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以優選理論分析西拉雅語重疊詞

Siraya Reduplication: An OT Analysis

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摘要

本篇論文的目的是重新分類西拉雅語重疊詞，並以優選理論為框架分析西拉雅語重疊詞。本論文認為西拉雅語重疊詞之分類是以語意為依據。西拉雅語重疊詞可分為四類：右向重疊、 -CV- 重疊、 CV 重疊、 C*a*-重疊。右向重疊通常表現圖象式語意(iconic meaning)，包含複數、習慣性動作、強調、未完成。C*a*-重疊可表示圖象式語意或非圖象式語意(non-iconic meaning)：圖象式語意為進行式，非圖象式語意為由動詞衍生之名詞，及計算人類指稱對象。-CV-重疊通常不牽涉任何語意改變。CV 重疊則用來計算非人類指稱對象。在分析方面，優選理論中的鄰近制約(adjacency constraints)被用來處理右向重疊、-CV-重疊、CV 重疊。Hendricks 提出的 Compression Model 則用來壓縮 C*a*- 重疊中的重疊詞綴之大小。本篇論文為第一篇針對西拉雅語重疊詞重新分類且運用優選理論分析之論文。

關鍵字：西拉雅語、重疊詞、優選理論

Abstract

The aim of this thesis is to re-categorize Siraya reduplication patterns and analyze Siraya reduplication patterns under the framework of Optimality Theory. This thesis argues that Siraya reduplication patterns are categorized semantically. There are four reduplication patterns in Siraya: rightward reduplication, -CV- reduplication, CV- reduplication, and C*a*- reduplication. A base taking rightward reduplication usually expresses iconic meanings, such as PLURAL, HABITUAL, INTENSIVE, and IMPERFECTIVE. A base taking C*a*- reduplication could express either iconic meaning, PROGRESSIVE, or non-iconic meanings, such as counting human referents and derive nouns from verbs. A base taking -CV- reduplication will result in no meaning change. A base taking CV- reduplication denotes a non-iconic meaning, counting nonhuman referents. An adjacency constraint family is adopted to analyze rightward, -CV-, and CV- reduplication. As for C*a*- reduplication, the Compression Model proposed by Hendricks (1999) is used to compress the size of the reduplicants. This thesis is the first attempt to re-categorize Siraya reduplication patterns and analyze them under OT framework.

Key words: Siraya, reduplication, Optimality Theory

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Chapter One

Introduction

This thesis investigates reduplication in Siraya, which is an extinct Austronesian language spoken in southwestern Taiwan until the second half of the nineteenth century (Blust, 2009:30). Austronesian languages can be divided into at least ten subgroups, including Atayalic, East Formosan, Puyuma, Paiwan, Rukai, Tsouic, Bunun, Westerns Plains, Northwest Formosan, and Malayo-Polynesian. Malayo-Polynesian refers to languages outside Taiwan, such as Yami. The rest of the nine subgroups are represented only in Taiwan and hence called Formosan languages. Siraya is once used by people lived on the southwestern plain, but it is categorized under the subgroup of East Formosan with Amis, Kavalan, and Basay. The categorization thus is not geographical but rather linguistic (Blust, 1999; Li, 2004).

Like most Formosan languages, Siraya uses productive reduplication patterns to form words. A considerable amount of researches have been done to investigate reduplication in Formosan languages. Some of them aim to give descriptions of specific languages (e.g. Yeh 2000 on Bunun and Saisiyat, Blust 2001 on Thao triplication, Lin 2002 on Amis, etc.), and some of them analyze reduplication data under the theoretical framework of Optimality Theory (e.g. Chang1998 on Thao, Tseng 2002 on Paiwan, Lin 2010 on Pazih, Lu 2003 on Pazeh, Amis, Paiwan, and Thao, etc.). As for Siraya, pieces of research have been done describing the reduplicative patterns (Adelaar, 2000, 2011; Macapili, 2008; Zeitoun & Wu, 2006); however, no research, to the best of my knowledge, has been done to account for the reduplicative patterns of Siraya using Optimality Theory (McCarthy & Prince, 1993; Prince & Smolensky, 1993).

This thesis has two main purposes. First, building on reduplication data in Adelaar (2000, 2011) and Macapili (2008), this thesis re-examines and re-categorizes Siraya reduplication patterns, trying to solve the problem mentioned in Adelaar's works about the overlapping semantic functions between disyllabic reduplication and rightward reduplication. Evidence shows that these two types of reduplication can be merged into one single reduplication pattern: rightward reduplication. Second, this thesis provides an OT analysis to account for different reduplication patterns in Siraya. Under the constraint interactions, we see how constraints regulate the size of reduplicants and affect the shape of reduplicants.

Another issue in concern is the choice between different types of Siraya reduplication. In some languages, the reduplication pattern a base takes depends on its syllable structure. For example, in Kavalan reduplication, the choice of different reduplicant shapes relies on the initial syllable of the base (Lee, 2009; Lin, 2012). In languages of this type, semantics plays no role in determining the reduplication patterns. On the contrary, in some languages, semantics is crucial in choosing reduplication pattern. For instance, according to Lin (2010), the directionality of Pazih disyllabic verbal reduplication is determined by three functionally distinct reduplicative morphemes, namely REDpl(ural), REDcont(inuous), and REDint(ensive). REDpl involves leftward reduplication while REDcont and REDint involve rightward reduplication. This thesis argues that in Siraya, the reduplication pattern of a base is determined by the semantic factors rather than the syllable structure of the base, as evidenced in the following data. The reduplicants are represented through underlining. For example, the reduplicant in (1a) *ra-ruha ki vual* 'two feet' is the underlined element *ra-* and the base is *ruha*. In this thesis, I will use '-' to represent morpheme boundaries.

(1)	***Base***	***Gloss***	***Reduplicated word***	***Gloss***	***Reduplication pattern***
a.	ruha	two	ra-ruha ki vual	two people	C*a*- reduplication
b.	ruha	two	ru-ruha ki rapal	two feet	CV- reduplication
c.	usĭŋ	little	usĭ-usĭ-ŋ	least	rightward rduplication
d.	usĭŋ	little	usĭ-sĭ-ŋ	small	-CV- reduplication

In Siraya reduplication, C*a*- reduplication, as in (1a), is used with numerals to count human referents and derive verbs from nouns. CV- reduplication, as in (1b), is used to count nonhuman referents. If the reduplication pattern of a base could be predicted from its syllable structure, it is not possible for a base to take different reduplication patterns. However, we do find bases such as (1c) and (1d) having more than one reduplication pattern. Besides, in (1), we find that disyllabic roots can take four types of reduplication: CV-, C*a*-, -CV- and rightward reduplication, verifying the argument that the choice of reduplication pattern in Siraya is determined semantically.

This thesis is outlined as follows. Chapter two reviews the theoretical background of Optimality Theory and related issues about reduplication. Theoretical background includes *Correspondence Theory* (McCarthy & Prince, 1995) and *The Emergence of the Unmarked* (McCarthy & Prince, 1994a). Related issues about reduplication encompass Marantz's argument of *Reduplication as Affixation of Skeletal Morphemes* (Marantz, 1982), *Compression Model* (Hendricks, 1999, 2001), and Lunden's proposal of reduplicant placement (Lunden, 2004). In addition, a semantic network proposed by Lee (2007) is presented in this section. Chapter three describes the phonemic inventory and syllable structure of Siraya. Discussions and constraint rankings regarding syllable structure are presented as well. In chapter four, previous categorization of Siraya reduplication is introduced, along with a refined categorization and an OT analysis of the reduplicative data. Section 5 concludes this thesis.

Chapter Two

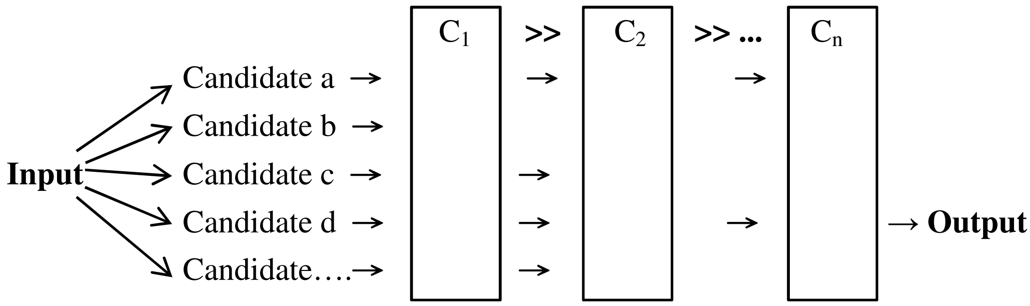
Literature Review

This thesis takes Optimality Theory as the theoretical framework to analyze Siraya reduplication. In section 2.1, the basic idea of Optimality Theory is introduced. Sections 2.2 and 2.3 review how Optimality Theory accounts for reduplication. Section 2.4 reviews how Marantz (1982) deals with reduplication and give explanation about why OT is adopted in this thesis. Section 2.5 is presents Lunden (2004)'s proposal of the reduplicant placement, anchoring, and locality. Section 2.6 is about the Compression Model (Hendricks, 1999, 2001). Section 2.7 presents a semantic network proposed by Lee (2007).

2.1 Optimality Theory

Optimality Theory (OT henceforth), proposed by Prince & Smolensky (1993, 2004) and McCarthy & Prince (1993), is a theory of how constraints interact with one another (McCarthy, 2008). OT assumes that each linguistic output form is optimal in the sense that it best-satisfies or minimally violates the grammar's constraint ranking (McCarthy & Prince, 1994a). The grammar (Generator, GEN for short) generates a set of candidates (CANs) from an input, and then this set of candidates goes through the evaluator (EVAL) which is composed of a set of hierarchically ranked constraints (CONs). After the evaluation, the optimal candidate is the output. The process is diagramed in Kager (1999:8) and reproduced in (2).

(2) Mapping of input to output in OT grammar (Kager, 1999:8)



Optimality Theory hypothesizes that constraints are universal and violable. Due to the violability, an optimal output may violate constraints in the grammar but remain optimal. As for universality, constraints are universal while the rankings are set on a language-specific basis. Thus, typology is the result of different constraint rankings among languages.

There are two main kinds of constraints in OT: markedness constraints and faithfulness constraints. Markedness constraints regulate the output forms while faithfulness constraints forbid differences between two corresponding forms. When a language has regular alternations, markedness constraints are dominating faithfulness constraints because faithfulness constraints play a dominant role only when the input is faithfully mapped to its output (McCarthy, 2008). Examples of markedness constraints are **ONSET** (Syllables must have onsets.) and **NO-CODA** (Syllables must not have codas.). Since markedness constraints work on output forms, they do not get involved in any alternations between inputs and outputs. Alternations between inputs and outputs always incur violations of faithfulness constraints. Examples of faithfulness constraints include **MAX** (No deletion.), **DEP** (No insertion.) and **IDENT(F)** which disallows value changes of features (McCarthy & Prince, 1995; McCarthy & Prince, 1999).

2.2 Correspondence Theory

In OT, Correspondence Theory (McCarthy & Prince, 1995) extends the demanding of faithfulness constraints from input-output mapping to base-reduplicant identity. The model of Correspondence Theory is schematized in (3).

(3) Basic Model of Correspndence Theory (McCarthy & Prince, 1995)

Input: **/Af_{RED} + Stem/**

↕ *I-O Faithfulness*

Output: **R ⟷ B**

BR Identity

The Reduplicant R is the phonological realization of a reduplicative morpheme RED which is not specified with a phonological content, and the Base B is the element which is copied and to which the reduplicant is attached to. For reduplicative prefixes, the Base is the following structure; for reduplicative suffixes, the Base is the preceding structure (Kager 1999:202;

McCarthy & Prince, 1994a). For example, the reduplicants in (1a) and (1b) are prefixes, and the Base is the following structure *ruha*. The reduplicants in (1c) and (1d) are suffixes, and the Base is the preceding structure *usĭ*. In (3), the stem is the input of the base while both base and reduplicant are output forms. Given that the reduplicant is a realization of a reduplicative element without lexical and phonological content, there is no input for it.

Constraints regulating IO correspondence include, among others, **MAX-IO**, **DEP-IO**, and so on. Instances of BR correspondence constraints are **MAX-BR** and **DEP-BR**.

2.3 The Emergence of the Unmarked (TETU)

In OT, if a candidate incurs no violation marks of a certain constraint, the candidate is said to be unmarked with respect to the C. *The Emergence of the Unmarked* was first recognized by McCarthy and Prince (1994a). They observe that even in languages where a markedness constraint MC is dominated, i.e. violated, the importance of MC can be seen under certain conditions. Therefore, the structure unmarked with respect to MC emerges in the specific domain.

