrect output. A tableau exemplifying this is given below.

In order to demonstrate my point, I must use a four-mora stem. The stem needs to be long since, due to *Repeat(af), CaRED cannot copy RtRED and RtRED cannot copy CaRED or the suffix. With this being the case, in three mora words or less, the reduplicant will position itself grammatically through pressure from *Repeat(af). Since I cannot find a four mora stem in my data, I will be using a hypothetical example.
Tableau 3.64 RtRED as a prefix, interaction with another reduplicative prefix:
CaRED + hypothetical four-mora stem + RtRED + LP

<table>
<thead>
<tr>
<th>Lexical: aRED + lialuas + µµRED + -an</th>
<th>No-Coda</th>
<th>Align-Pr-L</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [la-li.-la.-lu.a.-lu.a.s-a.n]ø</td>
<td>lilaluas</td>
<td>lalualuasan,san</td>
<td></td>
</tr>
<tr>
<td>b. * [la-li.-la.lu.-la.lu.a.s-a.n]ø</td>
<td>lalul</td>
<td>lalualuasan,asan</td>
<td></td>
</tr>
</tbody>
</table>

In the example above, the optimal candidate (a) will lose to candidate (b). This is because, if RtRED is a prefix, it will prefer to position itself as far to the left as possible.

Since cases where both reduplicates are suffixes in tableau (128) and where both reduplicants are prefixes in (129) will predict the incorrect output, I conclude that CaRED and RtRED must follow different alignment constraints. The simplest solution is to posit Ca reduplication to be a prefix and root reduplication to be a suffix.

3.6 Conclusion

I now present a full listing of constraint rankings for my analysis.

(79) Full Ranking of all Constraints

Full tableaux of all the constraints are presented below. As one can see, many of the constraints are unranked in relation to one another. I have placed every constraint in its potentially highest ranking position. This ranking, of course, may
become more specific when other types of phonological and morphological phenomena are analyzed in addition to reduplication and affixation.

Tableau 3.65 Complete constraint listing, dimoraic stem with prefix:
AP + "to drink" + RtRED = "drinking(AP)"

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>*Rep</th>
<th>An</th>
<th>Id-LS</th>
<th>Cr</th>
<th>Mx-N-L</th>
<th>Dp-L</th>
<th>A-Pr</th>
<th>A-S</th>
<th>On</th>
<th>Id-BR</th>
<th>Mark</th>
<th>Mx-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [t-e-m-e-ke.-te-ke.-l]ο</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11*</td>
<td>em</td>
<td></td>
</tr>
<tr>
<td>b. [t-e-m-e-ke.-e-ke.-l]ο</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10*</td>
<td>tem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. [t-e-m-e-ke.-e-ke.-l]ο</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11*</td>
<td>em</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. [t-e-m-e-ke.-ke.-l]ο</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10*</td>
<td>tem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. [t-e-m-e-ke.-ke.-l]ο</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9*</td>
<td>tem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. [t-e-m-e-ke.-ke.-l]ο</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8*</td>
<td>tem</td>
<td>k,l</td>
<td></td>
</tr>
<tr>
<td>g. [t-e-m-e-ke.-ke.-l]ο</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11*</td>
<td>te</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Below is a tableau illustrating a trimoraic stem that is prefixed and undergoes reduplication.

Tableau 3.66 Complete constraint listing, trimoraic stem with prefix:
AP + "to spit" + RtlRED = "spitting(AP)"

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>*Rep</th>
<th>An</th>
<th>Id-LS</th>
<th>Cr</th>
<th>Mx-N-L</th>
<th>Dp-L</th>
<th>A-Pr</th>
<th>A-S</th>
<th>On</th>
<th>Id-BR</th>
<th>Mar</th>
<th>Mx-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [s-e-m-u.ti-ra.-ti-ra.-y]ο</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13*</td>
<td>semu</td>
<td></td>
</tr>
<tr>
<td>b. [s-e-m-u.ti-ra.-i.-y]ο</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12*</td>
<td>semutj</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. [s-u.ti-e-m-i-ra.-i-ra.-y]ο</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13*</td>
<td>suem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. [s-e-m-u.ti-ra.-s.u.ti-ra.-y]ο</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15*</td>
<td>em</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. [em.-su.ti-ra.-ti-ra.-y]ο</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15*</td>
<td>semu</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. [s-e-m-u.-ti-ra.-y]ο</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13*</td>
<td>semu,y</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Below is an example of suffixal reduplication. Only certain candidates are shown in order to illuminate the interaction between suffixes and suffixal

---

reduplication.

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>djamuq + µRED + -an</th>
<th>*R</th>
<th>An</th>
<th>ep</th>
<th>Id</th>
<th>Cn</th>
<th>Cr</th>
<th>Mx</th>
<th>N</th>
<th>Dp</th>
<th>-LS</th>
<th>A-LS</th>
<th>A</th>
<th>Su</th>
<th>On</th>
<th>Id-BR</th>
<th>Mark</th>
<th>Mx-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. *</td>
<td>[dja.m-u. -dja.m-u.-q.an]ø</td>
<td>a</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td>qan</td>
<td>11*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>[dja.m-u.-dja.m-an-u.-q]ø</td>
<td>a</td>
<td>*</td>
<td>u</td>
<td></td>
<td>a</td>
<td>uq,q</td>
<td>11*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>[dja.m-q.an.-dja.m]ø</td>
<td>*</td>
<td>u</td>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>djamu</td>
<td>11* qan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>[dja.m-q.a.-mu.qa.-n]ø</td>
<td>a</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>n</td>
<td>11* dja</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, candidate (b) is less optimal because it violates Contig-R.

Candidate (c) is less optimal because it violates Anch-P and Anch-BR. Candidate (d) copies the a from the suffix –an, thus violating *Repeat(af). This tableau shows that when there are two suffixes competing for the same position, the correct output will still be predicted.

Below is an example of Ca reduplication with a suffix.

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>aRED + djukul + -an</th>
<th>*R</th>
<th>An</th>
<th>ep</th>
<th>Id</th>
<th>Cn</th>
<th>Cr</th>
<th>Mx</th>
<th>N</th>
<th>Dp</th>
<th>-LS</th>
<th>A-LS</th>
<th>A</th>
<th>Su</th>
<th>On</th>
<th>Id-BR</th>
<th>Mark</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. *</td>
<td>[dja.-duku.l-a.n]ø</td>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>a</td>
<td>9* kulan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>[dja.ku.-duku.l-a.n]ø</td>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11* lan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>[duku.-ka.-a.n]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>a</td>
<td>9* dju</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>[duku.-duku.l-a.n]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9* kulan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td>[a.-duku.l-a.n]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>a</td>
<td>8* djkulan</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, candidate (b) is less optimal due to the fact that the reduplicant has too many violations of markedness. Candidate (c) loses because it is
not aligned to the left edge of the prosodic word. Candidate (d) does not have an $a$ but instead reduplicates the $u$ in the base, violating Ident-LS(f). Candidate (e) does not copy the word-initial consonant, thus violating Anch-BR.

Below is an example of prefixal reduplication when there is also a non-reduplicative prefix. Only certain candidates are shown in order to illuminate interaction between the two types of prefixes.

Table 3.69 Ca Reduplication as a prefix, interaction with another prefix: $AP + \text{CaRED} + \text{"to throw up"} = \text{"to throw up at each other(AP)"}$

<table>
<thead>
<tr>
<th>Lexical: $ma+$ aRED + utjak</th>
<th>*R ep</th>
<th>An c</th>
<th>Id-</th>
<th>Cr</th>
<th>Mx-L</th>
<th>N-</th>
<th>Dp-</th>
<th>A-Pr</th>
<th>A-Su</th>
<th>On</th>
<th>Id-BR</th>
<th>Ma rk</th>
<th>Max-B R</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. $[\text{ma-}a-\text{.u.tja.k}]$</td>
<td>ma **</td>
<td>a **</td>
<td>7*</td>
<td>7*</td>
<td>tjak</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. $[\text{a.-ma-}\text{.u.tja.k}]$</td>
<td>ma **</td>
<td>a **</td>
<td>7*</td>
<td>7*</td>
<td>ma,tjak</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. $[\text{ma.-ma-}\text{.u.tja.k}]$</td>
<td>ma **</td>
<td>a **</td>
<td>8*</td>
<td>8*</td>
<td>utjak</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. $[\text{ma.-ma-}\text{.u.tja.k}]$</td>
<td>ma **</td>
<td>a **</td>
<td>8*</td>
<td>8*</td>
<td>utjak</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This example shows us that when a prefix and a prefixal reduplicant occur simultaneously within the same word, the reduplicant will position adjacent to the base in order to obey Anch-BR. This is the same behavior which we witness for suffixes and suffixal reduplicants when they occur simultaneously within the same word.

Next I have a tableau for a word with a reduplicative prefix, reduplicative suffix and non-reduplicative suffix.
Tableau 3.70 CaRED, RtRED and a non-reduplicative suffix:

\[ \text{CaRED} + \text{"green"} + \text{RtRED} + \text{LP} = \text{"green things"} \]

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>aRED + ljuas + µµRED + an</th>
<th>*R</th>
<th>An</th>
<th>Id-LS</th>
<th>Cr</th>
<th>MxN-C</th>
<th>DpL-LS</th>
<th>A-Su</th>
<th>On</th>
<th>Id-BR</th>
<th>Mark</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [la.-li.lju.a.-jua.-s-a.n]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>san **</td>
<td>a</td>
<td>15*</td>
<td>ljualujuasan ,lali</td>
<td></td>
</tr>
<tr>
<td>b. [la.-li.-jua.-]ljuas.a.n]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ljuasan **</td>
<td>a</td>
<td></td>
<td>ljualujuasan ,lali</td>
<td></td>
</tr>
<tr>
<td>c. [la.-li.lju.-li.ljuas.a.n]ø</td>
<td>li</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>liljuasan *</td>
<td>a</td>
<td>15*</td>
<td>an,la</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thus, even with three different types of affixation, our analysis will still predict the correct candidate as optimal. Note that candidate (c) is eliminated since RtRED copies CaRED, thus violating *Repeat(af).

Finally, the tableaux below show the two possible analyses I presented for words with word-internal codas.

