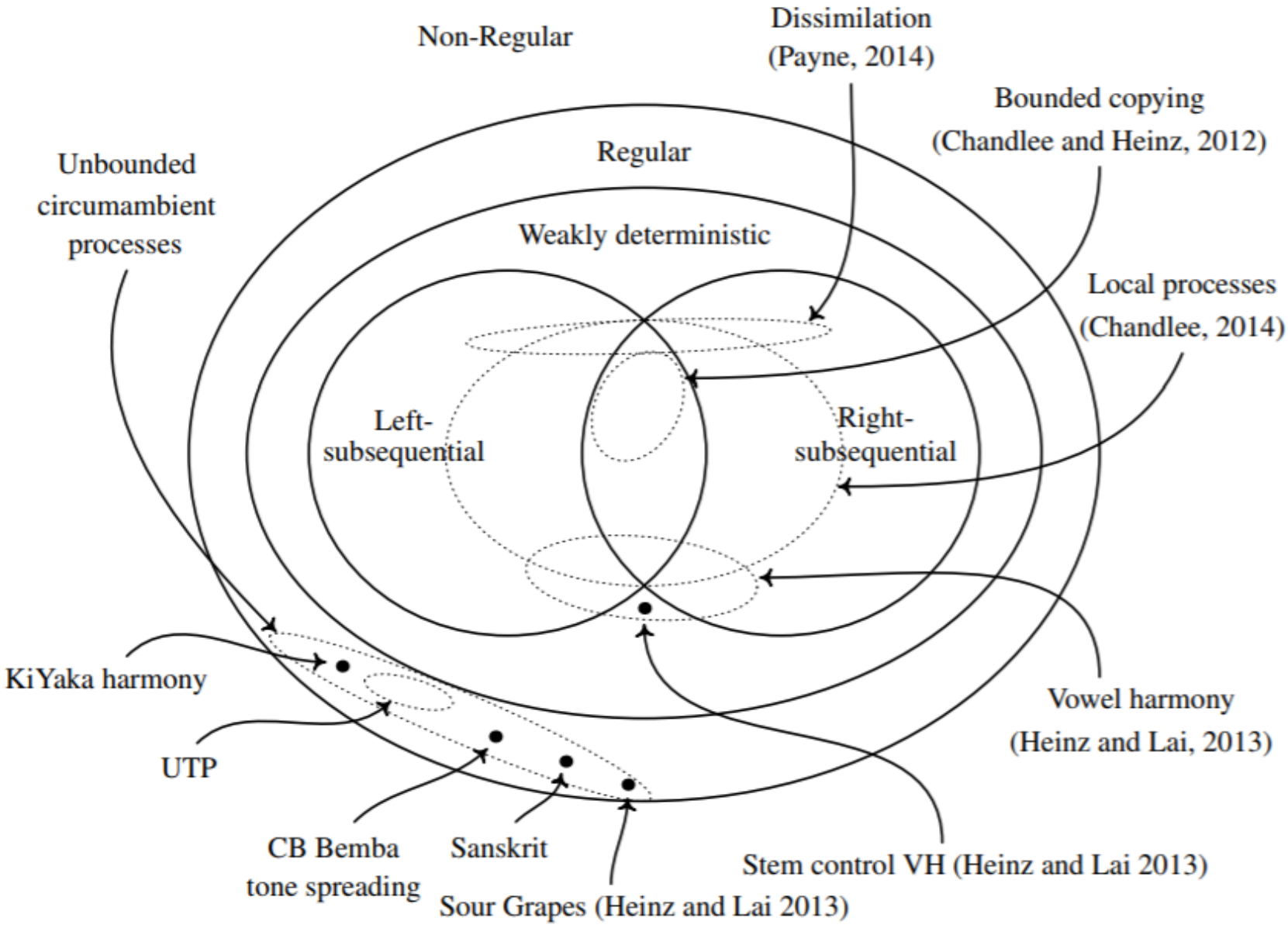