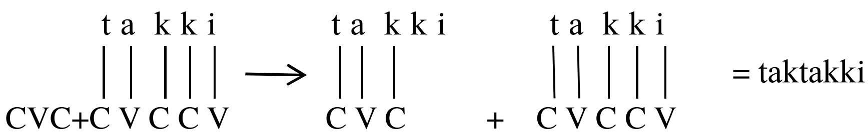
This phenomenon is commonly illustrated in reduplication (McCarthy & Prince, 1994a), where forms obeying MC is not seen in bases but observed in reduplicants. In reduplication, if a MC is dominated by an IO faithfulness constraint, then the bases will obey the IO faithful mapping. Bases violating MC will appear in the surface forms. If the same markedness constraint crucially dominates the BR faithfulness constraints, the MC will be obeyed in the reduplicants. The general ranking schema in TETU is **Faith$_{IO}$ ≫ MC ≫ Faith$_{BR}$** (McCarthy & Prince, 1994a). For example, if coda is permitted as a whole in a certain language, but prohibited in reduplicants, the constraint ranking will be **MAX-IO ≫ NO-CODA ≫ MAX-BR**. Codas are not favored in reduplicants even at the expense of imperfect copying. The normally inactive markedness constraint is active in BR mappings so that the unmarked structure emerges in reduplicants (McCarthy & Prince, 1994a). In this example, the unmarked structure is a syllable without a coda.

In this thesis, the general ranking schema of TETU will be applied when dealing with phenomenon such as C*a*- reduplication. The markedness constraint regulating the nucleus of the reduplicants **N/a** (The nucleus of a syllable is *a*.) is ranked under IO faithfulness constraints to avoid the change of vowels in bases, but ranked above BR faithfulness constraints so that /a/ will appear in reduplicants. Therefore, the structure unmarked with **N/a** emerges under the constraint ranking **Faith$_{IO}$ ≫ N/a ≫ Faith$_{BR}$**.

2.4 Reduplication as Affixation of Skeletal Morphemes (Marantz, 1982)

Marantz (1982) proposes that reduplication process is done not by transformational rules but by the normal morphological device of affixation (Broselow & McCarthy, 1983), and the mechanism proposed uses C-V skeleton as reduplicative/affixing templates to generate attested outputs. The difference between affixes and reduplicants lies in the specification of phonemic melody tiers. Whereas affixes are specified with both skeleton and phonemic melody tiers, reduplicants are only specified with empty C-V skeleton. The specification of phonemic melody tiers of reduplicants are achieved by associating the phonemic melody tiers of their roots with the empty C-V skeleton of reduplicants. The process is exemplified in (4). The first step is to prefix an unassociated CVC skeleton to the root, and then associate the copied melody with the CVC skeleton from left to right since the reduplicant is a prefix. If the reduplicant is a suffix, the direction is reversed. Finally the unassociated elements are erased.

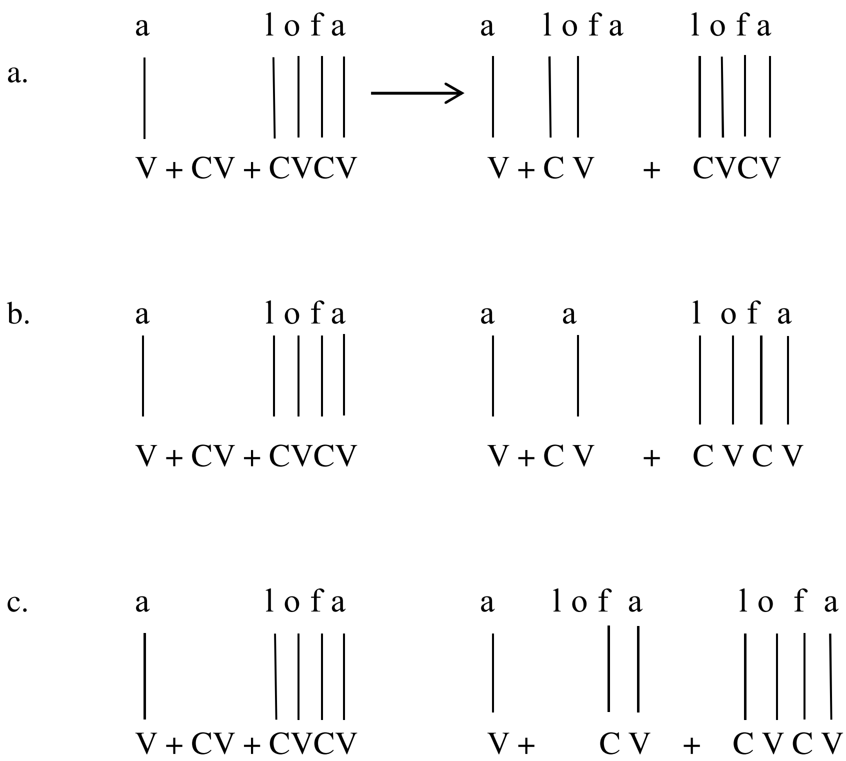
(4) CVC+ takki = taktakki (Marantz, 1982)



Marantz's proposal is against McCarthy and Prince's view of seeing reduplication as copying some prosodic constituents of such as a syllable, or a foot (McCarthy & Prince, 1986/1996, 1994b). He found well-attested evidence that reduplication copies sequences of consonants and vowels which form no constituent. Through correct association, those sequences can surface as reduplicants.

However, as Broselow and McCarthy (1983) points out, there are two major defects in Marantz's dealing with internal reduplication. The first defect is about the phonemic melody that is subject to association. Marantz does not give clear explanation about which portion of the phonemic melody should be copied and subject to associated. In the example of *a-lo-lofa*, a CV skeleton is placed after the first syllable, as descripted in (5a). Based on Marantz's proposal, a C-V skeleton can be associated to either the initial vowel *a* or the second syllable *lo*. We could copy and associate the first segment *a*, yielding an ungrammatical output **a-a-lofa*, as presented in (5b).

(5)



The second defect is about the directionality of association. The directionality of infixation is not defined in Marantz (1982). Since infixation is neither prefixation nor suffixation, the direction of infixation cannot be predicted. Therefore, the portion of the root that is going to be linked to the skeleton cannot be specified. How *alofa* gets *a-lo-lofa* by left-to-right association but not **a-fa-lofa* as in (5c) by right-to-left association remains unclear (Broselow & McCarthy, 1983).

So far we have seen the inadequacy of Marantz's templatic approach in dealing with infixation. In Siraya, rightward reduplication is a kind of infixation; reduplicants are infixed before the final consonant of roots if there is one. Since the direction of infixation is not clear in Marantz's copy-and-association framework, it may not be convincing applying this framework to account for Siraya rightward reduplication.

2.5 Reduplicant placement, anchoring and locality (Lunden, 2004)

While Marantz did not specify how reduplicants of infixation is copied and associated, Lunden (2004) proposed a locality generalization to state the tendency that reduplicants tend to be adjacency to their correspondent bases. A constraint family proposed captures this generalization under OT framework, as presented below.

(6) ADJACENCYBR constraint family (Lunden, 2004:10)

a. **ADJACENCYBR-BY-SEG (AD-BY-SEG)**: Every segment in the reduplicant is next to its correspondent base.

b. **ADJACENCYBR-BY-σ (AD-BY-σ)**: Every syllable in the reduplicant is next to its correspondent base.

c. **ADJACENCYBR-BY-FOOT (AD-BY-FOOT)**: Every foot in the reduplicant is next to its correspondent base.

Lunden follows the argument proposed by McCarthy (2002) that gradient violations should be avoided in a constraint family, hence the adjacency constraints are categorically violable. The violation and satisfaction of each constraint can be demonstrated with hypothetical examples in tableau (7) below. Notice that when the reduplicant is smaller than a syllable, it satisfies **AD-BY-σ** and **AD-BY-FOOT** vacuously. When the reduplicant is smaller than a foot, it satisfies **AD-BY-FOOT** vacuously.

(7) Hypothetical outputs evaluated by the ADJACENCYBR family of constraints (modified version of Lunden, 2004:10)

	AD-BY-SEG	**AD-BY-σ**	**AD-BY-FOOT**
a. ga-b-badu			
b. ga-gabadu	*		
c. gaba-gabadu	*	*	
d. gabadu-ga	*	*	*
e. gabadu-gabadu	*	*	*

In tableau (7), the reduplicant in (7a) is in a segment size, which is smaller than a syllable and a foot. Hence, candidate (7a) satisfies **AD-BY-SEG** and incurs no violation marks of **AD-BY-σ** and **AD-BY-FOOT**. The reduplicant in (7b), which is in a syllable size, is bigger than a segment but smaller than a foot, so it violates **AD-BY-SEG** but obeys **AD-BY-σ** and **AD-BY-FOOT**. In (7c), the size of the reduplicant is a foot, which is bigger than a syllable and a segment. Therefore, only **AD-BY-FOOT** is satisfied. As for (7d), though the reduplicant is in a syllable size, it is not placed next to its correspondent base. Therefore, (7d) incurs violation marks of all the adjacency constraints. The reduplicants in (7e) are larger than a foot, so it violates all the adjacency constraints although it is next to its correspondent base. From tableau (7), Lunden (2004) also points out that the ADJACENCYBR constraints are in a stringency relation: violation of **AD-BY-FOOT**, as in (7d) and (7e), entails violation of

AD-BY-σ and **AD-BY-SEG**. Violation of **AD-BY-σ**, as in (7c), entails violation of **AD-BY-SEG**.

The ADJACENCYBR constraints can not only govern the location of reduplicants, but also the size of them (Lunden, 2004). ADJACENCYBR constraints are in conflict with faithfulness constraints to shape the size of reduplicants. According to Lunden, full reduplication is the result of ranking **MAX-BR** above ADJACENCYBR constraints. Segment reduplication results from **AD-BY-SEG** dominating **MAX-BR**. The ranking **AD-BY-σ** ≫ **MAX-BR** ≫ **AD-BY-SEG** denotes syllable reduplication, and **AD-BY-FOOT** ≫ **MAX-BR** ≫ **AD-BY-SEG, AD-BY-σ** results in foot reduplication.

In this thesis, the constraint **AD-BY-FOOT** is applied to account for the location and size of reduplicants in Siraya reduplication. In Siraya rightward reduplication, the reduplicant of a tri-syllabic base is disyllabic. With the ranking of **AD-BY-FOOT** ≫ **MAX-BR**, the reduplicant is a foot and stand close to its correspondent base. In CV- and -CV- reduplication, the reduplicants are of a syllable size and the ranking **AD-BY-σ** ≫ **MAX-BR** ≫ **AD-BY-SEG** is applied. However, in C*a*- reduplication, the reduplicant of a consonant-initial base is in a CV size, while the reduplicant of a vowel-initial base is a single vowel. The ranking **AD-BY-σ** ≫ **MAX-BR** ≫ **AD-BY-SEG** alone cannot regulate the segment size of the reduplicants. Therefore, the Compression Model should be involved in the evaluation to compress the reduplicant to a single vowel. Section 2.6 reviews the Compression Model, and the combination of ADJACENCYBR constraints and the Compression Model will be presented in section 4.3.

2.6 Compression Model: A-Templatic Analysis (Hendricks, 1999, 2001)

Compression Model, proposed by Hendricks (1999) uses alignment constraints instead of a prosodic template to regulate the size of a reduplicant. The definition of templatic constraints given in McCarthy and Prince (1993) is as follows.

(8) Templatic constraints (McCarthy & Prince, 1993)

MCAT = PCAT

where Mcat ≡ Morphological Category ≡ Prefix, Suffix, RED, Root, Stem, LexWd, etc.

and Pcat ≡ Prosodic Category ≡ Mora, Syllable (type), Foot (type), PrWd (type), etc.

Templatic constraints were widely used to ensure the mapping from prosodic categories to RED (McCarthy & Prince, 1993). For example, to account for a disyllabic reduplicant, the easiest way is to set a templatic constraint such as RED=σσ. However, there are two drawbacks of templatic constraints.

First, templatic constraints may results in wrong prediction (Crowhurst, 2004; Hendricks, 1999, 2001; McCarthy & Prince, 1994a). For example, as McCarthy and Prince (1994a) points out, templatic constraints cannot explain the variance of reduplicants in Nootka. In

Nootka CV(:) reduplication, the vowel length is transferred from base to reduplicant. When the initial syllable of the base is a CV:, the reduplicant is a CV: string. While the initial syllable of the base is a CV string, the reduplicant is a CV string. Templatic constraints such as RED=μ fail to explain the variant shapes of redulplicants since the reduplicants are sometimes heavy and sometimes light.

Second, counterexamples are found to show the inadequacy of templatic constraints. For example, templatic constraints fail to account for the bare-consonant reduplication in Semai, a member of Austroasiatic languages (Hendricks, 2001). Examples of Semai bare-consonant reduplication are given below.

(9) Semai bare-consonant reduplication (Hendricks, 2001)

a. pɲ-payaɲ ‘appearance of being disheveled’

b. ct-cʔɛt:t ‘sweet’

c. kc-kmrʔɛ:c ‘short, fat arms’

The reduplicants in (9), a string of two consonants copied from both edges of the base, do not belong to a prosodic category. Thus, no templatic constraints can be set to condition the reduplicants. According to Hendricks, Semai bare-consonant reduplication can be captured under the Compression Model. Compression Model extends the usage of alignment constraints that were not used to regulate the size of the reduplicants. These constraints are more general than templatic constraints in that they do not specifically condition the size of the reduplicants, but they can achieve the goal as well. The size of reduplicants in (9) is the result of alignment constraints competing with each other at one edge of the base. Anchoring constraints ensure the correspondence between reduplicants and bases at both edges. The definition of constraints in use is given below.