Tableau 3.71 Lexical form with word-internal codas, Vowel epenthesis:

"flash" + RtRED = "flashing"

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>kalidj emblem + µµRED</th>
<th>*R</th>
<th>An</th>
<th>Id-LS</th>
<th>Cr</th>
<th>MxN-C</th>
<th>DpL-LS</th>
<th>A-Su</th>
<th>On</th>
<th>Id-BR</th>
<th>Mark</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [ka.li.dji.ki.-dj.ji.-dj]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>i</td>
<td>dj</td>
<td>13*</td>
<td>kali</td>
<td></td>
</tr>
<tr>
<td>b. [ka.li.dje.ki.dje.ki.-dj]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>e.i</td>
<td>dj</td>
<td>13*</td>
<td>kali</td>
<td></td>
</tr>
<tr>
<td>c. [ka.lidi.ki.dj.ki.dj]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>**</td>
<td>dj</td>
<td>11*</td>
<td>kali</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. [ka.li.dja.ki.dja.ki.-dj]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td>a</td>
<td>dj</td>
<td>13*</td>
<td>kali</td>
<td></td>
</tr>
</tbody>
</table>

Tableau 3.72 Lexical form with word-internal codas, allowing word-internal codas:

"flash" + RtRED = "flashing"

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>kalidj emblem + µµRED</th>
<th>*R</th>
<th>An</th>
<th>Id-LS</th>
<th>Cr</th>
<th>DpL-LS</th>
<th>MxN-C</th>
<th>A-Pr</th>
<th>A-Su</th>
<th>On</th>
<th>Id-BR</th>
<th>Mark</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [ka.li.dji.ki.-dj.ki.-dj]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>i</td>
<td>dj</td>
<td>13*</td>
<td>kali</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [ka.lidi.ki.-dj.ki.-dj]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>**</td>
<td>dj</td>
<td>11*</td>
<td>kali</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. [ka.lidi.kidj.ki.-dj]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>***</td>
<td>dj</td>
<td>11*</td>
<td>kali</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tableau 3.71 above shows the OT grammar needed if word-internal codas never surface in the language. Tableau 3.72 shows the OT grammar needed if
word-internal codas are tolerated in the surface form. The difference between the two tableaux is that Dep-LS is ranked lower than No-Coda in the first, and higher than No-Coda in the second.

I found some cases that cannot be correctly predicted through my grammar, namely pacu-cu-n "looking", maca-ca-m "very spicy" and taqa-ga-d "sleeping" or taje-gaje-d "sleeping" or "just fell asleep". I analyze them in Appendix A and conclude that they are lexical exceptions.

From this analysis of Paiwan reduplication and affixation it is shown that OT can be successfully utilized to predict the correct surface form when there is more than one type of reduplication and where there are other affixes present.

In addition to successfully describing the pattern of reduplication in Paiwan, this analysis shows that reduplication can follow the same constraints as affixation. This is thus evidence in support of Marantz’s (1982) claim that reduplication is really affixation. However, I also note that just because reduplication can follow the same constraints as affixation, that does not necessarily mean that they have to. For instance, I could have kept constraints on reduplication and affixation separate, even though many would overlap in function.63

In addition, this study shows clear evidence that root reduplication is more likely

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63 James Myers has noted that this overlap would be considered a serious weakness in the alternative hypothesis.
to be a suffix than a prefix. This is different from some past analyses which have considered it to be a prefix. As noted in Chapter two, if one insists that RtRED aligns to the left of its base, then one would have to align it to the left of the word-final foot. This is different from the alignment of prefixes in the language. In addition, since the reduplication of RtRED copies from the right side of the word, it is also more likely to be a suffix than a prefix.

The issue of reduplication as affixation will be explored in greater detail in the next chapter.
Chapter 4

Theoretical Implications

In the previous chapter I used OT to show that reduplicants can follow the same constraints as affixes. In addition, I listed the reduplicant as a morpheme in the lexicon, just like words and affixes. So now we are left with the question of what exactly the difference is between reduplicants, affixes and even words.

In this chapter, I will be taking a closer look at reduplicants and affixes. One of the issues I will look into is the role of reduplicative constraints (BR constraints) with regard to non-reduplicative affixes. Then I will propose that different types of morphemes have differing degrees of specification which could be thought of in terms of a spectrum.

I will also be looking at how Optimality Theory handles extraprosodic edges, an issue that is very pertinent to my analysis. In addition, OT has certain issues pertaining to correspondence which I will discuss in greater detail. The first is concerned with the role of Max-BR. The second discusses the differences between Input-Output and Lexical-Surface interfaces.

This chapter is divided into two sections. The first section discusses the main focus of the thesis, which are the implications of reduplication being affixation for OT.
The second section looks in detail at issues internal to OT. My analysis brought up certain issues about the way OT handles prosodic entities such as word-final codas and also how it deals with constraints like Max-BR and identity relationships between input, reduplicant and base.

4.1 Reduplicative Constraints Applicable to Affixes?

In chapter three I showed that reduplicants can be subject to the same constraints as affixes. Now I will show that affixes can be subject to constraints pertaining to reduplicants. In other words, I will assume that reduplicants and affixes are all in the same class, say Modifier. The BR identity relationships would then be changed to BM identity relationships.

This does not have a detrimental effect on the analysis since only reduplicants have unspecified content. Since any change in prespecified content will result in violations of LS constraints, only reduplicants can have the flexibility to change their content. See the tableaux below which show the effects of BR constraints as BM constraints.

Tableau 4.1 Demonstrating the use of base-modifier identity with BM constraints:

<table>
<thead>
<tr>
<th></th>
<th>Lexical:</th>
<th>*R ep</th>
<th>Anc-BM</th>
<th>Id-LS</th>
<th>Cr -M</th>
<th>N-C</th>
<th>Dp-LS</th>
<th>A-P</th>
<th>A-Set</th>
<th>Id-BM</th>
<th>Mark</th>
<th>Mx-BM</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>[si.-ge. le.ge.-le.ge.-]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>[si.le.-ge. le.ge.-le.ge.-]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>[ge.-ge.le.ge.-le.ge.-]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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The tableau above shows how we can use Anch-BM, Contig-M, Ident-BM(f) and Max-BM to look at all affixes in the word, including non-reduplicative ones. As with CaRED, I assume that the morphemes are in correspondence with the base. Thus, there are no Anch-BM violations from candidates (a) or (c). Instead, these candidates are violating the lower ranked Ident-BM(f).

Even when reduplicative and affixal constraints are combined into one category, my analysis still predicts the correct candidate. Thus, we could preliminarily conclude that affixes can and do follow the same constraints as reduplicants.

4.1.1 The Morpheme Spectrum

Up to this point, my analysis has been giving evidence in support of the claim that reduplication and affixation are one and the same class. They both can follow the same constraints without detrimental effects on my analysis. In addition, they are represented in the lexicon and both subject to LS constraints.

Thus, I will posit that the only difference between reduplicants and affixes is in the amount of specification. This can be represented with the spectrum below.

<table>
<thead>
<tr>
<th>complete</th>
<th>partial segmental</th>
<th>partial size</th>
<th>none</th>
</tr>
</thead>
<tbody>
<tr>
<td>affix</td>
<td>CaRED</td>
<td>RtRED</td>
<td>Nakanai Reduplication</td>
</tr>
</tbody>
</table>

Figure 4.1 Spectrum of morphemes arranged according to amount of specification
In the spectrum above, affixes (and words for that matter) are fully specified.

In the case of CaRED, the size of the reduplicant is not specified. However, there is partial segmental specification since CaRED must have an \( a \). RtRED has no segmental specification, but does have specification of size, i.e. two moras. The last category has size and segments both unspecified. This type of reduplication can be found in Spaelti’s (1999) analysis of Nakanai reduplication.

4.1.2 Conclusion

In conclusion, I have shown that not only do reduplicants follow the same constraints as affixes, but affixes also can follow the same constraints as reduplicants. This allows us to combine reduplicant and affix constraints under one category of morpheme constraints. This class of morphemes can then be organized along a spectrum according to their degree of prespecification. These claims all support Marantz’s (1982) claim that reduplication is really just a form of affixation. They are also consistent with a new, and perhaps radical, approach developed by Golston (1996) called Direct Optimality Theory (DOT). In DOT, all morphemes are represented in terms of constraint violations. In this way, there is automatically a uniform representation of all lexical items. Differences in specification would then be represented by what constraints the morpheme violates.
4.2 Issues Pertaining to Optimality Theory

In this section I look at issues that arose in my analysis which pertain to Optimality Theory itself. The first problem which I look at is how to analyze word-final codas in OT. The second issue, looks at the role of Max-BR. I base much of my discussion on Spaelti (1999). Max-BR causes different types of reduplicative behavior depending on whether it counts violations or "satisfactions", by which I mean the number of times a candidate conforms to a constraint. The third issue, also raised by Spaelti (1999), addresses the difference between the Lexical-Surface interface and the Input-Output (or Input-Base-Reduplicant) interface.

4.2.1 Word-Internal vs. Word-Final Codas

As noted in Chapter 2, Paiwan has virtually no word-internal codas, but has an abundance of word-final codas. In my analysis, I represented this fact by making the word-final coda extraprosodic. In this way, word-final codas can be allowed, even if word-internal codas are strictly forbidden.

The way I made the word-final coda extraprosodic involved one theoretical assumption and two anchor constraints. The theoretical assumption was that word-final codas are not codas at all, but actually are onsets to a dull syllable. I represented this dull syllable notationally after the prosodic word boundary with the Ø symbol. In this way, word-final codas did not violate the No-Coda constraint.
The two constraints which I used were Anch-R and Anch-P. The first is violated when the final segment of the reduplicant does not correspond to a mora. This constraint ensures that the reduplicant never copies the word-final coda. This is important in vowel-initial words which do not copy the word-final coda, even when doing so will satisfy Onset and have no violations of No-Coda (i.e. $m\_tja\_u\_tja\_-k$ and $^*m\_u\_tja\_k\_u\_tja\_k$). Anch-P is violated when the final segment of the word does not correspond to the final segment of a morpheme in the lexical entry. Thus, it ensures there will be no deletion of or epentheses after the word-final coda. This is important in monomoraic words, which could, in order to satisfy their bimoraic template, epenthesize a vowel after their word-final coda ($^*k\_em\_a\_na\_ka\_na$, instead of the grammatical $k\_em\_a\_ka\_n$).

Thus, the dull syllable assumption, Anch-R and Anch-P all work together to create an extraprosodic word-final coda.

