Comparing positional licensing patterns in HG and OT

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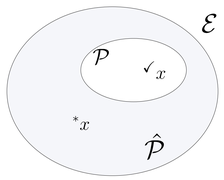
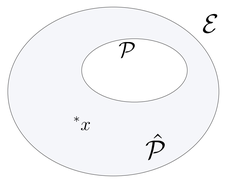
POSITIONAL LICENSING

Phonological elements are often observed to be limited to specific positions. These elements are said to be *licensed* in those positions.

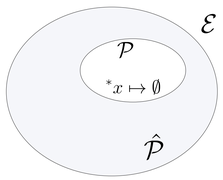


Positional licensing:
$\mathcal{E}$ = all positions
$\mathcal{P}$ = licensing position(s)
$\hat{\mathcal{P}}$ = non-licensing position(s)
x = $\mathcal{P}$-licensed element(s)

Positional markedness and faithfulness [4; 9] in HG [3] and OT [6]

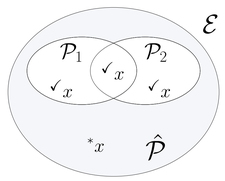


Positional markedness:
$^*x \mid x \in \hat{\mathcal{P}} \quad (x \notin \mathcal{P})$

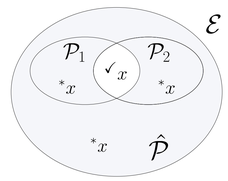


Positional faithfulness:
$^*x \mapsto \emptyset \mid x \mapsto \emptyset \in \mathcal{P}$

Disjunctive licensing and conjunctive licensing [2]



Disjunctive licensing:
$^*x \mid x \in \hat{\mathcal{P}} \quad (x \notin \mathcal{P}_1 \cup \mathcal{P}_2)$



Conjunctive licensing:
$^*x \mid x \notin \mathcal{P}_1 \cap \mathcal{P}_2$

System predictions, according to [2]

system = set of candidate sets evaluated by a set of constraints [1]

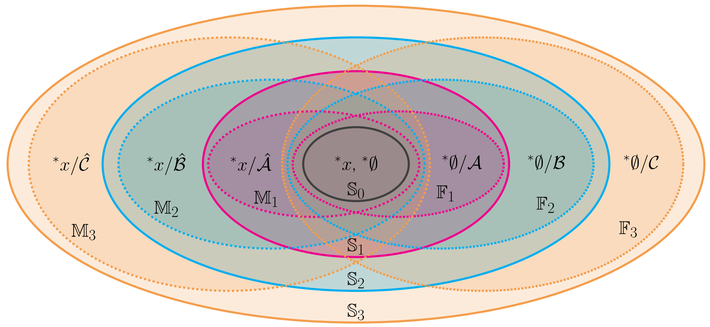
system	licensing with OT ranking	licensing with HG weighting
positional markedness	conjunctive $\mathbb{M}^{OT}$	conjunctive $\bigcup$ disjunctive $\mathbb{M}^{HG}$
positional faithfulness	disjunctive $\mathbb{F}^{OT}$	conjunctive $\bigcup$ disjunctive $\mathbb{F}^{HG}$
positional markedness $\bigcup$ positional faithfulness	conjunctive $\bigcup$ disjunctive $\mathbb{S}^{OT}$	conjunctive $\bigcup$ disjunctive $\mathbb{S}^{HG}$

KEY QUESTIONS

- (How) do the predictions of each of the $\mathbb{M}^{HG}$ and $\mathbb{F}^{HG}$ systems add up precisely to the predictions of the unioned $\mathbb{S}^{HG}$ system?
- (How) do the predictions of the unioned $\mathbb{S}^{OT}$ system add up precisely to those of the $\mathbb{M}^{HG}$, $\mathbb{F}^{HG}$, and $\mathbb{S}^{HG}$ systems?
- (How) do these predictions scale up to systems with larger sets of licensing positions than considered by [2] (n = 3)?

SYSTEMS

We analyzed 10 systems, differing along two dimensions:
– the number (0–3) of licensing positions referenced by constraints;
– whether those are markedness ($\mathbb{M}$), faithfulness ($\mathbb{F}$), or both ($\mathbb{S}$).



The 3 positions $\mathcal{A}, \mathcal{B}, \mathcal{C}$ are *fully intersectable* (e.g., $\mathcal{A}$ = 'initial σ', $\mathcal{B}$ = 'σ onset', $\mathcal{C}$ = 'stressed σ'; $\mathcal{A} \cap \mathcal{B} \cap \mathcal{C}$ = 'initial stressed σ onset').

PATTERNS

Factorial typologies under OT and HG were computed and analyzed.
(HG simulated with the equalizer algorithm [5] for deeper analysis w/ OTWorkplace [7]; confirmed w/ OT-Help [8].)

– **Result:** 10 systems, 9 sets of patterns, summarized here.