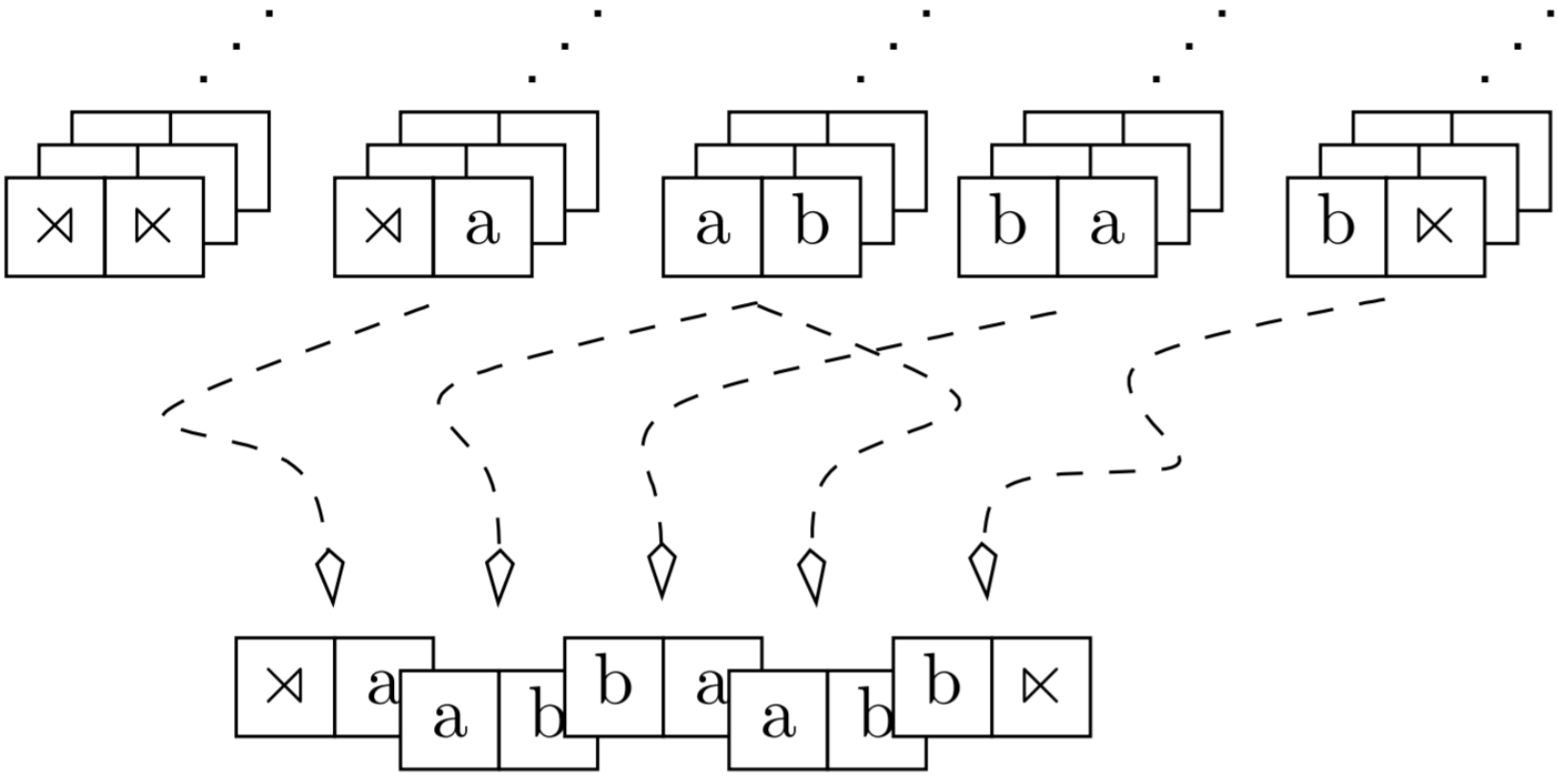