I now show why this approach is better than another approach in which the right edge of the prosodic word is misaligned with the right edge of the grammatical word. McCarthy and Prince (1993) and Kager (1999: 111) both have analyses where the stem or the grammatical word prefers to align with the prosodic word. They use high ranking alignment constraints to prevent segments from epenthesizing at the beginning of vowel-initial words. Epenthesis is forbidden, even though Onset would
favor it, because adding a segment to the left edge of the prosodic word will make the prosodic word misalign with the grammatical word.

Taking their idea a step further, one approach which I tried in Tseng (2002, 2003) involves the prosodic word and the grammatical word being misaligned to allow extraprosodic behavior of word-final codas. I used the anchoring constraint defined below.

(80) Anch(oring)-GP: The rightmost element of the grammatical word corresponds to the rightmost element of the prosodic word.

The tableau showing how this constraint is used is given below. The vertical line marks the grammatical word boundary.

Tableau 4.2 Extraprosody of word-final codas: "partner, etc." + RtRED = "partners, etc.",

<table>
<thead>
<tr>
<th>Candidates</th>
<th>Lexical: salad + RtRED</th>
<th>No-Coda</th>
<th>Anch-GP</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [sa.la.-(sa.la.)]dj</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. [sa.(la.-sa.)]la-dj</td>
<td></td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>c. [sa.la.-sa.(la-dj)]</td>
<td>dj</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thus, in the tableau above, the optimal candidate wins because it doesn't violate the high ranking No-Coda constraint. However, as one can see in the tableau below, this constraint ranking does not work when we have a word with a word-internal coda. This is because with No-Coda ranked higher than Anch-GP, the prosodic word will
move as far left as it can to avoid codas.

<table>
<thead>
<tr>
<th>Lexical: kalidj{kidj + μRED</th>
<th>No-Coda</th>
<th>Anch-GP</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [ka.lidj.kidj.-{ki}\dj</td>
<td>dj,dj</td>
<td>*</td>
</tr>
<tr>
<td>b. *[ka.lidj.(ki)\dj-kidj</td>
<td>dj</td>
<td>****</td>
</tr>
<tr>
<td>c. <em>+</em>[ka.li.-ka.li.-]djkidj</td>
<td>****</td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, candidate (c) will be optimal since it moves the prosodic word boundary far enough to the left that there are no coda violations. This, however, yields ungrammatical results in terms of segmental form and position of stress. Thus, with words containing word-internal codas, another method is needed.

Although this is not a problem in Paiwan, it will be for languages such at Thao, another Formosan language of Taiwan, which has many word-internal codas. For those interested, I have included an OT analysis of Thao in Appendix B.

### 4.2.2 Max-BR

Spaetti (1999: 19,20) notes that Max-BR will behave differently depending on whether it counts violations or satisfactions. In other words, we can either count violations of Max-BR or we can count how many times it is satisfied. This section will look at the different behavior of Max-BR. It will also show that for Paiwan, Max-BR's role is minimal in our analysis.

If we count violations, then there are two possible surface forms which Max-BR
will consider most optimal. The first is the result of what Spaelti calls the Max-R effect, where the reduplicant must be as large as possible. The tableau he uses to illustrate the Max-R effect is given below (he made up the data item as a hypothetical example).

### Tableau 4.4 Spaelti's Max-R Effect (1999: 19)

<table>
<thead>
<tr>
<th>Candidates</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexical: /RED + badupi/</td>
<td></td>
</tr>
<tr>
<td>a. badupi</td>
<td>badupi</td>
</tr>
<tr>
<td>b. badubadupi</td>
<td>**</td>
</tr>
<tr>
<td>c. babadupi</td>
<td>****</td>
</tr>
</tbody>
</table>

This Max-R effect is the effect that is usually expected when using the Max-BR constraint. However, Max-BR will also create what Spaelti calls a Min-B effect. The Min-B effect will favor deletion of the base, as opposed to complete reduplication. Spaelti illustrates the Min-B effect in the tableau below.

### Tableau 4.5 Spaelti's Min-B Effect (1999: 19)

<table>
<thead>
<tr>
<th>Candidates</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexical: /RED + badupi/</td>
<td></td>
</tr>
<tr>
<td>a. babadupi</td>
<td>babadupi</td>
</tr>
<tr>
<td>b. babadu</td>
<td>**</td>
</tr>
<tr>
<td>c. baba</td>
<td>****</td>
</tr>
</tbody>
</table>

This is not the effect that one usually expects from Max-BR. However, it is crucial in predicting the correct output in certain instances. For example, the Min-B effect does play a role in infixation. This is noted by Spaelti (1999) in the tableau.
Tableau 4.6 Spaelti’s Min-B effect in infixation: Example from Popjetur, "middle" (Spaelti 1999: 160)

<table>
<thead>
<tr>
<th>Candidates</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexical:  /RED + taporan/</td>
<td></td>
</tr>
<tr>
<td>a. ta-por-poran</td>
<td>an</td>
</tr>
<tr>
<td>b. tap-taporan</td>
<td>oran</td>
</tr>
</tbody>
</table>

In this example, candidate (a) has fewer violations of Max-BR because the base to the right of the infixed reduplicant is minimized. This type of analysis may be useful if one needs to explain reduplicant infixation.

By contrast, if Max-BR is interpreted in terms of how many times it is satisfied, then the winner would always be the one where the reduplicant maximizes the base. This is illustrated by Spaelti in the tableaux below. The smiley face means a "satisfaction" of Max⁺-BR.

Tableau 4.7 Spaelti’s Max⁺-BR constraint (1999: 20)

<table>
<thead>
<tr>
<th>Candidates</th>
<th>Max⁺-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexical: /RED + badupi/</td>
<td></td>
</tr>
<tr>
<td>a. badupi-badupi</td>
<td>☺☺☺☺☺☺</td>
</tr>
<tr>
<td>b. badubadupi</td>
<td>☺☺☺</td>
</tr>
<tr>
<td>c. babadupi</td>
<td>☺☺</td>
</tr>
</tbody>
</table>

Tableau 4.8 Spaelti’s Max⁺-BR constraint eliminates Min-B Effect (1999: 20)

<table>
<thead>
<tr>
<th>Candidates</th>
<th>Max⁺-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexical: /RED + badupi/</td>
<td></td>
</tr>
<tr>
<td>a. ba-badupi</td>
<td>☺☺</td>
</tr>
<tr>
<td>b. ba-badu</td>
<td>☺☺</td>
</tr>
<tr>
<td>c. ba-ba</td>
<td>☺☺</td>
</tr>
</tbody>
</table>

64 I have simplified the tableau from that in Spaelti’s original analysis, concentrating only on the final two candidates that weren’t eliminated through prosodic constraints.
Thus, using Max+±BR will result in favoring the candidate which copies more of its base. In order to do this, the base must be kept as large as possible. In addition, the reduplicant must be positioned at the extreme edge of the base in order to maximize its size. This is illustrated in the tableau below.

Tableau 4.9 Spaelti's Max+±BR constraint (1999: 20)

<table>
<thead>
<tr>
<th>Candidates</th>
<th>Max+±BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexical: /RED + badupi/</td>
<td></td>
</tr>
<tr>
<td>a. ¬ badupi-badupi</td>
<td>☺☺☺☺☺☺☺</td>
</tr>
<tr>
<td>b. babadupidupi</td>
<td>☺☺☺☻</td>
</tr>
<tr>
<td>c. badubadupi</td>
<td>☺☻</td>
</tr>
</tbody>
</table>

Thus, this Max+±BR constraint will not tolerate infixing without the help of some kind of outside constraint. This may be useful if you want to prevent infixation of the reduplicant.

Due to the Max-R and Min-B effects, Max-BR is ranked very low in the grammar. Instead, the template and Markedness constraints are all that influence the size of the reduplicant. As can be seen in the tableau below, whether I use Max-BR or Max+±BR has no effect on my analysis in Paiwan.

Tableau 4.10 Ca Reduplication as a suffix, interaction with another reduplicative suffix: CaRED + "small" + RtRED + LP = "small ones"

<table>
<thead>
<tr>
<th>aRED + keDi +µµRED + -an</th>
<th>*R ep</th>
<th>1d- Cn</th>
<th>Cr</th>
<th>N-</th>
<th>C</th>
<th>Dp-</th>
<th>A-P</th>
<th>u-R</th>
<th>On</th>
<th>1d- BR</th>
<th>Mar</th>
<th>Mx- BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [ka-keDi.-ke.Dj.-a.n]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td>a</td>
<td></td>
<td>12*</td>
<td>6 ☻</td>
</tr>
<tr>
<td>b. [kaDi.-keDi.-ke.Dj.-a.n]ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td>a</td>
<td></td>
<td>14*</td>
<td>8 ☻</td>
</tr>
</tbody>
</table>

Thus, in languages which have templatic requirements on reduplication,
Max-BR is very low ranked in the grammar.

4.2.3 The Base/Reduplicant/Input Distinction

In section 3.1.1 I introduced LS constraints. These look at correspondences between the lexical form and everything in the surface form, including the reduplicant. This type of correspondence or identity relationship is different from that of IB (Input-Base, otherwise known as IO or Input-Output) used in McCarthy and Prince’s (1995a) full model of correspondence relationships. This model is given below.

```
Lexical:    /Af RED + Stem/

I-R Faithfulness          I-B Faithfulness

Output:        R        B
               B-R Identity

Figure 4.2 Full Model (McCarthy and Prince 1995a: 358)
```

The model above shows three types of correspondence relationships: IR, IB and BR. IB relations are usually referred to as Input-Output or IO relations. McCarthy and Prince argue for the IR relationship with the following example from Klamath. Note that there are phonological constraints not listed which condition the base to change from *mbody + dk* to *mpditk*.
In the example above, the correct output can be predicted if it is assumed that the reduplicant is more faithful to the input than the base. However, there are theoretical issues which make using IR constraints controversial. McCarthy and Prince (1995a) note that with a three-way relationship, certain "pathological" results occur. An example of this occurs with the ranking \{BR Identity, IR Faithfulness\} >> C >> IB Faithfulness, where C represents a phonological constraint. This ranking can result in an unnatural form of underapplication. Their example is that of a language which requires \( t \) to palatize to \( \check{c} \) when it is preceded by \( i \). In the tableau below, they show that in a reduplicated form, the rule does not apply even though both the reduplicant and the base are in the proper environment. The reason it doesn’t apply is solely based on BR Identity and IR Faithfulness. These constraints cause the unusual situation where a phonological rule cannot apply to any part of reduplicated words, but will apply to all non-reduplicated words. This violates the principle of emergence of the unmarked, since reduplicated words will be more marked than unrepeated words. This type of reduplication-specific complete

\begin{table}
\centering
\begin{tabular}{|c|c|c|}
\hline
Input: & Ident-IR(F) & Ident-BR(F) \\
\hline
a. & mbo-mpdictk & * \\
b. & mpo-mpdictk & * \\
\hline
\end{tabular}
\caption{Tableau 4.11 I-R Faithfulness >> B-R Identity, in Klamath (McCarthy and Prince 1995a: 360)\textsuperscript{65}}
\end{table}

\textsuperscript{65} I have modified the tableau so that it conforms with conventions in this thesis. McCarthy and Prince (1995a) label the constraint I-R Faithfulness instead of Ident-IR(F) and B-R Identity instead of Ident-BR(F).

