All Dissimilation is Computationally Subsequential

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ABSTRACT. This paper presents a computational analysis of the 185 dissimilation patterns in the typological surveys by Suzuki (1998) and Bennett (2013), and shows that dissimilation is computationally less complex than has been previously shown. Dissimilation patterns are grouped into three general types (basic, blocking, and polarity), each of which can be modeled with a subsequential finite state transducer. This lends support to the claim that phonological patterns are not only regular, but in fact subsequential, which is a more restrictive class of patterns computationally, and provides a stronger bound on the types of processes expected in natural language phonology.*

Keywords: dissimilation, Chomsky hierarchy, complexity, subsequentiality, subregular hypothesis

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1. INTRODUCTION. Dissimilation, wherein two sounds in a word become less similar to one another (or the avoidance of similar sounds in a word is observed) is a well-attested phonological process both synchronically and diachronically (Suzuki, 1998; Bennett, 2013). Although it may be seen as the counterpart to assimilation, dissimilatory processes are often non-local, and may involve segments which block the dissimilation. Thus, if one were to look for a computationally 'complex' pattern in phonology, long-distance dissimilation would be a good candidate, since complexity is often tied to locality.

This paper establishes that the dissimilation patterns of the world's languages are computationally less complex than previously realized. It is well-known that phonological grammars are *regular*— that is, they can be expressed with finite state transducers (Johnson, 1972; Kaplan and Kay, 1994). (See Beesley and Kartunnen (2003) for a linguistically-oriented introduction to finite-state machines.) The analysis here reveals that each dissimilation pattern is *subsequential*, which means they can be expressed with a particular type of finite state transducer, one that is either left or right deterministic. (The terms 'regular,' 'subsequential,' and 'deterministic,' will all be defined in more detail in §2.)

Because the subsequential class of patterns is a proper subclass of the regular class of patterns, it can be said that this paper establishes a tighter computational characterization of dissimilation patterns than previously realized. In this way, this result is similar to other studies that have shown other segmental processes in phonology are subsequential, such as metathesis and vowel harmony (Gainor et al., 2012; Chandlee et al., 2012; Chandlee and Heinz, 2012; Heinz and Lai, 2013). (See Jardine (2016) for an argument that tonal patterns are not.)

The empirical basis for the study comes from Bennett (2013)'s 146 pattern typology of long distance dissimilatory patterns, as well as 57 segmental patterns from Suzuki (1998)'s dissimilation typology. The study revealed only one potential counterexample from Yidiny (Dixon, 1977). However, closer examination in §5.2 shows there is an analysis compatible with subsequentiality.

The main result of this paper, that dissimilation patterns are subsequential, helps address one of the fundamental questions of generative linguistics, namely: What are the possible

and impossible language patterns (Chomsky, 1965)? The study here provides support for what could be called *the Subsequential Hypothesis*: segmental processes in phonology must be subsequential. This hypothesis predicts that certain phonological patterns (those which are non-subsequential) cannot exist. An example of such a pattern—'unbounded circumambient assimilation'—is described in §2.2.

Beyond typology, the computational nature of linguistic patterns also has ramifications for processing, learning, and acquisition. If a pattern is regular, it means memory is restricted in an important way. Furthermore, with respect to subsequentiality, it is well-known that deterministic finite-state machines process inputs more efficiently than non-deterministic ones. When it comes to learnability, Heinz et al. (2015, chapter 3) argue that learning patterns describable with deterministic grammars is significantly easier. One illustrative example comes from Oncina and Vidal (1993), which provides the basis for the efficient, exact learning of subsequential patterns—the very kind shown here to include dissimilation patterns, including long distance ones. This contrasts with negative results on learning the regular class of patterns for which provably no exact learning algorithm exists (Gold, 1967). These learning results (see also (Gildea and Jurafsky, 1996)), in conjunction with the evidence favoring the Subsequential Hypothesis, signals a way in which segmental processes can be plausibly acquired.

The rest of this paper is organized as follows: Section 2 provides a computational background, including a definition of subsequentiality and finite state transducers; Section 3 provides a theoretical background for analyses of dissimilation in addition to addressing questions of representation; Section 4 describes the sources of typological data used in this paper as well as three subtypes of dissimilation patterns; Section 5 gives the computational analysis of each subtype, and Section 6 concludes with a discussion of the result's significance. An appendix provides a categorization for each of the language patterns covered by this analysis, as well as specific subsequential finite state transducers to generate each pattern.

2. COMPUTATIONAL BACKGROUND. One of the most well-known systems for formalizing the complexity of language patterns is the Chomsky Hierarchy (Chomsky, 1956), a schema which divides grammars (that is, the sets of rules and symbols which generate languages) into different levels of complexity, as shown in Figure 1 below.

<INSERT FIGURE 1 ABOUT HERE>

The larger ovals can be seen to imply a greater level of complexity; that is, the grammars that generate *context-free* languages can generate a larger set of languages than the grammars that generate *regular* languages, and so on. The diagram represents a subset relation, so any language that is generated by a regular grammar could also be generated by a context-free grammar. Therefore the class of 'regular languages' is strictly smaller than the class of 'context-free languages' (languages generated by a context-free grammar). For further information on these measures of complexity, see Partee et al. (1990).

However, the Chomsky Hierarchy classifies *formal languages* which are sets of strings, and we are interested in the nature of phonological *maps*, which can be thought of as string-to-string functions. Maps take some input string and return some output string – for instance, they map an underlying form to a surface form. Phonological maps can be described with an ordered list of rewrite rules of the form A $\rightarrow$ B / C __ D (Halle and Chomsky, 1968). They can also be described with OT grammars (Prince and Smolensky, 1993, 2004). Rewrite rule grammars are long known to generate regular maps (Johnson, 1972; Kaplan and Kay, 1994) and OT grammars generate regular maps under certain conditions (Frank and Satta, 1998; Riggle, 2004).

Figure 2 shows a hierarchy for the class of regular maps, with finite maps being the least complex, and non-regular maps the most complex.

<INSERT FIGURE 2 ABOUT HERE>

The relevant subset of the regular class for our purposes is the *subsequential* class, a class comprised of the union of the left-subsequential and right-subsequential patterns in Figure 2. The subsequential class includes all patterns that can be described with a subsequential finite state transducer (to be defined below). These subsequential patterns are strictly less

complex than non-subsequential regular patterns (Mohri, 1997).

Before defining subsequential finite state transducers, first consider what typifies finite state transducers (FSTs) in general. An example FST for a simple rule changing A to B word-finally is shown in Figure 3.

<INSERT FIGURE 3 ABOUT HERE>

This FST describes the same map as the following rule: A → B / __#. That is to say, A will change to B only at the end of a word. The FST describes this process in the following way: beginning in the state labelled '0', seeing a B as input (the left side of 'B:B') means that the FST will output a B (the right side of 'B:B') and return to state 0. Seeing an A could either mean that you loop back to state 0 and output an A, or that you transition to state 1 and output a B. This is a case of non-determinism, since the single input A could follow either path. However, since only state 1 is a final state with no outgoing transition, only word-final A will end up being as output as B, and the rest will remain As. A sample derivation for the string /BBAA/ is illustrated below in 1. Here, the string is read from left to right (see §2.1 below for more on directionality).

(1)

Input		B		B		A		A	
State	0	→	0	→	0	→	1	→	1
Output		B		B		A		B	

First, starting in the initial state 0, the segment B is read, and looping to state 0 outputs an B. The second B is read, and again looping back to state 0, we output another B. Next we read an A, and so we follow the transition back to state 0 and output an A, since this is not a word-final segment. (If we had transitioned to state 1, then we would not be able to process the final input segment.) Finally, we read another A, and transition to state 1, outputting a B. There are no more segments in the input, so we end in state 1.

Because this pattern is describable using an FST, it is regular, but this particular map is also subsequential, as represented in Figure 4. To be a subsequential FST (or sFST) requires two things. First, the FST is deterministic on the input, meaning that for any

given input in any state, there is only one possible path to take. Second, every final state in the FST also outputs a string when the derivation is finished. (It can also be the empty string ε.)

These restrictions mean that not every possible pattern can be described with a subsequential FST. In terms of phonology, the fact that the sFST must be deterministic means that from any point in the string, each output must be determinable from looking ahead and behind in the word only a bounded amount. At some point, you must choose a 'path' in the sFST. The outputs in the final state mean that eventually the string must have an ending point, and it can end by outputting some specific segment(s).

One example of a non-subsequential phonological pattern is given in §2.2. (Heinz and Lai (2013) and Jardine (2016) provide further examples of non-subsequential functions relevant to phonology.)

<INSERT FIGURE 4 ABOUT HERE>

A derivation for the input /BBAA/ using Figure 4 is given in 2.

(2)

Input		B		B		A		A		
State	0	→	0	→	1	→	1	→	1	→
Output		B		B		ε		A		B

Here, the input begins in state 0, where the segment B is read, and looping to state 0 outputs a B. The second B is read, and again looping back to state 0, we output another B. Next we read an A, and so we follow the transition to state 1 and output the empty string. This empty string is a way to store the fact that an A was seen, so that upon seeing the next segment, if one exists, the A can be output, but if there is no other segment, a B can be output. Finally, we read another A, and loop to state 1, outputting an A, corresponding to the previous A from the input. There are no more segments in the input, so we end in state 1, and output a B, producing the output string BBAB.

2.1 Directionality. Another important distinction is whether these maps are left-to-right subsequential, or right-to-left ('reverse') subsequential. The previous example

was left-to-right subsequential, and it works well with patterns where the trigger for dissimilation is to the left of the target (progressive dissimilations). However, for regressive dissimilations, where the trigger is to the right of the target, a right-to-left subsequential FST is typically necessary.

A left-to-right subsequential function is recognized by a subsequential transducer. A right-to-left subsequential function is recognized by a subsequential transducer which processes the input string from right-to-left. In other words, if a pattern is right-to-left subsequential, the initial input string is *reversed*, then the sFST applies, and finally the result is reversed again to get the proper output.

The pattern described an Figure 4, where A changes to B word finally, is describable with both a left-to-right subsequential and right-to-left subsequential transducer. An example of a right-to-left subsequential map for this pattern is as follows.

<INSERT FIGURE 5 ABOUT HERE>

Consider again the pattern described by the rule A $\rightarrow$ B / __ #, now using the right-to-left subsequential FST in Figure 5. Here, again, /AABB/ would surface as [AABA]. To generate the output for such a map, if you had the input string /BBAA/, you would reverse it (*AABB*) before applying the sFST. The derivation would then proceed as shown in 3. The first segment in the input is now an A, so we move to state 1 and output a B. Reading the next A, we loop to state 1 and output an A. Next we read a B, looping to state 1, and output an B. Finally, we read the final B, looping back to state 1 and outputting a B. We end here in state 1 and output the empty string.

(3)

Input		A		A		B		B		
State	0	$\rightarrow$	1	$\rightarrow$	1	$\rightarrow$	1	$\rightarrow$	1	$\rightarrow$
Output		B		A		B		B		ε

Finally the output of the sFST (*BABB*) would be reversed, yielding the correct output: *BBAB*.

2.2 Subsequential patterns are a proper subset of regular patterns. Finally, what about a regular pattern that is neither left-to-right nor right-to-left subsequential? Figure 6 shows a transducer for one such pattern, wherein a B will assimilate to an A if there is some A both preceding **and** following it: B → A / AZ_0 __ Z_0A. (Here Z_0 stands for any number of segments of either type.) Note that the As may be unboundedly far from the B on both ends of the word. This cannot be classified as a progressive or regressive harmony pattern, since it is a combination of both. If this seems like a strange phonological pattern, that is in fact a good thing, because the pattern is not subsequential, and indeed none of the dissimilation patterns investigated here are of this nature. (Note that it fails because there is nondeterminism stemming from state 1, where a /B/ may either be output as an [A] or a [B] depending on what happens later. (Jardine, 2016) calls these patterns *unbounded circumambient*, and proves they cannot be subsequential.

<INSERT FIGURE 6 ABOUT HERE>

A sample derivation for this FST is as follows - consider the string /ABBA/, which maps to [AAAA], as shown in 4. First we read an A, and moving to state 1, output an A. Next, we read a B, and move to state 3, outputting an A. (Note that if we had chosen to move to state 2 instead, we would not be able to read any additional A segments, so we must move to state 3.) Reading the next B loops back to state 3, outputting another A. Finally we read an A, move to state 0, and output another A, ending in state 0.

(4)

Input		A		B		B		A	
State	0	→	1	→	2	→	2	→	0
Output		A		A		A		A	

3. Theoretical background. Dissimilation has been analyzed in a variety of ways in phonological theory. However, some of the more common approaches involve a tier-based autosegmental analysis using the Obligatory Contour Principle (OCP) explicitly (Frisch

et al., 2004), or an Optimality Theoretic (OT) approach using local self-conjunction of constraints (Alderete, 1997), which is essentially another way to encode OCP violations (Itô and Mester, 1998). In an autosegmental approach, the dissimilating segments share a feature which is projected on a separate tier. In OT, constraints are used that ban a word from having multiple segments with the same feature value.[1]

One example of basic non-local dissimilation can be seen in Tashlhiyt Berber 5, where the first of two labial consonants dissimilates[2].

(5) /**m**-kadda**b**/ → [**n**-kadda**b**] 'consider a liar (reciprocal)' (Jebbour, 1985)

In OT, this can be analyzed with markedness constraints formed by local conjunction, following Alderete (1997). These constraints simply ban having multiple segments with the same feature value, as follows:

LAB-2: assign one violation for every word with two labial segments.[3]

COR-2: assign one violation for every word with two coronal segments.

IDENT(LAB): assign one violation for every segment with a different specification for [±labial] in the input and output.

IDENT(LAB)$_{stem}$: assign one violation for every segment in the stem with a different specification for [±labial] in the input and output.

(6)

/m + kaddab/	*LAB-2	*COR-2	IDENT(LAB)	IDENT(LAB)$_{stem}$
☞ n-kaddab		*	*	
m-kaddab	*!			
m-kaddad		*	*	*!

An autosegmental account without the use of OT is equally successful in this case. Suppose that labials are projected to their own tier, and two labials with the same feature specification (in this case, any two labials within the same word) are forbidden by the OCP. This ill-formed structure is dealt with by a delinking and deletion of the [+labial] feature from the first segment, as well as an insertion and linking of a [+coronal] feature.

Each of the aforementioned analyses can give an account for dissimilation data, and each of them describes dissimilation in terms of an input-output map. In the OT analysis, the input comes in the form of a phonological string with morpheme boundaries encoded. This input is mapped to the phonological output string which violates the highest ranked constraints least. In the autosegmental analysis, the input segments are strings of phonological segments which are linked to various features. This input maps to a linearized phonological output in which all OCP violations are removed. Though these accounts (as well as the computational account presented here) are not necessarily mutually exclusive, one might expect that different models could have differing explanatory power, or could account for different classes of patterns.

The computational analysis investigates the character of the map, regardless of whether it is represented with an OT grammar or autosegmental rules. It is worth noting that despite the various theoretical constructs (morphemes, features, etc) deployed in each of the analyses of dissimilation, the linearized surface output from each analysis must turn out to be the same phonetically, regardless of the theory used to get there. In using a subsequential model to describe the input-output relationship, it becomes apparent that the complexity of the actual input-output *map* is constant, despite possible differences in the theoretical representation of the input string (see §4.1 for an example of this fact, regarding the representation of long vowels). The analysis presented here is only concerned with mapping string to string representations, so while it is not speaking to every aspect of the phonological literature, it relies on the common assumption that input and output representations are strings. However, that is not to say that alternative interpretations of the actual processes involved in phonological data are not relevant for computational complexity – in fact, the interpretation of the data can be crucial, as discussed in the Yidiny case of §5.2. This is very different than the alternative representational depictions of something like the long vowels discussed in §4.1, which do not change the computational complexity of the map.

It is worth noting that many, if not all, of the languages with dissimilatory patterns mentioned in this paper contain lexical exceptions to the dissimilatory generalization for

the language. However, what is important here is the nature of the actual dissimilation process (or rule, or constraint), rather than the fact that it does not apply strictly to every vocabulary item. Thus from this point forward, any exceptions are being abstracted away from, but this does not affect the claims being made regarding the complexity of dissimilation processes themselves.

Also of note is the fact that while dissimilation patterns from Bennett (2013) are long-distance and often bounded by the word, the patterns in Suzuki (1998) are occasionally local or bounded by syllables, mora, or other domain signifiers (indicated by DOM for each pattern in his appendix). Is it significant for the sFST analysis that the boundaries for the application of dissimilation rules are so variable? The assumption in this paper is that each sFST applies to the relevant domain; however, it is possible to encode domain boundaries in an FST if necessary. For instance, we can easily output a word boundary symbol (rather than ε) at the end of the derivation, and the same goes for other boundary symbols, like a syllable or foot boundary. The corresponding outputs can then be concatenated into a single word (or sentence, or utterance). While issues of domain and locality are important for many dissimilation analyses, because we are considering only the functional map of dissimilation and not its interaction with other phonological processes, bounded patterns are no more challenging for the analysis here than are unbounded patterns.