(10) **ALIGN-RED-L:** Align the left edge of reduplicant with the left edge of the word.

(11) **ALIGN-ROOT-L:** Align the left edge of root with the left edge of the word.

(12) **R-ANCHOR$_{IR}$:** The right peripheral element of reduplicant corresponds to the right edge peripheral element of input.

(13) **L-ANCHOR$_{IR}$:** The left peripheral element of reduplicant corresponds to the left edge peripheral element of input.

An OT analysis of Semai bare-consonant reduplication is presented in (14).

(14) **R-ANCHOR$_{IR}$, L-ANCHOR$_{IR}$, ALIGN-RED-L ≫ ALIGN-ROOT-L ≫ MAX$_{IR}$** (Hendricks, 2001:296)

/ cʔɛ:t, RED /	**R-ANCHOR$_{IR}$**	**L-ANCHOR$_{IR}$**	**ALIGN-RED-L**	**ALIGN-ROOT-L**	**MAX$_{IR}$**
a. cʔɛ:t-cʔɛ:t				cʔɛ:!t	
b. cʔt-cʔɛ:t				cʔt!	*
☞ c. ct-cʔɛ:t				ct	**
d. c-cʔɛ:t	*!			c	***
e. t-cʔɛ:t		*!		t	***

In Semai, both the reduplicant and the base want to be leftmost. Given that the reduplicant is prefixed to the base, **ALIGN-RED-L** must dominate **ALIGN-ROOT-L**. Under the Compression Model, the reduplicant size will be minimal. Hence, with these two alignment constraints, the optimal candidate will be (14d) or (14e). However, the reduplicant cannot be any arbitrary segment of the base. The anchoring constraints, **R-ANCHOR$_{IR}$** and **L-ANCHOR$_{IR}$**, ensure that copying takes place at both edge of the string. Therefore the optimal output in (14) is candidate (c) which is compressed to a minimal size but remains anchored to the base.

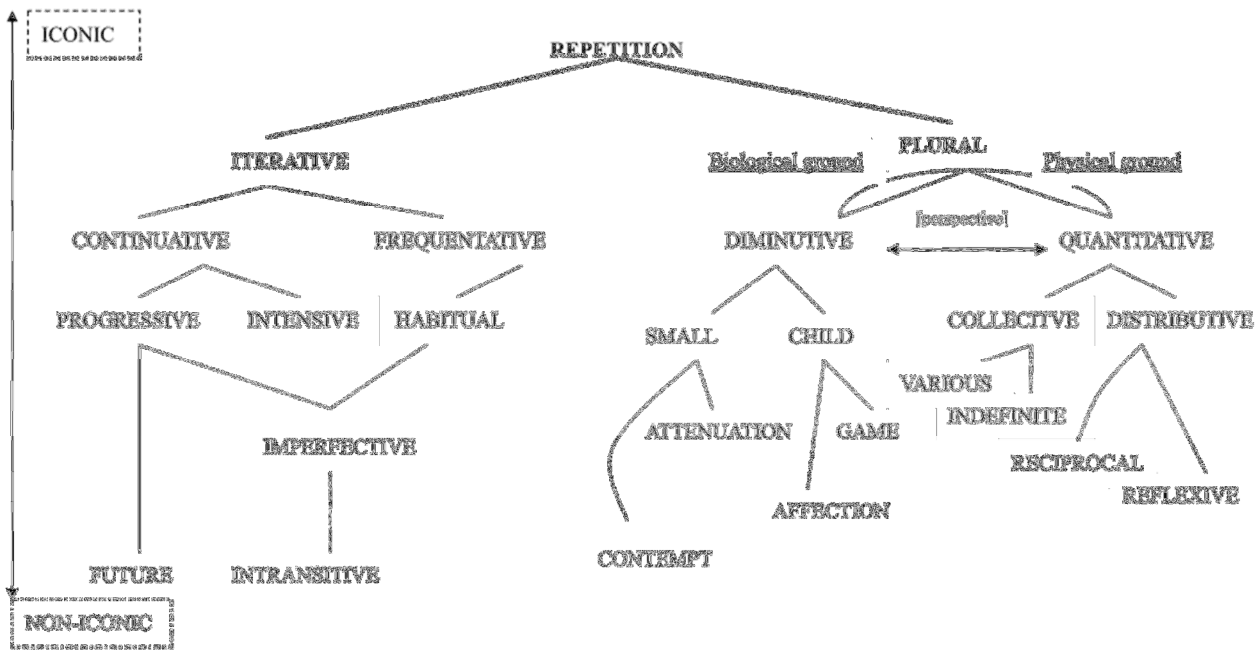
Compression Model can not only account for reduplicants that do not form a prosodic category, but also reduplicants that form a prosodic category. In Hendricks (1999), Compression Model is applied in dealing with reduplicants in foot size. With **FTBIN** (Feet must be binary at the moraic level.) undominated in the constraint ranking, the foot size of the reduplicant can be regulated.

Given that there are problems in templatic constraints, I will not adopt a templatic analysis. In this thesis, instead of setting templatic constraints such as **RED=σ**, the Compression Model will be used to deal with C*a*- reduplication. Unlike CV- reduplication, which bases are all consonant-initial, a reduplicant of C*a*- reduplication is a C*a*- string when the base is consonant-initial and a single vowel *a* when the base is vowel-initial. For a vowel-initial base, if the templatic constraint **RED=σ** is adopted, then the copy of the onset in the second syllable cannot be avoided. Therefore, the Compression Model is required in the analysis to compress the reduplicant size of a vowel-initial base to a single vowel. As for the consonant-initial bases, under the competition of alignments constraints as well as other markedness constraints such as ***COMP**, the reduplicants will be compressed to a minimal size but not a string of consonant clusters.

2.7 A semantic network for the meaning of reduplication (Lee, 2007)

Lee (2007) proposes a semantic network for the meaning of reduplication which is based on a cross-linguistic study on Formosan languages. The network is motivated by iconicity, and originated from the notion of REPETITION. The framework is presented below.

(15) A Semantic network for the meanings of reduplication (Lee, 2007:231)



Seeing iconicity as a continuum, the meaning at the top in this framework is considered the most iconic, and degree of iconicity is lowered when the meaning is lower in the network.

Since this framework is the only cross-linguistic one proposed for Formosan languages, in this thesis, I will base on this framework to analyze Siraya reduplication meanings.

Chapter 3

Phonemic Inventory and Syllable Structure

3.1 Phonemic Inventory

As illustrated in Adelaar (2011), there are totally 16 consonants in Siraya, including /p/, /b/, /t/, /d/, /k/, /v/, /s/, /x/, /h/, /m/, /n/, /ŋ/, /l/, /r/, /w/, and /j/, as presented in (16). The phonemes in parentheses represent Adelaar's transcription.

(16) Consonant Inventory

	bilabial	labio-dental	alveolar	palatal	velar	golttal
stop	p b		t d		k	
fricative		v	s		x	h
nasal	m		n		ŋ(ng)	
liquid			l/r			
glide	w			j(y)		

/v/ has a voiceless allophone [f] in preconsonantal and final position (Adelaar, 1999). /ŋ/ is transcribed as *ng* by Adelaar, and /j/ is transcribed as *y*. However, I will use the IPA symbols /ŋ/, and /j/ to substitute *ng* and *y* in my thesis. One thing worth noticing is that in Macapili (2008:2), he includes the affricate /c/ in the consonant inventory of Siraya while

Adelaar does not. Adelaar (2011:52) claims that /c/ must be a sort of affricate or sibilant, and it may be an allomorph of /s/. Since the phonetic value of /c/ is not clear, I do not list it in the consonant inventory.

As for vowels, Siraya has nine vowels, including /a/, /ă/, /e/, /i/, /ĭ/, /o/, /u/, /ŭ/ and /ə/ according to Adelaar (2011). As presented in (17), /ĭ/, /ă/, and /ŭ/ are short counterparts of long vowels /i/, /a/, and /u/. The minimal pair found to support the phonemic distinction of the high front vowels is *rĭma* 'five' and *rima* 'hand.' Despite the fact that there is no minimal pair of the other two pairs of vowels, he lists all of them in the vowel inventory notwithstanding in order not to risk information loss.[2] In addition, /a/ has a palatalized allophone [ä] (Adelaar, 1997, 2011). It is not listed in the vowel inventory because [a] and [ä] occur in free variation.

[2] In the original Gospel text, Adelaar's transcription of the word *rĭma* 'five' is written as *rymma* and *rima* 'hand' is written as *ryma*. Macapili (2008) does not differentiate these two words, but he does make the distinction of stress assignment between *ína* 'woman' and *iná* 'not' which correspond to *ina* and *ynna* in the original text. Adelaar uses vowel length to distinguish words while Macapili uses stress assignment to do so. Adelaar considers a vowel to be shorter if in the original text it is in a closed syllable, as in *rymma*. Macapili assigns a stress to a vowel if in the original text it is in an open syllable. However, the data with stress assignment in Macapili (2008) are few, so I will not discuss Siraya stress assignment in this thesis. I will follow Adelaar's transcription in this thesis.

(17) Vowel Inventory

	front	Central	back
high	i ĭ		u ŭ
mid	e	ə	o
low		a ă	

3.2 Syllable Structure

While the descriptive generalization of Siraya consonants and vowels are drawn in the literature, the ways that segments are organized into syllables await further investigation. In Adelaar's works, a Siraya syllable must contain a nucleus; it may contain at most two onsets, and at most one coda. There are six syllable types found in Adelaar's works: CCV, CV, V, VC, CVC, and CCVC, as illustrated below.

(18) Syllable Structure in (Adelaar, 1997, 1999, 2000, 2011)

a. CCV	rbo	'inside'
b. CV	ru	'when'
c. V	a	'to have; belong to'
d. VC	ad	'bring'
e. CVC	laf	'room'
f. CCVC	lpux	'to kill'

However, there is evidence showing that the cc-like structure in Siraya is phonologically hetero-syllabic. The orthography in the original Siraya Gospel text and historical comparative evidence support the hetero-syllabic argument. In Macapili (2008:233), Adelaar's(2011) transcription of the word *lpux* 'to kill' is transcribed as *lupug* which corresponds to *luhpough* in the original Gospel text. The vowel in the original text indicates that the liquid-obstruent sequence should be broken into different syllables. Furthermore, though transcribed as *rbo* 'inside' in Adelaar (2011), the same word is transcribed as *rəbo* in Adelaar (2012) due to the historical evidence from Proto Austronesian form **ləbo* 'interior'. The proto form also suggests that there should be a vowel between the liquid-obstruent sequence.

In addition, if we examine the Siraya data of consonant clusters, we found that they all violate the *Sonority Sequencing Principle* (SSP henceforth). SSP states the tendency that more sonorous segments stand closer to the syllable peak than less sonorous ones. Clements (1990) proposed a universal sonority scale that consists of four natural classes of sounds (obstruents, nasals, liquids, and nasals). The leftmost sounds in the ranking scale (19) are the least sonorous; the rightmost sounds are the most sonorous ones. More examples of cc-like sequences in Siraya are given in (20).

(19) Sonority Scale in Clements (1990)

Obstruents < Nasals < Liquids < Glides

(20) Siraya examples with consonant clusters (Adelaar (2011); Macapili (2008))

a. rbo ‘inside’

b. rkŭd ‘fast’

c. lbax ‘part’

d. lpux ‘kill’

e. ltax ‘thunder’

Consonant clusters in Siraya are restricted to liquid-obstruent sequences in onset position, in which we could see the reversing sonority scale appears. Therefore, it would be against the cross-linguistic tendency of sonority rising from onset to nucleus if the liquid-obstruent sequences occupy the onset position of a syllable.

Based on theoretical and historical evidences, this thesis argues that the apparent cc-like structures are intrinsically hetero-syllabic and thus should be separated by a vowel. To analyze the prohibition of Siraya cc- clusters under OT, I adopt the constraints *COMP since no consonant cluster is allowed to surface in Siraya. The definition of constraints is listed in (21). Tableaux (22) and (23) present the correct prediction of *ləpux* and *rəbo* with the constrain ***Comp**.

(21) ***Comp:** No complex syllable margins.

(22) Tableau for *lpux* 'kill'

	***Comp**
☞ a. ləpux	
b. lpux	*!

(23) Tableau for *rbo* 'inside'

	***Comp**
☞ a. rəbo	
b. rbo	*!

Therefore, we know that the syllable structure CCV and CCVC should be eliminated since there is no consonant cluster in the onset position. A Siraya syllable must contain a nucleus, at most one onset, and at most one coda. Analyzing Siraya cc-like sequences as hetero-syllabic also benefits the analysis of Siraya reduplication. In Siraya reduplication, except for the bases in (20), mono-syllabic roots are only found in mono-syllabic root reduplication. However, this type of reduplication is always lexicalized, and the bases do not stand alone. Therefore, if we take a hetero-syllabic point of view, the seemly mono-syllabic roots in (20) are in essence disyllabic. The bases that can undergo reduplication in Siraya are disyllabic and tri-syllabic roots. For instance, *ləbäx* 'part' > *ləba-ləbä-x* 'parts.' *päranäx* 'tree' > *päranä-ranä-x* 'trees.'