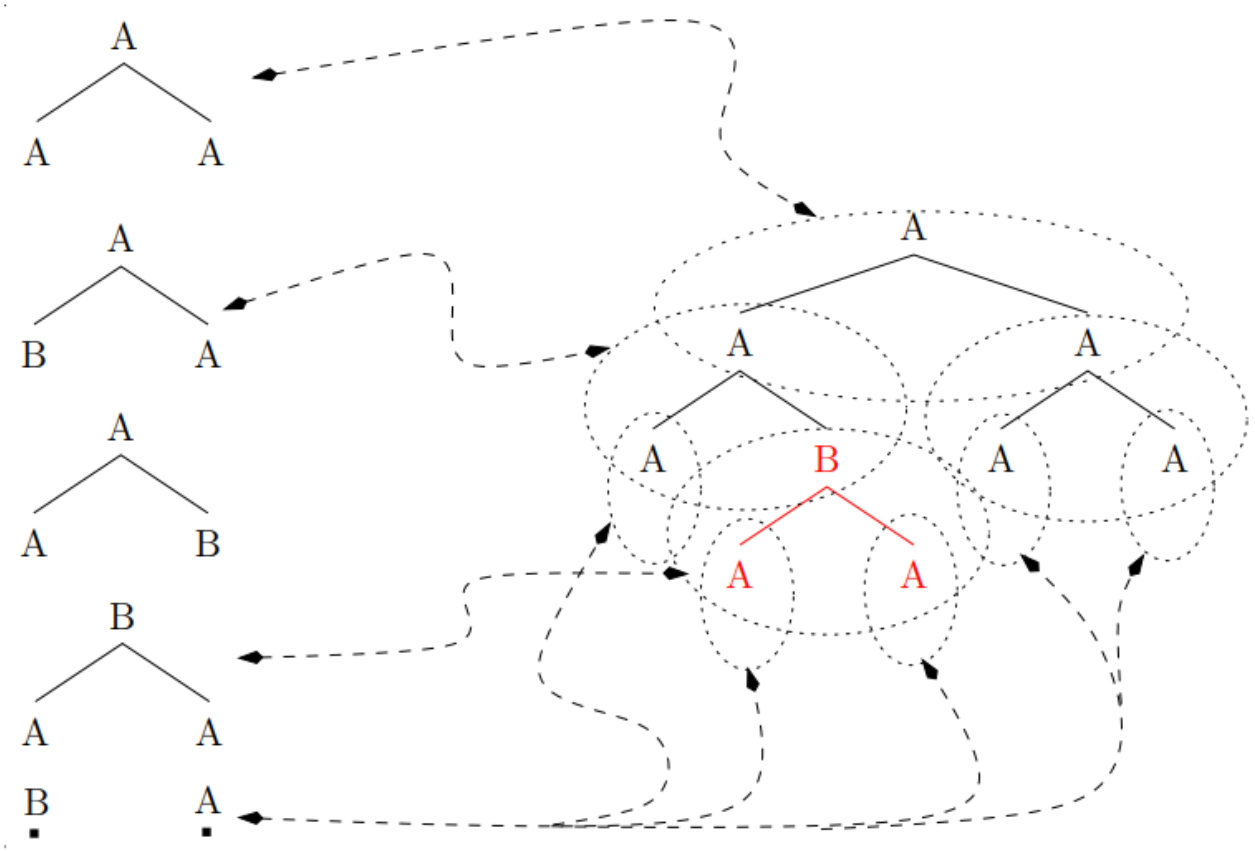