4. DISSIMILATION PATTERNS. The two main sources for the dissimilation patterns analyzed in this paper are Suzuki (1998) and Bennett (2013). Suzuki (1998)'s appendix describes 61 dissimilation patterns from 53 languages (some languages have multiple unique dissimilation patterns). While Suzuki's appendix contains 57 numbered patterns and 4 subpatterns, I make no distinction between patterns and subpatterns here and consider each as an individual pattern, even if many of them are quite similar. I have analyzed each of these 61 patterns, including the four tonal patterns (in Arusa, Bantu, Margi, and Peñoles Mixtec), which I consider non-segmental. Although Suzuki's survey contains patterns which Bennett does not consider true cases of dissimilation (e.g. Finnish length dissimilation (Bennett, 2013, pp. 586)), I included them all, since the assertion that

all dissimilation is subsequential is not weakened by their inclusion.[4] Bennett (2013)'s appendix describes 146 dissimilation patterns from 131 languages, all of which are included in this analysis. 49 total dissimilation patterns were described as morpheme structure constraints or co-occurence restrictions; these are not processes, but can still be analyzed with either left-to-right or right-to-left subsequential transducers and are thus included in this study.

There are 22 patterns which appear in both Bennett (2013) and Suzuki (1998); in cases of overlap, the descriptions of Suzuki and Bennett occasionally conflicted. When there were conflicting pattern descriptions, additional sources listed in the appendix were used to clarify. The languages with significantly conflicting definitions were Salish: Moses-Columbia, where I ultimately used Suzuki's description based on Bessell and Czaykowska-Higgins (1993); Latin, where I include both a simplified version from Suzuki as well as the description from Bennett and from Cser (2010); Yidiny, where I use the analysis in Dixon (1977); Zulu, where I used Bennett's description based on Beckman (1993); and Yucatec Mayan, where I use Suzuki's description based on Yip (1989). Given the 61 patterns in Suzuki, plus the 146 patterns in Bennett, there are 207 total patterns; subtracting the 22 overlapping patterns yields the 185 dissimilation patterns included in this paper's analysis.

These 185 patterns are listed in an appendix to this paper, organized by type. Each entry in the appendix provides the language name, pattern type, source, and an sFST for the dissimilation pattern. The non-basic dissimilation types used here are based on the generalizations given in Bennett, for blocking, and Suzuki, for polarity. Many dissimilation patterns belong to more than one type. This can depend partly on the particular assumptions made. This is not unusual in formal language theory where distinct classes do not necessarily imply disjoint groups of patterns. Most importantly, since each type will be shown to be subsequential, the fact that some patterns belong to more than one type will not challenge the subsequentiality hypothesis. For instance, only three patterns are categorized as 'blocking' patterns here, as they are what Bennett considers to be the three most empirically strong cases of segmental blocking patterns.

In this section, we review the dissimilation patterns from both Suzuki and Bennett. These can be collapsed into the categories of Basic Dissimilation, Blocking Dissimilation, and Polarity Dissimilation.

4.1 Pattern 1: 'Basic Dissimilation'. By far, the most common dissimilation pattern is one wherein two underlying segments in some domain (typically a word) that share one or more features are mapped to two surface segments which no longer share the same features. This *basic dissimilation* subtype involves only one target segment and one trigger for the dissimilation; there is no segment which intervenes and prevents the dissimilation (see §4.2). Some languages which exhibit basic dissimilation are Arabic (Yip, 1989), Cambodian (Yip, 1989), Javanese (Padgett, 1991), Russian (Padgett, 1991), and Yucatec Mayan (Yip, 1989) for [place], Ponapean (Goodman, 1995) and Yao (Ohala, 1981) for [labial], Akan (McCarthy and Prince, 1995) and Dakota (Hong, 1990) for [coronal], and Moses-Columbia Salish (Bessell and Czaykowska-Higgins, 1993) for [pharyngeal].

This pattern is exemplified by Chukchi's restriction on co-occurring nasal segments (Suzuki, 1998; Krause, 2007). For instance, consider the Chukchi form /e.naw.rəŋ.nən/ ('he presented him'), which surfaces as [e.naw.rəɣ.nən]. This dissimilatory map could be described as in 7.

(7) [+nasal] → [-nasal] / ___ [+nasal]

Length dissimilation may also be classified as a particular case of Basic Dissimilation. Rather than a single segment dissimilating, length dissimilation involves a complex segment dissimilating, but it follows the same basic template, much like *NC . . . NC dissimilation, another common basic dissimilation example. Essentially, length dissimilation involves long consonants or vowels dissimilating to short segments when in the context of another long consonant or vowel. Oromo provides an example for vowel length dissimilation, as the plural suffix *-oota* dissimilates to *-ota* when it follows any other long vowel in the preceding syllable (Alderete, 1997; Gragg, 1976) shown in 8.

(8) nam ‘person’ → nam-oota
fardd ‘horse’ → fardd-oota
gaal ‘camel’ → gaal-ota
loom ‘lemon tree’ → loom-ota

Long vowel dissimilation in Oromo presents the question of whether the way in which the vowel length is represented matters for the computational analysis. As shown in §5.1.1, it does not. Long vowels can be represented as either complex segments or a sequence of two vowels in an sFST, and since the pattern of dissimilation relies only on searching in one direction (in this case, leftward) for an identically complex segment or sequence of two vowels, it is subsequential regardless. Although the prosodic structure conditioning such dissimilation may be hierarchical and of a higher level of representational complexity, the surface pattern itself is not. Of the 185 dissimilation patterns investigated, 178 of them are of the Basic Dissimilation type.

4.2 Pattern 2: ‘Blocking’. Blocking patterns are those where one class of segments ‘blocks’ or prevents another segment from dissimilating, where the dissimilation would otherwise occur if the blocking segment were not present. Note that there is some ambiguity with regard to the meaning of the term ‘blocking’. In a sense, dissimilation is ‘blocked’ whenever it does not occur, but this could happen either as a lack of the proper environment for dissimilation, or because there is some particular segment which acts as a blocker. Bennett (2013) distinguishes between these cases with the terms ‘non-segmental blocking’ and ‘segmental blocking,’ respectively. The patterns Bennett describes as ‘non-segmental blocking’ are instances of basic dissimilation under the schema provided in §4.1, and I have classified them as such here. What Bennett (2013) calls segmental blocking is what I consider to be blocking in this analysis. Bennett (2013) focuses on exactly 3 cases of segmental blocking (Latin, Georgian, and Yidiny), which are the 3 that I also classify as blocking.

In Latin liquid dissimilation, typically the second of two /l/’s in a word will dissimilate to an /r/ – *unless* there is a blocking /r/ intervening between them, as seen in 9.

(9) /sol-alis/ (‘solar’) → [sol-aris]
/lun-alis/ (‘lunar’) → [lun-aris]
/flor-alis/ (‘floral’) → [flor-a**l**is] (Steriade, 1987)

Cser (2010) notes an additional exception to the dissimilation process in 9: not only is /r/ a blocker, but so too are all non-coronal segments (e.g. /g/ in [le**g**-alis]). The analysis in the exposition here is been simplified to only include /r/ as a blocking segment, but the complete pattern is still a blocking pattern and is available in Appendix A.3.

The blocking dissimilation seen in Georgian is very similar to Latin’s: the suffix /-uri/ is realised as [-uli] when following an /r/. However, this /r/ dissimilation is blocked by an intervening /l/, as seen in 10.

(10) /polon-uri/ (‘Polish’) → [polon-uri]
/sur-uri/ (‘Assyrian’) → [sur-uli]
/kartl-uri/ (‘Kartvelian’) → [kartl-u**r**i] (Odden, 1994)

Yidiny dissimilation is also commonly analyzed as blocking involving liquids, though it is slightly more complicated. In this situation, /l/ dissimilates to [r] before another /l/, but the dissimilation is blocked when the first /l/ is preceded by an /r/, as described by Crowhurst and Hewitt (1995). This pattern is shown in 11, with more discussion regarding the suffix change in §5.2.

(11) /duŋga-ŋa**l**in-ŋa**l**/ (‘went running with’) → [duŋga-**r**i-ŋa**l**]
/bu**r**wa-ŋa**l**in-ŋa**l**/ (‘went jumping with’) → [bu**r**wa-**l**i-ŋa**l**]
/bu**r**gi-ŋa**l**in-ŋa**l**/ (‘went walkabout with’) → [bu**r**gi-**l**i-ŋa**l**]
(Dixon, 1977)

At first glance, this Yidiny pattern appears similar to the unbounded circumambient assimilation in Figure 5, since the target of the dissimilation is between, but arbitrarily far from, both the trigger and the blocker. However, an alternate account of the same Yidiny

facts comes from Dixon (1977).

Dixon analyzes this apparent blocking as a double dissimilation, based on the fact that when the usual non-blocking /l/→[r] dissimulation occurs, this is not just an /l/→[r] before /l/ alternation, but the surface form also contains a different allomorph of the suffix. So, it is a two-step process: /bu**r**gi-ŋa**l**in-ŋa**l**/ → bu**r**gi - **r**in - ŋa**l** (basic /l/ to [r] dissimilation, which includes suffix reduction) → bu**r**gi - **l**in - ŋa**l** (basic /r/ to [l] dissimilation)

Or, as Dixon puts it:

> A case can be made out for saying that *-ːli-n* dissimilates to *-ːri-n* under pressure from *-ŋa-l* (and the form *-ːri-n* is then generalised to all conjugations), and that, as a second stage, *-ːri-n* dissimilates to *-ːli-n* in the presence of a rhotic (of either type) in the root.

Whether the pattern is a single dissimilation or a double one in this case really matters for the subsequential hypothesis. The 'unbounded circumambient' description is not amenable to a subsequential analysis, but Dixon's analysis is, as explained in §5.2. However, although the interpretation of the surface data here *is* crucial to determining its complexity, Dixon provides a description for the process under discussion which removes the crucially non-subsequential unbounded circumambient map.

4.3 Pattern 3: 'Polarity Dissimilation'. Suzuki (1998) notes a special dissimilation pattern of 'polarity dissimilation', where segments dissimilate from two 'opposing' directions – for instance, both high and low vowels dissimilating (high to low and low to high) or both high and low tone switching poles. This is essentially two dissimilation patterns described as one phenomenon, but since Suzuki's typology distinguishes it as a unique class, I maintain the distinction and show that this pattern is also subsequential.

An example of tone polarity dissimilation can be seen in Margi where the 2SG subject clitic *gu* appears with a low tone when it follows a high tone, and a high tone when it follows a low tone (Suzuki, 1998; Hoffmann, 1963)

(12) hègyì gú (‘you are a Higi’)
màrgyí gù (‘you are a Margi’)

Polarity dissimilation in Chontal is seen with regard to voicing: the imperative suffix /laʔ/ begins with an /l/ after a voiceless segment, and a /ɬ/ after a voiced segment, as seen in 13 (Suzuki, 1998; Kenstowicz and Kisseberth, 1979).

(13) fuš-laʔ (‘blow it!’)
ko-ɬaʔ (‘say it!’)

This type of dissimilation is further exemplified by a process called ‘dissimilative jakan’e’ in some southern dialects of Russian. A brief example of one dialect’s dissimilative jakan’e, the ‘Don subtype’, is shown in 14. Here, non-high vowels dissimilate to low vowels when they are followed by a high vowel, and non-high vowels dissimilate to high vowels when they are followed by a low vowel (Suzuki, 1998; Davis, 1970).

(14) /rʲeki/ → [rʲaki] (‘rivers’)
/glʲadat/ → [glʲidat] (‘they see’)

Of the 185 dissimilation patterns investigated, 4 of them are of the Polarity Dissimilation type. They are Chontal, Dinka, Margi, and Russian.

5. Computational Analysis. This section demonstrates that each of the three classes of dissimilation patterns discussed in Section 4 can be defined explicitly and modeled using subsequential FSTs. Recall that this subsequential characterization is stronger than the existing claim that phonological patterns (like dissimilation) are regular. Therefore, this establishes that all attested long-distance dissimilations are subsequential processes, which places a tighter restriction on the possible dissimilation patterns expected in human languages.

5.1 Pattern 1: 'Basic Dissimilation'. Recall that Basic Dissimilation patterns are of the following type: $AZ_0A \rightarrow AZ_0B$, applied left-to-right, where Z_0 represents any number of intervening non-A or -B segments.

An sFST exemplifying a basic dissimilation pattern is shown in Figure 7. This sFST can be used for both left-to-right and right-to-left subsequential patterns.

<INSERT FIGURE 7 ABOUT HERE>

Recall the basic dissimilation pattern seen in Chukchi (as in 4.1), that the first of two nasal segments dissimilates to a non-nasal segment.

(15) /e.naw.rəŋ.nən/ → [e.naw.rəɣ.nən]

A more specific sFST to describe this type of pattern is shown in Figure 8, a right-subsequential transducer. In Figure 8, [+nasal] stands for any nasal segment. Because the nasal feature partitions segments into two disjoint groups, there is no Z:Z loop nor X:X loop in Figure 8 like the ones seen in Figure 7.

<INSERT FIGURE 8 ABOUT HERE>

Consider how the Chukchi example, /enawrəŋnən/ → [enawrəɣnən], would be derived in this sFST. In this case we are concerned with the feature [+nasal]. Then, A = [+nasal], B = [-nasal], the non-nasal counterpart of the nasal, and Z = everything else. Because this is a right-to-left subsequential transduction, first the input string is reversed, yielding 'nənŋərwane'. Beginning in the start state 0 (indicated by the arrow), the first segment seen is an /n/. This is [+nasal], so we follow the transition to state 1 while outputting it as the [+nasal] segment that it is: [n]. Next is the segment /ə/, which is [-nasal]. Therefore, the [-nasal] transition is followed back to state 0, and [ə] is output. Then, from state 0, the next segment seen is the [+nasal] /n/. Therefore, following the transition to state 1, this [+nasal] segment [n] is output. Next, we see the [+nasal] segment /ŋ/, and so we follow the transition to state 0 which outputs a [-nasal] counterpart, [ɣ]. Next, a [-nasal] /ə/ is seen, and output as [ə] following the loop to state 0. The same occurs for the following [r], [w], and [a]. Next, a nasal /n/ is seen, and following the transition to state 1, the [+nasal]

string [n] is output. Finally, the non-nasal /e/ is read as we transition back to state 0, again outputting an [e]. Because there are no more remaining inputs, the process ends in state 0. We reverse the output string to obtain the desired result: [enawrəɣnən]. This derivation is shown in 16.

(16)

Input		n		ə		n		ŋ		ə		r		w		a		n		e		
State	0	→	1	→	0	→	1	→	0	→	0	→	0	→	0	→	0	→	1	→	0	→
Output		n		ə		n		ɣ		ə		r		w		a		n		e		ɛ

Representational Issues. Recall the Oromo vowel length dissimilation in 8, repeated in 17.

(17) harr ‘donkey’ → harr-oota
gaal ‘camel’ → gaal-ota

If long vowels are considered complex single segments, this is clearly just a case of basic dissimilation. Here, then, the language-particular sFST is simplified to the following, where a nonspecified V represents a short vowel, and A=[+long]V, B=V, and Z=V or C.

<INSERT FIGURE 9 ABOUT HERE>

A derivation for /gaaloota/ using the sFST in Figure 9 would then proceed as follows:

(18)

Input		g		aː		l		oː		t		a	
State	0	→	0	→	1	→	1	→	0	→	0	→	0	→
Output		g		aː		l		o		t		a	ɛ

However, one might prefer to represent each vowel segment individually. In this case, there is still a possible sFST for the pattern, shown in Figure 10.

<INSERT FIGURE 10 ABOUT HERE>

A derivation using the sFST with individual segments in Figure 10 for /gaaloota/ would

proceed as in 19:

(19)

Input		g		a		a		l		o		o		t		a						
State	0	→	0	→	1	→	2	→	2	→	3	→	0	→	0	→	1	→				
Output		g		a		a		l		o		ε		t		a		ε				

These two FSTs are functionally equivalent for Oromo– they produce identical outputs from the same input string, the only difference is the theoretical representation of long vowels. In some cases, if the long vowels in question must be identical ones (e.g. *aa* but not *ai*), it might be more illustrative to represent long vowels as complex segments, though an sFST with separate states for each individual vowel could be used to produce the same pattern. While the specific choice of representation for long vowels (or consonants) may have ramifications for certain linguistic theories, such a choice has no impact on either the final output of the process phonetically, or on the complexity of the pattern (it is subsequential regardless), provided the sFST is written correctly.

Similarly, while many dissimilation analyses (especially OCP-based ones) appeal to dissimilation operating only on specific 'featural' tiers, the resulting maps should be the same, regardless of tiers. The input/output map is identical. This is also the case for the polarity patterns of §5.3 – regardless of the representation of segments used, the underlying dissimilation processes turn out to be subsequential.

5.2 Pattern 2: 'Blocking'. Blocking dissimilation patterns are of the following type: AZ*A → AZ*B, where Z* represents any number of intervening non-A, -B, or -X segments. X is a blocking segment, e.g. AZ*XZ*A → AZ*XZ*A. In other words, dissimilation proceeds as in Basic Dissimilation, *except* that when segments of type X appear, the dissimilation does not occur. It is true that Blocking Dissimilation and Basic Dissimilation are nearly identical, and in fact, a great many of the Basic Dissimilation patterns investigated here could fit in to a Blocking Dissimilation template. However, only those patterns which have been particularly noted to be so-called 'segmental blocking dissimilation' patterns in Bennett (2013) are classified as such here, as discussed in §4.2.

An sFST for this pattern is in Figure 11. Note that unlike the Basic Dissimilation sFST of Figure 7, this sFST has an additional transition from state 1 to state 0, allowing for the dissimilation trigger to 'reset' and essentially become inactive if a blocking segment (X) occurs.

<INSERT FIGURE 11 ABOUT HERE>

Recall the /r/ blocking found in Latin liquid dissimilation in 9, repeated in 20.