\textsuperscript{66} DIST is the abbreviation for distributive, which is the semantic role of the reduplicant (McCarthy and Prince 1995a: 348).
underapplication does not occur in real languages.

| Tableau 4.12 A pathological (but hypothetical) example (McCarthy and Prince 1995a: 363) |
|----------------------------------|--------------------------------------------------|------------------|------------------|------------------|
| Input: i- + taki + RED | BR Identity | IR Faithfulness | C | IB Faithfulness |
| a. | i-taki-taki | | | |
| b. | i-čaki-čaki | * | | * |
| c. | i-čaki-taki | * | * | * |
| d. | i-taki-čaki | * | * | * |

Another example of a pathological ranking mentioned by McCarthy and Prince (1995a) is: IR Faithfulness >> C >> BR Identity, IB Faithfulness. This ranking is the same as that which results in emergence of the unmarked except that BR Identity has switched places with IR Faithfulness. The result is that now we get emergence of the marked. Thus, only in reduplicants will the phonological constraint fail to have any effect, so only in reduplicants will you find phonological structures that never appear anywhere else in the language. This situation does not occur in natural languages either.

To solve these problems, McCarthy and Prince conclude that Root Faithfulness must always be ranked above Affix Faithfulness, proposing the universal metaconstraint Root-Faith >> Affix-Faith. This effectively means that IR constraints can never outrank IB constraints.

This type of correspondence model, however, is not accepted by Spaelti (1999),

---

67 I have modified the form of the tableau so that it conforms to the conventions in this thesis.
who argues that there is no need for the IR relationship at all. He believes, instead, that reduplication is subject to normal faithfulness between a lexical representation and a surface representation. He posits the following relationship mapping.

Spaelti notes that according to his model, reduplication is double realization of underlying segments. This does not incur violations of Max-LS or Dep-LS, but it does incur violations of other constraints (such as *Repeat or NoEcho (Yip 1995), Integrity (McCarthy and Prince 1995a) or *Struc).

I now take the next step, which Spaelti (1999) did not take, and apply his analysis to the Klamath data given by McCarthy and Prince (1995a). As one can see, the correct candidate can still be predicted, since the extra violation of LS faithfulness will override the gain from BR Identity.
<table>
<thead>
<tr>
<th>Tableau 4.13 Demonstrating that IR is not needed: LS Faithfulness &gt;&gt; BR Identity, in Klamath</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexical: DIST + mbody' + dk</td>
</tr>
<tr>
<td>a. mbo-mdpdk</td>
</tr>
<tr>
<td>b. mpo-mdpdk</td>
</tr>
</tbody>
</table>

In conclusion, in Paiwan and Klamath at least, Spaelti’s claims still hold true.

4.2.4 Conclusion

In this section I addressed issues pertaining to the Optimality Theory framework.

I first looked at how one represents the differences between word-internal and word-final codas. As discussed in section 3, there is evidence in the previous literature (Hayes 1982, Harris and Gussmann 1998) which supports the view that the word-final coda is different in status from word-internal codas. In chapter 5.2.1 I show that an approach using a high ranking No-Coda constraint and the constraint Anch-GP, which misaligns the prosodic word boundary with the grammatical word boundary in order to allow word-final codas, is unfeasible in languages with word-internal codas. For an analysis of one of these types of languages, Thao, please consult Appendix B.

The second issue addressed in this section on the OT framework dealt with Max-BR vs. Max+-BR. The first constraint tallies how many times it is violated while the second constraint tallies how many times it is satisfied. I found that using either constraints will have no effect on my analysis since Max-BR is the lowest ranking constraint specified in my grammar. This low ranking is required in
languages have templatic size requirements on reduplicants.

The third issue addressed the Input-Output (McCarthy and Prince 1995a) vs. Lexical-Surface (Spaelti 1999) interface. This thesis adopts the Lexical-Surface interface since it addresses all the problems presented by McCarthy and Prince regarding the full model of correspondence (Input-Base-Reduplicant).
Chapter 5

Conclusions

This thesis has offered a new argument in favor of Marantz's (1982) claim that reduplication is really a form of affixation. It was shown that root reduplication follows the same constraints as suffixes and Ca reduplication follows the same constraints as prefixes. In addition, it cannot be the other way around. This offers a formal argument in support of the hypothesis that reduplication is really just a form of affixation.

I have also gone a step further to show that all constraints for reduplication can also be relevant to affixes. Thus, a new class of constraints which encompass both reduplicants and affixes could theoretically be established.

I use a morpheme spectrum to show the different degrees of specification which morphemes have. Thus, partial reduplication is at one extreme while non-reduplicative affixes are on the other extreme. In the middle we have reduplication of a set size and Ca reduplication. This representation gives us a unified approach to looking at affixation and reduplication.

In addition to the issues of reduplication and affixation, this thesis also shows different aspects of approaches to analyzing word-final coda extrametricality. It also
comments on the insignificant role of Max-BR in an analysis requiring templates. Then it gives evidence in support of the lexical-surface interface given by Spaelti (1999) as opposed to the Input-Base-Reduplicant interface given by McCarthy and Prince (1995a). Finally, since it analyzes many different morphological functions with one grammar, this study also shows that OT can be a very powerful and useful tool in analyzing morphology.

The next step would be to document the full range of affixation and test it with the analysis presented in this thesis. Also, the semantics of reduplication need to be investigated in greater detail. In addition, though this thesis looks only at two Austronesian languages, there are many other languages which can be used for comparison. For those interested, I have applied my analysis successfully to Thao reduplication in Appendix B. A broad perspective on reduplication will allow us to gain a clearer idea of the different types of reduplicative patterns that can occur cross-linguistically.

Finally, one advancement which I would be excited to see is applying Direct Optimality Theory (Golston 1996) to this analysis. In direct optimality theory, all morphemes are represented in terms of constraint violations. In this way, there is automatically a uniform representation of all lexical items.
References


APPENDIX A

Paiwan Lexical Exceptions

In this section I will show how the analysis in this thesis is not valid for certain lexical exceptions. I will also try to give possible reasons for their exceptional behavior. The first word, pacun "to see", is a very high-frequency verb which does not take the Actor Pivot marker. The tableau below shows how my analysis will predict the incorrect candidate.

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>*Rep</th>
<th>Anc</th>
<th>Id-Cn</th>
<th>Cr</th>
<th>Mx-LS</th>
<th>N-C</th>
<th>Dp-A-Pr</th>
<th>A-Su</th>
<th>On</th>
<th>Id-BR</th>
<th>Mark</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>pacun + µRED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. [pa.cu.-cu-n]Ø</td>
<td></td>
<td></td>
<td></td>
<td>µ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7* pa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. * [pa.cu.-pa.cu-n]Ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above, candidate (b) is optimal since it satisfies the template constraint. A way around this problem is to assume that pa may be some kind of archaic affix, which would make reduplicating it violate *Repeat(af). This is not a farfetched assumption since many affixes in Paiwan use ma and pa. In addition, pacun is never affixed with the AP. Thus, a possible solution is given in the tableau below.
I will now look at the lexical exception *macacam* "spicy (ind)". In this form, *ma* doesn't act like the prefix *ma-* which is commonly found in stative verbs. Instead, it acts more like a part of the stem.\(^{68}\) Thus, I will speculate that in the word *macacam* "spicy (ind)", the language treats morphemes beginning with *m* differently from the way it treats those that do not. Perhaps if the morpheme begins with *ma* it will be confused with the *ma*- prefix during reduplication.

Our next two exceptions are not as easily dismissed, where *taqed* "to sleep" has the reduplicated form of *taqe-qaqe-d* "just fell asleep" and *ta-qa-qed* "sleeping". I have no explanation for why this word does not reduplicate to form *taqe-taqe-d*, except to classify it as a lexical exception. Since it is such a common word, this is an acceptable explanation.

---

\(^{68}\) I learned this from communication with Wu Jun-ming (吳俊明), a classmate of mine at Taiwan National Chung Cheng University.
APPENDIX B

Thao Reduplication

B-1. Introduction

This appendix offers a detailed look at Thao reduplication, a language with word-internal codas and complex onsets. The data is taken from L. Chang's (1998) analysis of Thao. I propose that the OT analysis used for Paiwan reduplication is also applicable to Thao reduplication. I show that L. Chang's analysis faces difficulties due to her categorization of reduplication. Whereas I have one class of suffixal reduplication, she divides this class into two categories: full and rightward. The following section addresses this classification. The second section is a new OT analysis of Thao reduplication.

B-2. Categorizing Reduplication

L. Chang categorizes Thao reduplication into three main groups: full, Ca and rightward.$^{69}$ She bases these categories on their syllable structure and semantics (L. Chang 1998: 281-284). Like Spaelti (1999) among others, she tries to describe forms of reduplication as phonologically conditioned allomorphs, with different phonological shapes dependent on the phonological shape of the base which they

$^{69}$ She also has CV reduplication, but this is not a major grouping with only a few members. I will not be discussing it in this thesis.
attach to. She concludes that Ca reduplication cannot be considered an allomorph of full reduplication (L. Chang 1998: 286). In addition, her full and rightward reduplication are phonologically conditioned allomorphs. However, she posits that full reduplication has the reduplicant located to the left of the base, while rightward reduplication has the reduplicant located to the right of the base. As, will be demonstrated in the next section, this difference in location of the reduplicant will complicate her analysis. I now begin describing the different classes of reduplication in Thao.