Jardine 2016

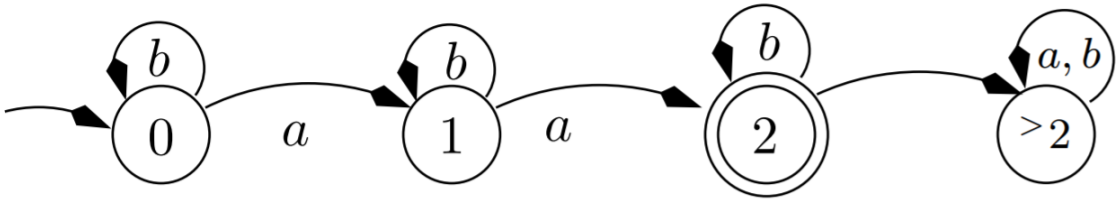


p.c. Heinz and Rogers 2014 esslli course

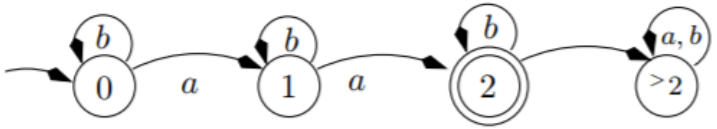
Local Tree Grammars



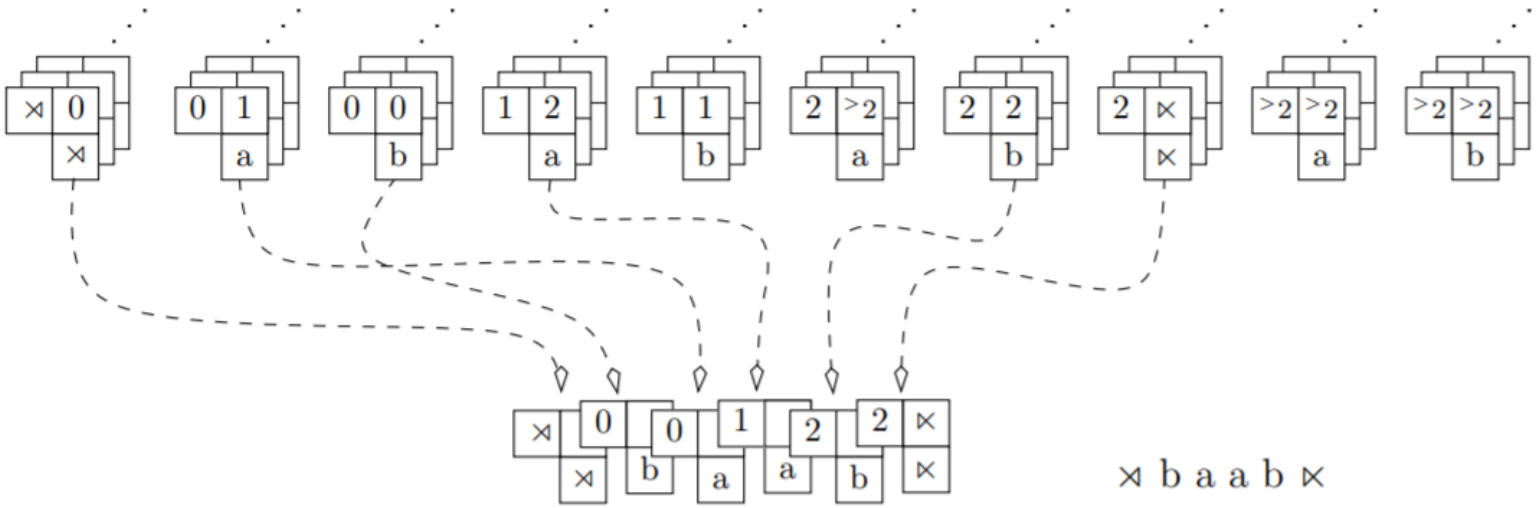
Intuition: Local Tree grammars are closed under subtree substitution. p.c. Heinz and Rogers 2014 esslli course

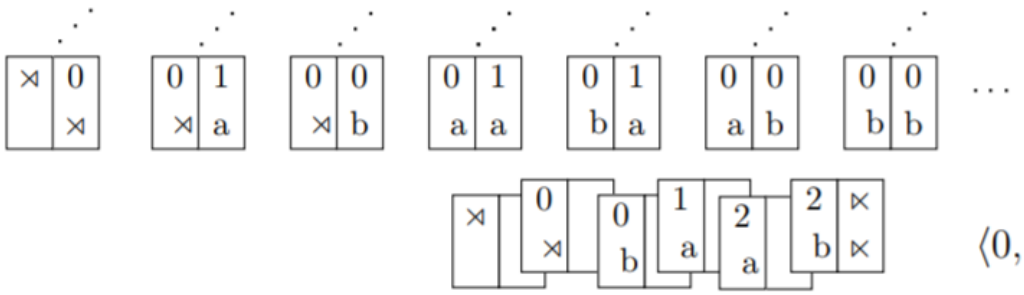


$\langle 0, 1, a\rangle, \langle 0, 0, b\rangle, \langle 1, 2, a\rangle, \langle 1, 1, b\rangle, \langle 2, {}^{>}2, a\rangle, \langle 2, 2, b\rangle, \langle {}^{>}2, {}^{>}2, a\rangle, \langle {}^{>}2, {}^{>}2, b\rangle$



$\langle 0,1,a\rangle, \langle 0,0,b\rangle, \langle 1,2,a\rangle, \langle 1,1,b\rangle, \langle 2,{}^{>}2,a\rangle, \langle 2,2,b\rangle, \langle {}^{>}2,{}^{>}2,a\rangle, \langle {}^{>}2,{}^{>}2,b\rangle$





$\langle 0, \rtimes\rangle\langle 0, b\rangle\langle 1, a\rangle\langle 2, a\rangle\langle 2, b\rangle\langle \ltimes, \ltimes\rangle$

p.c. Heinz and Rogers 2014 esslli course

Stringset Projections

- A Projection is an alphabetic homomorphism that maps one alphabet into another: $h : \Gamma \to \Sigma$.
- The image of a string under a projection is the result of applying that mapping to each symbol in the string in turn.
- The projection is functional, so it can't gain information. The number of distinct symbols in the image of a string can't exceed the number of distinct symbols in the string itself.
- Projections may be many to one, i.e. they can lose information. Intuitively, they strip away some of the distinctions that are made by the first alphabet.