(20) /nav-alis/ ('naval') → [nav-alis]
/milit-alis/ ('military') → [milit-aris]
/litor-alis/ ('of the shore') → [litor-alis] (the /r/ blocks dissimilation)

This Latin blocking pattern can be modeled as in Figure 12, where A = /l/, B=/r/, Z=non-liquid consonants and vowels, and X=/r/.

<INSERT FIGURE 12 ABOUT HERE>

Consider the derivation for 'litoralis'. Starting in state 0, we read an /l/ and move to state 1, outputting the [l]. Then we read /i/, which is a V, and output this [i] and loop back to state 1. Next we read a /t/ which is a non-liquid C, so we output this [t] and remain in state 1. Similarly we read an /o/, loop back to state 1, and output this [o]. Next we read an /r/, the blocking segment, and transition to state 0, outputting the [r]. We read an /a/ (another V), loop back to state 0, and output this [a]. Now when we see this /l/, we again transition to state 1 and output the [l] – the dissimilation does not occur. Finally we read an /i/, looping to state 1 and outputting the [i], and we read an /s/, looping to state 1 and outputting the [s]. We finish the derivation in state 1 and output the empty string, ε.

(21)

Input		l		i		t		o		r		a		l		i		s						
State	0	→	1	→	1	→	1	→	0	→	0	→	1	→	1	→	1	→	1	→				
Output		l		i		t		o		r		a		l		i		s		ε				

The more nuanced picture of Latin dissimilation shown by Cser (2010), where all

non-coronals are blockers, can be represented easily as a blocking dissimilation as seen in Figure 13. A derivation for /legalis/ using Figure 13 is shown in 22.

<INSERT FIGURE 13 ABOUT HERE>

(22)

Input		l		e		g		a		l		i		s		
State	0	→	1	→	0	→	0	→	1	→	1	→	1	→	1	→
Output		l		e		g		a		l		i		s		ε

YIDINY DOUBLE DISSIMILATION. As noted in section 4.2, dissimilation in Yidiny *appears* to be a complex case of blocking dissimilation, where the blocker is to the left of the target and the trigger is to the right. Such a pattern, if unbounded, would not be subsequential. However, per Dixon's description in 4.2, this blocking dissimilation is really just two distinct basic dissimilation processes, which are both subsequential, as per §5.1.

If one wanted to think of their combination as a single process, that process would be *weakly deterministic*, a concept explained in Heinz and Lai (2013). A weakly deterministic pattern is a composition of a left-to-right subsequential (here, the L to R dissimilation) and right-to-left subsequential (the R to L dissimilation) process, which does not require any additional symbols in the intermediate representation. While this weakens the subsequential hypothesis to some degree, Heinz and Lai argue that it is still significantly more restricted than entirely non-subsequential patterns like the unbounded circumambient assimilation seen in §2.2.

5.3 PATTERN 3: 'POLARITY DISSIMILATION'. Polarity Dissimilation patterns are of the following type: AY*B → AY*Z, AY*A → AY*Z, ZY*B → ZY*A, and ZY*Z → ZY*A, where A and Z are opposite 'poles' – something like high and low toned segments. B is a segment of the same type as A and Z, but not at either 'pole' (e.g. a mid vowel, or a segment with neutral tone). Y* represents any number of intervening non-A, -B, or -Z segments. This pattern may look complicated, but in fact, it is really two basic dissimilations considered in union. An sFST schema is as in Figure 14.

<INSERT FIGURE 14 ABOUT HERE>

An example of polarity dissimilation is seen in Russian (as in 14, repeated below as 23), where only non-high vowels undergo polarity dissimilation – becoming low before a high vowel, and high before a low vowel.

(23) /r^{j}eki/ → [r^{j}aki] ('rivers')
/gl^{j}adat/ → [gl^{j}idat] ('they see')

The sFST for this pattern is right-subsequential, and would look like Figure 15, with A=[+high, -low], B=[-high, -low], Y=consonants, Z=[-high, +low].

<INSERT FIGURE 15 ABOUT HERE>

Using this sFST, a derivation for [r^{j}aki] is as follows:

First, reverse the input: /r^{j}eki/ → *iker*^{j} Then follow the sFST to obtain the map in 24. Starting in state 0, we read an /i/, which is a high vowel, and go to state 2, outputting the high vowel [i]. Next we read the consonant /k/, loop back to state 2, and output [k]. Reading an /e/, which is a non-high vowel, we go to state 0, and output a low vowel [a]. Next we read the consonant /r^{j}/, staying in state 0, and output a [r^{j}], ending in state 0.

(24)

Input		i		k		e		r^{j}	
State	0	→	2	→	2	→	0	→	0
Output		i		k		a		r^{j}	ε

Finally, reverse the result to obtain the surface form: *ikar*^{j} → [r^{j}aki].

The process proceeds similarly for a word like [gl^{j}idat], which dissimilates to a high vowel rather than a low one. Again, we reverse the input: /gl^{j}adat/ → *tadal*^{j}*g*. Following the sFST in Figure 15 to get the derivation in 25, we read and output a /t/, remaining in state 0. Next we read the low vowel /a/ and go to state 1, outputting the [a]. Next we read the consonant /d/, looping back to state 1, and output [d]. Reading an /a/, which is a non-high vowel, we go to state 0, and output a high vowel [i]. We read the consonant /l^{j}/, staying in state 0, and output a [l^{j}], and then another consonant /g/, looping to state 0 and

outputting the [g] before ending in state 0.

(25)

Input		t		a		d		a		l^j		g	
State	0	→	1	→	1	→	0	→	0	→	0	→	0
Output		t		a		d		i		l^j		g	ε

Finally, reverse the result to obtain the surface form: *tadiɬʲg* → [gl^jidat].

6. Conclusions. An investigation of each dissimilation pattern in Bennett (2013) and Suzuki (1998) reveals that each of these dissimilation patterns can be described by a subsequential FST. This result has significance for many reasons. If every dissimilation pattern is subsequential, it is further evidence that segmental phonology in general is subsequential. If true, it would have ramifications for typology, learnability, and acquisition. Typologically, the subsequentiality hypothesis provides a strong, falsifiable claim regarding whether a certain pattern could exist in natural language. For instance, a dissimilation pattern similar to the circumambient unbounded example in 2.2 is predicted to be impossible. Consider the hypothetical example in 26 below, where an /l/ dissimilates to an /r/ only if there is another /l/ both preceding and following it somewhere in the word.

(26) /karo**l**inia**l**/ → [karo**l**inia**l**]
/**l**amako**l**inia**l**/ → [**l**amako**r**inia**l**]
/**l**amakoakoakoakoakoakoako**l**inia**l**/ → [**l**amakoakoakoakoakoakoako**r**inia**l**]

Patterns like those in 26 may seem like plausible ones, but if the distance between target and trigger is truly unbounded, such a pattern is not subsequential and thus not predicted to be possible in segmental phonology.

The learning results from Oncina and Vidal (1993) show that the class of total left-to-right subsequential patterns is learnable, and Gildea and Jurafsky (1996) adapt their algorithm for phonology. This means that all dissimilation patterns are learnable as well with these techniques, which lends more credence to the subsequentiality hypothesis.

Future research avenues include investigating the possibility of an even more restrictive characterization than subsequentiality for phonological patterns, as well as building on learning results. Some work in this avenue for bounded patterns includes Chandlee et al. (2014) and Chandlee (2014). Related work has investigated the psycholinguistic predictions for learning artificial language patterns in various classes of complexity (Lai, 2015). This too is a ripe area for future investigation.

Though some details of individual language patterns may have been simplified in this account, such simplifications do not endanger the conclusion that each of the patterns is subsequential in nature. This means that dissimilation processes in general, insofar as they have been described (by Suzuki & Bennett), are less complex and more restrictive than regular relations. It may be the case, therefore, that all segmental phonological patterns are restricted in this way, placing a more narrow bound on the possible phonological patterns one could expect to find in the world's languages. In other words, this paper has shown that "being subsequential" is a universal property of dissimilation patterns, and this is the strongest known computational universal property of these patterns to date.

A. Categorization and FST representations of language patterns. This appendix lists the dissimilation patterns studied in the paper, and categorizes them descriptively by type. For example, Yidiny is classified as a blocking dissimilation pattern because Dixon's analysis suggests that the Yidiny pattern is the composition of two basic dissimilations.

This appendix presents FST representations for each pattern. All states are final states, state 0 is always the initial state, and ε is the empty string. Most transitions are given in terms of the features Bennett and Suzuki used to describe each pattern, but occasionally specific segments are mentioned because they are particular morphemes. This is how Bennett and Suzuki typically describe the patterns, but I maintain it for readability only – the notation used is not meant to imply anything about the conceptual reality of particular features.

A.1 Basic Dissimilations - Left-to-right Subsequential.

Language: Arusa

Pattern: High tone dissimilation

Direction: Left-to-right

Sources: Suzuki (1998, pp. 157)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 1, [+high]:[+high]),
(0, 0, [-high]:[-high]),
(1, 0, [-high]:[-high]),
(1, 0, [+high]:[-high])

Note: takes place on a tonal tier

Language: Atayal: Mayrinax

Pattern: Labial dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 642), Zuraw and Lu (2009)

FST:

States: (0, ε), (1, [+labial])

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:ε),
(1, 0, [-syllabic]:[+labial][-syllabic]),
(1, 0, [+syllabic]:[+labial][+syllabic]),
(1, 0, /=um=/ infix:[m])

Language: Bakairi

Pattern: Voiceless dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 642)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 1, [+voice]:[+voice]),
(0, 1, [-voice]:[-voice]),
(1, 1, [+voice]:[+voice]),
(1, 2, [-voice]:[-voice]),
(2, 2, [+voice]:[+voice]),
(2, 2, [-voice]:[+voice])

Note: takes place on a consonantal tier

Language: Bantu languages (Makonde, Kihehe, etc.)

Pattern: High tone dissimilation

Direction: Left-to-right

Sources: Suzuki (1998, pp. 157)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 1, [+high]:[+high]),
(0, 0, [-high]:[-high]),
(1, 0, [-high]:[-high]),
(1, 0, [+high]:[-high])

Note: takes place on a tonal tier

Language: Bardi

Pattern: NC dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 642)

FST:

States: (0, ε), (1, ε), (2, ε), (3, [+nasal])

Transitions: (0, 0, [-nasal]:[-nasal]),
(0, 1, [+nasal], [+nasal]),
(1, 2, [-nasal]:[-nasal]),
(1, 1, [+nasal]:[+nasal]),
(2, 0, [-nasal]:[-nasal]),
(2, 3, [+nasal]:ε),
(3, 0, [-nasal]:[-nasal]),
(3, 1, [+nasal]:[+nasal][+nasal])

Note: takes place on a consonantal tier

Language: Basque: Zuberoan (Souletin)

Pattern: Spread glottis dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 642)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-spread glottis]:[-spread glottis]),
(0, 1, [+spread glottis]:[+spread glottis]),
(1, 1, [-spread glottis]:[-spread glottis]),
(1, 0, [+spread glottis]:[-spread glottis])

Language: Berber: Imdlawn Tashlhiyt

Pattern: Labial dissimilation

Direction: Left-to-right

Sources: Suzuki (1998, pp. 153)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-high]:[-high]),
(0, 0, [-round]:[-round]),
(0, 1, [+high, +round]:[+high, +round]),
(1, 1, [-labial]:[-labial]),
(1, 1, [-sonorant]:[-sonorant]),
(1, 0, [+labial, +sonorant]:[+dorsal])

Language: Bilinara

Pattern: NC dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 642)

FST:

States: (0, ε), (1, ε), (2, ε), (3, [+nasal])

Transitions: (0, 0, [-nasal]:[-nasal]),
(0, 1, [+nasal]:[+nasal]),
(1, 2, [-nasal]:[-nasal]),
(1, 1, [+nasal]:[+nasal]),
(2, 0, [-nasal]:[-nasal]),
(2, 3, [+nasal]:ε),
(3, 0, [-nasal]:[-nasal]),
(3, 1, [+nasal]:[+nasal][+nasal])

Note: takes place on a consonantal tier

Language: Cantonese

Pattern: Labial dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 642), Suzuki (1998, pp. 153)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 1, [-labial]:[-labial]),
(1, 0, [+labial]:[-labial])

Language: Finnish

Pattern: Consonant length dissimilation

Direction: Left-to-right

Sources: Suzuki (1998, pp. 157), Keyser and Kiparsky (1984)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-voice]:[-voice]),
(0, 0, [+sonorant]:[+sonorant]),
(0, 1, [-voice, -sonorant]:[-voice, sonorant]),
(1, 2, .:.),
(2, 0, [-voice, -sonorant]:ε)

Note: . represents a syllable boundary

Language: Gidabal

Pattern: Vowel length dissimilation

Direction: Left-to-right

Sources: Suzuki (1998, pp. 157)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-long]:[-long]),
(0, 1, [+long]:[+long]),
(1, 0, [-long]:[-long]),
(1, 0, [+long]:[-long])

Note: takes place on a vowel tier

Language: Gooniyandi

Pattern: NC dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 643), Suzuki (1998, pp. 155)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε), (4, [+nasal])

Transitions: (0, 0, [-nasal]:[-nasal]),
(0, 1, [+nasal]:[+nasal]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+syllabic]:[+syllabic]),
(3, 4, [+nasal]:ε),
(1, 1, [+nasal]:[+nasal]),
(2, 0, [+consonantal]:[+consonantal]),
(3, 0, [-nasal]:[-nasal]),
(4, 0, [-nasal, +consonantal]:[-nasal, +consonantal])

Language: Gothic

Pattern: Voice dissimilation

Direction: Left-to-right

Sources: Suzuki (1998, pp. 155)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-cont]:[-cont]),
(0, 1, [+cont, αvoice]:[+cont,αvoice]),
(1, 1, [-cont]:[-cont]),
(1, 1, [-αvoice:-αvoice]),
(1, 0, [+cont, αvoice]:[+cont, -αvoice])

Language: Gurindji

Pattern: NC dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 643), Suzuki (1998, pp. 155)

FST:

States: (0, ε), (1, ε), (2, ε), (3, [+nasal])

Transitions: (0, 0, [-nasal]:[-nasal]),
(0, 1, [+nasal]:[+nasal]),
(1, 2, [-nasal]:[-nasal]),
(1, 1, [+nasal]:[+nasal]),
(2, 0, [-nasal]:[-nasal]),
(2, 3, [+nasal]:ε),
(3, 0, [-nasal]:[-nasal]),
(3, 1, [+nasal]:[+nasal][+nasal])

Note: takes place on a consonantal tier

Language: Huave

Pattern: Spread glottis dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 643)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-spread glottis]:[-spread glottis]),
(0, 1, [+spread glottis]:[+spread glottis]),
(1, 1, [-spread glottis]:[-spread glottis]),
(1, 0, [+spread glottis, -coronal]:ε)

Language: Hungarian

Pattern: Sibilant dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-sibilant]:[-sibilant]),
(0, 1, [+sibilant]:[+sibilant]),
(1, 1, not s:not s),
(1, 0, s:Vl)

Note: only applies to 2nd singular suffix /s/

Language: Judeo-Spanish (Ladino)

Pattern: Dorsal dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε), (2, ε), (3, [+dorsal, -voice])

Transitions: (0, 0, [-dorsal]:[-dorsal]),
(0, 1, [+dorsal]:[+dorsal]),
(1, 2, [+high, +front, +syllabic]:[+high, +front, +syllabic]),
(2, 3, [+dorsal, -voice]: ε),
(3, 0, [+syllabic]: [+coronal, -dorsal][+syllabic]),
(3, 0, [-syllabic]: [+dorsal, -voice][-syllabic])

Note: only applies to the suffix -ikV

Language: Kalkatungu

Pattern: NC dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε), (2, ε), (3, [+nasal])

Transitions: (0, 0, [-nasal]:[-nasal]),
(0, 1, [+nasal]:[+nasal]),
(1, 2, [-nasal]:[-nasal]),
(1, 1, [+nasal]:[+nasal]),
(2, 0, [-nasal]:[-nasal]),
(2, 3, [+nasal]:ε),
(3, 0, [-nasal]:[-nasal]),
(3, 1, [+nasal]:[+nasal][+nasal])

Note: takes place on a consonantal tier

Language: Konni

Pattern: Liquid dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-liquid]:[-liquid]),
(0, 1, [+liquid]:[+liquid]),
(1, 0, [+consonantal]:[+consonantal]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [+liquid]:[-liquid, -voice, +coronal]),
(2, 0, [-liquid]:[-liquid])

Language: Kwanyama

Pattern: NC dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε), (4, [+nasal])

Transitions: (0, 0, [-nasal]:[-nasal]),
(0, 1, [+nasal]:[+nasal]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+syllabic]:[+syllabic]),
(3, 4, [+nasal]:ε),
(1, 1, [+nasal]:[+nasal]),
(2, 0, [+consonantal]:[+consonantal]),
(3, 0, [-nasal]:[-nasal]),
(4, 0, [-nasal, +consonantal]]:[-nasal, +consonantal])

Language: Manambu

Pattern: Rhotic dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε), (2, ε), (3, l)

Transitions: (0, 0, [-rhotic]:[-rhotic]),
(0, 1, [+rhotic]:[+rhotic]),
(1, 2, [+syllabic]:[+syllabic]),
(1, 1, [+rhotic]:[+rhotic]),
(2, 0, [-rhotic]:[-rhotic]),
(2, 3, [+rhotic]:ε),
(3, 0, [-rhotic]:[+rhotic][-rhotic]),
(3, 1, [+rhotic]:[+rhotic][+rhotic]),
(3, 2, [+syllabic]:[+rhotic][+syllabic])