Apart from the syllable structure, vowel coloring is relevant to reduplication and in need of further examination as well as theoretical account. In Siraya, the vowel /a/ is raised to /e/ when it is followed by /j/ in word-final position (Adelaar 2011:22). Evidence of V-raising comes from the reduplicated form of *ej*-ending words in rightward reduplication, as exemplified in (24). Rightward reduplication reduplicates the last three or four segments from the right edge, skipping the final consonant if there is any. The reduplicants, as in (24), are CVCV strings placed before the final consonant of the base. Therefore, there is no environment to trigger the vowel alternation in the base. Hence, the vowel in the base remains unchanged, while the vowel /a/ in the reduplicant is changed due to the neighboring consonant /j/.

(24) Reduplication of words ending with *ey*

a.	riŋej	'work'	riŋa-riŋe-j	'works'
b.	patej	'the dead'	ma-pata-pate-j	'to scuffle, brawl'

The constraints necessary in dealing with the vowel coloring phenomenon in Siraya include two faithfulness constraints as well as two markedness constraints. The markedness constraints are **$*aj]_\sigma$** and **HNUC** (Prince & Smolensky, 1993). ***aj]** is a language-specific constraint that bans *aj*-ending words. **HNUC** is a constraint that favors the most harmonic nucleus. According to de Lacy (2004), there is a universal preference for a high sonority nucleus in syllables. As shown in the vowel-sonority scale in (25), the higher sonority nucleus '*a*' is more harmonic than the lower sonority nucleus '*e, o*', and '*e, o*' are more harmonic than '*i,u*', etc.

(25) Vowel-Sonority Hierarchy (de Lacy, 2004:146)

low peripheral > *mid peripheral* > *high peripheral* > *mid central* > *high central*

'a'	'e,o'	'i,u'	'ə'	'ɨ'

The definition of the constraints is given below.

(26) **IDENT-IO(round)**: Correspondent segments in input and output have the same values for [round].

(27) **IDENT-IO:** Correspondent segments have identical value.

(28) **$*aj]_\sigma$:** No syllable ends with **aj.**

(29) **HNUC:** A higher sonority nucleus is more harmonic than one of lower sonority. Assign

a nucleus one violation-mark for each degree of sonority less than the sonority of *a*.

The ranking of ***aj]$_\sigma$** should be very high since there is no words ending with -*aj* in Siraya. It dominates **IDENT-IO** to ensure the vowel change. However, to prevent the vowel from changing in other vowel-glide sequences, such as *aw*, **IDENT-IO** should dominate **IDENT-IO (round)** and **HNUC**. If **IDENT-IO** is low-ranked, the vowel in the vowel-glide sequence *aw* will be changed. The ranking of **IDENT-IO(round)** and **HNUC** is not crucial.

Tableau (30) presents the vowel alternation from [aj] to [ej].

(30) /riŋaj/→[riŋej]

/riŋaj/	***aj]$_\sigma$**	**IDENT-IO**	**IDENT-IO (round)**	**HNUC**
☞ a. riŋej		*		*
b. riŋoj		*	*	*!
c. riŋuj		*	*	*!*
d. riŋij		*		**!
e. riŋəj		*		**!*
f. riŋaj	*!			

Candidate (e) is assigned three violation marks under the constraint **HNUC** since the sonority scale of the vowel *ə* is three steps lower than the most sonorous *a*. As for candidate (c) and (d), the vowel *u* and *i* are two steps lower than *a*. Vowels *e* and *o* are one step lower than *a*. The constraint ranking of Siraya vowel coloring is summarized below.

(31) Constraint ranking for Siraya vowel coloring

$*aj]_\sigma \gg$ IDENT-IO $\gg$ IDENT-IO(round) $\gg$ HNUC

3.3 Summary

In this chapter, an introduction to Siraya inventories and syllable structures are presented with analysis under OT framework. The canonical form of a Siraya word is CV.CVC, which also constitutes the majority of bases in reduplication. Though syllable structure will not affect the choice between different patterns, it is still crucial in that we could only find the underlying form of words ending with *ej* when we examine the reduplicated forms. Besides, if we take a hetero-syllabic point of view toward the onset consonant clusters, the bases in reduplication will be consistently disyllabic and tri-syllabic.

Chapter Four

Siraya Reduplication

This chapter is devoted to the presentation of reduplication data and analysis. The remainder of this chapter is organized as follows. Section 4.1 presents Adelaar's classification of Siraya reduplication, followed by the proposal of a re-categorization in section 4.2. Section 4.3 analyzes reduplicative data under the OT framework. Section 4.4 summarizes this section.

4.1 Siraya Reduplication: Adelaar's classification

According to Adelaar (2000, 2011), there are five reduplicative patterns in Siraya[3], including (a) monosyllabic-root reduplication, (b) disyllabic-root reduplication, (c) rightward reduplication, (d) first-syllable reduplication, and (e) C*a*- reduplication. Descriptions and

[3] In Adelaar (2000), there is another type of reduplication termed as *pa*- reduplication. According to Adelaar (2000), *pa-pa-* composes of two prefixes. It usually seems that it is not an instance of prefix reduplication, but a combination of the causative *pa*- and the transitive *ma*-, and the latter becomes *pa*- in the following morphological processes. For example, *ma-kulamux* 'wear a garment'. *pa-pa-kulamux* 'give a garment to wear'. Zeitoun and Wu (2006) also mentions that this type of reduplication is a "false" reduplication. Since the so called "*pa*-reduplication" is indeed a prefix combination of *pa*- and *ma*- and is excluded from reduplication in Adelaar (2011), I will not discuss this pattern in this thesis.

examples of each pattern are given in each subsection below. Though Adelaar does not underline the reduplicants in his data, we could still infer from his data presentation that he considers Siraya reduplication as prefixation except for the rightward reduplication, as exemplified in (32) and (33).

(32) ni-ma-patey ta neni ka ni-**kiĭ**-kĭim nein ta vati ki rawey
PAST-siv-dead TM 3P.TOP LNK PAST-**RED**-SEEK 3P.AG TM souls of children
'Those who looked for the souls of children have died.' (Adelaar, 2000:40)

(33) Iru **ka**-kita-n tĭn ta vare ka ma-lix-da, ma-takut-ato
when **CARED**-see-UO 3S.AG TM wind LNK SIV-strong-but, SIV-afraid-EMPH
'But when he saw the strong wind, he became afraid.' (Adelaar, 2000:43)

Therefore, in presenting Adelaar's data in 4.1, I underline the reduplicants as prefixes except for rightward reduplication.

4.1.1 Mono-syllabic root reduplication

Mono-syllabic root reduplication is a kind of total reduplication that applies on monosyllabic roots. Word bases of this type often have inherently iterative meaning and they are always lexicalized, so the roots do not occur by themselves. There are three varieties of mono-syllabic root reduplication: (a) simple reduplication, (b) reduplication with *-ar-* or *-al-* infixation, and (c) reduplication with linking *-i-*. Reduplication of this kind consists of words that are doubled by their roots; the affixes *-ar-*, *-al-*, and *-i-* are not reduplicated, as shown in (34)-(36).

(34) **simple reduplication**

a. tap-tap 'to shake off (dust)'

b. tok-tok 'skull'

c. dŭm-dŭm 'torrential rain, cloudburst'

(35) **reduplication with –*ar*-or -*al*-infixation**

a. s-ar-am-sam 'useless'

b. p-al-uŋ-puŋ 'to cease'

(36) **reduplication with linking –*i*-**

a. pak-ĭ-pak 'crumbs, lumps'

b. ait-ka-řip-i-řip 'purses'

4.1.2 Disyllabic-root reduplication

According to Adelaar (2000) and Zeitoun & Wu (2006), Siraya disyllabic-root reduplication denotes plurality, generality, or indefiniteness to nouns, indicates repetitive aspect, distributive or habitual action with verbs, and marks continuality, repetition, and graduality to adverbs.

Disyllabic root reduplication includes four sub-patterns depending on different shapes of the root: (a) CVCV-CVCVC, (b) (C)VCV-(C)VCV, (c) VC-VCVC, and (d) CVC*a*-CVC*ej* reduplication, as exemplified in (37)-(40). In CVCV-CVCVC reduplication, the coda is not copied. For example, *ralum* 'water' > *ralu-ralum* 'waters.' As for (C)VCV-(C)VCV reduplication, this type of reduplication is total reduplication as well, but it differs from simple reduplication (34) in the number of root syllables. For example, *mila* 'again' > *mila-mila* 'gradually.' VC-VCVC reduplication applies on vowel initial bases. In this type of reduplication, the first two segment of the root is copied. Adelaar (2000, 2011) observed that the second vowel of base in VC-VCVC reduplication is always identical to the first one or is a schwa. Adelaar argued that the VC-VCVC reduplication may be derived from *VCV-VCVC, so *aj-ajam* 'birds' may be derived from **aja-ajam*. However, he did not provide evidence to support this argument. As for CVC*a*-CVC*ej* reduplicatoion, Adelaar (1999) proposed that [ej] is derived from [aj] in word-final position, and the final consonant is not copied in reduplication. Hence, the reduplicant of CVC*ey* would be CVC*a.* For example, *riŋej* 'work' > *riŋa-riŋej* 'works.' In Adelaar (2011), he categorizes CVC*a*-CVC*ej* reduplication under the CVCV-CVCVC sub-pattern, so the number of subpatterns in disyllabic-root reduplication is reduced to three. More examples of disyllabic-root reduplication are given below.

(37) **$C_1V_1C_2V_2$-$C_1V_1C_2V_2C_3$**

	base	gloss	reduplicated words	gloss
a.	ravak	‘grave’	rava-ravak	‘graves’
b.	purux	’land’	puru-purux	‘countries, regions’
c.	daraŋ	‘road’	dara-daraŋ	‘roads’

(38) **$(C_1)V_1C_2V_2$-$(C_1)V_1C_2V_2$**

	base	gloss	reduplicated words	gloss
a.	l̆itu	‘devil’	l̆itu-l̆itu	‘devils’
b.	ăsu	‘dog’	ăsu-ăsu-an	‘dogs’
c.	siki	‘stretch’	siki-siki	‘stretching’

(39) **V_1C_1-$V_1C_1V_2C_2$**

	base	gloss	reduplicated words	gloss
a.	apad	‘piece of cloth’	ap-apad	‘some piece of cloth’
b.	adəm	‘thorn’	ad-adəm	‘thorns, thorny bush’
c.	uzuŋ	‘secret’	uz-uzuŋ	‘adultery’

(40) **$C_1V_1C_2$*a*-$C_1V_1C_2$*ej***

	base	gloss	reduplicated words	gloss
a.	riŋej	‘work’	riŋa-riŋej	‘works’
b.	patej	‘the dead’	ki paka-pa-pata-patej	‘guilty of death’

4.1.3 Rightward reduplication

Adelaar (2000, 2011) points out that Siraya rightward reduplication does not differ semantically from disyllabic reduplication.

Rightward reduplication was first termed by Chang (1998:290) in describing Thao reduplication, and has been found in some Formosan languages, such as Pazih, Amis, Paiwan, and Thao (Chang, 1998; Lu, 2003). Chang (1998) defines rightward reduplication as "copying the last three or four segments from the right edge of the base, skipping the final consonant if there is one." The reduplicant suffixes to a vowel-ending base (41) and infixed before the final consonant of a consonant-ending base, as illustrated in (42) and (43). Siraya rightward reduplication is special in that the reduplicants in (41) and (42) can be composed of only two segments. The reduplicant size does not conform to the definition proposed by Chang (1998).

(41) **$(C_1)\ V_1C_2V_2$-$\underline{C_2V_2}$**

	base	**gloss**	**reduplicated words**	**gloss**
a.	vato	'stone'	vato-<u>to</u>-an	'stony place'
b.	mi-tuko	'to stand'	maku-tuko-<u>ko</u> maku-Ali-lid	'to pray standing'

(42) $\mathbf{V_1C_1V_2\text{-}\underline{C_1V_2}\text{-}C_2}$

	base	gloss	reduplicated words	gloss
a.	usĭŋ	‘small’	usĭ-sĭ-ŋ	‘little’
b.	m-avok	‘to eat’	avo-vo-k	‘ to feast’

(43) $\mathbf{C_1V_1C_2V_2C_3V_3\text{-}\ \underline{C_2V_2C_3V_3}\text{-}C_4}$

	base	gloss	reduplicated words	gloss
a.	paranax	‘tree’	parana-rana-x	‘trees’
b.	m-ĭliŋix	‘to listen’	a-ĭliŋi-liŋi-x	‘to listen with’

4.1.4 First-syllable reduplication

First syllable reduplication is applied to numerals to count words with nonhuman referents. This type of reduplication reduplicates the first syllable of the root and prefixes to it, as shown in (44).