B-2.1 Full Reduplication and Rightward Reduplication

In this section, I will argue that full reduplication and rightward reduplication are allomorphs. However, unlike L. Chang, I will show that full reduplication is actually rightward reduplication. L. Chang believes that full reduplication is leftward.

Let's first look at examples of full reduplication. In the case of full reduplication, the reduplicant prefixes to roots which have a maximum of two syllables and have no word-internal coda and no complex onset. Examples of full reduplication are given below.
(81) Full reduplication in Thao (L. Chang 1998: 280)

a. Full reduplication in disyllabic bases

<table>
<thead>
<tr>
<th>Base</th>
<th>Affix</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>ca.kaw</td>
<td>ma ca ca ca Kaw</td>
<td>&quot;very greedy&quot;</td>
</tr>
<tr>
<td>ca.pu</td>
<td>ma ca pu ca pu</td>
<td>&quot;will sweep and sweep&quot;</td>
</tr>
<tr>
<td>da.uk</td>
<td>mi da du da uk</td>
<td>&quot;to keep still&quot;</td>
</tr>
<tr>
<td>za.i</td>
<td>mi in zai zai</td>
<td>&quot;to say repeatedly&quot;</td>
</tr>
<tr>
<td>a.can</td>
<td>mia ac a can</td>
<td>&quot;to have everything&quot;</td>
</tr>
<tr>
<td>a.ra</td>
<td>ar a ra</td>
<td>&quot;to take, fetch, get&quot;</td>
</tr>
</tbody>
</table>

b. Full reduplication in monosyllabic bases

<table>
<thead>
<tr>
<th>Base</th>
<th>Affix</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>braq</td>
<td>kum bra braq</td>
<td>&quot;to peck open&quot;</td>
</tr>
<tr>
<td>qca</td>
<td>pig qca qca</td>
<td>&quot;to change the location of something&quot;</td>
</tr>
<tr>
<td>tup</td>
<td>kan tu tup</td>
<td>&quot;to follow persistently&quot;</td>
</tr>
<tr>
<td>du</td>
<td>mash du du</td>
<td>&quot;to pass something along&quot;</td>
</tr>
<tr>
<td>kan</td>
<td>pa ka kan</td>
<td>&quot;to feed repeatedly&quot;</td>
</tr>
</tbody>
</table>

As can be seen from the list above, L. Chang believes full reduplication is leftward reduplication. Before I argue for it being rightward, let us take a look at rightward reduplication.

Rightward reduplication occurs on bases of two or more syllables with the following properties. If the base is disyllabic it must contain a consonant cluster in initial or medial position. Otherwise, the base has to be over two syllables long (L. Chang 1998: 284). Examples of this class of reduplication are given below.

---

70 I underline the reduplicant and put the affix in bold to make L.Chang’s original data conform to the notation of this thesis.
71 Glosses were not given for the unreduplicated forms.
72 Chang notes here that this form is derived from mia + aca-akan after coalescence of vowels, likewise for ara-ara.
Rightward reduplication (L. Chang 1998: 284)

a. lhqizi "to look after, protect" a’. lh-ug-qizi-qizi "to protect, watch over"

b. qriu’ "to steal" b’. q-un-riu-riu’ "to steal constantly, habitually"

c. shnara "to ignite, catch fire" c’. pa-shnara-nara "to burn s.t. repeatedly"

d. m-igkmir "to grasp in one hand" d’. igkmi-kmi-i-in "to be rolled into a ball in one hand"

e. m-arfaz "to fly, be flying" e’. m-arfa-raf-z "to keep flying around"

f. m-armuz "to dive" f’. m-armu-rmu-z "to dive repeatedly"

g. patihaul "a spell, a curse" g’. matihau-hau-l "to cast a spell on s.o."

Note that in her classification above, rightward reduplication patterns look much like Paiwan's suffixal reduplication. The reduplicant doesn't copy the word-final coda and infixes in front of it.

After examining L. Chang’s classifications, there seems to be justification to categorize full and rightward reduplication together as rightward reduplication. Furthermore, looking at the characteristics of full and rightward reduplication reveal that they are very similar. For instance, one notices that rightward reduplication also does not reduplicate the word-final coda, just like full reduplication. Since full reduplication is restricted to bases of maximally two syllables in length and the reduplicant is two syllables long, there is no way of justifying that the reduplication is leftward rather than rightward. In words of two syllable or less, it seems simpler to believe that reduplication is leftward because the coda is not copied (i.e. fari-fariw as opposed to fari-fari-w "to go shopping, shop around"). However, this is not a strong argument since we already know that rightward reduplication does not reduplicate word-final codas either (i.e. m-arfa-raf-z "to keep flying around").
Looking at the data below we can compare full reduplication with rightward reduplication. I have shown, by underlining, what full reduplication would look like if it were classified as rightward reduplication.

(83) Rightward reduplication (L. Chang 1998: 284)

<table>
<thead>
<tr>
<th>English</th>
<th>Paiwan</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. lhqizi</td>
<td>&quot;to look after, protect&quot;</td>
</tr>
<tr>
<td>&quot;to protect, watch over&quot;</td>
<td></td>
</tr>
<tr>
<td>b. qriu'</td>
<td>&quot;to steal&quot;</td>
</tr>
<tr>
<td>&quot;to steal constantly, habitually&quot;</td>
<td></td>
</tr>
<tr>
<td>c. shnara</td>
<td>&quot;to ignite, catch fire&quot;</td>
</tr>
<tr>
<td>&quot;to burn s.t. repeatedly&quot;</td>
<td></td>
</tr>
<tr>
<td>d. m-igkmir</td>
<td>&quot;to grasp in one hand&quot;</td>
</tr>
<tr>
<td>&quot;to be rolled into a ball in one hand&quot;</td>
<td></td>
</tr>
<tr>
<td>e. m-arfaz</td>
<td>&quot;to fly, be flying&quot;</td>
</tr>
<tr>
<td>&quot;to keep flying around&quot;</td>
<td></td>
</tr>
<tr>
<td>f. m-armuz</td>
<td>&quot;to dive&quot;</td>
</tr>
<tr>
<td>&quot;to dive repeatedly&quot;</td>
<td></td>
</tr>
<tr>
<td>g. patihaul</td>
<td>&quot;a spell, a curse&quot;</td>
</tr>
<tr>
<td>&quot;to cast a spell on s.o.&quot;</td>
<td></td>
</tr>
</tbody>
</table>

(84) Full reduplication as rightward reduplication

<table>
<thead>
<tr>
<th>English</th>
<th>Paiwan</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. cpiq</td>
<td>&quot;to whip, beat, etc.&quot;</td>
</tr>
<tr>
<td>&quot;to whip repeatedly&quot;</td>
<td></td>
</tr>
<tr>
<td>b. fariw</td>
<td>&quot;to buy&quot;</td>
</tr>
<tr>
<td>&quot;to go shopping; to shop around&quot;</td>
<td></td>
</tr>
<tr>
<td>c. kan</td>
<td>&quot;to eat&quot;</td>
</tr>
<tr>
<td>&quot;to feed repeatedly&quot;</td>
<td></td>
</tr>
<tr>
<td>d. kari</td>
<td>&quot;to dig up or out&quot;</td>
</tr>
<tr>
<td>&quot;to dig up repeatedly/habitually&quot;</td>
<td></td>
</tr>
</tbody>
</table>

Looking at the data, full reduplication written as rightward reduplication looks very similar to Paiwan's root reduplication. For instance, it copies up to two moras, excluding the word-final coda. It copies from right to left and also does not copy affixes. In addition, since rightward reduplication has the same properties, I will conclude full reduplication is actually rightward reduplication.

In addition to this, according to L. Chang, the semantics of the two groups are the same. Whereas Ca reduplication has certain specialized meanings which set it apart from other types of reduplication, full and rightward reduplication have identical semantic functions. This is also support for classifying full and rightward
reduplication together under one single class.

Finally, with only twenty members, rightward reduplication is not nearly as productive as full or Ca reduplication. This could be the result of the language having very few trisyllabic words that aren’t historically derived through CVC reduplication (which are only allowed to undergo Ca reduplication). Thus, it is plausible to assume that putative examples of rightward reduplication are actually members of what we already know to be the most productive class for reduplication in the language: full reduplication. This would allow full reduplication to occur on all words no matter how many syllables they consist of, making it a more encompassing reduplicative class. Thus, full reduplication is actually rightward in terms of its phonological structure. From now on I will be referring to this class as root reduplication (RtRED).

The major difference between Paiwan's root reduplication and Thao's root reduplication is that L. Chang's class of rightward reduplication does include some members with complex onsets in the last syllable, and codas in the penultimate syllable. Paiwan does not have complex onsets and it has very words with word-internal codas. These words do behave differently from typical root reduplication in that they copy in what could be described as a CCV pattern rather than a CV or CV(C)V pattern (note that there is no CVCV pattern available for
(85) Rightward reduplication of complex onsets
a. m-/ig.kmir/ 'to grasp in one hand' igkmi-kmi-r-in 'to be rolled into a ball in one hand'
b. /bu.qnur/ 'anger, hatred' mia-buqnu-qnu-r 'to be irritable'
c. /pa.tqal/ 'a mark' patqa-tqa-l-an 'to put marks on things'
d. ma-/ku.tnir/ 'compact, hard' mia-kutni-tni-r 'to harden'
e. /ta.qnar/ gloss not given mia-taqna-qna-r 'to doze or relax'
f. /dut.khun/ gloss not given mia-dutkhu-khu-n 'to hunch over, bend over'
g. /ag.qtu/ 'to contemplate' agktu-agtu 'think about'

(86) Rightward reduplication of penultimate coda
a. m-/ar.faz/ 'to fly, be flying' m-arfa-rfa-z 'to keep flying around'
b. m-/ar.muz/ 'to dive' m-armu-mu-z 'to dive repeatedly'
c. ma-/par.fu/ 'wrestle with one another' ma-parfu-fu 'wrestle repeatedly w. one another'
d. /par.bu/ 'will bake' parbu-rbu-an 'place where s.t. is baked'
e. /sig.ki/ gloss not given sigki-kki 'to kneel'
f. /lun.duz/ 'rectilinear quality' mia-lundu-ndu-z 'to go in a straight line'
g. /ram.bak./ gloss not given mia-ramba-mba-k 'fall open, as one’s mouth when startled'

I will show in the next section that these characteristics of Thao can be accounted for with the addition of a constraint forbidding complex clusters and a re-ranking of Dep-LS.