Language: Mayali

Pattern: Labial and dorsal dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-nasal]:[-nasal]),
(0, 0, [-dorsal]:[-dorsal]),
(0, 1, [+nasal, +dorsal]:[+nasal, +dorsal]),
(1, 0, [-nasal]:[-nasal]),
(1, 0, [-dorsal]:[-dorsal]),
(1, 0, [+nasal, +dorsal]:[+coronal, -dorsal])

Note: takes place on a consonantal tier

Language: Meitei

Pattern: Spread glottis dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-spread glottis]:[-spread glottis]),
(0, 1, [+spread glottis]:[+spread glottis]),
(1, 1, [-spread glottis]:[-spread glottis]),
(1, 0, [+spread glottis]:[-spread glottis])

Language: Mingrelian

Pattern: Continuancy dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, [+voice, +delayed release, -continuant])

Transitions: (0, 0, [-voice]:[-voice]),
(0, 0, [+continuant]:[+continuant]),
(0, 1, [+voice, +delayed release, -continuant]:ε),
(1, 0, [-voice, +delayed release, -continuant]:[+voice, -delayed release, -continuant][-voice, +delayed release, -continuant]),
(1, 0, [+voice]:[+voice, +delayed release, -continuant][+voice]),
(1, 0, [-continuant]:[+voice, +delayed release, -continuant][-continuant])

Note: takes place on a consonantal tier

Language: Mingrelian

Pattern: Rhotic dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-rhotic]:[-rhotic]),
(0, 1, [+rhotic]:[+rhotic]),
(1, 0, [-rhotic]:[-rhotic]),
(1, 0, [+rhotic]:[-rhotic])

Note: takes place on a consonantal tier

Language: Modern Greek

Pattern: Continuancy dissimilation

Direction: Left-to-right

Sources: Suzuki (1998, pp. 156)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-cont]:[-cont]),
(0, 1, [+cont]:[+cont]),
(1, 0, [-cont]:[-cont]),
(1, 0, [+cont]:[-cont])

Language: Mudbura

Pattern: NC dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε), (2, ε), (3, [+nasal])

Transitions: (0, 0, [-nasal]:[-nasal]),
(0, 1, [+nasal]:[+nasal]),
(1, 2, [-nasal]:[-nasal]),
(1, 1, [+nasal]:[+nasal]),
(2, 0, [-nasal]:[-nasal]),
(2, 3, [+nasal]:ε),
(3, 0, [-nasal]:[-nasal]),
(3, 1, [+nasal]:[+nasal][+nasal])

Note: takes place on a consonantal tier

Language: Nhanda

Pattern: NC dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε), (4, [+nasal])

Transitions: (0, 0, [-nasal]:[-nasal]),
(0, 1, [+nasal]:[+nasal]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+syllabic]:[+syllabic]),
(3, 4, [+nasal]:ε),
(1, 1, [+nasal]:[+nasal]),
(2, 0, [+consonantal]:[+consonantal]),
(3, 0, [-nasal]:[-nasal]),
(4, 0, [-nasal, +consonantal]:[-nasal, +consonantal])

Language: Ni'ihau Hawai'ian

Pattern: Coronal dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-dorsal]:[-dorsal]),
(0, 0, [+voice]:[+voice]),
(0, 1, [-voice, +dorsal, -continuant]:[-voice, +dorsal, -continuant]),
(1, 0, [+consonantal]:[+consonantal]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [-voice, +dorsal, -continuant]:[-dorsal, +coronal]),
(2, 0, [+voice]:[+voice]),
(2, 0, [-dorsal]:[-dorsal])

Language: Oromo

Pattern: Vowel length dissimilation

Direction: Left-to-right

Sources: Suzuki (1998, pp. 157)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-long]:[-long]),
(0, 1, [+long]:[+long]),
(1, 0, [-long]:[-long]),
(1, 0, [+long]:[-long])

Note: takes place on a vowel tier

Language: Paiwan: Ljaljawran

Pattern: Labial dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:-[labial]),
(0, 1, [+labial]:[+labial]),
(1, 0, /=əm/ infix:/=ən/),
(1, 1, [-syllabic]:[-syllabic]),
(1, 1, [+syllabic]:[+syllabic])

Language: Paiwan: Tjuabar

Pattern: Labial dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 647)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:-[labial]),
(0, 1, [+labial]:[+labial]),
(1, 0, /=əm/ infix:/=ən/),
(1, 1, [-syllabic]:[-syllabic]),
(1, 1, [+syllabic]:[+syllabic])

Language: Paiwan: other (various)

Pattern: Labial dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 647)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:-[labial]),
(0, 1, [+labial]:[+labial]),
(1, 0, /=əm/ infix:/=ən/),
(1, 1, [-syllabic]:[-syllabic]),
(1, 1, [+syllabic]:[+syllabic])

Language: Persian: Sabzevari

Pattern: Lateral dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 647)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-lateral]:[-lateral]),
(0, 1, [+lateral, +liquid]:[+lateral, +liquid]),
(1, 0, [+consonantal]:[+consonantal]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [+lateral, +liquid]:[-lateral, +rhotic]),
(2, 0, [-lateral]:[-lateral])

Language: Peñoles Mixtec

Pattern: Low tone dissimilation

Direction: Left-to-right

Sources: Suzuki (1998, pp. 157)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 1, [+low]:[+low]),
(0, 0, [-low]:[-low]),
(1, 0, [+low]:[-low, -high]),
(1, 0, [-low]:[-low])
Note: takes place on a tonal tier

Language: Seri

Pattern: Glottal stop dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-glottal]:[-glottal]),
(0, 0, [+continuant]:[+continuant]),
(0, 1, [+glottal, -continuant]:[+glottal, -continuant]),
(1, 2, [+syllabic]:[+syllabic]),
(1, 1, [+glottal, -continuant]:[+glottal, -continuant]),
(1, 0, [-glottal]:[-glottal]),
(1, 0, [+continuant]:[+continuant])
(2, 0, [-glottal]:[-glottal]),
(2, 0, [+continuant]:[+continuant]),
(2, 0, [+glottal, -continuant]:ε)

Language: Slovak

Pattern: Vowel length dissimilation

Direction: Left-to-right

Sources: Suzuki (1998, pp. 157)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-long]:[-long]),
(0, 1, [+long]:[+long]),
(1, 0, [-long]:[-long]),
(1, 0, [+long]:[-long])

Note: takes place on a vowel tier

Language: Spanish (Colombian)

Pattern: Coronal dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-coronal]:[-coronal]),
(0, 0, [+voice]:[+voice]),
(0, 0, [+continuant]:[+continuant]),
(0, 1, [+coronal, -voice, -continuant]:[+coronal, -voice, -continuant]),
(1, 0, not the suffix -ito:not the suffix -ito),
(1, 0, -ito:-iko)

Note: only applies to the suffix -ito

Language: Svan

Pattern: Rhotic dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-rhotic]:[-rhotic]),
(0, 1, [+rhotic]:[+rhotic]),
(1, 2, [+syllabic]:[+syllabic]),
(1, 1, [+rhotic][+rhotic]),
(1, 0, [-rhotic]:[-rhotic]),
(2, 0, [-rhotic]:[-rhotic]),
(2, 0, [+rhotic]:[-rhotic, +lateral])

Language: Takelma

Pattern: Coronal dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-coronal]:[-coronal]),
(0, 1, [+coronal]:[+coronal]),
(1, 0, [+coronal, +nasal]:[-coronal, +labial]),
(1, 1, [-coronal]:[-coronal]),
(1, 1, [-nasal]:[-nasal])

Language: Turkish

Pattern: Sibilant dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 649)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-sibilant]:[-sibilant]),
(0, 1, [+sibilant]:[+sibilant]),
(1, 1, [-sibilant]:[-sibilant]),
(1, 0, [+sibilant]:[-sibilant])

Language: Yimas

Pattern: Liquid dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 649), Suzuki (1998, pp. 154)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-liquid]:[-liquid]),
(0, 1, [+liquid]:[+liquid]),
(1, 2, [+syllabic]:[+syllabic]),
(1, 1, [+liquid]:[+liquid]),
(1, 0, [-liquid]:[-liquid]),
(2, 0, [-liquid]:[-liquid]),
(2, 0, [+liquid]:[-liquid, +coronal, -voice])

Language: Yindjibarndi

Pattern: NC dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 649)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε), (4, [+nasal])

Transitions: (0, 0, [-nasal]:[-nasal]),
(0, 1, [+nasal]:[+nasal]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+syllabic]:[+syllabic]),
(3, 4, [+nasal]:ε),
(1, 1, [+nasal]:[+nasal]),
(2, 0, [+consonantal]:[+consonantal]),
(3, 0, [-nasal]:[-nasal]),
(4, 0, [-nasal, +consonantal]:[-nasal, +consonantal])

Language: Yindjibarndi

Pattern: Rhotic type dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 649), Suzuki (1998, pp. 154)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-rhotic]:[-rhotic]),
(0, 1, [αanterior, +rhotic]:[αanterior, +rhotic]),
(1, 1, [αanterior, +rhotic]:[αanterior, +rhotic]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [-rhotic]:[-rhotic]),
(2, 0, [αanterior, +rhotic]:[-αanterior])

A.2 Basic Dissimilations - Right-to-left Subsequential. Recall that here the input string should be reversed before applying the FST (and then the output reversed).

Language: Acehnese

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 641)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 2, [+syllabic]:[+syllabic]),
(1, 1, [+labial]:[+labial]),
(1, 0, [-labial]:[-labial]),
(2, 0, [-labial]:[-labial]),
(2, 0, [+labial]:[+coronal, -labial, -voice, +continuant])

Language: Ainu

Pattern: Rhotic dissimilation

Direction: Right-to-left

Sources: Suzuki (1998, pp. 156)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-liquid]:[-liquid]),
(0, 1, [+liquid]:[+liquid]),
(1, 1, [-liquid]:[-liquid]),
(1, 0, [+liquid]:[+coronal, +nasal, -liquid])

Language: Akan

Pattern: Coronal dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 641), Suzuki (1998, pp. 153)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-coronal]:[-coronal]),
(0, 1, [+coronal]:[+coronal]),
(1, 2, [+syllabic]:[+syllabic]),
(1, 1, [+coronal]:[+coronal]),
(1, 0, [-coronal]:[-coronal]),
(2, 0, [-coronal]:[-coronal]),
(2, 0, [+coronal, +delayed release, -voice]:[-coronal, +dorsal, -delayed release])

Language: Akkadian

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 641), Suzuki (1998, pp. 153)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 0, [-labial]:[-labial]),
(1, 0, [+labial, +nasal]:[-labial, +coronal])

Language: Arabic: Maltese

Pattern: Pharyngealization dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 641)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-pharyngeal]:[-pharyngeal]),

(0, 1, [+pharyngeal]:[+pharyngeal]),

(1, 0, [+pharyngeal]:[-pharyngeal]),

(1, 1, [-pharyngeal]:[-pharyngeal])

Language: Arabic: Palestinian

Pattern: Pharyngealization dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 642), Davis (1970)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-pharyngeal]:[-pharyngeal]),

(0, 1, [+pharyngeal]:[+pharyngeal]),

(1, 0, [+pharyngeal]:[-pharyngeal]),

(1, 1, [-pharyngeal]:[-pharyngeal])

Language: Arusa

Pattern: Vowel height dissimilation

Direction: Right-to-left

Sources: Suzuki (1998, pp. 156)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-low]:[-low]),
(0, 1, [+low]:[+low]),
(1, 0, [-high, -low]:[+high]),
(1, 0, [+high]:[+high]),
(1, 0, [+low]:[+low])

Note: takes place on vowel tier

Language: Bemba

Pattern: NC dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 642)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε), (4, ε)

Transitions: (0, 0, [+nasal]:[+nasal]),
(0, 1, [-nasal, +consonantal]:[-nasal, +consonantal]),
(1, 2, [+nasal, +consonantal]:[+nasal, +consonantal]),
(2, 3, [+syllabic]:[+syllabic]),
(3, 4, [-nasal, +consonantal]:ε),
(1, 1, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 0, [+consonantal]:[+consonantal]),
(3, 0, [+nasal]:[+nasal]),
(4, 0, [+nasal, +consonantal]:[+nasal, +consonantal][+nasal, +consonantal])

Language: Bena

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 642)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε)

Transitions: (0, 0, [+voice]:[+voice]),
(0, 1, [-voice]:[-voice]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+syllabic]:[+syllabic]),
(1, 1, [-voice]:[-voice]),
(2, 0, [-nasal,+consonantal]:[-nasal,+consonantal]),
(3, 0, [-dorsal][-dorsal]),
(3, 0, [+voice]:[+voice]),
(3, 0, [+dorsal, -voice, -continuant]:[+voice, +continuant])

Language: Berber: Ayt Ndhir Tamazight

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 642)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 0, [-labial]:[-labial]),
(1, 0, [+labial, +nasal]:[-labial, +coronal])

Language: Berber: Imdlawn Tashlhiyt

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 642), Suzuki (1998, pp. 153)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 0, [-labial]:[-labial]),
(1, 0, [+labial, +nasal]:[-labial, +coronal])

Language: Berber: Tadaksahak

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 642)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 0, [-labial]:[-labial]),
(1, 0, [+labial, +nasal]:[-labial, +coronal])

Language: Berber: Tamashek Tuareg

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 642)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 0, [-labial]:[-labial]),
(1, 0, [+labial, +nasal]:[-labial, +coronal])

Language: Chaha

Pattern: Continuancy dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 642)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-continuant]:[-continuant]),
(0, 1, [+continuant]:[+continuant]),
(1, 1, [-continuant]:[-continuant]),
(1, 1, [+voice]:[+voice]),
(1, 1, [-dorsal]:[-dorsal]),
(1, 0, [+dorsal, +continuant, -voice]:[-continuant])

Language: Chukchi

Pattern: Nasal dissimilation

Direction: Right-to-left

Sources: Suzuki (1998, pp. 155), Krause (2007)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-nasal]:[-nasal]),
(0, 1, [+nasal]:[+nasal]),
(1, 0, [-nasal]:[-nasal]),
(1, 0, [+nasal]:[-nasal])

Language: Dakota

Pattern: Coronal dissimilation

Direction: Right-to-left

Sources: Suzuki (1998, pp. 153)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-coronal]:[-coronal]),
(0, 1, [+coronal]:[+coronal]),
(1, 0, [+coronal]:[-coronal, +dorsal]),
(1, 1, [-coronal]:[-coronal])

Language: EkeGusii

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 643)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε)

Transitions: (0, 0, [+voice]:[+voice]),
(0, 1, [-voice]:[-voice]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+syllabic]:[+syllabic]),
(1, 1, [-voice]:[-voice]),
(2, 0, [-nasal,+consonantal]:[-nasal,+consonantal]),
(3, 0, [-dorsal][-dorsal]),
(3, 0, [+voice]:[+voice]),
(3, 0, [+dorsal, -voice, -continuant]:[+voice, +continuant])

Language: Ekoti

Pattern: Spread glottis dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 643)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-spread glottis]:[-spread glottis]),
(0, 1, [+spread glottis]:[+spread glottis]),
(1, 1, [-spread glottis]:[-spread glottis]),
(1, 0, [+spread glottis]:[-spread glottis])

Language: Embu

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 643)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε)

Transitions: (0, 0, [+voice]:[+voice]),
(0, 1, [-voice]:[-voice]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+syllabic]:[+syllabic]),
(1, 1, [-voice]:[-voice]),
(2, 0, [-nasal,+consonantal]:[-nasal,+consonantal]),
(3, 0, [-dorsal][-dorsal]),
(3, 0, [+voice]:[+voice]),
(3, 0, [+dorsal, -voice, -continuant]:[+voice, +continuant])

Language: Endo

Pattern: Liquid type dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 643), Larsen (1991)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-liquid]:[-liquid]),
(0, 0, [-lateral]:[-lateral]),
(0, 1, [+liquid, +lateral]:[+liquid, +lateral]),
(1, 0, [+liquid, +lateral]:[-lateral, +rhotic]),
(1, 0, [-lateral]:[-lateral]),
(1, 0, [-liquid]:[-liquid])

Language: Ganda

Pattern: NC dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 643)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε)

Transitions: (0, 1, [+nasal, +consonantal]:[+nasal, +consonantal]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 3, [-nasal, +consonantal]:ε),
(1, 0, [+consonantal]:[+consonantal]),
(2, 0, [+nasal]:[+nasal]),
(3, 0, [+nasal, +consonantal]:[+nasal, +consonantal][+nasal, +consonantal])

Language: Gogo

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 643)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 1, [-voice]:[voice]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [-voice]:[+voice]),
(2, 0, [+voice]:[+voice])

Language: Guere

Pattern: Vowel height dissimilation

Direction: Right-to-left

Sources: Suzuki (1998, pp. 156)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [+high]:[+high]),
(0, 1, [-high]:[-high]),
(1, 1, [+high]:[+high]),
(1, 0, [-high]:[+high])

Note: takes place on a vowel tier

Language: Ha

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 643)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 1, [-voice]:[voice]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [-voice]:[+voice]),
(2, 0, [+voice]:[+voice])

Language: Havu

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 643)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 1, [-voice]:[voice]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [-voice]:[+voice]),
(2, 0, [+voice]:[+voice])

Language: Haya

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 643)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 1, [-voice]:[-voice]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [-voice]:[+voice]),
(2, 0, [+voice]:[+voice])