(44) **Examples of first syllable reduplication**

	base	gloss	reduplicated words	gloss
a.	turu	‘three’	tu-turu ki waï	‘three days’
b.	saat	‘one’	sa-saat ki juko	‘one sheep’

4.1.5 C*a*- reduplication

C*a*- reduplication combines with numerals to count human referents, but the application of C*a*- reduplication is not restricted to numerals. It derives nouns from verbs and expresses the progressive aspect, generic aspect, and a state of verbs.

C*a*- reduplication was first observed by Blust (1998); it applies on roots by copying the initial consonant of the root followed by a fixed segment *a*, as exemplified in (45).

(45) **Examples of C*a*- reduplication**

	base	Gloss	reduplicated words	gloss
a.	diri	'to sow'	da-diri-ən	'sowing'
b.	ruha	'two'	ra-ruha-ki vual	'two people'
c.	liko	'to lie down'	ma-la-liko	'lying down'

4.2 Re-categorization

4.2.1 Problems

Adelaar's classification is generally correct in terms of the monosyllabic-root reduplication, first syllable reduplication, and C*a*- reduplication, but problematic with regard to disyllabic-root and rightward reduplication. There are three defects that make Adelaar's categorization problematic. First, there is no clear semantic distinction between the disyllabic reduplication and rightward reduplication. As Adelaar (2000) points out, the meaning of these two types of reduplication often overlap and thus cannot be distinguished. However, as presented in the first chapter, we know that the different patterns of reduplication are semantically governed since a single root can undergo different reduplication patterns to denote different meanings. The example of roots in (1) that take different types of reduplication base on the meaning are repeated below.

(46)	***Base***	***Gloss***	***Reduplicated word***	***Gloss***	***Reduplication pattern***
a.	ruha	two	ra-ruha ki vual	two people	C*a*- reduplication
b.	ruha	two	ru-ruha ki rapal	two feet	CV- reduplication
c.	us̆iŋ	little	us̆i-us̆i-ŋ	least	rightward rduplication
d.	us̆iŋ	little	us̆i-s̆i-ŋ	small	-CV- reduplication

Second, the semantics of those mono-syllabic reduplicants seem to differ from disyllabic reduplicants in rightward reduplication. Besides, the mono-syllabic reduplicants in rightward reduplication (as in (41) and (42)) do not match the definition of Chang's (1998) definition of reduplicants in rightward reduplication, which states that the reduplicants of rightward reduplication are composed of three or four segments. The semantics of these mono-syllabic reduplicants will be elaborated in section 4.2.2.

Third, Adelaar's classification of is not clear-cut with respect to the categorization of reduplication patterns. For example, in Siraya disyllabic-root reduplication, the bases are undoubtedly disyllabic. However, disyllabic roots are also found in every other type of reduplication. A Siraya disyllabic root can take more than one type of reduplication. Hence, categorizing the reduplication pattern by the syllable number of the roots may not be appropriate. Besides, Adelaar's categorization of these patterns is not coherent. While mono-syllabic root reduplication and disyllabic-root reduplication are defined with syllable numbers of the roots, first syllable reduplication refers to the syllable the reduplicant copies. While C*a*- reduplication represents the shape of reduplicants, rightward reduplication indicates the direction reduplication takes. Furthermore, the categorization of reduplication patterns that are based on the roots (as in mono-syllabic and disyllabic root reduplication) is fairly rare. Reduplication patterns of Formosan languages are usually categorized with the shapes or copying directions of reduplicants, such as CVCV-reduplication, CV- reduplication, or rightward reduplication (See Zeitoun and Wu 2006 for more reduplication patterns in Formosan languages). Since Siraya belongs to Formosan languages, it is better to categorize its reduplication pattern by the shapes of reduplicants or the directionality of reduplication.

4.2.2 Solutions and re-categorization

4.2.2.1 Rightward reduplication

(C)VCV reduplicant

In the new categorization, I argue that disyllabic reduplication should be classified under the rightward reduplication. The first piece of evidence comes from the identical semantic functions they denote. According to Adelaar (2000) and Zeitoun & Wu (2006), Siraya disyllabic-root reduplication as well as rightward reduplication combines with nouns to indicate plurality, with verbs to denote repetitive aspect, and with adverbs to represent continuality, repetition, and graduality. Since they denote the same meaning, they could be categorized as a single reduplication pattern. However, I do not find examples to support the continuality and repetition meanings in the reduplicated forms of adverbs. The only example of adverb reduplication I find is *mila* 'again' > *mila-mila* 'gradually.' To analyze this data under the semantic network in Lee (2007), I categorize it under the INTENSIVE meaning. Lee (2007) proposes that INTENSIVE meaning is usually expressed by reduplicating stative verbs. Some linguists have argued that in some Formosan languages adjectives and adverbs generally behave like stative verbs, so I classify the Siraya adverb reduplication data under the INTENSIVE meaning. An example of adjective reduplication in Siraya is *usĭŋ* 'little' > *usĭ-usĭ-ŋ* 'least.' If a Siraya noun takes rightward reduplication, it usually expresses the meaning of PLURAL, as exemplified below.

(47) Examples of nouns taking rightward reduplication to express PLURAL

	base	**Gloss**	**reduplicated words**	**gloss**
a.	litu	'devil'	litu-litu	'devils'
b.	vare	'wind'	vare- vare	'winds'
c.	ralum	'water'	ralu- ralu-m	'waters'

d. paranax ‘tree’ parana-rana-x ‘trees’

For a Siraya verb to take rightward reduplication, it usually denotes repetitive aspect, distributive or habitual action. Under the semantic network, I analyze the meaning of repetitive action to be merged into HABITUAL since repetitive actions always lead to the meaning of HABITUAL (Lee, 2007). Examples of verbs expressing HABITUAL meaning in (32a) are repeated below with more examples.

(48) Examples of verbs expressing HABITUAL meaning (Adelaar, 2000)

a. ni-ma-patey ta neni ka ni-**kiĩ**-kĩm nein ta vati

PAST-siv-dead TM 3P.TOP LNK PAST-SEEK **-RED** 3P.AG TM souls

ki rawey.

of children

‘Those who looked for the souls of children have died.’

b. ka aya-tukad ki vauŋ ta avaŋ, ka ni-pa-rako-**rako** ki ruŋwal.

LNK be.at-middle RM sea TM ship LNK PAST-TR-toss **-RED** RM waves

‘And the ship was in the middle of the sea, tossed by the waves.’

For the examples that are considered to express distributive action in Adelaar (2000), I categorize them under the IMPERFECTIVE meaning, for these verbs express the notion that an internal temporally event is being examined. Hence, the target action is viewed as a part of the entire event, as exemplified below.

(49) Examples of verbs expressing IMPERFECTIVE meaning (Adelaar, 2000)

a. ka ru siki-**siki**-x ki rima t̆in ma-ĭ-vavaw ki,

LNK when stretch-**RED** RM hand 3S.POSS SIV-LOC-top RM

patatautauxən t̆in, ni-kima, k̆it-ey ta rarenan-au,

disciple 3S.POSS PAST-(say).like.this look-subj+uo TM mother-1POSS

ki taiapara-apa-mau.

RM brother-and-1POSS

'And stretching out his hand over his disciples, he said: Behold my mother and my brothers.'

b. ka ru ni-ma-diŋi-**diŋi**, ni-lupux ki əməd ki ra-rawey

LNK when PAST-AGOR-order -**RED** PAST-kill RM all RM RED-child

ka tu Bethlehem.

LNK at Bethlehem

'And he ordered to kill all children in Bethlethem.'

The second piece of evidence comes from the shape of reduplicants in these two types of reduplication. In disyllabic reduplication, the reduplicants are disyllabic (C)VCV, which are the same as the reduplicants of tri-syllabic roots in rightward reduplication. The copying direction of (C)VCV reduplicants is not clear when examining the disyllabic roots since either way is possible. But the rightward directionality is clear in tri-syllabic roots.

CVCa- reduplicant

While categorizing CVC*a*-CVC*ej*, I follow Adelaar's (1999) analysis that [*ej*] is derived from [*aj*] in the word final position since I could find no bona fide cases of words ending with *aj*. Adelaar (2011) includes CVC*a*-CVC*ej* under normal CVCV-CVCVC pattern, which belongs to the disyllabic-root reduplication. For I consider Adelaar's disyllabic-root reduplication as rightward reduplication, in the new categorization, CVC*a*-CVC*ej* pattern is categorized under rightward reduplication.

VC reduplicant

The evidence I find to support Adelaar's argument of the derivation from *VCV-VCVC to VC-VCVC is a Kavalan data *m-ʁi-ʔaɬa-ʔaɬam* 'to keep catching birds' (Li & Tsuchida, 2006). In Kavalan, the reduplication of *ʔaɬam* 'bird' is *m-ʁi-ʔaɬa-ʔaɬam* 'to keep catching birds,' while in Siraya the word 'birds' is represented by *aj-ajam*. Like Siraya, Kavalan belongs to the East Formosan subgroup of Formosan languages (Blust, 1999). According to Lin (2012), in Kavalan reduplication, there are also vowel-initial bases, i.e. V.CV-BASE. Some of the V.CV-BASE contain two identical vowels in the first two syllables of the base, and the reduplicants of them do not copy the second vowel, as VC.V-BASE always do, due the violation of a highly ranked of constraint **OCP(VOC)**, which bans vocalic sequences of identical place features. For instance, the reduplicative form of *m-ipiɾ* 'to listen' is *m-ip-ipiɾ* 'to keep listening' rather than **m-ipi-ipiɾ*, which violates **OCP(VOC)**. For *m-ʁi-ʔaɬa-ʔaɬam* 'keep catching birds,' though there are two identical vowels in the first two syllables of the base, the second is reduplicated as well. *m-ʁi-ʔaɬa-ʔaɬam* in Kavalan does not violate the **OCP(VOC)** constraint due to the separation of the two identical vowels (one in the reduplicant and the other in the base) by the onset of the base. On the contrary, the adjacent identical vowels in Siraya **aja-ajam* 'birds' incurs the violation of the **OCP** constraint, so the reduplicant of *ajam* 'bird' will be *aj-ajam* 'birds.' Though the reduplicant of this pattern is a string of two segments, which does not conform to the definition of rightward reduplication, I still categorize it under rightward reduplication because of the similar semantic functions it shares with rightward reduplication. In addition, as presented above, the VC reduplicants may be derived from VCV reduplicants. Therefore, the reduplicants could be treated as disyllabic, V.C(V), the same as the reduplicants in rightward reduplication. For I consider VC-VCVC pattern as rightward reduplication, I will underline the reduplicant as

VCV-<u>CV</u>-C in the rest of this thesis.

4.2.2.2 -CV- reduplication

As for the mono-syllabic reduplicants in Adelaar's rightward reduplication, i.e. (41) and (42), I consider them to form a separate type of reduplication, which I refer to as -CV- reduplication in my re-categorization. One example that shows the need to distinguish -CV- reduplication from rightward reduplication is the reduplication of the root *usĭŋ* 'little'. This root can take both *usĭ-<u>sĭ</u>-ŋ* 'small' and *usĭ-<u>usĭ</u>-ŋ* 'least' as its reduplicated forms. While the former does not show the semantic difference with its root, the later shows intension of the adverb. The semantic functions of -CV- reduplication differ from rightward reduplication in that the reduplicative forms of this type do not show semantic differences with their bases, and the shape of reduplicants is consistently a -CV- string infixed before the root-final consonant if there is one. I consider rightward and -CV- reduplication as suffixation to a vowel-ending root and infixation before a root-final consonant if there is any because it is more natural to place the reduplicants after the bases if the copying direction is from right to left. Though the direction of -CV- reduplication is rightward as well, it is not categorized under rightward reduplication mainly due to its distinct semantic functions from rightward reduplication. Examples of -CV- reduplication in (41) and (42) are repeated with more data.

(50) Examples of -CV- reduplication

	base	gloss	reduplicated words	Gloss
a.	vato	'stone'	vato-to-an	'stony place'
b.	m-avok	'to eat'	avo-vo-k	'to feast'
c.	alid	'God'	maku-ali-li-d	'to pray to God'
d.	usĭŋ	'little'	usĭ-sĭ-ŋ	'small'
e.	heyriŋ	'hook'	pa-heyri-ri-ŋ-an-ey	'to cast a hook'
f.	arux	'across'	saat ka-tunun-an ki n a ka-aru-ru-x ki rapal	'one thousand of steeps across the street'

In examples above, the meaning of the reduplicative forms in (50a), (50c), and (50e) seem to differ from their bases semantically. However, the changes are due to the affixes attached to them. In (50a), *-an-* is a locative affix. In (50c), the verbal prefix *maku-* denotes the meaning of 'say, talk to' (Adelaar, 2004). In (50e), the prefix *pa-* indicates a causative mode, *an-* is a locative affix, and *-ey* represents an oblique case.

