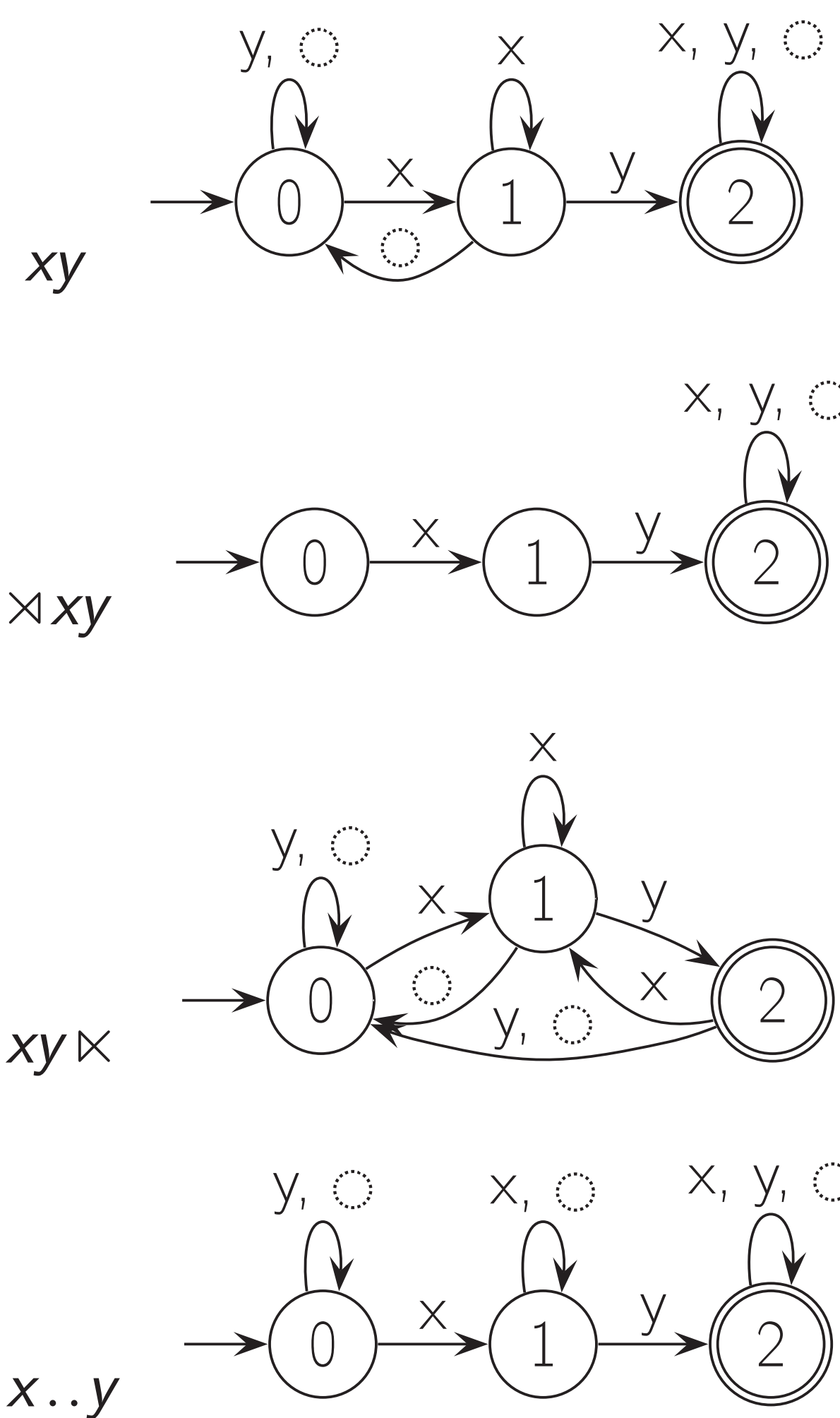


A logical and computational methodology for exploring systems of phonotactic constraints

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Logic and automata



Any of these can be treated as pieces p_i , where the Piecewise-Local factor $p_1..p_2.. \dots ..p_n$ is realized by concatenation: $p_1 \bullet p_2 \bullet \dots \bullet p_n$.

Constraints

Alphabet:

Three weights:
L (light), H (plain heavy), S (superheavy).
Both H and S are heavy.
Two levels of stress:
○ (unstressed), '○ (primary stress).

Assumed universals:

Exactly one primary stress occurs:
Obligatoriness (at least one).
Culminativity (at most one).
No words are without content.