Language: Iban

Pattern: Continuancy dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-continuant]:[-continuant]),
(0, 1, [+continuant], [+continuant]),
(1, 2, [+syllabic]:[+syllabic]),
(1, 1, [+continuant]:[+continuant]),
(1, 0, [-continuant]:[-continuant]),
(2, 0, [-continuant]:[-continuant]),
(2, 0, [+continuant]:[-continuant])

Language: Japanese

Pattern: Length dissimilation

Direction: Right-to-left

Sources: Suzuki (1998, pp. 157)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-long]:[-long]),
(0, 1, [+long]:[+long]),
(1, 0, [-long]:[-long]),
(1, 0, [+long]:[-long])

Note: takes place on a consonantal tier

Language: Jewish Koy Sanjaq

Pattern: Pharyngealization dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-pharyngeal]:[-pharyngeal]),
(0, 1, [+pharyngeal]:[+pharyngeal]),
(1, 0, [-pharyngeal]:[-pharyngeal]),
(1, 0, [+pharyngeal]:[-pharyngeal])

Note: takes place on a consonantal tier

Language: Kera

Pattern: Vowel height dissimilation

Direction: Right-to-left

Sources: Suzuki (1998, pp. 156)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-low]:[-low]),
(0, 0, [+ATR]:[+ATR]),
(0, 1, [+low, -ATR]:[+low, -ATR]),
(1, 0, [+low, -ATR]:[+ATR]),
(1, 0, [-low]:[-low]),
(1, 0, [+ATR]:[+ATR])

Note: takes place on vowel tier

Language: Kıya

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε)

Transitions: (0, 0, [+voice]:[+voice]),
(0, 1, [-voice]:[-voice]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+syllabic]:[+syllabic]),
(1, 1, [-voice]:[-voice]),
(2, 0, [-nasal,+consonantal]:[-nasal,+consonantal]),
(3, 0, [-dorsal][-dorsal]),
(3, 0, [+voice]:[+voice]),
(3, 0, [+dorsal, -voice, -continuant]:[+voice, +continuant])

Language: Kikuria

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε)

Transitions: (0, 0, [+voice]:[+voice]),
(0, 1, [-voice]:[-voice]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+syllabic]:[+syllabic]),
(1, 1, [-voice]:[-voice]),
(2, 0, [-nasal,+consonantal]:[-nasal,+consonantal]),
(3, 0, [-dorsal][-dorsal]),
(3, 0, [+voice]:[+voice]),
(3, 0, [+dorsal, -voice, -continuant]:[+voice, +continuant])

Language: Kikuyu

Pattern: NC dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε), (4, [+consonantal, -nasal])

Transitions: (0, 1, [-nasal, +consonantal]:[-nasal, +consonantal]),
(1, 2, [+nasal]:[+nasal]),
(2, 3, [+syllabic]:[+syllabic]),
(3, 4, [+consonantal, -nasal]:ε),
(4, 0, [+nasal]:[+nasal]),
(4, 0, [-nasal]:[-nasal]),
(1, 0, [+consonantal, -nasal]:[+consonantal, -nasal]),
(2, 0, [+consonantal]:[+consonantal]),
(3, 0, [+nasal, +consonantal]:[+nasal, +consonantal])

Language: Kikuyu

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 644), Suzuki (1998, pp. 155)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε)

Transitions: (0, 0, [+voice]:[+voice]),
(0, 1, [-voice]:[-voice]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+syllabic]:[+syllabic]),
(1, 1, [-voice]:[-voice]),
(2, 0, [-nasal,+consonantal]:[-nasal,+consonantal]),
(3, 0, [-dorsal][-dorsal]),
(3, 0, [+voice]:[+voice]),
(3, 0, [+dorsal, -voice, -continuant]:[+voice, +continuant])

Language: Kinyarwanda

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 1, [-voice]:[-voice]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [-voice]:[+voice]),
(2, 0, [+voice]:[+voice])

Language: Kirundi

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 1, [-voice]:[-voice]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [-voice]:[+voice]),
(2, 0, [+voice]:[+voice])

Language: Kiput

Pattern: Continuancy dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 1, [+continuant]:[+continuant]),
(1, 0, [-continuant]:[-continuant]),
(1, 0, [+continuant]:[-continuant, -voice, +coronal])

Language: Kuman

Pattern: Lateral dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 645), Suzuki (1998, pp. 154)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-lateral]:[-lateral]),
(0, 1, [+lateral, -voice]:[+lateral, -voice]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [+lateral, -voice]:[-lateral, +rhotic, +voice]),
(2, 0, [-lateral]:[-lateral])

Language: Lamba

Pattern: NC dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε), (4, [+consonantal, -nasal])

Transitions: (0, 1, [-nasal, +consonantal]:[-nasal, +consonantal]),
(1, 2, [+nasal]:[+nasal]),
(2, 3, [+syllabic]:[+syllabic]),
(3, 4, [+consonantal, -nasal]:ε),
(4, 0, [+nasal]:[+nasal]),
(4, 0, [-nasal]:[-nasal]),
(1, 0, [+consonantal, -nasal]:[+consonantal, -nasal]),
(2, 0, [+consonantal]:[+consonantal]),
(3, 0, [+nasal, +consonantal]:[+nasal, +consonantal])

Language: Latin (Lex Mamilla)

Pattern: Length dissimilation

Direction: Right-to-left

Sources: Suzuki (1998, pp. 157)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-long]:[-long]),
(0, 1, [+long]:[+long]),
(1, 0, [-long]:[-long]),
(1, 0, [+long]:[-long])

Note: takes place on a consonantal tier

Language: Limos Kalinga

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 1, /=um=/:/=um=/),
(1, 0, [+labial]:[-labial, +dorsal]),
(1, 0, [-labial]:[-labial])

Note: only applies to the infix /um/

Language: Linngithigh

Pattern: NC dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε), (2, ε), (3, [+nasal]), (4, [+nasal][+syllabic])

Transitions: (0, 0, [-syllabic]:[-syllabic]),
(0, 1, [+syllabic]:[+syllabic]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+nasal]:ε),
(3, 4, [+syllabic]:ε),
(4, 0, [+nasal]:[+syllabic][+nasal]),
(4, 0, [-nasal]:[+nasal][+syllabic][-nasal]),
(3, 0, [+consonantal]:[+nasal][+consonantal]),
(2, 0, [-nasal]:[-nasal])

Language: Lugulu

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 1, [-voice]:[-voice]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [-voice]:[+voice]),
(2, 0, [+voice]:[+voice])

Language: Lumasaaba

Pattern: NC dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε)

Transitions: (0, 1, [+nasal, +consonantal]:[+nasal, +consonantal]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 3, [-nasal, +consonantal]:ε),
(1, 0, [+consonantal]:[+consonantal]),
(2, 0, [+nasal]:[+nasal]),
(3, 0, [+nasal, +consonantal]:[+nasal, +consonantal])

Language: Luyia

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε)

Transitions: (0, 0, [+voice]:[+voice]),
(0, 1, [-voice]:[-voice]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+syllabic]:[+syllabic]),
(1, 1, [-voice]:[-voice]),
(2, 0, [-nasal,+consonantal]:[-nasal,+consonantal]),
(3, 0, [-dorsal][-dorsal]),
(3, 0, [+voice]:[+voice]),
(3, 0, [+dorsal, -voice, -continuant]:[+voice])

Language: Marshallese

Pattern: Vowel height dissimilation

Direction: Right-to-left

Sources: Suzuki (1998, pp. 156)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-low]:[-low]),
(0, 1, [+low]:[+low]),
(1, 0, [+low]:[-low, +ATR]),
(1, 0, [-low]:[-low])

Note: takes place on vowel tier

Language: Meru (Chuka)

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε)

Transitions: (0, 0, [+voice]:[+voice]),
(0, 1, [-voice]:[-voice]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+syllabic]:[+syllabic]),
(1, 1, [-voice]:[-voice]),
(2, 0, [-nasal,+consonantal]:[-nasal,+consonantal]),
(3, 0, [-dorsal][-dorsal]),
(3, 0, [+voice]:[+voice]),
(3, 0, [+dorsal, -voice, -continuant]:[+voice])

Language: Meru (Imenti)

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε)

Transitions: (0, 0, [+voice]:[+voice]),
(0, 1, [-voice]:[-voice]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+syllabic]:[+syllabic]),
(1, 1, [-voice]:[-voice]),
(2, 0, [-nasal,+consonantal]:[-nasal,+consonantal]),
(3, 0, [-dorsal][-dorsal]),
(3, 0, [+voice]:[+voice]),
(3, 0, [+dorsal, -voice, -continuant]:[+voice])

Language: Minor Mlabri

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε)

Transitions: (0, 0, [+voice]:[+voice]),
(0, 1, [-voice]:[-voice]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+syllabic, +low]:[+syllabic, +low]),
(1, 1, [-voice]:[-voice]),
(2, 0, [-low]:[-low]),
(3, 0, [-anterior]:[-anterior]),
(3, 0, [+coronal]:[+coronal]),
(3, 0, [+voice]:[+voice]),
(3, 0, [+continuant]:[+continuant]),
(3, 0, [+anterior, -coronal, -voice, -continuant]:[+voice])

Language: Modern Greek

Pattern: Rhotic dissimilation

Direction: Right-to-left

Sources: Suzuki (1998, pp. 154)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-rhotic]:[-rhotic]),
(0, 1, [+rhotic]:[+rhotic]),
(1, 1, [-rhotic]:[-rhotic]),
(1, 0, [+rhotic]:[-rhotic, +lateral])

Note: takes place on a liquid tier

Language: Mori Bawah

Pattern: NC dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε), (4, [-voice, +consonantal])

Transitions: (0, 0, [+voice]:[+voice]),
(0, 1, [-voice, +consonantal]:[-voice, +consonantal]),
(1, 2, [+nasal]:[+nasal]),
(2, 3, [+syllabic]:[+syllabic]),
(3, 4, [-voice, +consonantal]:ε),
(4, 0, [+nasal]:[+nasal]),
(4, 0, [-nasal]:[-voice, +consonantal][-nasal]),
(3, 0, [+voice]:[+voice])

Language: Moro

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 1, [-voice]:[-voice]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [-voice]:[+voice]),
(2, 0, [+voice]:[+voice])

Language: Muna

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, not /=um=/:not /=um=/),
(0, 1, /=um=/:/=um=/),
(1, 1, [-labial]:[-labial]),
(1, 0, [+labial]:ε)

Note: only applies to infix /=um=/

Language: Murut: Timugon

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, not /=um=/:not /=um=/),
(0, 1, /=um=/:/=um=/),
(1, 1, [-labial]:[-labial]),
(1, 0, [+labial]:ε)

Note: only applies to infix /=um=/

Language: Murut: Timugon

Pattern: NC dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε), (2, ε), (3, [+consonantal, -nasal])

Transitions: (0, 0, [+nasal]:[+nasal]),
(0, 1, [-nasal]:[-nasal]),
(1, 2, [+nasal]:[+nasal]),
(2, 2, [+nasal]:[+nasal]),
(2, 3, [+consonantal, -nasal]:ε),
(3, 2, [+nasal]:[+nasal]),
(3, 3, [-nasal, +consonantal]:[-nasal][+consonantal])

Language: Mwimbi

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε)

Transitions: (0, 0, [+voice]:[+voice]),
(0, 1, [-voice]:[-voice]),
(1, 2, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 3, [+syllabic]:[+syllabic]),
(1, 1, [-voice]:[-voice]),
(2, 0, [-nasal,+consonantal]:[-nasal,+consonantal]),
(3, 0, [-dorsal][-dorsal]),
(3, 0, [+voice]:[+voice]),
(3, 0, [+dorsal, -voice, -continuant]:[+voice])

Language: Ndebele

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 0, [-sonorant]:[-sonorant]),
(0, 1, [+labial, +sonorant]:[+labial, +sonorant]),
(1, 0, [+labial]:[-labial, +palatal]),
(1, 0, [-labial]:[-labial])

Language: Ngaju Dayak

Pattern: Continuancy dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-continuant]:[-continuant]),
(0, 0, [+voice]:[+voice]),
(0, 0, [-coronal]:[-coronal]),
(0, 1, [+continuant, -voice, +coronal, +anterior]:[+continuant, -voice, +coronal, +anterior]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [+continuant, -voice, +coronal, +anterior]:[-continuant]),
(2, 0, [-continuant]:[-continuant]),
(2, 0, [+voice]:[+voice]),
(2, 0, [-coronal]:[-coronal])

Language: Ngaju Dayak

Pattern: NC dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε), (4, [+consonantal, -nasal])

Transitions: (0, 1, [-nasal, +consonantal]:[-nasal, +consonantal]),
(1, 2, [+nasal]:[+nasal]),
(2, 3, [+syllabic]:[+syllabic]),
(3, 4, [+consonantal, -nasal]:ε),
(4, 0, [+nasal]:[+nasal]),
(4, 0, [-nasal]:[-nasal]),
(1, 0, [+consonantal, -nasal]:[+consonantal, -nasal]),
(2, 0, [+consonantal]:[+consonantal]),
(3, 0, [+nasal, +consonantal]:[+nasal, +consonantal])

Language: Ni'ihau Hawai'ian

Pattern: Coronal dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [+continuant]:[+continuant]),
(0, 0, [+voice]:[+voice]),
(0, 0, [-coronal]:[-coronal]),
(0, 1, [+coronal, +anterior, -continuant, -voice]:[+coronal, +anterior, -continuant, -voice]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [+coronal, +anterior, -continuant, -voice]:[+dorsal, -anterior, -coronal]),
(2, 0, [+continuant]:[+continuant]),
(2, 0, [+voice]:[+voice]),
(2, 0, [-coronal]:[-coronal])

Language: Northern Greek

Pattern: Continuancy dissimilation

Direction: Right-to-left

Sources: Suzuki (1998, pp. 156)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-continuant]:[-continuant]),
(0, 0, [+voice]:[+voice]),
(0, 0, [-coronal]:[-coronal]),
(0, 1, [+continuant, -voice, +anterior, +coronal]:[+continuant, -voice, +anterior, +coronal]),
(1, 0, [-continuant]:[-continuant]),
(1, 0, [+voice]:[+voice]),
(1, 0, [-coronal]:[-coronal]),
(1, 0, [+continuant, -voice, +anterior, +coronal]:ε)

Language: Nyamwezi

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 1, [-voice]:[-voice]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [-voice]:[+voice]),
(2, 0, [+voice]:[+voice])

Language: Ofo

Pattern: Spread glottis dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-spread glottis]:[-spread glottis]),
(0, 1, [+spread glottis]:[+spread glottis]),
(1, 1, [-spread glottis]:[-spread glottis]),
(1, 0, [+spread glottis]:[-spread glottis])

Language: Palauan

Pattern: Continuancy dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 647)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 0, /=m=/:=w=),
(1, 0, not /=m=/:not /=m=/)
only for /=m=/ infix

Language: Palauan

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 647), Suzuki (1998, pp. 153)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 0, /=m=/:[+syllabic, -consonantal, +back, +round]),
(1, 0, not /=m=/:not /=m=/)
only for /=m=/ infix

Language: Phuthi

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 647)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-sonorant]:[-sonorant]),
(0, 0, [-labial]:[-labial]),
(0, 1, [+sonorant, +labial]:[+sonorant, +labial]),
(1, 0, [+labial]:[-labial, +palatal]),
(1, 0, [-labial]:[-labial])

Language: Salish: Moses-Columbia

Pattern: Constricted glottis dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 647), Suzuki (1998, pp. 153), Bessell and Czaykowska-Higgins (1993)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-constricted glottis]:[-constricted glottis]),
(0, 1, [+constricted glottis]:[+constricted glottis]),
(1, 1, [-constricted glottis]:[-constricted glottis]),
(1, 0, [+constricted glottis]:[-constricted glottis])

Language: Salish: Okanagan

Pattern: Constricted glottis dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 647)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-constricted glottis]:[-constricted glottis]),
(0, 1, [+constricted glottis]:[+constricted glottis]),
(1, 1, [-constricted glottis]:[-constricted glottis]),
(1, 0, [+constricted glottis]:[-constricted glottis])

Language: Salish: Shuswap

Pattern: Constricted glottis dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 647)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-constricted glottis]:[-constricted glottis]),
(0, 1, [+constricted glottis]:[+constricted glottis]),
(1, 1, [-constricted glottis]:[-constricted glottis]),
(1, 0, [+constricted glottis]:[-constricted glottis])

Language: Salish: Tillamook

Pattern: Constricted glottis dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 647)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-constricted glottis]:[-constricted glottis]),
(0, 1, [+constricted glottis]:[+constricted glottis]),
(1, 1, [-constricted glottis]:[-constricted glottis]),
(1, 0, [+constricted glottis]:[-constricted glottis])

Language: Sanskrit

Pattern: Spread glottis dissimilation

Direction: Right-to-left

Sources: Suzuki (1998, pp. 155)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-spread glottis]:[-spread glottis]),
(0, 1, [+spread glottis]:[+spread glottis]),
(1, 1, [-spread glottis]:[-spread glottis]),
(1, 0, [+spread glottis]:[-spread glottis])

Language: Sarangani Blaan

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 647)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, not /=am=/:not /=am=/),
(0, 1, /=am=/:/=am=/),
(1, 1, [-labial]:[-labial]),
(1, 0, [+labial]:ε)

Note: only applies to infix /=am=/

Language: Sarangani Manobo

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 647)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, not /=om=/:not /=om=/),