B-2.2 Ca Reduplication

This section will briefly introduce Ca reduplication in Thao. Some examples are given below.
Ca reduplication in Thao is very similar to that in Paiwan. It doesn't reduplicate other prefixes and is located to the left of the stem.

B-2.3 Conclusion

Thus, from this section I have concluded that Thao has two types of reduplication. Thao's full and rightward reduplication are all rightward. I call this rightward reduplication root reduplication. In addition, Thao also has Ca reduplication.

These two types of reduplication have patterns very similar to those of root reduplication and Ca reduplication in Paiwan. In the next section, I will show that, with some modification, the OT analysis I used for Paiwan also works for Thao.

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73 Forms such as this one, which already have an a in the base, make it less easy to determine if this is Ca reduplication or the less productive CV reduplication. I follow L. Chang's classification and list them as Ca reduplication. For further discussion, the reader is referred to L. Chang's paper (1998).
B-3. An Optimality Theory Analysis of Thao Reduplication

As mentioned in Chapter 4, Thao is a language with word-internal codas. Thus, using the Anch-GP constraint will be problematic. In this chapter I will be using Harris and Gussman's proposal and consider the word-final coda to be an onset.

Before jumping into the full analysis, I will be introducing one new constraint. Since Thao is unlike Paiwan in having many word-internal codas and consonant clusters, I will be using the *CC constraint defined below.

(88) *CC or *Complex (Kager 1999: 288, Prince and Smolensky 1993)
No complex syllable margins.

This constraint is illustrated in the tableau below. The candidate specified by L. Chang as optimal is labeled with an arrow. As can be seen in the tableau, L. Chang's optimal candidate and the winner in my analysis only differ in terms of their syllabification of the complex onset. I believe that complex clusters are syllabified into codas and onsets.

<table>
<thead>
<tr>
<th>Lexical: patqal + μμRED + -an</th>
<th>Max-LS</th>
<th>*CC</th>
<th>No-Coda</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [pat.qa-t.qa.-l-a.n]Ø</td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>b. → [pa.tqa.-tqa.-l-a.n]Ø</td>
<td>μ</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>c. [pa.tqa.-pa.tqa.-l-a.n]Ø</td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>d. [pa.qa.-pa.qa.-l-a.n]Ø</td>
<td>t</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

"a mark" + RtRED + -an = "to put marks on things", (data from L. Chang 1998: 293, b)
As can be seen in the tableau above, without the *CC constraint, the optimal candidate would be the ungrammatical (c) *patqa-*patqa-*l-an*. Note that *CC must be ranked over No-Coda, otherwise the language will prefer consonant clusters over codas. Note that the optimal candidate (a) has reduplicated the coda of the previous syllable. I will be assuming that it satisfies the dimoraic template specified in the lexicon.

Another change in our grammar for Thao is a re-ranking of the Dep-LS. Unlike Paiwan, Thao allows word-internal codas. Thus, I do not need to posit that words with word-internal codas undergo epenthesis. Instead, epenthesis is forbidden. Thus, I will have to rank Dep-LS higher than *CC, Align-Su-R, No-Coda and Onset.

This is demonstrated in the tableau below.

Tableau B.2 Complex onset CCV reduplication: "to grasp in one hand" + RtRED = "to be rolled into a ball in one hand", (data from L. Chang 1998: 292, (10))

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>Dep-LS</th>
<th>*CC</th>
<th>No-Coda</th>
<th>Align-Su-R</th>
<th>Onset</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [ig.kmi-k.mi.-r.i.n]Ø</td>
<td>-</td>
<td>*</td>
<td>*</td>
<td>rin</td>
<td>*</td>
</tr>
<tr>
<td>b. [kigi.kamir-i.mi ri-i.n]Ø</td>
<td>k,i,a,i</td>
<td></td>
<td></td>
<td>in</td>
<td></td>
</tr>
</tbody>
</table>

In the tableau above it can be seen that Dep-LS must be ranked higher in the grammar than *CC, Align-Su-R, No-Coda and Onset. I will also not be using the No-Cross and No-Spread constraint in my analysis.

Now I will show complete tables for Thao root and Ca reduplication.
Tableau B.3 RtRED in dimoraic stem: \textit{ma-} + "greed" + RtRED = "very greedy or gluttonous",
(data from L. Chang 1998: 281)

<table>
<thead>
<tr>
<th>Lexical:</th>
<th><em>Re</em></th>
<th>Anc</th>
<th>Id-</th>
<th>Cn</th>
<th>*C</th>
<th>Dp-</th>
<th>LS</th>
<th>Mx-L</th>
<th>S</th>
<th>N-C</th>
<th>A-Pr</th>
<th>A-Su</th>
<th>On</th>
<th>Id-BR</th>
<th>Mar</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{ma-} + cakaw + µµ\text{RED}</td>
<td></td>
<td>p</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. [\textit{ma}.-ka.ka.-ka.-w]Ø</td>
<td>**</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [\textit{ma}.-ca.kaw.-kaw.]Ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Tableau B.4 RtRED in trimoraic stem: \textit{p} + \textit{i} + "there" + RtRED = "to be put there repeatedly",
(data from L. Chang 1998: 284)

<table>
<thead>
<tr>
<th>Lexical:</th>
<th><em>Re</em></th>
<th>Anc</th>
<th>Id-</th>
<th>Cn</th>
<th>*C</th>
<th>Dp-</th>
<th>LS</th>
<th>Mx-L</th>
<th>S</th>
<th>N-C</th>
<th>A-Pr</th>
<th>A-Su</th>
<th>On</th>
<th>Id-BR</th>
<th>Mar</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{p} + \textit{i} + suhui + µµ\text{RED}</td>
<td></td>
<td>p</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. [\textit{p}.-su.hu.i.-hu.i.]</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [\textit{p}.-su.hu.-su.hu.-i.]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

The example in tableau B.3 was considered by L. Chang to illustrate a different type of reduplication, full reduplication, than that of tableau B.4, rightward reduplication. As one can see, they can be analyzed successfully as root reduplication.

Below I look at an example of a vowel-initial word undergoing root reduplication.

Tableau B.5 RtRED in vowel-initial word: \textit{mia-} + gloss not given + RtRED = "to protect, watch over",
(data from L. Chang 1998: 284)

<table>
<thead>
<tr>
<th>Lexical:</th>
<th><em>Re</em></th>
<th>Anc</th>
<th>Id-</th>
<th>Cn</th>
<th>*C</th>
<th>Dp-</th>
<th>LS</th>
<th>Mx-L</th>
<th>S</th>
<th>N-C</th>
<th>A-Pr</th>
<th>A-Su</th>
<th>On</th>
<th>Id-BR</th>
<th>Mar</th>
<th>Max-BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{mia-} + acan + µµ\text{RED}</td>
<td></td>
<td>p</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. [\textit{mi}.a.-a.ca.-a.ca.-n]Ø</td>
<td>3*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [\textit{mi}.a.-a.can.-can.]Ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. [\textit{mi}.a.-a.ca.n-a.ca.n]Ø</td>
<td>n</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. [\textit{mi}.a.-a.ca.n-a.ca.]Ø</td>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note that candidate (c) above motivated L. Chang (1998: 288) to posit a

\footnote{Remember that Anc is short for Anch-BR, Anch-R and Anch-P.}

178
My analysis is given below.

I have analyzed her complex clusters as codas and onsets instead of complex onsets. Candidate (c) above). Candidate (d) is eliminated through violation of Anch-P.

In this next tableau, I show L. Chang’s complex onset reduplication examples.

I have analyzed her complex clusters as codas and onsets instead of complex onsets.

### Tableau B.6 Complex onset CCV reduplication as RtRED:

| Lexical: | agqtu + μμRED | *Rep | Anc | Id-LS | Cn | ** | DP-LS | Mx-LS | N-C | A-Pr | A-Su | On | 1d- | BR | Mar | Max- | BR |
|----------|---------------|------|-----|-------|-----|-----|-------|-------|-----|-----|-----|----|-----|-----|-----|-----|-----|     |
| a.      | [ag.qtu-tu]Ö |      |     | *     |   |     | **    |       | *   |     |     |    | 8*  | ag  |     |     |     |     |
| b.      | [ag.qtu.tu]Ö |      |     | *     | μ  | **  |       |       | *   |     |     |    | 7*  | agq |     |     |     |     |
| c.      | →[ag.qtu.tu]Ö |      |     | **    | μ  | *   |       |       | *   |     |     |    | 8*  | ag  |     |     |     |     |

### Tableau B.7 Complex onset CCV reduplication as RtRED:

| Lexical: | pa.tqal.μ + μμRED + -an | *Rep | Anc | Id-LS | Cn | ** | DP-LS | Mx-LS | N-C | A-Pr | A-Su | On | 1d- | BR | Mar | Max- | BR |
|----------|--------------------------|------|-----|-------|-----|-----|-------|-------|-----|-----|-----|----|-----|-----|-----|-----|-----|     |
| a.      | [pa.tqal-ta]Ö |      |     | *     | μμ | 2*  | lan   |       | 11* | pa  |     |    |     |     |     |     |     |     |
| b.      | [pa.tqal.ta]Ö |      |     | μμ    | μμ | 3*  | lan   |       | 13* | pa  |     |    |     |     |     |     |     |     |
| c.      | →[pa.tqal.ta]Ö |      |     | **    | μμ |     | lan   |       | 13* | pa  |     |    |     |     |     |     |     |     |
| d.      | →[pa.tqal.ta]Ö |      |     | **    | μμ |     | lan   |       | 11* | pa  |     |    |     |     |     |     |     |     |
| e.      | →[pa.tqal.ta]Ö |      |     | **    | μμ | 1*  | an    |       | 12* | pa  |     |    |     |     |     |     |     |     |

### Tableau B.8 Complex onset CCV reduplication as RtRED: "to grasp in one hand" + RtRED + -in = "to be rolled into a ball in one hand", (data from L. Chang 1998: 292, (10))

| Lexical: | igkmi.r-μ + μμRED + -in | *Rep | Anc | Id-LS | Cn | ** | DP-LS | Mx-LS | N-C | A-Pr | A-Su | On | 1d- | BR | Mar | Max- | BR |
|----------|--------------------------|------|-----|-------|-----|-----|-------|-------|-----|-----|-----|----|-----|-----|-----|-----|-----|     |
| a.      | [ig.kmi-k.m.-r]Ö |      |     | *     | μμ | 2*  | rin   |       | 11* | ig  |     |    |     |     |     |     |     |     |
| b.      | [ig.kmi.g.m.-r]Ö |      |     | **    | μμ | 2*  | rin   |       | 12* | i   |     |    |     |     |     |     |     |     |
| c.      | →[ig.kmi.k.m.-r]Ö |      |     | **    | μμ |     | rin   |       | 11* | i   |     |    |     |     |     |     |     |     |
| d.      | →[ig.kmi.r-i]Ö |      |     | *     | μμ |     | in    |       | 10* | igkm|     |    |     |     |     |     |     |     |

The last problematic cases for L. Chang were words with word-internal codas.