Cheremis Meadow

"In words of all sizes, primary stress falls on the final syllable if it is superheavy, else on the right-most non-final heavy syllable, else on the final syllable if it is heavy, else on the final syllable. In words of all sizes, there is no secondary stress." [GHvdH15]

Categorizing constraints

	Local	PL	Piecewise
Obligatory stress	$\acute{\sigma}$	coSL ₁	coSPL _{1,1} coSP ₁
Culminative stress	$\neg\acute{\sigma}.. \acute{\sigma}$	LTT _{1,2}	SPL _{2,1} SP ₁
No primary stress precedes superheavy	$\neg\acute{\sigma}..S$	SF	SPL _{2,1} SP ₂
No primary stress precedes a nonfinal heavy	$\neg\acute{\sigma}..H.. \acute{\sigma}$	SF	SPL _{3,1} SP ₃
Light can only have primary stress if final	$\neg\acute{L} \acute{\sigma}$	SL ₂	SPL _{2,1} SP ₂
Primary light cannot occur with heavy	$\neg(\acute{L} \wedge \acute{H})$	LT ₁	SPL _{2,1} SP ₂
Primary light cannot occur with heavy	$\neg(\acute{L} \wedge \acute{S})$	LT ₁	SPL _{2,1} SP ₂
Final plain heavy: unstressed if preceded by heavy	$\neg H.. \acute{H} \times$	LT ₂	SPL _{2,2} SF
Final plain heavy: unstressed if preceded by heavy	$\neg S.. \acute{H} \times$	LT ₂	SPL _{2,2} SF