(0, 1, /=om=/:/=om=/),

(1, 1, [-labial]:[-labial]),

(1, 0, [+labial]:ε)

only applies to infix /=om=/

Language: Seri

Pattern: Constricted glottis dissimilation

Direction: Right-to-left

Sources: Suzuki (1998, pp. 155)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-constricted glottis]:[-constricted glottis]),

(0, 1, [+constricted glottis]:[+constricted glottis]),

(1, 1, [-constricted glottis]:[-constricted glottis]),

(1, 0, [+constricted glottis]:ε)

Language: Shambala

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-voice]:[-voice]),

(0, 1, [+voice]:[+voice]),

(1, 0, [+voice]:[+voice]),

(1, 2, [+syllabic]:[+syllabic]),

(2, 0, [+voice]:[-voice]),

(2, 0, [-voice]:[-voice])

Language: Shi

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-voice]:[-voice]),

(0, 1, [+voice]:[+voice]),

(1, 0, [+voice]:[+voice]),

(1, 2, [+syllabic]:[+syllabic]),

(2, 0, [+voice]:[-voice]),

(2, 0, [-voice]:[-voice])

Language: Sundanese

Pattern: Liquid dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 648), Suzuki (1998, pp. 154)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-rhotic]:[-rhotic]),
(0, 1, [+rhotic]:[+rhotic]),
(1, 0, [+rhotic]:[+rhotic]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [+rhotic]:[-rhotic, +lateral]),
(2, 0, [-rhotic]:[-rhotic])

Language: Swati

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-sonorant]:[-sonorant]),
(0, 0, [-labial]:[-labial]),
(0, 1, [+sonorant, +labial]:[+sonorant, +labial]),
(1, 0, [+labial]:[-labial, +palatal]),
(1, 0, [-labial]:[-labial])

Language: Tahitian

Pattern: Coronal dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [+voice]:[+voice]),
(0, 0, [+continuant]:[+continuant]),
(0, 0, [-coronal]:[-coronal]),
(0, 1, [-voice, -continuant, +coronal, +anterior]:[-voice, -continuant, +coronal, +anterior]),
(1, 0, [+consonantal]:[+consonantal]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [-voice, -continuant, +coronal, +anterior]:[-anterior, -coronal, +dorsal]),
(2, 0, [+voice]:[+voice]),
(2, 0, [+continuant]:[+continuant]),
(2, 0, [-coronal]:[-coronal]),

Language: Tahitian

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 0, [+labial, +continuant, -voice]:[-labial, +dorsal, -anterior]),
(1, 1, [-labial]:[-labial])

Language: Tharaka

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-voice]:[-voice]),
(0, 1, [+voice]:[+voice]),
(1, 0, [+voice]:[+voice]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [+voice]:[-voice]),
(2, 0, [-voice]:[-voice])

Language: Tzutujil

Pattern: Backness dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 649)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-velar]:[-velar]),
(0, 1, [+velar]:[+velar]),
(1, 2, [+syllabic]:[+syllabic]),
(1, 0, [-syllabic]:[-syllabic]),
(2, 0, [+velar]:[+velar, +palatalized]),
(2, 0, [-velar]:[-velar])

Language: Umbundu

Pattern: NC dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 649)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε), (4, [+consonantal, -nasal]),

Transitions: (0, 1, [+syllabic]:[+syllabic]),

(1, 2, [+nasal]:[+nasal]),

(2, 3, [+syllabic]:[+syllabic]),

(3, 4, [+consonantal, -nasal]:ε),

(4, 0, [+nasal]:[+nasal]),

(4, 0, [-nasal]:[+consonantal, -nasal][-nasal]),

(1, 0, [+consonantal]:[+consonantal]),

(2, 0, [+consonantal, -nasal]:[+consonantal, -nasal]),

(3, 0, [+nasal, +consonantal]:[+nasal, +consonantal])

Language: Western Bade

Pattern: Voicing dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 649)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε),

Transitions: (0, 1, [+syllabic]:[+syllabic]),

(1, 2, [+voice, +consonantal]:[+voice, +consonantal]),

(2, 3, [+syllabic]:[+syllabic]),

(3, 0, [+consonantal, +voice]:[+consonantal, -voice]),

(3, 0, [-voice]:[-voice]),

(1, 0, [+consonantal]:[+consonantal]),

(2, 0, [-voice]:[-voice])

Language: Woleaian

Pattern: Vowel dissimilation

Direction: Right-to-left

Sources: Suzuki (1998, pp. 156)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-low]:[-low]),
(0, 1, [+low]:[+low]),
(1, 0, [+low]:[-low, +ATR]),
(1, 0, [-low]:[-low])

Note: takes place on vowel tier

Language: Xhosa

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 649)

Xhosa:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 0, [-sonorant]:[-sonorant]),
(0, 1, [+labial, +sonorant]:[+labial, +sonorant]),
(1, 0, [+labial]:[-labial, +palatal]),
(1, 0, [-labial]:[-labial])

Language: Yao

Pattern: NC dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 649), Suzuki (1998, pp. 153)

FST:

States: (0, ε), (1, ε), (2, ε), (3, ε), (4, [continuant, +voice, +coronal, +anterior]),

Transitions: (0, 1, [+consonantal, -nasal]),
(1, 2, [+nasal]:[+nasal]),
(2, 3, [+syllabic]:[+syllabic]),
(3, 4, [-continuant, +voice, +coronal, +anterior]:ε),
(4, 0, [+nasal]:[+nasal]),
(4, 0, [-nasal]:[-continuant, +voice, +coronal, +anterior][-nasal]),
(1, 0, [+syllabic]:[+syllabic]),
(2, 0, [+consonantal, -nasal]:[+consonantal, -nasal]),
(3, 0, [-continuant]:[-continuant]),
(3, 0, [-voice]:[-voice]),
(3, 0, [-coronal]:[-coronal]),
(3, 0, [-anterior]:[-anterior])

Language: Zalamo

Pattern: Voiceless dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 649)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-voice]:[-voice]),
(0, 1, [+voice]:[+voice]),
(1, 0, [+voice]:[+voice]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [+voice]:[-voice]),
(2, 0, [-voice]:[-voice])

Language: Zulu

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 649), Suzuki (1998, pp. 153), Beckman (1993)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 0, [-sonorant]:[-sonorant]),
(0, 1, [+labial, +sonorant]:[+labial, +sonorant]),
(1, 0, [+labial]:[-labial, +palatal]),
(1, 0, [-labial]:[-labial])

A.3 Blocking dissimilations - left-to-right subsequential.

Language: Georgian

Pattern: Liquid dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 643), Suzuki (1998, pp. 154)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [+lateral]:[+lateral]),
(0, 0, [+syllabic]:[+syllabic]),
(0, 0, [-liquid]:[-liquid]),
(0, 1, [+rhotic]:[+rhotic]),
(1, 0, [+lateral]:[+lateral]),
(1, 0, [+rhotic]:[-rhotic, +lateral]),
(1, 1, [+syllabic]:[+syllabic]),
(1, 1, [-liquid]:[-liquid])

Language: Latin

Pattern: Liquid dissimilation (/r/ as a blocker)

Direction: Left-to-right

Sources: Bennett (2013, pp. 645), Suzuki (1998, pp. 154)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [+rhotic]:[+rhotic]),
(0, 0, [+syllabic]:[+syllabic]),
(0, 0, [-liquid]:[-liquid]),
(0, 1, [+lateral]:[+lateral]),
(1, 0, [+rhotic]:[+rhotic]),
(1, 0, [+lateral]:[-lateral, +rhotic]),
(1, 1, [+syllabic]:[+syllabic]),
(1, 1, [-liquid]:[-liquid])

Language: Latin

Pattern: Liquid dissimilation (full /l/ dissimilatory pattern)

Direction: Left-to-right

Sources: Bennett (2013, pp. 645), Suzuki (1998, pp. 154), Cser (2010)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [+rhotic]:[+rhotic]),
(0, 0, [+syllabic]:[+syllabic]),
(0, 0, [-liquid]:[-liquid]),
(0, 1, [+lateral]:[+lateral]),
(1, 0, [+rhotic]:[+rhotic]),
(1, 0, [-coronal, +consonantal]:[-coronal, +consonantal]),
(1, 0, [+lateral]:[-lateral, +rhotic]),
(1, 1, [+syllabic]:[+syllabic]),
(1, 1, [-liquid, +coronal]:[-liquid, +coronal])

A.4 Blocking dissimilations - Right-to-left subsequential. Though this pattern looks like rightward blocking, these are actually two separate basic dissimilations. The first is right-to-left subsequential, the second, left-to-right.

Language: Yidiny

Pattern: Liquid dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 649), Suzuki (1998, pp. 154), Dixon (1977)

FST:

States: (0, ε), (1, ε),

Transitions: (0, 0, [-lateral]:[-lateral]),

(0, 1, [+lateral]:[+lateral]),

(1, 0, [-lateral]:[-lateral]),

(1, 0, [+lateral]:[-lateral, +rhotic])

Note: the first l to r dissimilation (reverse the input string)

Language: Yidiny

Pattern: Liquid dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 649), Suzuki (1998, pp. 154), Dixon (1977)

FST:

States: (0, ε), (1, ε),

Transitions: (0, 0, [-rhotic]:[-rhotic]),

(0, 1, [+rhotic]:[+rhotic]),

(1, 0, [-rhotic]:[-rhotic]),

(1, 0, [+rhotic]:[-rhotic, +lateral])

Note: the second r to l dissimilation

A.5 Polarity dissimilations - left-to-right subsequential.

Language: Chontal

Pattern: Voicing dissimilation

Direction: Left-to-right

Sources: Suzuki (1998, pp. 158)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 1, [+voice]:[+voice]),
(0, 2, [-voice]:[-voice]),
(2, 0, /-laʔ/:-laʔ),
(1, 0, /-laʔ/:/-ɬaʔ/),
(1, 1, [+voice]:[+voice]),
(2, 2, [-voice]:[-voice]),
(2, 1, [+voice]:[+voice]),
(1, 2, [-voice]:[-voice])

Note: only applies to the suffix -laʔ

Language: Dinka

Pattern: Vowel length dissimilation

Direction: Left-to-right

Sources: Suzuki (1998, pp. 158)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-long]:[-long]),
(0, 1, [+long]:[+long]),
(0, 2, [-long]:[-long]),
(2, 0, [-long]:[+long]),
(1, 0, [+long]:[-long]),
(1, 1, [+long]:[+long]),
(2, 2, [-long]:[-long])

Note: takes place on a vowel tier

Language: Margi

Pattern: Tone dissimilation

Direction: Left-to-right

Sources: Suzuki (1998, pp. 157)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 1, [+high]:[+high]),
(0, 2, [+low]:[+low]),
(1, 2, [+low]:[+low]),
(2, 1, [+high]:[+high]),
(2, 0, [-high, -low]:[+high]),
(1, 0, [-high, -low]:[+low])

Note: takes place on a tonal tier

Language: Russian

Pattern: Vowel height dissimilation

Direction: Left-to-right

Sources: Suzuki (1998, pp. 158)

FST:

States: (0, ε), (1, [-high, -low])

Transitions: (0, 0, [+high]:[+high]),
(0, 1, [-high, -low]:ε),
(1, 1, [-high, -low]:[-high, -low]),
(1, 0, [+low]:[+high][+low]),
(1, 0, [+high]:[+low][+high])

Note: takes place on a vowel tier

A.6 Co-occurrence restrictions. These co-occurrence restrictions are not explicit maps, but the maps chosen here are consistent with surface representations. In languages with many such maps (e.g. Arabic), one potential map is given. Each of these patterns can be described with either a left-to-right or right-to-left subsequential transducer; both are provided here if they are not identical.

Language: Ainu

Pattern: Vowel backness dissimilation

Direction: Left-to-right or Right-to-left

Sources: Suzuki (1998, pp. 156)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-back]:[-back]),
(0, 0, [-high]:[-high]),
(0, 1, [+back, +high]:[+back, +high]),
(1, 0, [-back]:[-back]),
(1, 0, [-high]:[-high]),
(1, 0, [+back, +high]:[-back, +high])

Note: takes place on a vowel tier

Language: Akkadian

Pattern: Constricted glottis dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 641)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-constricted glottis]:[-constricted glottis]),
(0, 1, [+constricted glottis]:[+constricted glottis]),
(1, 1, [-constricted glottis]:[-constricted glottis]),
(1, 0, [+constricted glottis]:ε)

Language: Arabic

Pattern: Place dissimilation

Direction: Left-to-right or Right-to-left

Sources: Suzuki (1998, pp. 152), Frisch et al. (2004), Yip (1989)

FSTs:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 0, [-labial]:[-labial]),
(1, 0, [+labial]:[-labial])

States: (0, ε), (1, ε)

Transitions: (0, 0, [-coronal]:[-coronal]),
(0, 0, [-continuant]:[-continuant]),
(0, 1, [+coronal, +continuant]:[+coronal, +continuant]),
(1, 0, [-coronal]:[-coronal]),
(1, 0, [+coronal, +continuant]:[-continuant])

States: (0, ε), (1, ε)

Transitions: (0, 0, [-coronal]:[-coronal]),
(0, 0, [+continuant]:[+continuant]),
(0, 1, [+coronal, -continuant]:[+coronal, -continuant]),
(1, 0, [-coronal]:[-coronal]),
(1, 0, [+coronal, -continuant]:[+continuant])

States: (0, ε), (1, ε)

Transitions: (0, 0, [-coronal]:[-coronal]),
(0, 0, [-sonorant]:[-sonorant]),
(0, 1, [+sonorant, +coronal]:[+coronal, +sonorant]),
(1, 0, [-coronal]:[-coronal]),
(1, 0, [+coronal, +sonorant]:[-sonorant])

States: (0, ε), (1, ε)

Transitions: (0, 0, [-dorsal]:[-dorsal]),
(0, 1, [+dorsal]:[+dorsal]),
(1, 0, [-dorsal]:[-dorsal]),
(1, 0, [+dorsal]:[-dorsal])

States: (0, ε), (1, ε)

Transitions: (0, 0, [-pharyngeal]:[-pharyngeal]),
(0, 1, [+pharyngeal]:[+pharyngeal]),
(1, 0, [-pharyngeal]:[-pharyngeal]),
(1, 0, [+pharyngeal]:[-pharyngeal])

Note: This is a 'place' dissimilation, which can be thought of as a combination of several FSTs restricting combinations for each place

Language: Aymara: Bolivian
Pattern: Constricted glottis dissimilation
Direction: Left-to-right or Right-to-left
Sources: Bennett (2013, pp. 642)
FST:
States: (0, ε), (1, ε)
Transitions: (0, 0, [-constricted glottis]:[-constricted glottis]),
(0, 1, [+constricted glottis]:[+constricted glottis]),
(1, 1, [-constricted glottis]:[-constricted glottis]),
(1, 0, [+constricted glottis]:[-constricted glottis])

Language: Aymara: Peruvian
Pattern: Constricted glottis dissimilation
Direction: Left-to-right or Right-to-left
Sources: Bennett (2013, pp. 642)
FST:
States: (0, ε), (1, ε)
Transitions: (0, 0, [-constricted glottis]:[-constricted glottis]),
(0, 1, [+constricted glottis]:[+constricted glottis]),
(1, 1, [-constricted glottis]:[-constricted glottis]),
(1, 0, [+constricted glottis]:[-constricted glottis])

Language: Aymara: Peruvian
Pattern: Spread glottis dissimilation
Direction: Left-to-right or Right-to-left
Sources: Bennett (2013, pp. 642)
FST:
States: (0, ε), (1, ε)
Transitions: (0, 0, [-spread glottis]:[-spread glottis]),
(0, 1, [+spread glottis]:[+spread glottis]),
(1, 1, [-spread glottis]:[-spread glottis]),
(1, 0, [+spread glottis]:[-spread glottis])

Language: Berber: Imdlawn Tashlhiyt
Pattern: Labial dissimilation
Direction: Left-to-right or Right-to-left
Sources: Bennett (2013, pp. 642), Suzuki (1998, pp. 153)
FST:
States: (0, ε), (1, ε)
Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 1, [-labial]:[-labial]),
(1, 0, [+labial][-labial])

Language: Cambodian

Pattern: Place dissimilation

Direction: Left-to-right or Right-to-left

Sources: Suzuki (1998, pp. 152), Yip (1989)

FSTs:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 0, [-labial]:[-labial]),
(1, 0, [+labial]:[-labial])

States: (0, ε), (1, ε)

Transitions: (0, 0, [-coronal]:[-coronal]),
(0, 1, [+coronal]:[+coronal]),
(1, 0, [-coronal]:[-coronal]),
(1, 0, [+coronal]:[-coronal])

States: (0, ε), (1, ε)

Transitions: (0, 0, [-dorsal]:[-dorsal]),
(0, 1, [+dorsal]:[+dorsal]),
(1, 0, [-dorsal]:[-dorsal]),
(1, 0, [+dorsal]:[-dorsal])

Note: This is a 'place' dissimilation, which can be thought of as a combination of several FSTs restricting combinations for each place

Language: Cantonese

Pattern: Labial dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 642), Suzuki (1998, pp. 153)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 1, [-labial]:[-labial]),
(1, 0, [+labial]:[-labial])

Language: Chol

Pattern: Constricted glottis dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 643)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-constricted glottis]:[-constricted glottis]),
(0, 1, [+constricted glottis]:[+constricted glottis]),
(1, 1, [-constricted glottis]:[-constricted glottis]),
(1, 0, [+constricted glottis]:[-constricted glottis])

Language: Georgian (old)