4.2.2.3 New categorization

In the refined categorization, I propose that there are four reduplication patterns in Siraya: Rightward reduplication (which contains Adelaar's disyllabic-root reduplication (37)-(40) and tri-syllabic roots of rightward reduplication(43)), C*a*- reduplication (45), CV- reduplication (which is equivalent to Adelaar's first syllable reduplication(44)), and -CV- reduplication

((41),(42), and (50)). Mono-syllabic root reduplication is lexicalized and the bases do not stand alone. Therefore, I do not consider it to be a reduplicative pattern. The comparison of Adelaar's categorization and my re- categorization is listed in (51), along with the semantic functions of each new pattern is give as well.

(51) New categorization of Siraya reduplication

<table>
<tr><th colspan="2">Adelaar's Categorization</th><th>New Categorization</th><th>Functions</th></tr>
<tr><td colspan="2">mono-syllabic root reduplication</td><td>N/A</td><td>N/A</td></tr>
<tr><td rowspan="4">disyllabic-root reduplication</td><td><u>(C)VCV</u>-(C)VCV</td><td rowspan="5">rightward reduplication</td><td rowspan="5">PLURAL, HABITUAL, and IMPERFECTIVE</td></tr>
<tr><td><u>CVCV</u>-CVCVC</td></tr>
<tr><td><u>CVCa</u>-CVCey</td></tr>
<tr><td><u>VC</u>-VCVC</td></tr>
<tr><td rowspan="2">rightward reduplication</td><td>Bases of 3 σ</td></tr>
<tr><td>Bases of 2σ</td><td>-CV- reduplication</td><td>No semantic change</td></tr>
<tr><td colspan="2">first syllable reduplication</td><td>CV- reduplication</td><td>Count nonhuman referents</td></tr>
<tr><td colspan="2">Ca- reduplication</td><td>Ca- reduplication</td><td>(a) Count human referents
(b) Derive nouns from verbs
(c) PROGRESSIVE</td></tr>
</table>

The new categorization has two merits. First, the distinction of semantic functions of each type of reduplication is clear. Bases take different reduplication patterns depending on the meaning they denote. Second, the new categorization is more coherent than Adelaar's in that those patterns are defined with the forms of reduplicants except for rightward reduplication, which is defined by the direction of reduplication. Though rightward reduplication can be categorized as (C)VCV reduplication by its shape of reduplicant, the same way of categorizing other Siraya reduplication patterns, I still categorized this pattern by the rightward directionality of reduplication because in Formosan languages, a pattern like this, i.e. copying last three or four segments from the right edge, is usually categorized as rightward reduplication. In addition, those new patterns are widely acknowledged in other Formosan languages. For example, CV- reduplication in Thao and Tsou (Lu, 2003; Zeitoun & Wu, 2005), C*a*- reduplication in Thao, Tsou, Rukai, Saisiyat, and so on (Hsin, 2000; Lu, 2003; Zeitoun & Wu, 2005, 2006). Languages take rightward reduplication include Rukai, Thao, Amis, etc. (Chang, 1998; Hsin, 2000; Lu, 2003).

4.3 OT Analysis

This section provides an OT analysis to each type of reduplication. Recall that reduplication in Siraya cannot be predicted from the syllable structure of bases, so there will not be a set of constraint ranking for all kinds of reduplication. Instead, each type of reduplication takes a set of constraint ranking independently. For example, there will be two sets of constraint ranking used to determine the reduplicative forms of the base *vare* 'wind' depending on the semantics it chooses. To denote plurality, a certain set of constraint ranking is used to predict *vare-vare* 'winds'; to derive a verb, another set of constraint ranking is applied to predict *va-vare* 'to blow.' In the following subsections, constraint rankings for each reduplication pattern and their interaction with reduplicative data are presented. Section 4.3.1 discusses the affixation in reduplication. Section 4.3.2 presents the OT analysis of rightward reduplication. Section 4.3.3 deals with -CV- reduplication. Section 4.3.4 accounts for CV- reduplication. Finally, section 4.3.5 provides the OT analysis of C*a*- reduplication.

4.3.1 Affixation in reduplication

In Siraya, the affix is never reduplicated. To account for this fact under OT framework, I adopt a constraint which is proposed by Tseng (2003) that prevents affixes from being reduplicated. In Siraya, this constraint is highly ranked so that the reduplicant that contains an affix will not surface. In the rest of my thesis, I do not include candidates that violate this constraint.

(52) ***REPEAT(AF)**: Output must not contain two identical affixal elements. (Tseng, 2003:77)

(53) ***REPEAT(AF)**

taŋi-taŋi-ən ≻ **taŋi-ən-taŋi-ən*

4.3.2 Rightward reduplication

This section is devoted to the analysis of rightward reduplication. The OCP effect, no-coda, size and placement of the reduplicants are discussed and analyzed in the following subsections.

Rightward reduplication is the most productive reduplication pattern in Siraya. The reduplicant of this type takes a foot size CV.CV as its canonical shape. Other variants include CV.V and V.CV, depending on the existence of onsets in bases. Reduplicants of rightward reduplication are composed of open syllables; the coda is never copied. More examples of rightward reduplication are presented below.

(54) More examples of rightward reduplication

	base	**syllable structure**	**gloss**	**reduplicated words**	**syllable structure**	**gloss**
a.	mila	CV.CV	again	mila-<u>mila</u>	CV.CV	gradually
b.	ralum	CV.CVC	water	ralu-<u>ralu</u>-m	CV.CV	waters
c.	vual	CV.VC	body	maix-vua-<u>vua</u>-l	CV.V	each person
d.	uma	V.CV	field	uma-<u>uma</u>	V.CV	fields
e.	ayam	V.CVC	bird	aya-<u>ya</u>-m	V.CV	birds
f.	kirivil	CV.CV.CVC	shore	kirivi-<u>rivi</u>-l	CV.CV	boarders

4.3.2.1 OCP

In (54e), the first vowel of the base is not copied in the reduplicant since copying it would lead to the adjacency of two identical vowels in the morpheme boundary. The **OCP-V** constraint must be ranked above **MAX-BR** to preserve the vowel in the base. **MAX-IO** should also dominate **MAX-BR** to preserve the vowel in the base. Since Siraya permits identical vowels within a single morpheme, **MAX-IO** should also dominate **OCP-V** to preserve the vowel in the roots. The definition of **OCP-V** is given in (55) and the domination of **MAX-IO**, **OCP-V** is illustrated in (56) and (57).

(55) **OCP-V**: No identical adjacent vowels.

(56) **MAX-IO ≫ OCP-V**

saat 'one'

saat ≻ * *sat*

(57) **MAX-IO ≫ OCP-V ≫ MAX-BR**

a. **MAX-IO ≫ MAX-BR**

aya-<u>ya</u>-m 'birds' (< *ayam* 'bird')

aya-<u>ya</u>-m ≻ **ay-<u>aya</u>-m*

b. **OCP-V ≫ MAX-BR**

aya-<u>ya</u>-m ≻ **aya-<u>aya</u>-m*

4.3.2.2 No coda

For Siraya reduplication, **NO-CODA** must be highly ranked because the reduplicants do not copy the last consonant even if there is one. **NO-CODA** is ranked below **MAX-IO** to avoid the deletion of the last consonant in the base, but ranked above **MAX-BR** to avoid the reduplication of codas. The definition of constraints **MAX-IO** and **NO-CODA** are given in (58) and (59), followed by the presentation of the constraint ranking **MAX-IO** ≫ **NO-CODA** ≫ **MAX-BR** in (60).

(58) **MAX-IO:** Every segment of input has a correspondence in output.

(59) **NO-CODA**: Syllables are open.

(60) **MAX-IO** ≫ **NO-CODA** ≫ **MAX-BR**

a. **MAX-IO** ≫ **NO-CODA**

kirivi-rivi-l 'boarders' (< *kirivil* 'shore')

kirivi-rivi-l ≻ **kirivi-rivi*

b. **NO-CODA** ≫ **MAX-BR**

kirivi-rivi-l ≻ **kirivil-rivil*

The tableau of selecting the attested output *kirivi-rivi-l* by the constraint ranking **MAX-IO,**

OCP-V ≫ NO-CODA ≫ MAX-BR is presented below. (The incorrect winner is indicated by a 💣, and the attested (desired) output is indicated by a ☞.)

(61) **MAX-IO, OCP ≫ NO-CODA ≫ MAX-BR**

/kirivil+RED/	**MAX-IO**	**OCP-V**	**NO-CODA**	**MAX-BR**
☞ a. kirivi-<u>rivi</u>-l			*	**!
b. kirivil-<u>rivil</u>			**!	**
c. kirivi-<u>rivi</u>	*!			**
d. kirivi-<u>irivi</u>-l		*!	*	*
💣 e. kirivi-<u>kirivi</u>-l			*	

With the constraint ranking ***REPEAT(AF) ≫ MAX-IO, OCP-V ≫ NO-CODA ≫ MAX-BR**, the reduplicant will not contain codas but codas in the base will be preserved. However, the present constraint ranking cannot rule out the unattested candidate (61e) **kirivi-<u>kirivi</u>-l* since it incurs less violation marks of **MAX-BR.** The reduplicant in (61e) is larger than a foot, and there is no constraint so far to regulate the size of the reduplicant.

4.3.2.3 Foot size reduplicants

In the literature, the foot size of reduplicants can be accounted for by three ways. The first approach, also the one to be applied in this thesis, that aims to govern the disyllabic size of reduplicants is to use an adjacency constraint **ADJACENCYBR-BY-FOOT**. This constraint belongs to the ADJACENCYBR constraint family (Lunden, 2004) that can govern the size of reduplicants in Siraya rightward reduplication. Since the weight of a Siraya coda is not clear, I adopt the syllabic analysis of foot binary, i.e. a foot contains two syllables. However, whether the coda is moraic or not will not affect the winning of the attested output. The definition of the constraint **ADJACENCYBR-BY-FOOT** in (6c) is given again in (62).

(62) **ADJACENCYBR-BY-FOOT (AD-BY-FOOT)**: Every foot in the reduplicant is next to its correspondent base.

With the constraint ranking **ADJACENCYBR-BY-FOOT** ≫ **MAX-BR**, reduplicants of rightward reduplication are disyllabic, as illustrated in (63). The reduplicant that is bigger than a foot incurs a violation mark with respect to **ADJACENCYBR-BY-FOOT**.

(63) **ADJACENCYBR-BY-FOOT** ≫ **MAX-BR**

kirivi-[(ri.vi)]-l ≻ **kirivi-[(ki.ri)vi]-l*

The ranking of **ADJACENCYBR-BY-FOOT** and **MAX-IO** is not crucial, nor the ranking of **ADJACENCYBR-BY-FOOT** and **NO-CODA** since the violation of either one constraint does not entail the satisfaction of the other. Thus, the constraint ranking so far is ***REPEAT(AF)**,

MAX-IO, ADJACENCYBR-BY-FOOT, OCP-V ≫ NO-CODA ≫ MAX-BR, as presented below.

(64) ***REPEAT(AF)**, **MAX-IO, ADJACENCYBR-BY-FOOT, OCP-V ≫ NO-CODA ≫ MAX-BR**

/kirivil+RED/	MAX-IO	OCP-V	AD-BY-FT	NO-CODA	MAX-BR
☞ a. kirivi-[(ri.vi)]-l				*	**!
b. kirivil-[(ri.vil)]				**!	**
c. kirivi-[(ki.ri)vi]-l			*!	*	
d. kirivi-[(ri.vi)]	*!				**
e. kirivi-[(i.ri)vi]-l		*!	*	*	*
💣 f. ki-[(ri.vi)]-rivil				*	*

The second one is to set a templatic constraint RED=σσ, as adopted in Lu (2003) in dealing with rightward reduplication in four Formosan languages. Since we have seen the inadequacy of templatic constraints in §2.5, I will not adopt a templatic constraint here.

The third one is to apply the Compression Model to limit the size of reduplicants. As proposed by Lin (2010) to account for disyllabic verbal reduplication in Pazih, the constraints **RED-PRWD-L** and **RED-PRWD-R** are used to regulate the reduplicants to start and end with a prosodic word. With **FTBIN** (A foot is disyllabic.) undominated, the reduplicants are minimally disyllabic. To condition the reduplicant in exactly a disyllabic size, the other two alignment constraints **ALIGN-RED-L** and **ALIGN-ROOT-L** are adopted to compress the reduplicants to disyllabic, as presented below. The reduplicant in candidate (65b) incurs more violation marks than the attested output in terms of **ALIGN-ROOT-L**, which favors a smaller reduplicant.