Theorem (Medvedev) *A set of strings is Regular iff it is a projection of a Strictly 2-Local set.*

Theorem (Thatcher) *A set of Σ-labeled trees is recognizable by a finite-state tree automaton (i.e. regular) iff it is a projection of a local set of trees.*

Theorem (Thatcher) *A set of strings L is the yield of a local set of trees (equivalently, is the yield of a recognizable set of trees) iff it is Context-Free.*

Phonology: long-distance harmony

Samala sibilant harmony

Sibilants must agree in anteriority. (Applegate 1972)

1. haʃxintilawaʃ
2. *hasxintilawaʃ
3. *haʃxintilawas

'his former Indian name'

4. sishuleqpeyus
5. *siʃhuleqpeyus
6. *sishuleqpeyuʃ

'they two want to follow it'

- The distance between two sibilants can be unbounded.
- Why is this not SL?

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Tier-based strictly local (TSL)

TSL intuition: TSL grammar can ignore certain symbols in the string, therefore making other symbols adjacent. (Heinz et. al. 2011)

- T lists symbols that are not ignored by the grammar *(tier alphabet)*;
- G lists prohibited n-grams;
- n defines the *locality window* of the grammar.

Language: *xx*, *axxaxx*, *xaa*, *xoox*, *oxo*, *oooxo*, . . . **axxox*, **oxoo*, . . .

Grammar: $T = \{\text{o}, \text{a}\}$ $G = \langle \text{ao}, \text{oa} \rangle$ $n = 2$

^{ok}xaaxa→ ⋊xaaxa⋉ *xaaxxoxx→ ⋊xaaxxoxx⋉

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- All segments apart from s and ʃ are irrelevant for the pattern;
- ʃ cannot follow s;
- s cannot follow ʃ.
- Grammar: $T = \{\text{s}, \text{ʃ}\}$ $G = \langle *\text{sʃ}, *\text{ʃs}\rangle$ $n = 2$

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Phonology: long-distance harmony [cont.]

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Phonology: several harmonies

Bukusu applicative suffix

Construction: `V + el/er/il/ir` (Hyman 1995)

1. tleex-el ‘use smth to cook’
2. reeb-er ‘use smth to ask’
3. lim-il ‘use smth to cultivate’
4. ir-ir ‘use smth to die’

- Generalized pattern: $(\texttt{l},\texttt{e})^{+} \cup (\texttt{l},\texttt{i})^{+} \cup (\texttt{r},\texttt{e})^{+} \cup (\texttt{r},\texttt{i})^{+}$
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MTSL intuition: MTSL grammar represents several TSL grammars evaluating the same string simultaneously.

- $T_1 \dots T_m$ lists all tier alphabets;
- $G_1 \dots G_m$ lists grammar G_i for every T_i;
- n defines the *locality window* of the grammars.

Language: *aabbaab*, *ooboo*, *apppa*, *opopo*, ... **abbop*, **opobb*, ...

Grammar: $T_v = \{\text{o, a}\}$ $G_v = \langle \text{ao, oa} \rangle$ $n = 2$

$T_c = \{\text{b, p}\}$ $G_c = \langle \text{bp, pb} \rangle$

^{ok}obboob $\begin{cases} ^{ok}\rtimes\text{obboob}\ltimes \\ ^{ok}\rtimes\text{obboob}\ltimes \end{cases}$

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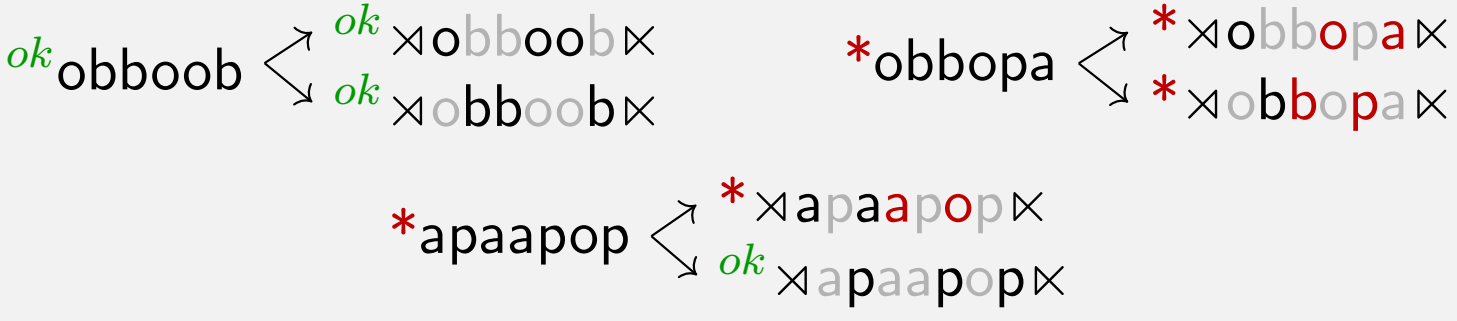