Pattern: Constricted glottis dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 643)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-constricted glottis]:[-constricted glottis]),
(0, 1, [+constricted glottis]:[+constricted glottis]),
(1, 1, [-constricted glottis]:[-constricted glottis]),
(1, 0, [+constricted glottis]:[-constricted glottis])

Language: Gojri

Pattern: Spread glottis dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 643)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-spread glottis]:[-spread glottis]),
(0, 1, [+spread glottis]:[+spread glottis]),
(1, 1, [-spread glottis]:[-spread glottis]),
(1, 0, [+spread glottis]:[-spread glottis])

Language: Harauti

Pattern: Spread glottis dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 643)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-spread glottis]:[-spread glottis]),
(0, 1, [+spread glottis]:[+spread glottis]),
(1, 1, [-spread glottis]:[-spread glottis]),
(1, 0, [+spread glottis]:[-spread glottis])

Language: Hausa

Pattern: Constricted glottis dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-constricted glottis]:[-constricted glottis]),
(0, 1, [+constricted glottis, $+\alpha$ place]:[+constricted glottis, $+\alpha$ place]),
(1, 1, [-constricted glottis]:[-constricted glottis]),
(1, 0, [+constricted glottis, $-\alpha$ place]:[-constricted glottis, -α place]),
(1, 1, [+constricted glottis, $+\alpha$ place]:[+constricted glottis, $+\alpha$ place])

Language: Jah Hut

Pattern: Rhotic dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-rhotic]:[-rhotic]),
(0, 1, [+rhotic]:[+rhotic]),
(1, 0, [-rhotic]:[-rhotic]),
(1, 0, [+rhotic]:[-rhotic])

Note: takes place on a consonantal tier

Language: Jahai

Pattern: Rhotic dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-rhotic]:[-rhotic]),
(0, 1, [+rhotic]:[+rhotic]),
(1, 0, [-rhotic]:[-rhotic]),
(1, 0, [+rhotic]:[-rhotic])

Note: takes place on a consonantal tier

Language: Japanese

Pattern: Length dissimilation

Direction: Left-to-right or Right-to-left

Sources: Suzuki (1998, pp. 157)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-long]:[-long]),
(0, 1, [+long]:[+long]),
(1, 0, [-long]:[-long]),
(1, 0, [+long]:[-long])

Note: takes place on a consonantal tier

Language: Japanese

Pattern: Voicing dissimilation

Direction: Left-to-right or Right-to-left

Sources: Suzuki (1998, pp. 155), Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 1, [+voice]:[+voice]),
(1, 0, [-voice]:[-voice]),
(1, 0, [+voice]:[-voice]),
(0, 0, [-voice]:[-voice])

Language: Japanese (old)

Pattern: NC dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε), (2, ε), (3, [+nasal])

Transitions: (0, 0, [-nasal]:[-nasal]),
(0, 1, [+nasal]:[+nasal]),
(1, 2, [-nasal]:[-nasal]),
(1, 1, [+nasal]:[+nasal]),
(2, 0, [-nasal]:[-nasal]),
(2, 3, [+nasal]:ε),
(3, 0, [-nasal]:[-nasal]),
(3, 1, [+nasal]:[+nasal][+nasal])

Note: takes place on a consonantal tier

Language: Japanese (old)

Pattern: NC dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε), (2, ε), (3, [+consonantal, -nasal])

Transitions: (0, 0, [+nasal]:[+nasal]),
(0, 1, [-nasal]:[-nasal]),
(1, 2, [+nasal]:[+nasal]),
(2, 2, [+nasal]:[+nasal]),
(2, 3, [+consonantal, -nasal]:ε),
(3, 2, [+nasal]:[+nasal]),
(3, 3, [-nasal, +consonantal]:[-nasal][+consonantal])

Language: Javanese

Pattern: Liquid dissimilation

Direction: Left-to-right or Right-to-left

Sources: Suzuki (1998, pp. 154)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-liquid]:[-liquid]),
(0, 1, [+liquid]:[+liquid]),
(1, 0, [-liquid]:[-liquid]),
(1, 0, [+liquid]:[-liquid])

Language: Javanese

Pattern: Place dissimilation

Direction: Left-to-right or Right-to-left

Sources: Suzuki (1998, pp. 152), Padgett (1991)

FSTs:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),

(0, 1, [+labial]:[+labial]),

(1, 0, [-labial]:[-labial]),

(1, 0, [+labial]:[-labial])

States: (0, ε), (1, ε)

Transitions: (0, 0, [-coronal]:[-coronal]),

(0, 1, [+coronal]:[+coronal]),

(1, 0, [-coronal]:[-coronal]),

(1, 0, [+coronal]:[-coronal])

States: (0, ε), (1, ε)

Transitions: (0, 0, [-dorsal]:[-dorsal]),

(0, 1, [+dorsal]:[+dorsal]),

(1, 0, [-dorsal]:[-dorsal]),

(1, 0, [+dorsal]:[-dorsal])

Note: This is a 'place' dissimilation, which can be thought of as a combination of several FSTs restricting combinations for each place

Language: Kammu

Pattern: Rhotic dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 644)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-rhotic]:[-rhotic]),

(0, 1, [+rhotic]:[+rhotic]),

(1, 0, [-rhotic]:[-rhotic]),

(1, 0, [+rhotic]:[-rhotic])

Note: takes place on a consonantal tier

Language: Kurmanji

Pattern: Pharyngealization dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 645)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-pharyngeal]:[-pharyngeal]),
(0, 1, [+pharyngeal]:[+pharyngeal]),
(1, 0, [-pharyngeal]:[-pharyngeal]),
(1, 0, [+pharyngeal]:[-pharyngeal])

Note: takes place on a consonantal tier

Language: Muna

Pattern: NC dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε), (2, ε), (3, [+nasal])

Transitions: (0, 0, [-nasal]:[-nasal]),
(0, 1, [+nasal]:[+nasal]),
(1, 2, [-nasal]:[-nasal]),
(1, 1, [+nasal]:[+nasal]),
(2, 0, [-nasal]:[-nasal]),
(2, 3, [+nasal]:ε),
(3, 0, [-nasal]:[-nasal]),
(3, 1, [+nasal]:[+nasal][+nasal])

Note: takes place on a consonantal tier

Language: Muna

Pattern: NC dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 646)

FST:

States: (0, ε), (1, ε), (2, ε), (3, [+consonantal, -nasal])

Transitions: (0, 0, [+nasal]:[+nasal]),
(0, 1, [-nasal]:[-nasal]),
(1, 2, [+nasal]:[+nasal]),
(2, 2, [+nasal]:[+nasal]),
(2, 3, [+consonantal, -nasal]:ε),
(3, 2, [+nasal]:[+nasal]),
(3, 3, [-nasal, +consonantal]:[-nasal][+consonantal])

Language: Ngbaka

Pattern: Vowel height dissimilation

Direction: Left-to-right or Right-to-left

Sources: Suzuki (1998, pp. 156)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-high]:[-high]),
(0, 0, [-back]:[-back]),
(0, 1, [+high, +back]:[+high]),
(1, 0, [-high]:[-high]),
(1, 0, [-back]:[-back]),
(1, 0, [+high, +back]:[-high])

Note: takes place on vowel tier

Language: Ponapean

Pattern: Labial dissimilation

Direction: Left-to-right or Right-to-left

Sources: Suzuki (1998, pp. 153)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 1, [-labial]:[-labial]),
(1, 0, [+labial]:[-labial])

Language: Proto-Indo-European

Pattern: Liquid dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 647)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-liquid]:[-liquid]),
(0, 1, [+liquid]:[+liquid]),
(1, 0, [+consonantal]:[+consonantal]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [+liquid]:[-liquid]),
(2, 0, [-liquid]:[-liquid])

Language: Proto-Indo-European
Pattern: Voicing dissimilation
Direction: Left-to-right or Right-to-left
Sources: Bennett (2013, pp. 647)
FST:
States: (0, ε), (1, ε), (2, ε)
Transitions: (0, 0, [-voice]:[-voice]),
(0, 1, [+voice]:[+voice]),
(1, 0, [+voice]:[+voice]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [+voice]:[-voice]),
(2, 0, [-voice]:[-voice])

Language: Quechua (Bolivian)
Pattern: Constricted glottis dissimilation
Direction: Left-to-right or Right-to-left
Sources: Bennett (2013, pp. 647)
FST:
States: (0, ε), (1, ε)
Transitions: (0, 0, [-constricted glottis]:[-constricted glottis]),
(0, 1, [+constricted glottis]:[+constricted glottis]),
(1, 1, [-constricted glottis]:[-constricted glottis]),
(1, 0, [+constricted glottis]:[-constricted glottis])

Language: Quechua (Bolivian)
Pattern: Spread glottis dissimilation
Direction: Left-to-right or Right-to-left
Sources: Bennett (2013, pp. 647)
FST:
States: (0, ε), (1, ε)
Transitions: (0, 0, [-spread glottis]:[-spread glottis]),
(0, 1, [+spread glottis]:[+spread glottis]),
(1, 1, [-spread glottis]:[-spread glottis]),
(1, 0, [+spread glottis]:[-spread glottis])

Language: Quechua (Cuzco)
Pattern: Constricted glottis dissimilation
Direction: Left-to-right or Right-to-left
Sources: Bennett (2013, pp. 647)
FST:
States: (0, ε), (1, ε)
Transitions: (0, 0, [-constricted glottis]:[-constricted glottis]),
(0, 1, [+constricted glottis]:[+constricted glottis]),
(1, 1, [-constricted glottis]:[-constricted glottis]),
(1, 0, [+constricted glottis]:[-constricted glottis])

Language: Quechua (Cuzco)

Pattern: Spread glottis dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 647)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-spread glottis]:[-spread glottis]),
(0, 1, [+spread glottis]:[+spread glottis]),
(1, 1, [-spread glottis]:[-spread glottis]),
(1, 0, [+spread glottis]:[-spread glottis])

Language: Russian

Pattern: Place dissimilation

Direction: Left-to-right or Right-to-left

Sources: Suzuki (1998, pp. 152), Alderete (1997)

FSTs:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 0, [-labial]:[-labial]),
(1, 0, [+labial]:[-labial])

States: (0, ε), (1, ε)

Transitions: (0, 0, [-coronal]:[-coronal]),
(0, 0, [-continuant]:[-continuant]),
(0, 1, [+coronal, +continuant]:[+coronal, +continuant]),
(1, 0, [-coronal]:[-coronal]),
(1, 0, [+coronal, +continuant]:[-continuant])

States: (0, ε), (1, ε)

Transitions: (0, 0, [-coronal]:[-coronal]),
(0, 0, [+continuant]:[+continuant]),
(0, 1, [+coronal, -continuant]:[+coronal, -continuant]),
(1, 0, [-coronal]:[-coronal]),
(1, 0, [+coronal, -continuant]:[+continuant])

States: (0, ε), (1, ε)

Transitions: (0, 0, [-coronal]:[-coronal]),
(0, 0, [-sonorant]:[-sonorant]),
(0, 1, [+sonorant, +coronal]:[+coronal, +sonorant]),
(1, 0, [-coronal]:[-coronal]),
(1, 0, [+coronal, +sonorant]:[-sonorant])

Language: Semelai

Pattern: Rhotic dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-rhotic]:[-rhotic]),
(0, 1, [+rhotic]:[+rhotic]),
(1, 2, [+syllabic]:[+syllabic]),
(1, 1, [+rhotic]:[+rhotic]),
(1, 0, [-rhotic]:[-rhotic]),
(2, 0, [-rhotic]:[-rhotic]),
(2, 0, [+rhotic]:[-rhotic])

Language: Sre

Pattern: Rhotic dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-rhotic]:[-rhotic]),
(0, 1, [+rhotic]:[+rhotic]),
(1, 2, [+syllabic]:[+syllabic]),
(1, 1, [+rhotic]:[+rhotic]),
(1, 0, [-rhotic]:[-rhotic]),
(2, 0, [-rhotic]:[-rhotic]),
(2, 0, [+rhotic]:[-rhotic])

Language: Sre

Pattern: Rhotic dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-rhotic]:[-rhotic]),
(0, 1, [+rhotic]:[+rhotic]),
(1, 0, [+rhotic]:[+rhotic]),
(1, 2, [+syllabic]:[+syllabic]),
(2, 0, [+rhotic]:[-rhotic]),
(2, 0, [-rhotic]:[-rhotic])

Language: Tagalog

Pattern: Labial dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 0, [-nasal]:[-nasal]),
(0, 1, [+labial, +nasal]:[+labial, +nasal]),
(1, 0, /=um=/ infix:not /=um=/ infix),
(1, 1, [-syllabic]:[-syllabic]),
(1, 1, [+syllabic]:[+syllabic])

Note: only applies to infix /=um=/

Language: Tagalog

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, not /=um=/:not /=um=/), (0, 1, /=um=/:/=um=/), (1, 1, [-nasal]:[-nasal]), (1, 1, [-labial]:[-labial]), (1, 0, [+labial, +nasal]:ε)

Note: only applies to infix /=um=/

Language: Takelma

Pattern: Nasal dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]), (0, 1, [+labial, +nasal]:[+labial, +nasal]), (1, 0, [+coronal, +nasal]:[-nasal, +lateral]), (1, 1, [-nasal]:[-nasal]), (0, 0, [-coronal]:[-coronal])

Language: Takelma

Pattern: Nasal dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-nasal]:[-nasal]), (0, 1, [+nasal]:[+nasal]), (1, 0, [+nasal, +coronal]:[-nasal, +lateral]), (1, 1, [-nasal]:[-nasal], (1, 1, [-coronal]:[-coronal])

Language: Thao

Pattern: Labial dissimilation

Direction: Left-to-right

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-nasal]:[-nasal]), (0, 0, [-labial]:[-labial]), (0, 1, [+nasal, +labial]:[+nasal, labial]), (1, 0, /=um=/ infix:not /=um=/ infix), (1, 1, [-syllabic]:[-syllabic]), (1, 1, [+syllabic]:[+syllabic])

Note: only applies to infix /=um=/

Language: Thao

Pattern: Labial dissimilation

Direction: Right-to-left

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, not /=um=/:not /=um=/),
(0, 1, /=um=/:/=um=/),
(1, 1, [-labial][-labial]),
(1, 0, [+labial]:ε)

Note: only applies to infix /=um=/

Language: Tigre

Pattern: Guttural dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-guttural]:[-guttural]),
(0, 1, [+guttural]:[+guttural]),
(1, 1, [-guttural]:[-guttural]),
(1, 0, [+guttural]:[-guttural])

Language: Tigrinya

Pattern: Guttural dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 648)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-guttural]:[-guttural]),
(0, 1, [+guttural]:[+guttural]),
(1, 1, [-guttural]:[-guttural]),
(1, 0, [+guttural]:[-guttural])

Language: Tzeltal

Pattern: Constricted glottis dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 649)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-constricted glottis]:[-constricted glottis]),
(0, 1, [+constricted glottis]:[+constricted glottis]),
(1, 1, [-constricted glottis]:[-constricted glottis]),
(1, 0, [+constricted glottis]:[-constricted glottis])

Language: Tzeltal

Pattern: Vowel backness dissimilation

Direction: Left-to-right or Right-to-left

Sources: Suzuki (1998, pp. 156)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-back]:[-back]),
(0, 0, [-high]:[-high]),
(0, 1, [+back, +high]:[+back, +high]),
(1, 0, [-back]:[-back]),
(1, 0, [-high]:[-high]),
(1, 0, [+back, +high]:[-back, +high])

Note: takes place on a vowel tier

Language: Tzutujil

Pattern: Constricted Glottis dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 649)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-constricted glottis]:[-constricted glottis]),
(0, 1, [+constricted glottis]:[+constricted glottis]),
(1, 1, [-constricted glottis]:[-constricted glottis]),
(1, 0, [+constricted glottis]:[-constricted glottis])

Language: Warlpiri

Pattern: Rhotic dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 649)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-rhotic]:[-rhotic]),
(0, 1, [+rhotic]:[+rhotic]),
(1, 2, [+syllabic]:[+syllabic]),
(1, 1, [+rhotic]:[+rhotic]),
(1, 0, [-rhotic]:[-rhotic]),
(2, 0, [-rhotic]:[-rhotic]),
(2, 0, [+rhotic]:[-rhotic, +lateral])

Language: Xiamen

Pattern: Labial dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 649)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial], [+labial]),
(1, 2, [+syllabic]:[+syllabic]),
(1, 1, [+labial]:[+labial]),
(2, 0, [+labial]:[-labial]),
(2, 0, [-labial]:[-labial])

Language: Xiamen

Pattern: Nasal dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 649)

FST:

States: (0, ε), (1, ε), (2, ε)

Transitions: (0, 0, [-nasal, +consonantal]:[-nasal, +consonantal]),
(0, 1, [+nasal, +consonantal], [+nasal, +consonantal]),
(1, 2, [+nasal, +syllabic]:[+nasal, +syllabic]),
(1, 1, [+nasal, +consonantal]:[+nasal, +consonantal]),
(1, 0, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 0, [-nasal, +consonantal]:[-nasal, +consonantal]),
(2, 0, [+nasal, +consonantal]:[-nasal])

Language: Yao

Pattern: Labial dissimilation

Direction: Left-to-right or Right-to-left

Sources: Suzuki (1998, pp. 153)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 1, [-labial]:[-labial]),
(1, 0, [+labial]:[-labial])

Language: Yucatec Mayan

Pattern: Place dissimilation

Direction: Left-to-right or Right-to-left

Sources: Bennett (2013, pp. 649), Suzuki (1998, pp. 152), Yip (1989)

FSTs:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 0, [-labial]:[-labial]),
(1, 0, [+labial]:[-labial])

States: (0, ε), (1, ε)

Transitions: (0, 0, [-coronal]:[-coronal]),
(0, 1, [+coronal]:[+coronal]),
(1, 0, [-coronal]:[-coronal]),
(1, 0, [+coronal]:[-coronal])

States: (0, ε), (1, ε)

Transitions: (0, 0, [-dorsal]:[-dorsal]),
(0, 1, [+dorsal]:[+dorsal]),
(1, 0, [-dorsal]:[-dorsal]),
(1, 0, [+dorsal]:[-dorsal])

Note: This is a 'place' dissimilation, which can be thought of as a combination of several FSTs restricting combinations for each place

Language: Zulu

Pattern: Labial dissimilation

Direction: Left-to-right or Right-to-left

Sources: Suzuki (1998, pp. 153)

FST:

States: (0, ε), (1, ε)

Transitions: (0, 0, [-labial]:[-labial]),
(0, 1, [+labial]:[+labial]),
(1, 1, [-labial]:[-labial]),
(1, 0, [+labial]:[-labial])

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Notes

[1]Note that these approaches are not incompatible, and it is possible to incorporate autosegmental representations in OT as well (Yip, 2002).

