

Phonological Underspecification

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

Russian Voicing Assimilation

		Assimilation	
[voice]	Contrast	Target	Trigger
Obstruents	\checkmark	\checkmark	✓
Sonorants	×	×	×

- Underspecification analysis: For all sonorants x, $[voice](x) = \emptyset$ -sonorants are not triggers because they **don't** have a [voice] value -sonorants are not targets because they **can't** have a [voice] value
- **Redundancy rule:** $[+\texttt{sonorant}] \rightarrow [+\texttt{voice}]$

Determining Russian [voice] valuation

• Assimilation and redundancy rules unified as a decision tree.



• Note: the voicing specification for an input sonorant is never considered.

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 $\phi_i(x_1, ..., x_n) = T_i$ 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**.



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MAIN RESULT

A shared computational structure is used when defining the types of phonological maps that have been analyzed with underspecification, independent of subsegmental representational choices. Consequently, underspecification is epiphenominal and not a necessary property of phonological representations.

UNDERSPECIFICATION MAPS

An UNDERSPECIFICATION MAP is any map that has been analyzed using underspecified representations. These computational structure conditions hold of such maps. (1) The map will define 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.

Russian Voicing Assimilation with BMRS

ϕ (m) ·	(1)	U
$\varphi_{\text{voi}}(x) =$	(2)	n
$\frac{\text{LF SON}(\mathcal{X}) \text{ IHEN }}{\text{PLOP TP } = \left(= \left(= \left(= \right) \right) \text{ THPN } = \left(= \left(= \right) \right)$	(3)	a
ELSE IF SON(S(x)) IHEN VO1(x)	(4a)	P
ELSE VOI $(s(x))$	(4b)	O

- This BMRS program satisfies all conditions for an UNDERSPECIFICATION MAP. • It never calls the input function voi() on an element that could be "underspecified". • The conditional calls partition both the set of potential targets (P) and the set of potential triggers (Q), thus unifying the redundancy and assimilation rules.

Catalan Voicing Assimilation with BMRS

• In Catalan, sonorants are not targets for voicing assimilation, but they are triggers.

$\begin{array}{l} \phi_{\texttt{voi}}(x) := \\ \texttt{IF son}(x) \texttt{ THEN } \top \\ \texttt{ELSE IF syll}(\texttt{s}(x)) \texttt{ THEN voi}(x) \\ \texttt{ELSE voi}(\texttt{s}(x)) \end{array}$	 (1) (2) (3) (4a) (4b) 	ur ne ar P Q
	(4b)	Q

- This BMRS program does *not* satisfy all UNDERSPECIFICATION MAP conditions. • Changing the upper conditional P to syll(x) would erroneously include sonorant consonants in the set of targets.
- Changing the lower conditional Q to son(s(x)) would erroneously exclude sonorant consonants from the set of triggers.

x takes on the value for [voi] of the following element

IF son(x) THEN \exists ELSE voi(x)



- inderspecified feature? nested conditional? intecedent of redundancy rule? partitions targets (4b) *Q* partitions triggers

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Diacritic Underspecification

(a)	[-voice]	$[devlet] \sim [devleti]$	'state \sim ACC'
(b)	[+voice]	$[etyd] \sim [etydy]$	'study \sim ACC'
(c)	[0 voice]	$[kanat] \sim [kanaduu]$	'wing \sim ACC'

Turkish Voicing with BMRS

 $\phi_{\texttt{voi}}(x) :=$ IF $f(x) \lor \operatorname{son}(x)$ THEN \top ELSE IF $coda(x) \land stop(x)$ THEN \bot ELSE voi(x)

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• Three classes of stop-final morphemes in Turkish: (a) non-alternating voiceless, (b) non-alternating voiced, and (c) alternating between voiceless (in codas) and voiced (elsewhere).

• Inkelas et al. (1997) propose that the final stops in each of these classes are represented as follows, with strictly feature-filling processes handling the eventual valuations of the alternating stops in class (c).

• Suppose the final stops of class (b) are underlyingly specified with a diacritic feature [+f], and [voice] is fully specified across the board.

• The exceptional cases (b) are captured by the upper conditional *P* which acts like a redundancy rule. The non-exceptional cases (a) and (c) are then subject to what is essentially the standard devoicing grammar.

• This BMRS program is not an UNDERSPECIFICATION MAP, but the use of underspecification is different here: it marks exceptions and therefore is only concerned with whether or not a segment is a target.

Conclusion

• Underspecification can be viewed as a purely computational property.

•Our approach highlights a difference between standard uses of underspecification (e.g. Russian) and diacritic uses (e.g. Turkish).

• Future work will expand the conditions on defining UNDERSPECIFICA-TION MAPS to better capture all the distinct uses of underspecification.

References

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