(65) Pazih disyllabic verbal reduplication (Lin, 2010:703)

Input: /(maa-), REDpl, pabarət/	**RED-PRWD-L**	**RED-PRWD-R**	**ALIGN-ROOT-L**
☞ a. [(maa-)[paba]PW- pabarət]PW			maapabə
b. [(maa-)[pabarə]PW- pabarət]PW			maapabar!ə
c. [[(maa-)pa]PW- pabarət]PW	*!		maapa

However, the Compression Model cannot be adopted in Siraya rightward reduplication since the reduplicant is infixed before the root-final consonant. Hence, **ALIGN-ROOT-R** cannot compress the size of the reduplicant, as presented below. Therefore, I will not adopt the Compression Model in dealing with Siraya rightward reduplication.

(66) Siraya rightward reduplication

Input: /kirivil+RED/	**RED-PRWD -L**	**RED-PRWD -R**	**ALIGN-ROOT -R**	**ALIGN-RED -R**
☞ a. [kirivi-[rivi]PW-l]PW				*
💣 b. [kirivi-[kirivi]PW-l]PW				*

4.3.2.4 The place of reduplicant

With the constraint ranking in (64), we could choose a reduplicant that is a foot with two open syllables, but the location of the reduplicant cannot be predicted from the constraint ranking. Thus, the candidate (64f) **ki-rivi-rivil*, which performs better than the attested output (64a), cannot be ruled out. The only difference between these two candidates is the location of the reduplicants. The constraint proposed to account for the location of the reduplicant is an alignment constraint that requires the reduplicant to be rightmost. The definition of this alignment constraint is given below.

(67) **ALIGN-RED-R: The reduplicant is at the rightmost position.**

The alignment constraint must be dominated by **MAX-IO** to prevent *kirivi-rivi* from winning. It should be dominated by **NO-CODA** as well to prohibit the copying of codas.

(68) **MAX-IO ≫ ALIGN-RED-R**

kirivi-rivi-l 'boarders' (< *kirivil* 'shore')

kirivi-rivi-l ≻ **kirivi-rivi*

(69) **NO-CODA ≫ ALIGN-RED-R**

kirivi-rivi-l ≻ **kirivil-rivil*

Tableau (70) presents the interaction of the alignment constraint and the others.

(70) ***REPEAT(AF)**, **MAX-IO, OCP-V**, **ADJACENCYBR-BY-FOOT** ≫**NO-CODA**≫

ALIGN-RED-R≫ **MAX-BR**

/kirivil+RED/	MAX-IO	OCP-V	AD-BY-FT	NO-CODA	ALIGN-RED-R	MAX-BR
☞ a. kirivi-[(ri.vi)]-l				*	*	**
b. kirivi-vi-l				*	*	***!*
c. ki-[(ri.vi)]-rivil				*	**!***	*
d. kirivil-[(ri.vil)]				**!		**
e. kirivi-[(ki.ri)vi]-l			*!	*	*	
f. kirivi-[(ri.vi)]	*!					**
g. kirivi-[(i.ri)vi]-l		*!	*	*	*	*
h. kirivi-[(ki.ri)]-l			*!	*	*	**

The constraint **AD-BY-FOOT** is used to rule out candidates (70e) and (70g) with reduplicants larger than a foot. According to the definition of considering a Siraya foot composed of two syllables, (70d) does not incur a violation mark of **AD-BY-FOOT**. But whether candidate (70d) violates **AD-BY-FOOT** does not affect the result because it performs worse than the attested output in terms of **NO-CODA**. The present constraint ranking for rightward reduplication is summarized below.

(71) Constraint ranking for rightward reduplication:

***REPEAT(AF), MAX-IO, OCP-V, ADJACENCYBR-BY-FOOT**

≫ NO-CODA ≫ ALIGN-RED-R ≫ MAX-BR

4.3.2.5 CV- reduplicants

The set of constraint ranking in (71) can account for CVCV reduplicants as well as CV ones, which also belongs to rightward reduplication. Tableaus for CV reduplicants are given below.

(72) *ayam* 'bird' > *aya-ya-m* 'birds'

/ayam+RED/	**MAX-IO**	**OCP-V**	**AD-BY-FT**	**NO-CODA**	**ALIGN-RED-R**	**MAX-BR**
☞ a. aya-ya-m				*	*	*
b. aya-[(a.ya)]-m		*!		*	*	
c. ayam-[(a.yam)]				**!		
d. aya-ya	*!					*

In (72), candidate (72a) and (72d) satisfy **AD-BY-FOOT** vacuously since the reduplicants are smaller than a foot. The constraint works to rule out larger reduplicants such as (72b) and

(72c) are **OCP-V** and **NO-CODA**.

4.3.2.6 Other examples

So far we have seen the constraint ranking works for tri-syllabic roots and disyllabic V.CVC roots. This section presents the tableaux for disyllabic CVCV, VCV, and CVCVC roots.

(73) CVCV base: *litu* 'devil' > *litu-<u>litu</u>* 'devils'

	/litu+RED/	**MAX-IO**	**OCP-V**	**AD-BY-FOOT**	**NO-CODA**	**ALIGN-RED-R**	**MAX-BR**
☞	a. litu-[(<u>li.tu</u>)]						
	b. litu-<u>tu</u>						*!*
	c. litu-[(<u>i.tu</u>)]						*!
	d. [(<u>li.tu</u>)]-litu					*!***	
	e. litu-<u>u</u>		*!				
	f. lit-<u>u</u>	*!					
	g. litu-<u>lit</u>				*!		

(74) VCV base: *uma* 'field' > *uma-uma* 'fields'

/uma+RED/	MAX-IO	OCP-V	AD-BY-FOOT	NO-CODA	ALIGN-RED-R	MAX-BR
☞ a. uma-[(u.ma)]						
b. uma-ma						*!
d. [(u.ma)]-uma					*!**	
e. uma-a		*!				**

(75) CVCVC base: *daraŋ* 'road' > *dara-dara-ŋ* 'roads'

/daraŋ+RED/	MAX-IO	OCP-V	AD-BY-FOOT	NO-CODA	ALIGN-RED-R	MAX-BR
☞ a. dara-[(da.ra)]-ŋ				*		
b. [(da.ra)]-daraŋ				*		*!
c. dara-ra-ŋ				*		*!*
d. daraŋ-[(da.raŋ)]				**!		
e. dara-a-ŋ		*!		*		***
f. dara-[(da.raŋ)]	*!			*		

4.3.2.6 Interim conclusion for rightward reduplication

To conclude, Siraya rightward reduplication takes a foot size reduplicant which is composed of two open syllables. The reduplicant is infixed before the final consonant of the root if there is one. The constraints that regulate the shape of reduplicant are **AD-BY-FT** and **NO-CODA**, and the constraint that governs the location of reduplicant is **ALIGN-RED-R**.

4.3.3 -CV- reduplication

-CV- reduplication is also a kind of reduplication that copies from the right. The reduplicant suffixes to a vowel-ending root, and infixes before the final consonant of a consonant-ending root. It differs from rightward reduplication in that its reduplicant is of a syllable size. Recall that the constraint ranking for rightward reduplication is ***REPEAT(AF)**, **MAX-IO**, **OCP-V**, **ADJACENCYBR-BY-FOOT** ≫ **NO-CODA** ≫ **ALIGN-RED-R** ≫ **MAX-BR**. The constraint **AD-BY-FT** should be replaced by **AD-BY-σ.** The definition of **AD-BY-σ** is repeated below, followed by a tableau presenting the constraint ranking of Siraya -CV- reduplication in VCVC bases.

(76) **AD-BY-σ**: Every syllable in the reduplicant is next to its correspondent base.

(77) VCVC base: *usĭŋ* 'little' > *usĭ-s̲ĭ̲-ŋ* 'small'

/usĭŋ+RED/	**MAX-IO**	**OCP-V**	**AD-BY-σ**	**NO-CODA**	**ALIGN-RED-R**	**MAX-BR**
☞ a. usĭ-s̲ĭ̲-ŋ				*	*	*
b. u-s̲ĭ̲-siŋ				*	**!*	*
c. usĭ-u̲s̲i̲-ŋ			*!	*	*	
d. usĭŋ-u̲s̲i̲ŋ̲			*!	**!		
e. usĭ-s̲i̲	*!					*
f. usĭ-i̲-ŋ		*!		*	*	**

The constraint **AD-BY-σ** is crucial in ruling out (77c) and (77d), in which the reduplicants are bigger than a syllable. Without the adjacency constraint, the constraint ranking will not be able to rule out (77c), which performs better than the attested output with respect to **MAX-BR**. The present constraint can also account for CVCV bases, as presented below.

(78) CVCV base: *vato* 'stone' > *vato-to-an* 'stony place'

/vato+RED/	MAX-IO	OCP-V	AD-BY-σ	NO-CODA	ALIGN-RED-R	MAX-BR
☞ a. vato-to						**
b. vato-o		*!				***
c. vato-t				*!		***
d. va-to-to					*!*	
e. vato-vato			*!			

(79) CVCCVC base: *hejriŋ* 'hook' > *hejri-ri-ŋ* 'hook'

/hejriŋ+RED/	MAX-IO	OCP-V	AD-BY-σ	NO-CODA	ALIGN-RED-R	MAX-BR
☞ a. hejri-ri-ŋ				**	*	***
b. hejriŋ-riŋ				***!		***
c. hejri-ri	*!			*		***
d. hejriŋ-hejriŋ			*!	****		
e. hej-ri-riŋ				**	**!*	*
f. hejri-i-ŋ		*!		**	*	****
g. hejriŋ-iŋ				***!	**	****
h. hej.ri-j.ri-ŋ				***!	*	**

The constraint ranking for -CV- reduplication is summarized in (80).

(80) Constraint ranking for -CV- reduplication

***REPEAT(AF), MAX-IO, OCP-V, ADJACENCY-BY-σ**

≫ NO-CODA ≫ ALIGN-RED-R≫ MAX-BR

4.3.4 CV- reduplication

CV- reduplication applies on numerals to count nonhuman referents. The size of the reduplicant is a syllable, the same as the reduplicants in -CV- reduplication. The difference between CV- and -CV- reduplication is the edge the reduplicants aligned to. The difference can be accounted for by the alignment constraint denoting the opposite edge, as given in (81).

(81) **ALIGN-RED-L: The reduplicant is at the leftmost position.**

Besides, the constraint ***COMP** that bans onset consonant clusters should occupy a high position in the ranking since Siraya does not prohibit onset consonant clusters. The tableau for the constrain ranking ***REPEAT(AF)**, ***COMP**, **MAX-IO, OCP-V**, **ADJACENCY-BY-σ≫ NO-CODA ≫ ALIGN-RED-L≫ MAX-BR** are presented below.

(82) CV- reduplication: *ruha* 'two' > *ru-ruha* 'two feet'

/RED+ruha/	MAX-IO	*COMP	OCP-V	AD-BY-σ	NO-CODA	ALIGN-RED-L	MAX-BR
☞ a. ru-ruha							**
b. ru-ru	*!*						
c. ru-u-ha			*!			**	*
d. ruh-ruha					*!		*
e. ruha-ruha				*!			
f. r-ruha		*!					***
g. u-ruha							***!
h. ha-ruha				*!			**
i. ru-ru-ha						*!*	

AD-BY-σ rules out (82e) because the reduplicant in (82e) is larger than a syllable. Candidate (82g) satisfies **AD-BY-σ**, but it incurs more violation marks of **MAX-BR**, which favors total copying. The **AD-BY-σ** constraint also rules out (82h) because the reduplicant and its correspondent base are not adjacent, though it is in a syllable size. The alignment constraint **ALIGN-RED-L** ensures that the reduplicant is a prefix, as compared in (82a) and (82i). The constraint ranking for Siraya CV- reduplication is summarized below.

(83) Constraint ranking for Siraya CV- reduplication

***REPEAT(AF)**, ***COMP**, **MAX-IO, OCP-V**, **ADJACENCY-BY-σ**

≫ **NO-CODA** ≫ **ALIGN-RED-L** ≫ **MAX-BR**

4.3.5 C*a*- reduplication

C*a*- reduplication is common with Formosan languages. This patterns applies by copying the first segment of the root and attach it to a fixed segment *a*. In Siraya, the constraints used for accounting for C*a*- reduplication are similar to that of CV- reduplication since they both take a syllable size reduplicant and the reduplicants are anchored and aligned with the left edge of bases. The difference between CV- reduplication and C*a*- reduplication is the fixed vowel *a* in C*a*- reduplication. The idea of fixed segmentism was first employed in OT by Alderete et al. (1999) and evidenced in many languages. This idea was built on TETU in that the replacement of the original vowel by a default *a* decreases the markedness of the structure. Notwithstanding, *a* is the most unmarked vowel in Siraya. In Siraya, the vowels in loanwords are not usually *a*, so I cannot find evidence to support its default status. Therefore, I follow Lu (2003) in analyzing C*a*- reduplication in four Formosan languages to consider the vowel *a* to be a fixed segment in C*a*- reduplication. To account for the vowel alternation in reduplicants, constraint **N/a** must be considered. To avoid the vowel alternation in bases, **IDENT-IO** must outrank **N/a**.

(84) **N/a**: The nucleus of a syllable is *a*.