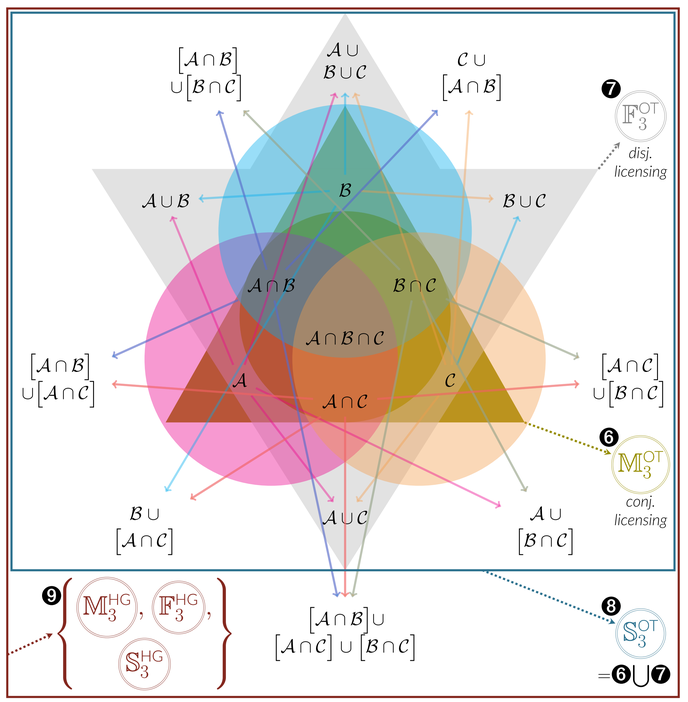
❶ $\{\mathbb{S}_0^{OT}, \mathbb{S}_0^{HG}\} = x \in \mathcal{E}$

❷ $\left\{\begin{matrix}\mathbb{M}/\mathbb{F}/\mathbb{S}_1^{OT} \\ \mathbb{M}/\mathbb{F}/\mathbb{S}_1^{HG}\end{matrix}\right\} = \left\{\begin{matrix}❶ + \\ x \in \mathcal{A}\end{matrix}\right\}$

❸ $\mathbb{M}_2^{OT} = \left\{\begin{matrix}❷ + \\ x \in \mathcal{B} \\ x \in \mathcal{A} \cap \mathcal{B}\end{matrix}\right\}$ — *conjunctive licensing*

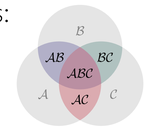
❹ $\mathbb{F}_2^{OT} = \left\{\begin{matrix}❷ + \\ x \in \mathcal{B} \\ x \in \mathcal{A} \cup \mathcal{B}\end{matrix}\right\}$ — *disjunctive licensing*

❺ $\left\{\begin{matrix}\mathbb{S}_2^{OT} \\ \mathbb{M}/\mathbb{F}/\mathbb{S}_2^{HG}\end{matrix}\right\} = ❸ \cup ❹$

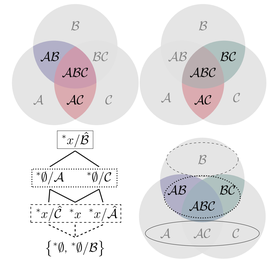


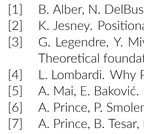
ANALYSIS

OT positional licensing predictions with three positions:
– $\mathbb{F}_3^{OT} \Rightarrow$ disjunctive (= *unions*)
– $\mathbb{M}_3^{OT} \Rightarrow$ conjunctive (= *intersections*)
– $\mathbb{S}_3^{OT} \Rightarrow$ unions, intersections, unions-of-intersections
— *except:* $[\mathcal{A} \cap \mathcal{B}] \cup [\mathcal{A} \cap \mathcal{C}] \cup [\mathcal{B} \cap \mathcal{C}] \notin \mathbb{S}_3^{OT}$



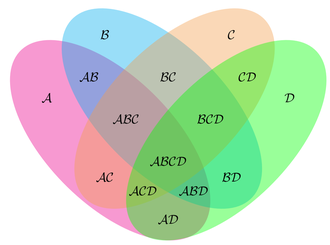
Consider the simpler cases with just two unioned intersections (right). There is one *anchor position* common to both intersections. Assume anchor = $\mathcal{B}$. In $\mathbb{S}_3^{OT}$, $^*x/\hat{\mathcal{B}}$ first excludes the complement of the anchor, faithfulness then protects the intersections $[\mathcal{A} \cap \mathcal{B}]$ and $[\mathcal{B} \cap \mathcal{C}]$, and markedness then excludes the remainder of the anchor $\mathcal{B}$.





In the challenging case with three unioned intersections (left), there is no single anchor, and thus no way to exclude all of the necessary complements & remainders without constraint ganging as provided by $\mathbb{M}_3^{HG}/\mathbb{F}_3^{HG}/\mathbb{S}_3^{HG}$.

This is confirmed in four-position systems (right). An anchor is shared in each of the union-of-intersection patterns that $\mathbb{S}_4^{OT}$ predicts (46/96); no anchor is shared in any of the additional union-of-intersection patterns that $\mathbb{M}_4^{HG}/\mathbb{F}_4^{HG}/\mathbb{S}_4^{HG}$ predicts (72/168).



CONCLUSIONS

- (How) do $\mathbb{M}^{HG} = \mathbb{F}^{HG} = \mathbb{S}^{HG}$?
  - They do, due to the power of constraint gangs in HG.
    – In $\mathbb{M}^{HG}$, $\mathbb{M}$-gangs exclude remainders without prior filtering by $\mathbb{F}$.
    – In $\mathbb{F}^{HG}$, $\mathbb{F}$-gangs include intersections without prior filtering by $\mathbb{M}$.
- (How) does $\mathbb{S}^{OT} = \{\, \mathbb{M}^{HG} = \mathbb{F}^{HG} = \mathbb{S}^{HG} \,\}$?
  - It does, up to and including union-of-intersection patterns that share a single anchor position. (Only discernible with three or more positions.)
- (How) do things scale up to larger systems?
  - Examination of four-position systems thus far confirms these predictions. Deeper analysis and further expansion are the topics of ongoing efforts.‡

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