[2]Tashlhiyt Berber dissimilation has many analyses, especially given that many of the changes are diachronic co-occurrence restrictions. The description presented here is just one possible option, and others are listed in the appendix.

[3]These 'local-conjunction' constraints are essentially Strictly Piecewise constraints with k=2 (Rogers et al., 2010); they forbid 2 labials from appearing in the same domain.

[4]In fact, since the subsequential hypothesis asserts that all segmental phonological patterns are subsequential, it is still support for the hypothesis that these patterns are subsequential, even if they are not necessarily dissimilation patterns.

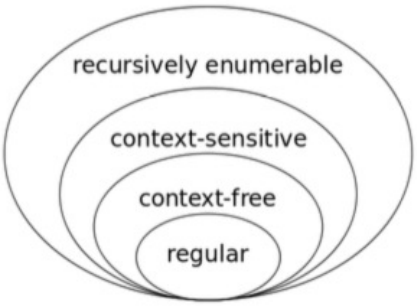

Figure 1. The Chomsky Hierarchy.

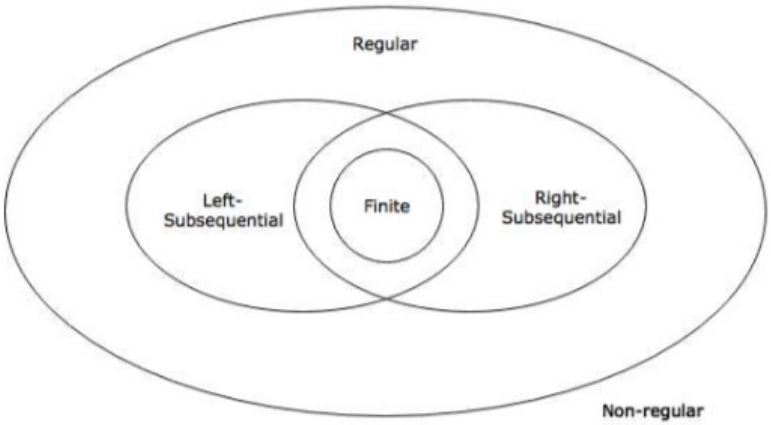

Figure 2. A hierarchy for string-to-string functions.

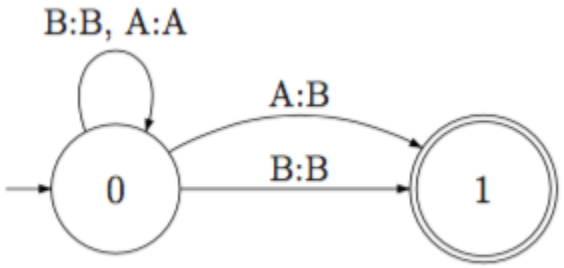

FIGURE 3. Non-subsequential FST.

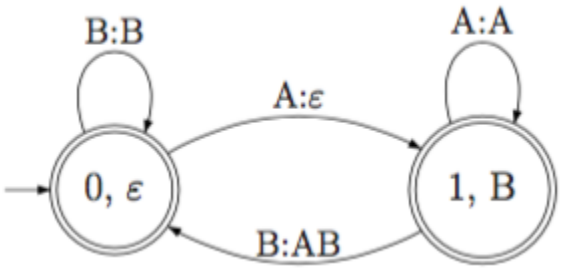

FIGURE 4. Left-to-right subsequential FST.

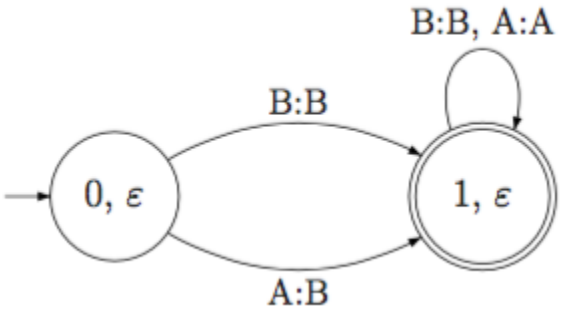

FIGURE 5. Right-to-left subsequential FST.

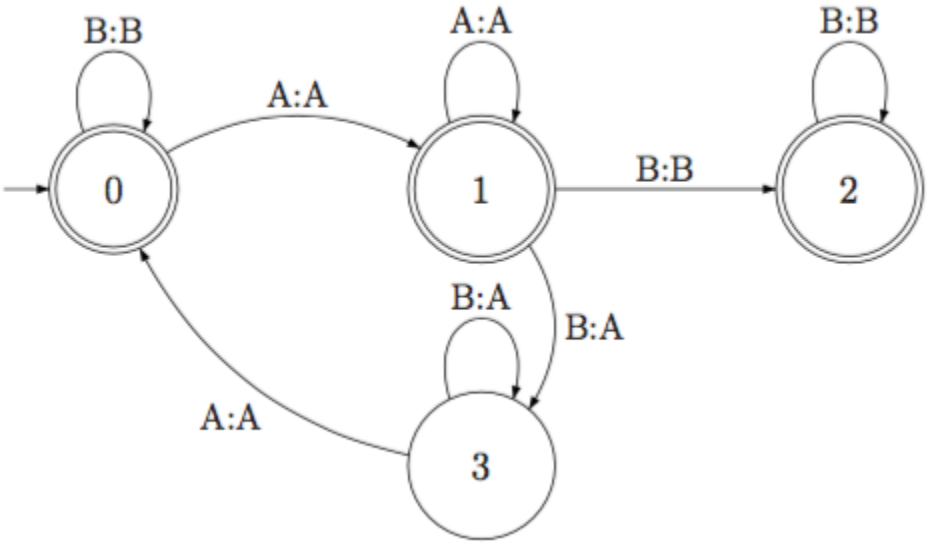

FIGURE 6. Unbounded circumambient assimilation.

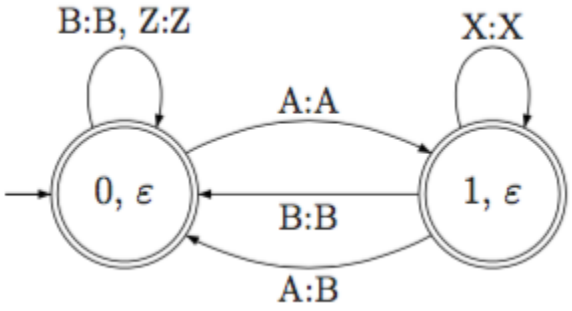

FIGURE 7. Basic dissimilation.

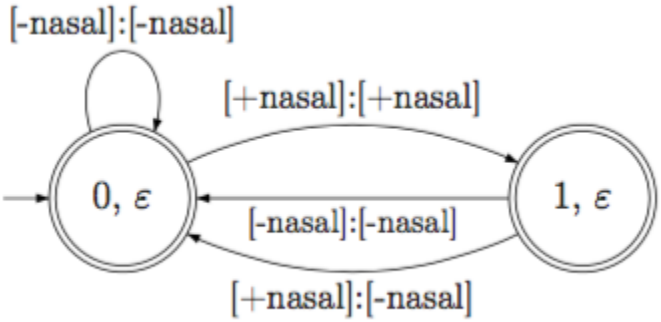

FIGURE 8. Chukchi basic regressive dissimilation.

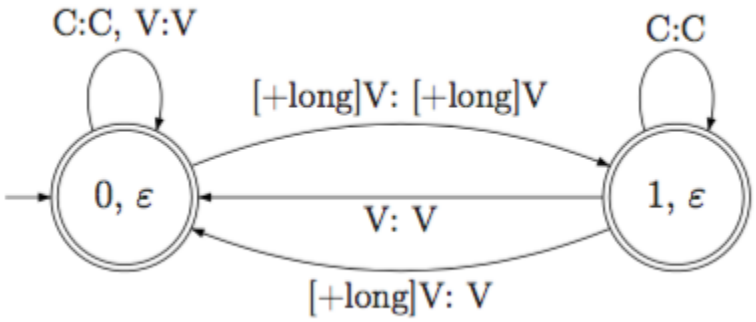

FIGURE 9. Vowel length dissimilation (complex segments).

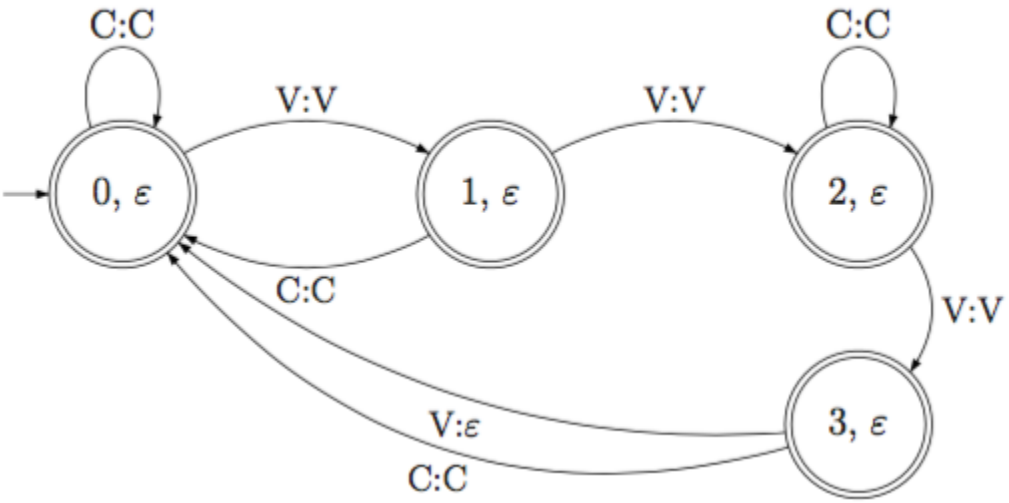

FIGURE 10. Vowel length dissimilation (individual segments).

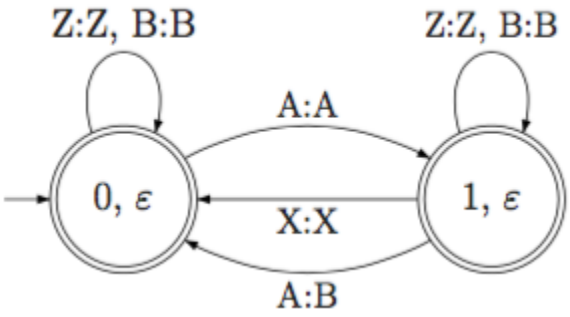

FIGURE 11. Blocking dissimilation.

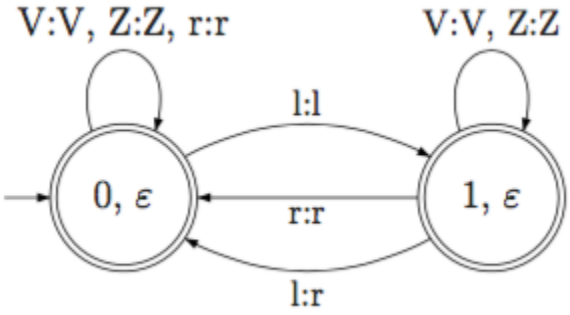

FIGURE 12. Latin blocking dissimilation (simplified).

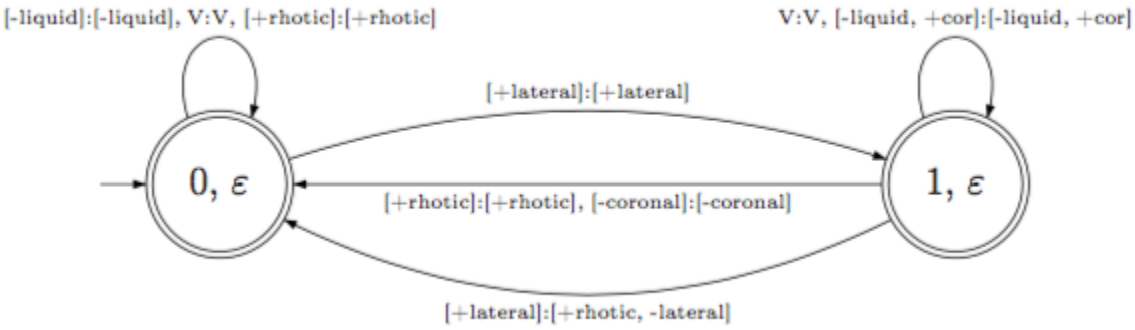

FIGURE 13. Latin blocking dissimilation (complete).

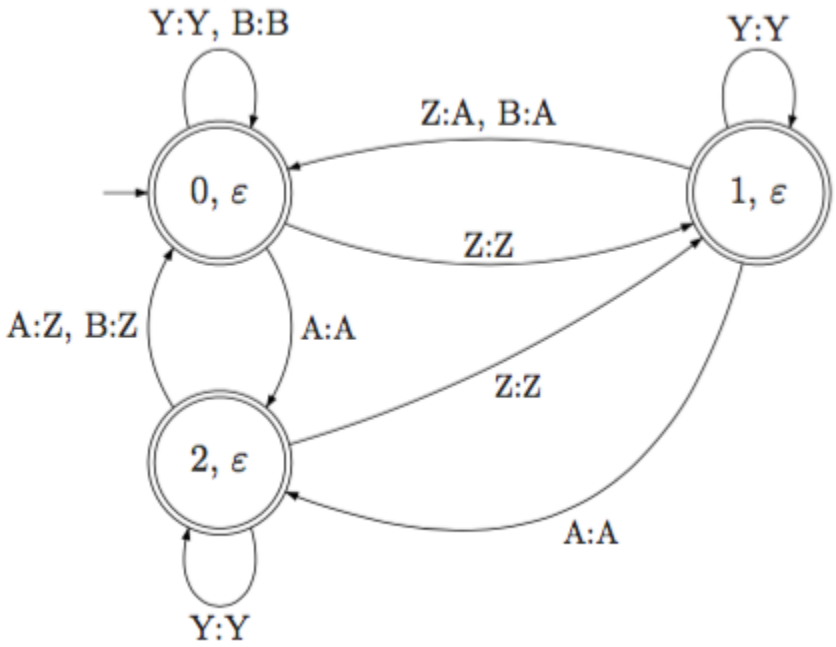

FIGURE 14. Polarity dissimilation.

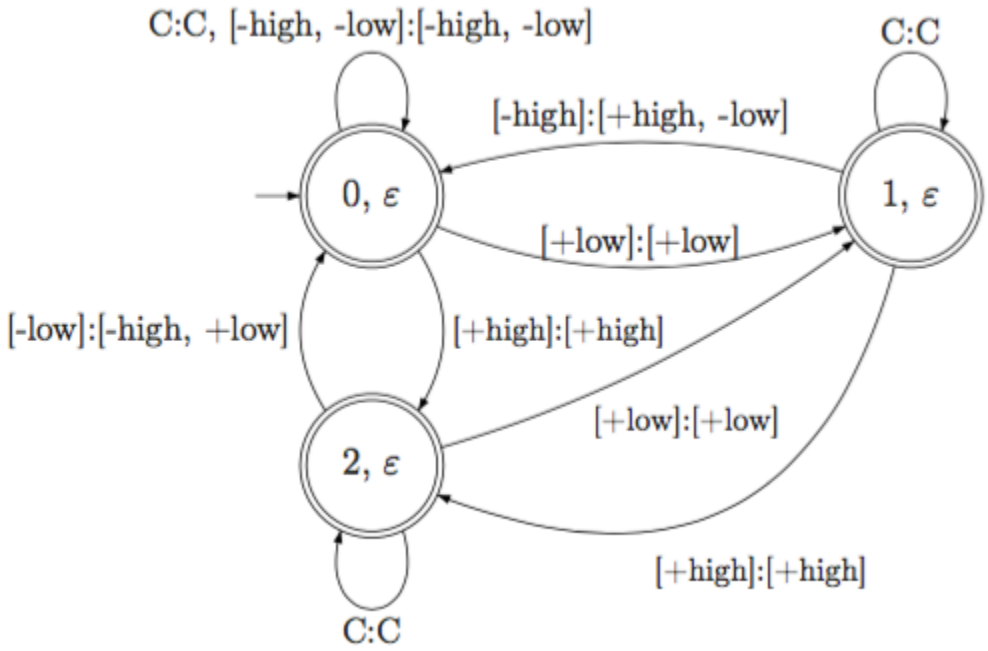

FIGURE 15. Russian polarity dissimilation.