Adjacency: SF Precedence: SF Both: LT₂ + SP₃ Combined: SPL_{3,2} + coSPL_{1,1}

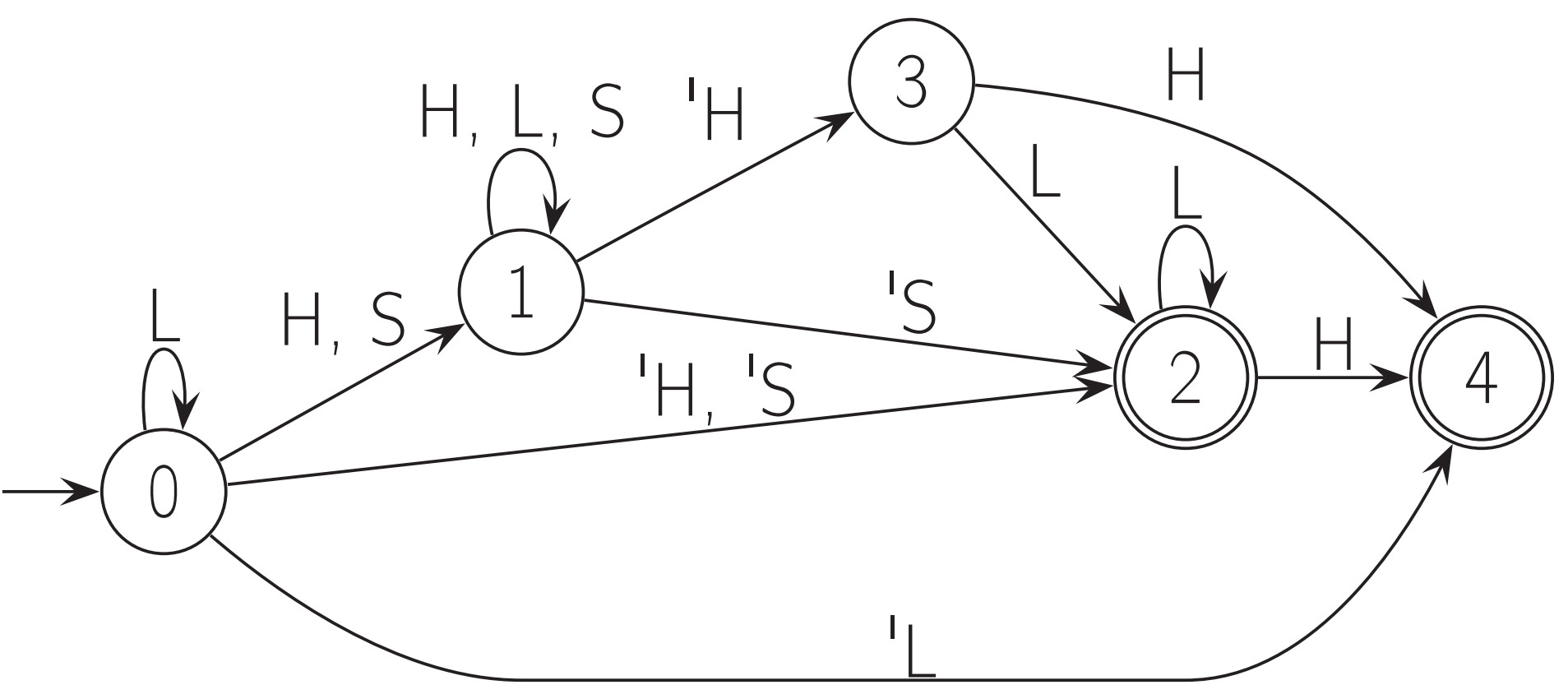
The Local Language Toolkit

plebby Piecewise-Local Expression Builder
interpreter

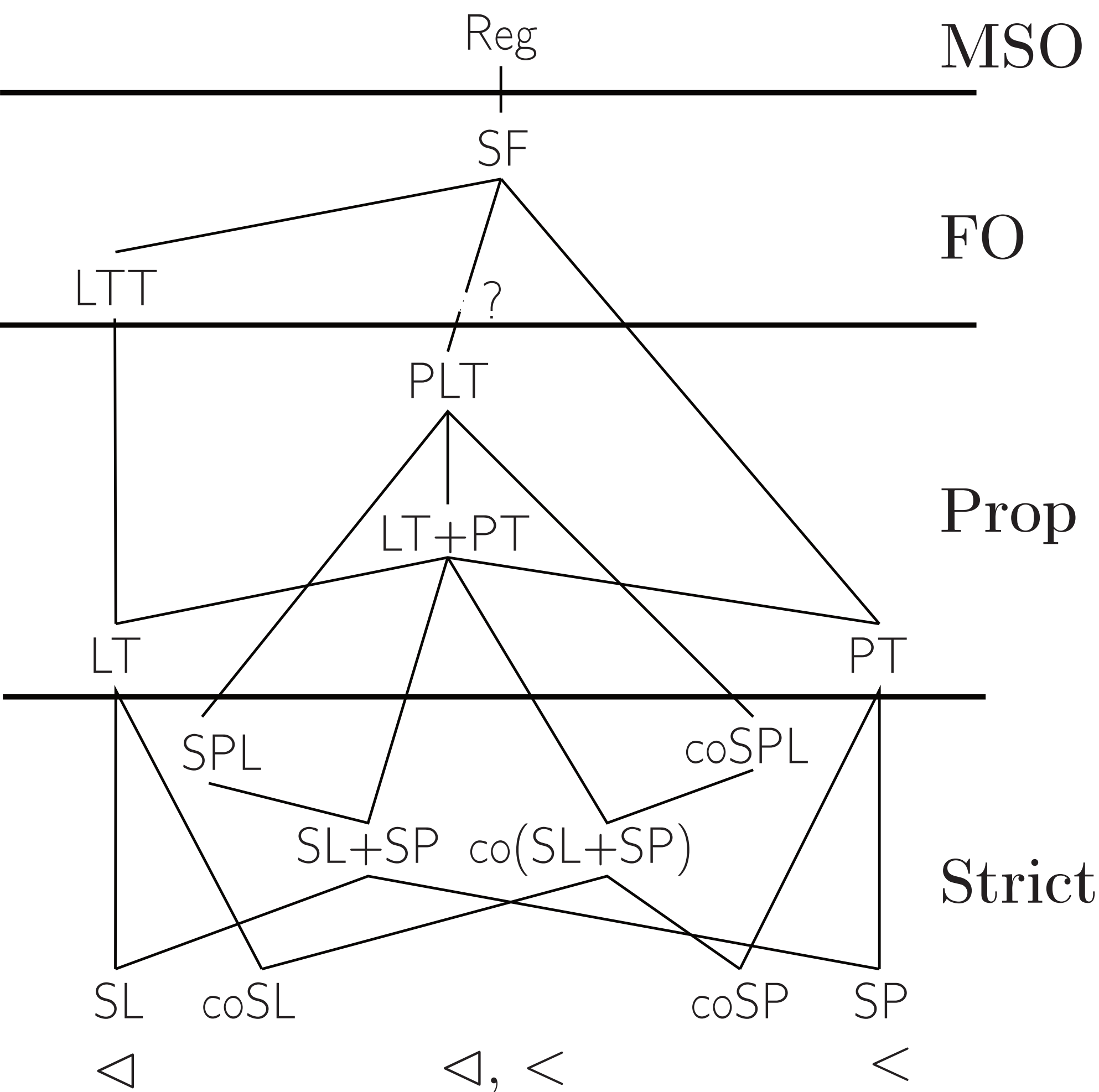
factorize Automatically extract certain classes of constraints from automata

Interacting with plebby

$= \sigma \{ /L, /H, /S \}$
 $= ' \sigma \{ /'L, /'H, /'S \}$
 $= * \sigma \{ \sigma, ' \sigma \}$
 $= * \text{heavy} \{ /H, /S, /'H, /'S \}$
 $= \text{obligatoriness} \langle ' \sigma \rangle$
 $= \text{culminativity} \neg \langle ' \sigma, ' \sigma \rangle$
 $= d1 \neg \langle ' \sigma, /S \rangle$
 $= d2 \neg \langle ' \sigma, /H, * \sigma \rangle$
 $= d3 \neg \langle /'L, * \sigma \rangle$
 $= d4 \cap \{ \neg \langle /'L, * \text{heavy} \rangle, \neg \langle * \text{heavy}, /'L \rangle \}$
 $= d5 \neg \times \langle * \text{heavy}, /'H \rangle$
 $\cap \{ \text{obligatoriness}, \text{culminativity}, d1, d2, d3, d4, d5 \}$
:display it



A local hierarchy



References

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- Jeffrey Heinz, *The inductive learning of phonotactic patterns*, Ph.D. thesis, University of California, Los Angeles, 2007.
- James Rogers, Jeff Heinz, Margaret Fero, Jeremy Hurst, Dakotah Lambert, and Sean Wibel, *Cognitive and sub-regular complexity*, Formal Grammar 2012 (Glyn Morrill and Mark-Jan Nederhof, eds.), Lecture Notes in Computer Science, vol. 8036, Springer, 2012, pp. 90–108.

See full paper for full list.