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$$\texttt{(l,e)}^{+} \cup \texttt{(l,i)}^{+} \cup \texttt{(r,e)}^{+} \cup \texttt{(r,i)}^{+}$$

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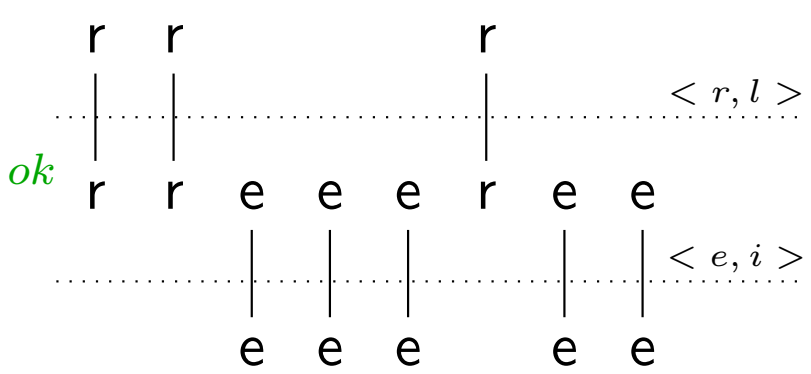

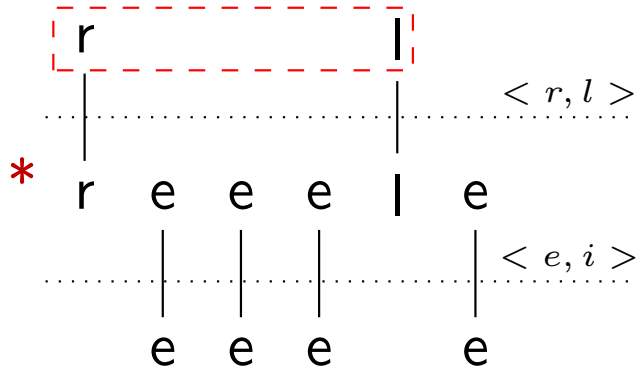

Samala (Revisited)

Sibilant Harmony in Samala (?)

1) Unbounded sibilant harmony

a.	/k-su-ʃojin/	kʃuʃojin	"I darken it"
b.	/k-su-k'ili-mekeken-ʃ/	kʃuk'ilimekeketʃ	"I straighten up"

2) /s/→ [ʃ] when preceding (adjacent) [t, n, l]

a.	/s-lok'in/	ʃlok'in	"he cuts it"
b.	/s-tepu?/	ʃtepu?	"he gambles"

3) Long-distance agreement overrides local disagreement

a.	/s-iʃt-iʃti-jep-us/	sististijepus	"they show him"
b.	/s-net-us/	snetus	"he does it to him"

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- anticipatory sibilant harmony
- palatalization to avoid local restrictions
- sibilant harmony overrides palatalization

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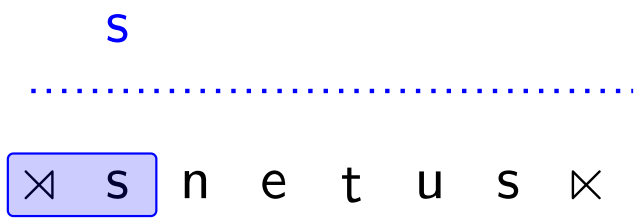

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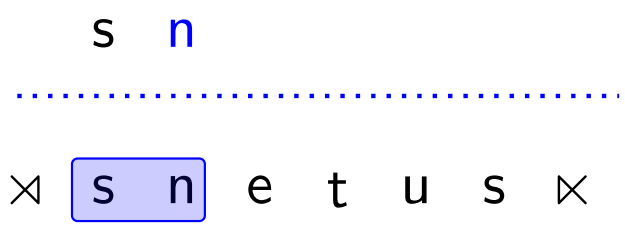