(85) **IDENT-IO ≫ N/a**

<u>da</u>-diri ‘sowing’ (< *diri* ‘sow’)

<u>da</u>-diri ≻ **<u>da</u>-dara*

The ranking of **MAX-IO, ADJACENCY-BY-σ** and **IDENT-IO** is not crucial in C*a*- reduplication because the violation of one of them does not incurs the violation of others. The ranking of these three constraints are very high because they are never violated by the attested outputs. The tableau presents the constraint ranking is given in (86).

(86) *diri* 'sow' > *da-diri* 'sowing'

/RED+diri/	MAX-IO	*COMP	OCP-V	AD-BY-σ	IDENT-IO	N/a	NO-CODA	ALIGN-RED-L	MAX-BR
☞ a. da-diri						**			**
b. di-diri						***!			**
c. da-dara					*!*				**
d. dara-diri				*!		**			
e. a-diri						**			***!
f. di-da-ri						**		*!*	
g. d-diri		*!				**			***
h. da-di	*!*					*			**
i. dar-diri						**	*!		*

However, the present constraint ranking cannot account for vowel-initial bases in C*a*-reduplication, as shown below (Irrelevant candidates and constraints are eliminated.).

(87) VCVCV base: *awlux* ‘to baptize’ > *a-awlux* ‘baptism’

/RED+awlux/	**MAX-IO**	**OCP-V**	**AD-BY-σ**	**NO-CODA**	**ALIGN-RED-L**	**MAX-BR**
☞ a. a.-aw.lux		*!		**		****!
💣 b. a.w-aw.lux				**		***
c. [(aw.lu)]-awlux			*!	***		*

From tableau (87), we know that the **OCP** constraint is violated by the attested output. The reduplicants in vowel-initial roots of C*a*- reduplication will inevitably incurs two adjacent vowels in the morpheme boundary. Therefore, the ranking of **OCP** in this type of reduplication should be lowered. Besides, the adjacency constraint **AD-BY-σ** cannot rule out the unattested candidate (87b) since the reduplicant is in a syllable size. The consonant in the reduplicant is re-syllabified as the onset of the following syllable. Thus, candidate (87b) performs equally well with the attested output (87a) in terms of **NO-CODA**, and better in **MAX-BR**. Due to the variant shape of reduplicants in C*a*- reduplication, there should be constraints that can compress the size of the reduplicants to a minimal one. Therefore, the Compression Model should be applied to compress the reduplicant size of vowel-initial bases in C*a*- reduplication. One more constraint should be added in the ranking for compression, as given below.

(88) **ALIGN-ROOT-L:** Align the left edge of the root with the left edge of the word.

The size of the reduplicant can be accounted for under the Compression Model by the use of competing alignment constraints **ALIGN-ROOT-L** and **ALIGN-ROOT-R**. Since C*a*-reduplication is prefixation, **ALIGN-RED-L** should dominate **ALIGN-ROOT-L**. **ALIGN-ROOT-L** should also dominate **MAX-BR** due to the imperfect copying.

(89) **ALIGN-RED-L ≫ ALIGN-ROOT-L**

a-awlux ≻ * *a-a-wlux*

(90) **ALIGN-ROOT-L ≫ MAX-BR**

a-awlux ≻ * *awlux-awlux*

(91) awlux→a-awlux

/RED+awlux/	**MAX-IO**	**NO-CODA**	**ALIGN-RED-L**	**ALIGN-ROOT-L**	**OCP-V**	**MAX-BR**
☞ a. a.-aw.lux		**		*	*	****
b. a.w-aw.lux		**		**!		***
c. a.-a-w.lux		**	*!		*	
d. aw.lu.-aw.lux		***!		****		*

In short, though the reduplicants of consonant-initial bases in C*a*- reduplication can be accounted for with the adjacency constraint, but the reduplicants of vowel-initial bases cannot be compressed to a single vowel by **AD-BY-σ**. The problem can be solved by the adoption of **ALIGN-ROOT-L**, which forbids a larger reduplicant. The constraint ranking for C*a*-reduplication is summarized below.

(92) Constraint ranking for C*a*- reduplication

***REPEAT(AF)**, **MAX-IO**, ***COMP**, **IDENT-IO**

≫ **N/a**, **NO-CODA** ≫ **ALIGN-RED-L**

≫ **ALIGN-ROOT-L** ≫ **OCP-V** ≫ **MAX-BR**

4.4 Summary

This section presents Siraya reduplication data and discusses the defects of the previous categorization and the merits of the new one. This section also provides semantic evidence to support the argument that Siraya reduplication can be predicted semantically. This section also provides an OT analysis to analyze Siraya different reduplication patterns, aiming to see the interaction of constraints in choosing the attested output. In Siraya reduplication, the most productive pattern is rightward reduplication, which account for more than half of the reduplicative data. The semantic functions of each pattern and the constraint rankings are summarized below. The meanings associated with rightward reduplication are all iconic, while CV- reduplication expresses non-iconic meanings. Siraya C*a*- reduplication denotes iconic meaning of PROGRESSIVE and non-iconic meanings of deriving nouns from verbs and count human referents.

(93) Rightward reduplication (INTENSIVE, HABITUAL, and IMPERFECTIVE)

***REPEAT(AF), MAX-IO, OCP-V, ADJACENCYBR-BY-FOOT**

≫ NO-CODA ≫ ALIGN-RED-R ≫ MAX-BR

(94) -CV- reduplication (No meaning change)

***REPEAT(AF), MAX-IO, OCP-V, ADJACENCY-BY-σ**

≫ NO-CODA ≫ ALIGN-RED-R≫ MAX-BR

(95) CV- reduplication (Count nonhuman referents)

***REPEAT(AF), *COMP, MAX-IO, OCP-V, ADJACENCY-BY-σ**

≫ NO-CODA ≫ ALIGN-RED-L ≫ MAX-BR

(96) C*a*- reduplication (derive nouns from verbs, count human referents, and PROGRESSIVE)

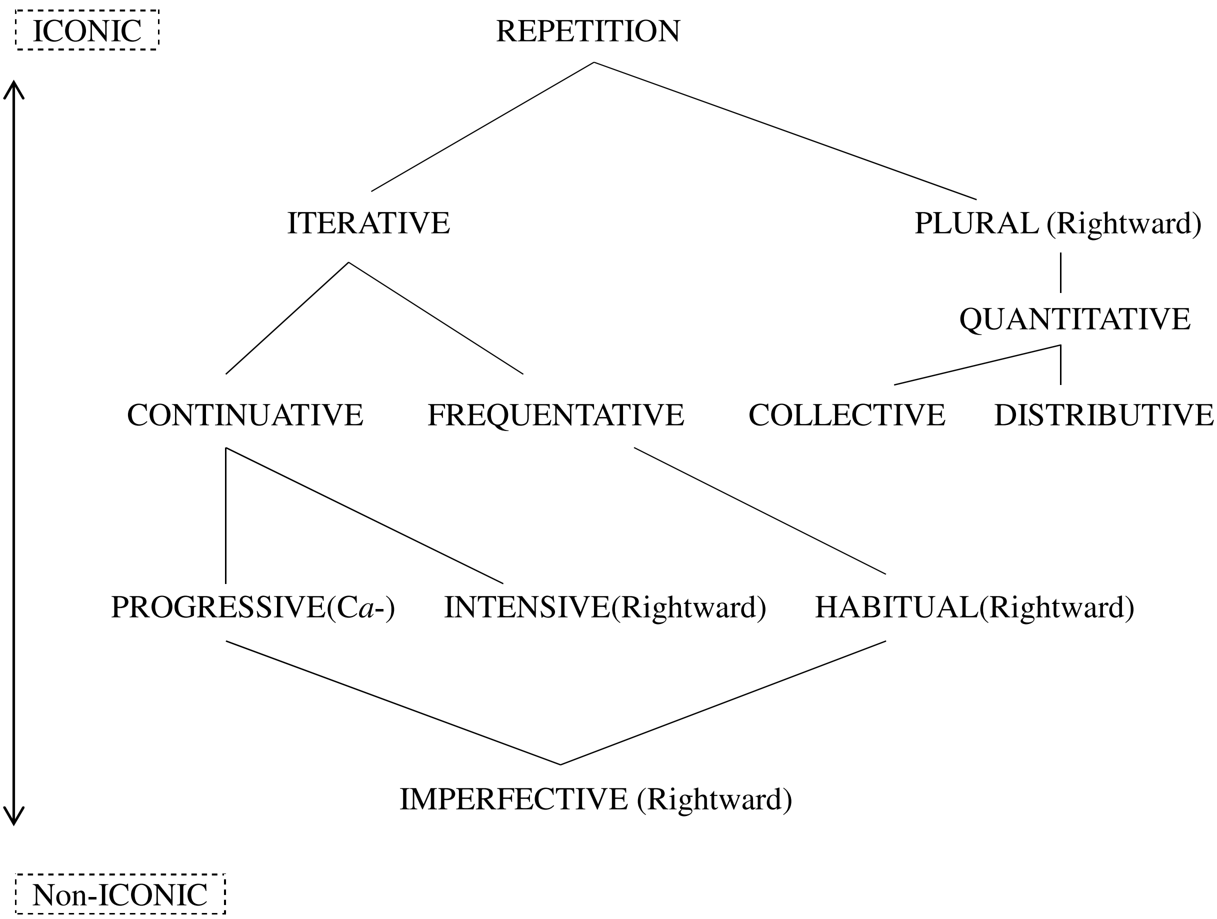
***REPEAT(AF), MAX-IO, *COMP, IDENT-IO**

≫ N/a, NO-CODA ≫ ALIGN-RED-L

≫ ALIGN-ROOT-L≫ OCP-V ≫ MAX-BR

Based on the semantic network proposed by Lee (2007), a semantic network for the meanings of reduplication in Siraya is given below. The functions of Siraya rightward reduplication are all iconic, whereas those in C*a*- reduplication are iconic or non-iconic. CV- and -CV- reduplication are both non-iconic reduplication.

(97) A semantic network for Siraya reduplication



Chapter Five

Conclusion

In this thesis, an OT analysis is proposed to analyze Siraya reduplication patterns that have been re-categorized according to the semantics of different reduplication patterns. Starting by examining Siraya syllable structure, which is highly relevant to the analysis of reduplication, we found that Siraya does not permit consonant clusters. The seemingly cc-like sequences are in fact hetero-syllabic. Bases in Siraya reduplication are disyllabic and tri-syllabic in size.

As for Siraya reduplication, a refined categorization based on Adelaar (2000, 2011) is provided. The new categorization is defined not only by the semantic functions of each pattern, but also the shape of reduplicants. It solves the problem in Adelaar's categorization about the overlapping semantic functions in disyllabic-root reduplication and rightward reduplication by merging them into a single pattern. Besides, the new categorization captures the characteristics that except for rightward reduplication, reduplicants are mono-syllabic. The syllable size of reduplicants is resulted from two competing alignment constraints rivaling with each other to be leftmost/rightmost. Thus, the reduplicant size is compressed to a minimal one.

While reduplicants in C*a*-, CV-, and -CV- reduplication are of a syllable size, the reduplicant size of rightward reduplication is larger. Given that rightward reduplication is a kind of full reduplication in disyllabic roots, the reduplicants are not compressed to a minimal size. The reduplicants of rightward reduplication are in a foot size and placed adjacent to its correspondent base. An adjacency constraint **ADJACENCYBR-BY-FOOT** is adopted to explain the placement and size of the reduplicants. As for -CV- reduplication, another adjacency constraint **ADJACENCYBR-BY-σ** is used to condition the size of the reduplicant. However, as presented in §4.3.5, the **ADJACENCYBR-BY-σ** fails to explain the reduplicants in a single segment. Hence, the Compression Model helps to compress the size of the reduplicant.

This thesis is the first attempt to analyze Siraya syllable structure and reduplication under OT framework. The reduplication pattern of a base is determined by semantics rather than the syllable structure. The way of determining reduplication pattern semantically is the distinct feature of Siraya, but it is commonly found in other Formosan languages.

However, there are some issues await further research. First, a deep examination of Siraya vowel system is needed. Whether Siraya has diphthongs remains unclear in present studies. In this thesis, when two vowels occur together, they are analyzed as hetero-syllabic. This analysis is based on Adelaar's first syllable reduplication. In this type of reduplication, the example *saat* 'one' > *sa-saat ki juko* 'one sheep' does not reduplicate the second vowel, which implies that the two vowels are of two syllables. If these two syllables are of one syllable, then the vowel in the reduplicant must be lengthened. If there are diphthongs in Siraya, then more constraints must be considered in the OT analysis, and the argument that Siraya bases are disyllabic or tri-syllabic must be revised. Second, the vowel length distinction is not yet fully attested. This issue is relevant to the stress assignment. If Siraya does not use vowel length to distinguish words, then stress may take part in the decision. Adelaar (2000, 2011) does not use stress assignment to distinguish words, while Macapili (2008) does. However, the data presenting stress contrast are still few in the literature, so more efforts must be done to investigate this issue. Third, in Siraya, some meanings in Lee's (2007) semantic network are not found. Therefore, more data should be recruited to examine the existence of the lost meanings in Siraya.

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