Computation Clarifies Mixed Specification Behavior of Coronals in English

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Phonological Underspecification

- A phonological segment x is a set of **feature-value specifications**.
  - features $\Phi = \{\varphi_1, \varphi_2, \ldots, \varphi_n\}$; $\varphi_i(x) = \{+, -\}$
- x is **underspecified** if $\exists \varphi_i \in \Phi$ such that $\varphi_i(x) = \varnothing$
  - Typically used when φ_i is **irrelevant/inert** for x or is **not contrastive** for a class of segments to which x belongs.

Underspecification Maps

Nelson and Baković (2024) define an **underspecification map** as any map that has been analyzed using underspecified representations. These computational structure conditions hold of such maps.

(1) The map defines input-output conditions for the "underspecified feature".

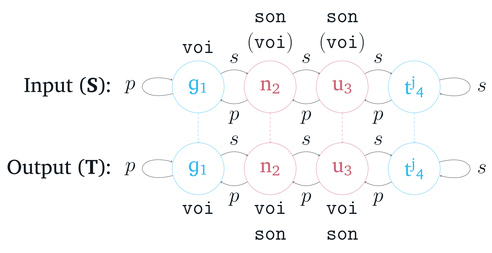
(2) Any underspecification map will include a nested conditional BMRS term.

(3) The upper conditional P and lower conditional Q will determine a truth value using the antecedent of the redundancy rule that fills in the "underspecified feature".

(4) P partitions the set of targets while Q partitions the set of triggers.

Boolean Monadic Recursive Schemes (BMRS)

- BMRS are IF . . . THEN . . . ELSE programs that operate over model-theoretic structures (Bhaskar et al., 2020; Chandlee and Jardine, 2021).
- A BMRS program consists of functions $\phi_i(x_1, \ldots, x_n) = T_i$ that determine the truth value of a given term for each element in a structure, and can be viewed as string-to-string transductions between structures **S** and **T**.



$\phi_{\texttt{voi}}(x) :=$
IF $\texttt{son}(x)$ THEN $\top$
ELSE $\texttt{voi}(x)$

Russian Voicing Assimilation with BMRS

$\phi_{\texttt{voi}}(x) :=$
IF $\texttt{son}(x)$ THEN $\top$
ELSE IF $\texttt{son}(\texttt{s}(x))$ THEN $\texttt{voi}(x)$
ELSE $\texttt{voi}(\texttt{s}(x))$

(1)	underspecified feature?	✓
(2)	nested conditional?	✓
(3)	antecedent of redundancy rule?	✓
(4a)	P partitions targets	✓
(4b)	Q partitions triggers	✓

- In Russian, obstruents but not sonorants contrast in voicing and also participate as both triggers and targets of a voicing assimilation process. This can be analyzed with a general assimilation rule, underspecified [voice] for sonorants, and a redundancy rule: [+sonorant] → [+voice].

MAIN RESULT

We build on the work of Nelson and Baković (2024) and apply the hypothesis to the fact that in the phonology of English, [Coronal] behaves as if it is specified at early stages of the derivation but as if it is unspecified at later stages (McCarthy and Taub, 1992). We show how this contradiction vanishes when viewing underspecification as a property of computation rather than representation.

Lexical /s/-voicing in English

- A number of *lexical* processes/constraints in English require direct reference to the feature [Coronal] (Mohanan, 1991).
- E.g. - /s/-voicing requires [Coronal] specification in the structural description.

advi[s]*e* ∼ *advi*[z]*ory*
re[f] ∼ *re*[f]*er*

Postlexical nasal place assimilation in English

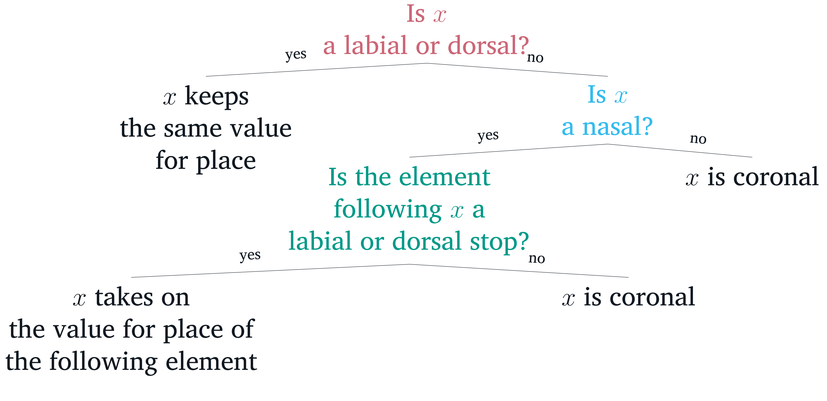
- In English, coronal nasals assimilate in place to a following obstruent *post-lexically*.
- The status of non-coronal nasal assimilation is contested, but it has been argued to be absent in certain dialects. One way to account for this behavior is [Coronal] underspecification (Avery and Rice, 1989).

i[m] [p]*ort Jefferson*
i[ŋ] [k]*anada*
i[n] [t]*acoma*

fro[m] [p]*ort Jefferson*
fro[m] [k]*anada*
fro[m] [t]*acoma*

Computing the place property

- A decision tree highlights what information is necessary to compute place of articulation. Crucially, the input property of being [Coronal] is never considered.



Nasal Place Assimilation with BMRS

- The decision tree can be turned directly into a BMRS program.
- We assume $\texttt{place} : D \to \{\texttt{lab}, \texttt{cor}, \texttt{dor}\}$ is a function from domain elements to major place features to match the analysis given by Avery and Rice (1989).

$\phi_{\texttt{place}}(x) :=$
IF $\texttt{place}(x) \in \{\texttt{lab}, \texttt{dor}\}$ THEN $\texttt{place}(x)$
ELSE IF $\texttt{nas}(x)$ THEN IF $\texttt{stop}(\texttt{s}(x)) \wedge \texttt{place}(\texttt{s}(x)) \in \{\texttt{lab}, \texttt{dor}\}$
THEN $\texttt{place}(\texttt{s}(x))$ ELSE cor ELSE cor

- Since none of the statements check if an input element has the property cor, the output property for [Coronal] for a given segment is determined regardless of its specification for [Coronal] in the input.

Is Nasal Place Assimilation an Underspecification Map?

(1)	underspecified feature?	✓
(2)	nested conditional?	✓
(3)	antecedent of redundancy rule?	✓
(4a)	P partitions targets	✓
(4b)	Q partitions triggers	✓

Conclusion

- In the approach presented here, underspecification emerges as a specific type of computational knowledge contra standard views of it being a type of representational knowledge.
- The computational structure implicit in Underspecification Maps suggests the representational encoding of "underspecified" features is arbitrary.
- The data from English segmental phonology suggest that "underspecified" features like [Coronal] are in fact always fully specified. Consequently, having late "underspecification" and early "full specficiation" is fully compatible with our approach.

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