My analysis is given below.
Tableau B.9 Word-internal coda CCV reduplication as RtRED: mia- + gloss not given + RtRED = "fall open, as one's mouth when startled", (data from L. Chang 1998: 294, c)

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>mìa- + rambak + μìRED</th>
<th>*R</th>
<th>An</th>
<th>Id-</th>
<th>Cn</th>
<th>*C</th>
<th>Dp-</th>
<th>LS</th>
<th>Mx-L</th>
<th>S</th>
<th>N-C</th>
<th>A-</th>
<th>Pr</th>
<th>A-</th>
<th>Su</th>
<th>On</th>
<th>Id-</th>
<th>BR</th>
<th>Mar</th>
<th>Max-</th>
<th>BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. &lt;[mi.a.-ram.ba-m.ba-]-k]\0</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>2*</td>
<td>k</td>
<td>*</td>
<td>12*</td>
<td>mìaara</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [mi.a.-ram.ba-ram.ba-k]\0</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>μ</td>
<td>2*</td>
<td>k</td>
<td>*</td>
<td>14*</td>
<td>mìa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. [mi.a.-ram.bak.-m.ba.k]\0</td>
<td>k</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>3*</td>
<td>*</td>
<td>*</td>
<td>13*</td>
<td>mìaara</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tableau B.10 Word-internal coda CCV reduplication as RtRED: "to fly, be flying" + RtRED = "to keep flying around", (data from L. Chang 1998: 291, d)

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>m- + arfaz + μμRED</th>
<th>*R</th>
<th>An</th>
<th>Id-</th>
<th>Cn</th>
<th>*C</th>
<th>Dp-</th>
<th>LS</th>
<th>Mx-L</th>
<th>S</th>
<th>N-C</th>
<th>A-</th>
<th>Pr</th>
<th>A-</th>
<th>Su</th>
<th>On</th>
<th>Id-</th>
<th>BR</th>
<th>Mar</th>
<th>Max-</th>
<th>BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.  &lt;[m-ar.f-a-r.f-a-z]\0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>**</td>
<td>z</td>
<td></td>
<td>9*</td>
<td>m</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.  [m-ar.faz-faz]\0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>***</td>
<td></td>
<td></td>
<td>9*</td>
<td>mar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.  [m-ar.f-a-r.f-a-z]\0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>μ</td>
<td>**</td>
<td>z</td>
<td>*</td>
<td>10*</td>
<td>m</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.  [m-ar.faz-rfa.z]\0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>z</td>
<td>*</td>
<td>μ</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thus, words with word-internal coda reduplication can also be successfully analyzed with this OT grammar. Note that the template counts the coda of the previous syllable as one mora.

I conclude this section with a tableau analyzing Ca reduplication.

Tableau B.11 Dimoraic stem with CaRED: ma + "wet soil, thick mud" + RtRED = "muddy all over; covered with mud", (data from L. Chang 1998: 284)

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>ma- + aRED dip.lhaq</th>
<th>*R</th>
<th>An</th>
<th>Id-</th>
<th>Cn</th>
<th>*C</th>
<th>Dp-</th>
<th>LS</th>
<th>Mx-L</th>
<th>S</th>
<th>N-C</th>
<th>A-</th>
<th>Pr</th>
<th>A-</th>
<th>Su</th>
<th>On</th>
<th>Id-</th>
<th>BR</th>
<th>Mar</th>
<th>Max-</th>
<th>BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.  &lt;[ma.-da.-dip.lha.q]\0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td>ma</td>
<td></td>
<td>a</td>
<td>10*</td>
<td>plhaq</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.  [ma.-dan.-dip.lha.q]\0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>**</td>
<td></td>
<td></td>
<td>a</td>
<td>11*</td>
<td>plhaq</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.  [ma.-di.-dip.lha.q]\0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td>ma</td>
<td></td>
<td>a</td>
<td>10*</td>
<td>plhaq</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thus, Ca reduplication can also be successfully analyzed with this grammar.
B-4. Conclusion

The constraint ranking used in this analysis of Thao reduplication is virtually the same as that for Paiwan. The main differences come in a re-ranking of Dep-LS and the need to specify the *CC constraint. This is because Thao, unlike Paiwan, has word-internal codas and complex consonant clusters.

This analysis of Thao shows that Paiwan and Thao reduplication are very similar in nature. In addition, it shows that a seemingly complicated pattern of reduplication can still be successfully analyzed using OT.
APPENDIX C

The Actor Pivot Prefix \textit{em}-

\textbf{C-1. Introduction}

As noted in chapter three, there is an alternation between \textit{m}-, \textit{em}- and \textit{en}-.

H-C. Chang (2000: 94) notes that actor pivot markers (AP) can have all of the following forms: \textit{ma}-; \textit{ø}; \textit{-em-} (or \textit{m}- or \textit{-en-}). Thus, the last marker, \textit{-em-}, used with dynamic verbs, has two allomorphs, \textit{m}- and \textit{-en-}. We have already seen instances of \textit{-em-} in \textit{t-em-ekel} "to drink(AP)", \textit{m-} in \textit{m-utjak} "to throw up(AP)" and \textit{-en-} in \textit{p-en-atjez} "to chisel(AP)".

The different forms of this prefix are conditioned by phonological environment (H-C. Chang 2000: 97). For instance, words with non-labial initial consonants have the labial infix \textit{-em-}. Words with labial-initial consonants have the infix \textit{-en-}. Words with vowels as their initial segments will be prefixed with \textit{m-}.

This appendix gives an analysis of \textit{em-} allomorphy using \textit{em-} specific constraints and constraints against adjacent labial consonants.\textsuperscript{76} The first section determines the underlying form of the prefix to be \textit{em-} and the second section is the

\textsuperscript{76} Another possible analysis which does not require \textit{em-} specific constraints is to assume the underlying form is \textit{m-}. Then, this \textit{m-} will infix into words to avoid violating the sonority hierarchy. Thus, I would be assuming that there are syllabic nasals in the language, such that \textit{t-em-eke-teke-} is really \textit{t-m-eke-teke-}. If it can be shown that syllabic nasals do exist, then this would be the preferred analysis.
OT analysis. For further discussion on em- allomorphy in other languages, the reader is referred to Klein (2002) and Yu (2002).

C-2. Finding the Underlying Form

In order to begin analysis of -em- affixation, the underlying form must be determined. Since -en- only occurs in environments with labial onsets, I will eliminate it from consideration as the underlying form.

I will not be regarding m- to be the underlying form of the affix. If this were the case then I would have to posit epenthesis of e when there are consonant-initial words. This claim is unsustainable, however, due to the ungrammaticality of words such as \(^*m\)-(e)tekel. With this analysis, there is no motivation for m- to infix into the word. In other words, how does m- + tekel become the grammatical t-em-ekel? Thus, I reject the hypothesis that the infix is underlyingly m-. Instead, my analysis will regard the prefix as being underlyingly em-.

C-3. Analyzing Actor Focus Prefixation with OT

In chapter three, I already analyzed the infixes in- and em- as prefixes that infix to avoid violating No-Coda. In order to explain the deletion of e from em- when prefixing to vowel-initial words, I cannot propose that the tendency for syllables in general to have onsets (Onset) is stronger than the tendency to delete vowels (Max-LS). This is because onsetless prefixes, onsetless syllables in stems and in
suffixes occur throughout the language.

Tableau C.1 Deleting the vowel in another vowel-initial prefix: PF + "to run" + "already" = "already ran", (data from H-C. Chang 2000: 98)

<table>
<thead>
<tr>
<th>Lexical: in- + ekel + -anga</th>
<th>Onset</th>
<th>Max-LS</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [i.n-e.ke.l-a. nga]Ø</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. [n-e.ke.l-a. nga]Ø</td>
<td></td>
<td>i</td>
</tr>
</tbody>
</table>

Tableau C.2 Deleting the vowel in onsetless words: "to speak" + RtRED = "speaking"

<table>
<thead>
<tr>
<th>Lexical: ivu + RtRED</th>
<th>Onset</th>
<th>Max-LS</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [i.vu-ivu]Ø</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>b. [v[i.vu]]Ø</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

Tableau C.3 Deleting the vowel from an onsetless suffix: "to speak" + RtRED + AP = "spokesman" (data from H-C. Chang 2000: 77)

<table>
<thead>
<tr>
<th>Lexical: qaivu + RtRED + -an</th>
<th>Onset</th>
<th>Max-LS</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [qa.i.vu.-i.vu.-a.n]Ø</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>b. [qa.i.vu.i.vu.-n]Ø</td>
<td>**</td>
<td>a</td>
</tr>
</tbody>
</table>

Max-LS must be ranked higher than Onset. Another way to analyze the deletion of e is to create a separate Max constraint for em- prefixes.78

(89) Max-LS(em-) (c.f. McCarthy and Prince, 1995a: 264)
Every segment of em- in the lexical form has a correspondent in the surface form.

A tableau showing the consequences of this analysis is given below.

---

77 Note that in- is not an infix here since this word is vowel-initial and there is no violation of No-Coda.
78 Another possible constraint which could be used is one that would allow schwa deletion in prefixes.
Deletion of segments is only allowed in the \textit{em}- prefix. Onset or Max-LS(\textit{em}-) must be ranked above the prefix alignment constraint and Max-BR as well. A tableau illustrating this is given below.