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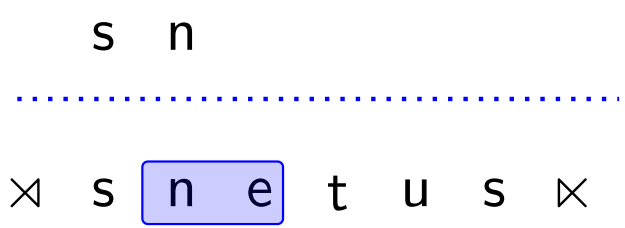

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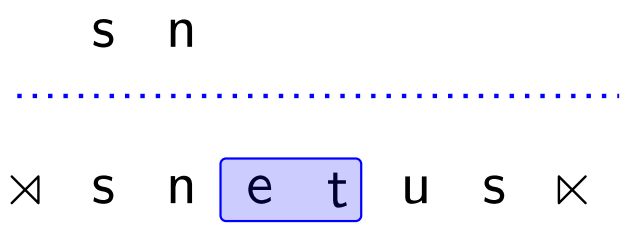

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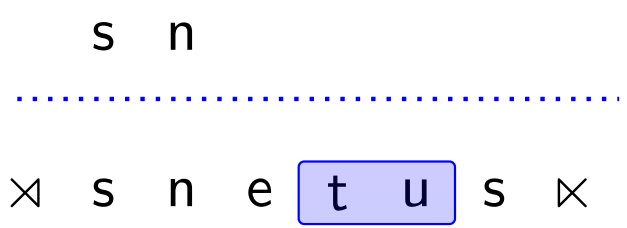

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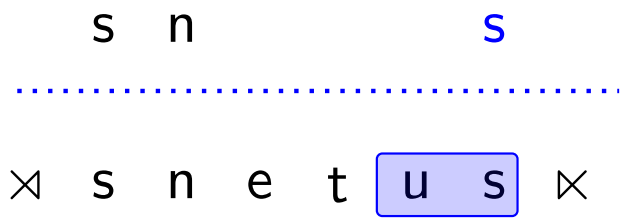

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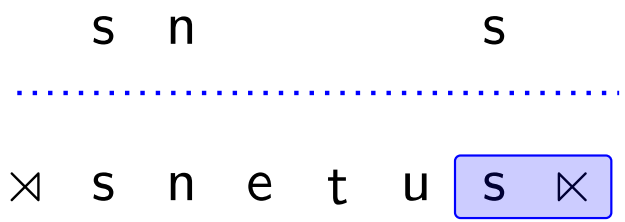

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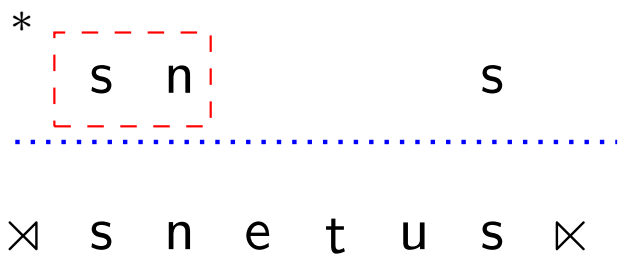

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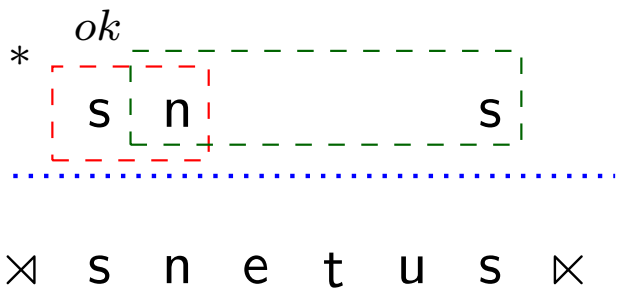

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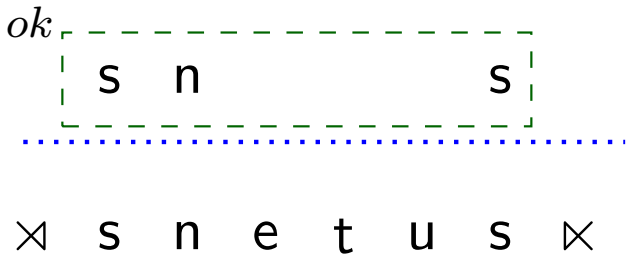

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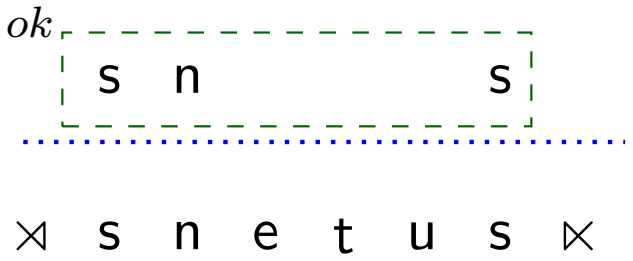
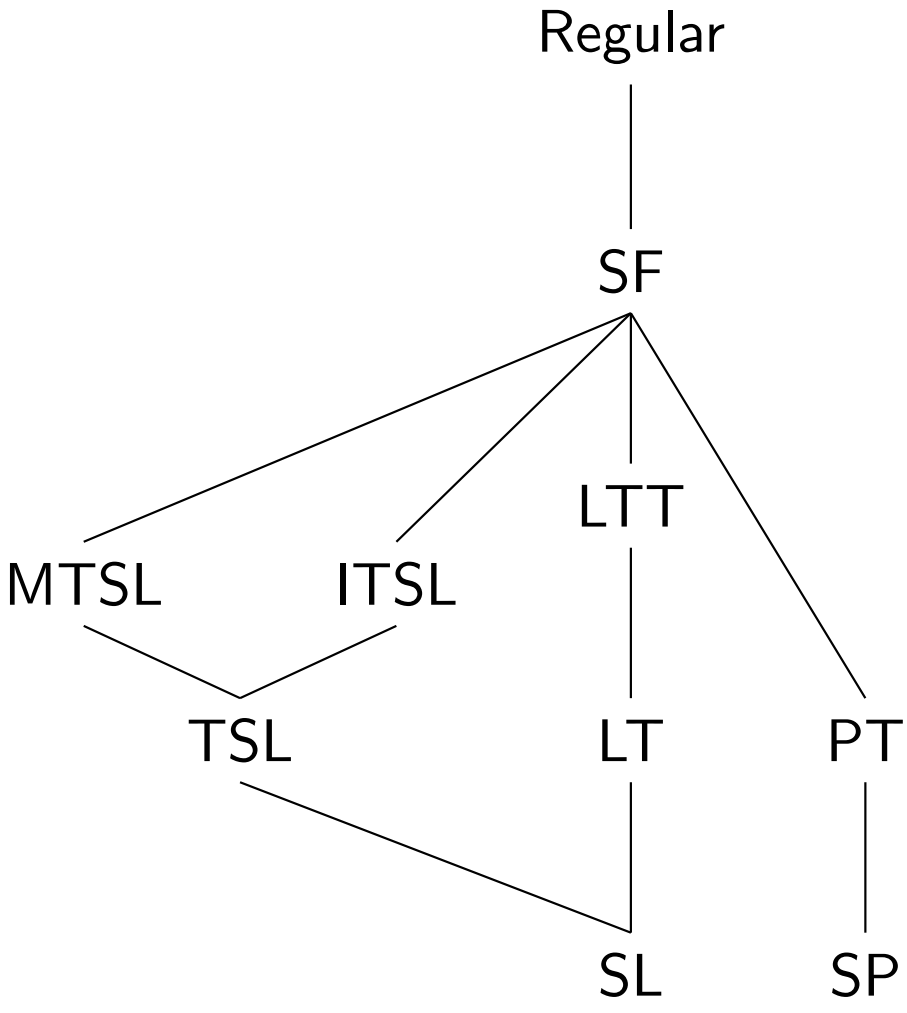


Grammar

$\mathsf{T} = \{\ \sigma : \sigma \in \{\mathsf{s}, \mathsf{ʃ}\} \vee (\sigma \in \{\ \mathsf{n}, \mathsf{t}, \mathsf{l}\ \} \wedge \mathsf{s} \prec^{+} \sigma)\}$

$\mathsf{S} = \{^{*}\mathsf{sʃ}, {}^{*}\mathsf{sʃ}, {}^{*}\mathsf{sn}(\neg\mathsf{s}), {}^{*}\mathsf{st}(\neg\mathsf{s}), {}^{*}\mathsf{sl}(\neg\mathsf{s})\}$

Relations to Other Classes (De Santo & Graf 2019)



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