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|c|}
\hline
Lexical: & Max-LS & Onset & Max-LS(\textit{em}-) \\
\textit{em}- & utjak & & \\
\hline
a. & [\textit{em}-u.tja.k]\emptyset & & \\
b. & \textit{m}-u.tja.k]\emptyset & e & \\
c. & [u.tj-\textit{em}-a.k]\emptyset & * & \\
d. & [u.tja.k]\emptyset & * & \textit{em} \\
\hline
\end{tabular}
\caption{Tableau C.4 Deleting the vowel in the \textit{em}- prefix: AP + "to throw up" = "to throw up(AP)"}
\end{table}

This ranking is not a problem for the grammar since the only constraint rankings for Align-Pr-L are that 1) it is ranked higher than Ident-BR(f) and Max-BR and 2) it is ranked lower than No-Coda or Onset.

Now that our analysis of \textit{e} deletion in \textit{em}- is complete, I will be focusing on the \textit{m} and \textit{n} alternation. A constraint is needed which prohibits the nasal consonant of the \textit{em}- prefix from having the same place features as the word-initial onset. In Paiwan prefixation, a labial nasal sometimes dissimilates in the presence of other nasals or labial stops.\textsuperscript{79} I will posit an OCP-L constraint against adjacent labials and

\textsuperscript{79} Wu Jun-ming 吳俊明 informed me that the word \textit{mangtjez} "go back", when prefixed with the
an Ident(F) constraint specific to place features of nasals.

(90) OCP-L (based on Gussenhoven and Jacobs, 1998: 143-145)
Adjacent labials are forbidden.

(91) Id-LS(np) or Ident-LS(nasal place)
Lexical correspondents of nasals [ □ place] are also [ □ place].

A tableau demonstrating these constraints is given below.

Tableau C.6 Dissimilation of labial nasal place features in prefixes: AP + "to chisel" = "to chisel(AP)"

<table>
<thead>
<tr>
<th>Lexical: em- + patjez</th>
<th>OCP-L</th>
<th>Id-LS(np)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [p-\text{em}a.tje.z]</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. *[p-\text{em}a.tje.z]</td>
<td></td>
<td>m</td>
</tr>
</tbody>
</table>

Thus, OCP-L must be ranked above Ident-LS to ensure that \( m \) changes to \( n \).

Complete tableaux of all the constraints so far are given below.

Tableau C.7 Non-labial consonant-initial words with \em-: AP + "to drink" = "to drink(AP)"

<table>
<thead>
<tr>
<th>Lexical: \em- + tekel</th>
<th>No-Coda</th>
<th>Onset</th>
<th>Max-LS(\em-)</th>
<th>OCP-L</th>
<th>Align-Pr-L</th>
<th>Id-LS(np)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [\text{em-}te.\text{ke.l}]\Ø</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. *[t-\text{em}e.\text{ke.l}]\Ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. [te.-\text{em}ke.l]\Ø</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
<td>te</td>
<td></td>
</tr>
<tr>
<td>d. [te.k-\text{em}e.l]\Ø</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>tek</td>
<td></td>
</tr>
</tbody>
</table>

perfective \( na- \) will form \( na\text{-pangtjez} \). Thus, the \( m \) will dissipilate from the nasal by changing to a stop. Examples of \( m \) allomorphy seems to take place only at the beginning of the word.
**Tableau C.8 Vowel-initial words with vowel-initial prefix: AP + "to throw up" = "to throw up(AP)"**

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>No-Coda</th>
<th>Onset</th>
<th>Max-LS(em-)</th>
<th>OCP-L</th>
<th>Align-Pr-L</th>
<th>Id-LS(np)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Tableau C.9 Labial consonant-initial words with vowel-initial prefix:**

<table>
<thead>
<tr>
<th>Lexical:</th>
<th>No-Coda</th>
<th>Onset</th>
<th>Max-LS(em-)</th>
<th>OCP-L</th>
<th>Align-Pr-L</th>
<th>Id-LS(np)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There are further details concerning designating Coronal as the default place feature which can also be worked out. Recall that Gafos (1998: 524) and Alderete et al. (1999: 335) use a universal place hierarchy where Labial and Dorsal are most marked, followed by coronal, followed by pharyngeal. Thus, I can use the following place markedness constraints to predict the correct surface form.

Place Constraints (adapted from Alderete et al. 1999: 335)
(92) *Dorsal/Labial
Place features cannot be dorsal/labial

(93) *Coronal
Place features cannot be coronal.

These constraints are listed in the tableau below.
Tableau C.10 Labial consonant-initial words with \textit{em-}, emergence of unmarked place feature: \[ \text{AP + "to chisel" = "to chisel(\text{AP})"} \]

<table>
<thead>
<tr>
<th>Lexical: \textit{em-} + patjez</th>
<th>OCP-L</th>
<th>Id-LS(np)</th>
<th>*Dorsal/*Labial</th>
<th>*Coronal</th>
</tr>
</thead>
</table>
| a. \[ \text{p-em-a.tjez.\text{\textregistered}} \]
| \text{Ø} | * | p,m | tj,z |
| b. \[ \text{p-em-a.tjez.\text{\textregistered}} \]
| m | p | n,tj,z |
| c. \[ \text{p-\textit{em}-a.tjez.\text{\textregistered}} \]
| m | p,ng |

Thus, the nasal will take coronal place features because they are least marked in the grammar. This completes our analysis of \textit{em-} allomorphy.

C-4. Conclusion

This analysis used \textit{em-} specific constraints as well as prefix specific constraints in order to correctly predict the surface form. This is necessary since other vowel-initial prefixes do not show the allomorphy displayed by \textit{em-}. It seems apparent from evidence in Appendix B and in this section that labial nasals have a special status in Paiwan phonology.
Reduplication as Affixation in Paiwan

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Student: Meylysa Tseng

August 2003
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Finally, I would like to thank my parents for supporting me in all of my endeavors and giving me the opportunity to come to Taiwan to study. Thank you for giving me such a good education. I feel like the luckiest kid alive. I hope I can keep making you proud of me.
In this thesis I investigate the morphological structure of reduplication in Northern Paiwan, a Formosan language of Southern Taiwan. The main objective is to use Optimality Theory (OT), as first formulated by Prince and Smolensky (1993), to show that reduplication can be considered the same as affixation. This is in support of Marantz (1982).

I do this by first classifying reduplication into two classes: prefixing (Ca reduplication or CaRED) and suffixing (root reduplication or RtRED). Factors determining these classes are phonological structure and semantics. Phonologically, RtRED is dimoraic and copies all of its segments from the stem. CaRED, on the other hand, is monomoraic with the vowel invariably surfacing as a. I find that the more prototypical and commonly used reduplication, RtRED, also has the more prototypical semantic functions of reduplication. CaRED, on the contrary, has more specialized meanings with a narrower distribution.

Next, I show that reduplication and affixation follow the same constraints. Thus, suffixal reduplicants follow the same constraints as suffixes and prefixal reduplicants follow the same constraints as prefixes. In addition, suffixes and prefixes can also follow constraints previously restricted to the domain of
reduplication.

One of the conclusions that come forth from the analysis is that templates are needed to describe Paiwan root reduplication. This is in opposition to recent efforts by McCarthy (1997), Gafos (1998) and Spaelti (1999) to eliminate template constraints.

My analysis also needs to consider the word-final coda to be extraprosodic. To do so, following Harris and Gussmann (1998), word final codas are reanalyzed as onsets. In this way, word-final codas will not violate No-Coda. In addition, I look at Max-BR and how it has no important role in analyses that require templates. I also choose to work in Spaelti's (1999) lexical-surface (LS) framework, as opposed to McCarthy and Prince's (1995a) input-base-reduplicant (IBR) framework. I motivate this by showing that the LS interface will solve all of the problems created by the IBR interface.

With this analysis arises one complete OT grammar which can be used to analyze both reduplicants and affixes. In addition, included in the Appendix is a successful application of this grammar to Thao, another Formosan language. This analysis shows how the grammar can handle word-internal codas and consonant clusters, both of which are abundant in Thao and missing in Paiwan.
摘要

本論文探討排灣語中重疊現象的構詞結構,北排灣語是台灣南部的一種南島語。主要目標是用優選理論(Prince and Smolensky 1993)來證明重疊現象和加綴現象是相同的構詞現象。這也證明 Marantz (1982)所提出來的理論。

我先根據音韻結構與語意將這些重疊現象分成兩種: 詞幹重疊(root reduplication)與 Ca 重疊。以音韻結構來看,詞幹重疊的現象是雙重韻的(dimoraic), 從詞幹(root)複製所有的音段; 而 Ca 重疊的現象是單重韻的(monomoraic), 其母音都是由 a 構成。我發現詞幹重疊是一種典型且常出現的重疊現象,其語意也與典型重疊現象的語意功能較為相近。相反地, Ca 重疊現象是一種比較少出現的重疊現象,所以表現出來的語意則較為特別。

我並論證重疊和加綴這兩種現象遵守相同的 OT 限制(OT constraints): 後綴性重疊現象跟後綴遵守相同的 OT 限制; 而前綴性重疊現象也遵守與前綴相同的 OT 限制。此外, 前綴和後綴也遵守重疊現象的 OT 限制。


在這種分析下可以得到一個極為完整的 OT 語法, 並可利用這個語法來分析所有的重疊與詞綴現象。此外, 在附錄中你們也可以看到, 這套語法也可以成功地分析邵語。我的分析中也展現了這套語法如何處理詞中韻尾(word-internal coda)以及子音群(consonant cluster), 這兩種成分在邵語很常見, 但在排灣語卻完全不出現。
List Of Abbreviations

AP    actor pivot
CL    classifier
CM    construction marker
CMP   complementizer
GEN   genitive
LK    linker
LOC   location marker
LP    locative pivot
IP    instrumental or benefactive pivot
IMP   imperative
NEG   negative
NOM   nominative
NPV   non-pivot
OBL   oblique
PF    perfective
POS   possessive
PV    pivot
REL   relative clause marker
UG, UP undergoer pivot
List of Symbols and Notational Devices

. syllable boundary
() foot boundary
[] prosodic word boundary
\[\] grammatical word boundary
- morpheme boundary
bold affixes
* citations from a language
italics reduplicant
underline ungrammatical
σ syllable
µ mora
Ø dull syllable
 metavariables optimal candidate
\! fatal violation of a constraint
x >> y x is ranked higher than y
x << y x is ranked lower than y
x = y x and y are equally ranked
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