

# Morphosyntactic Patterns Follow Monotonic Mappings

Sophie Moradi

Stony Brook University

*sedigheh.moradi@stonybrook.edu*

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# The point

- Language variability is not limitless:
- Typology rarely covers the full range of logically possible options.
- Universals should be able to explain the restrictions on attestability;
- Monotonicity is one such universal.

# Typological gaps

Morphological paradigms show different types of typological gaps.  
For example:

- \*ABA
- Person Case Constraint

# Graf's account (2019)

The limited number of attested patterns can be explained via three components (Graf 2019):

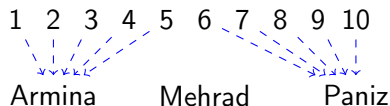
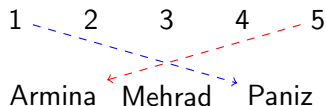
- a base hierarchy with certain prominence relations
- a mapping from each base hierarchy to the relevant output form
- the monotonicity principle

In all attested patterns, the mappings from the base hierarchy to the output forms are **monotonic**.

- Case study 1: tense syncretism
- Case study 2: gender resolution rules

# Monotonicity

- Monotonicity = order preservation
- $A$  = a list of ordered numbers
- $B$  = a list of names in alphabetical order
- Function  $f$  from  $A$  to  $B$  is monotonic *iff* it preserves the relative order of elements.



## Example: \*ABA is monotonic

- If  $\leq$  is a linear order, monotonicity corresponds exactly to the \*ABA generalization.

### \*ABA Generalization (Bobaljik 2012)

Two paradigmatic cells cannot be syncretic to the exclusion of any intervening cells.

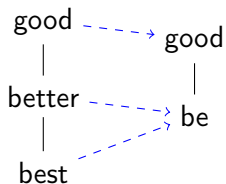
#### (1) Adjectival Gradation

- a. smart, smarter, smartest (AAA)
- b. good, better, best (ABB)
- c. \*good, better, goodest (ABA)

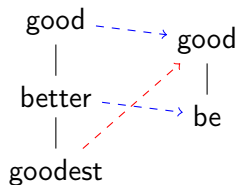
- A mapping that produces ABA violates **monotonicity**.

# Non-monotonicity in ABA

Order      Output



Order      Output



# Tense Syncretism

- But monotonicity is more general because it is also defined for partial orders; e.g., verb stem syncretism (Moradi 2019)

(2)

English	Past	Participle	Present	Pattern
	sang	sung	sing	ABC
	shone	shone	shine	AAB
	came	come	come	ABBB
	walked	walked	walk	AAA

BUT,

(3)

	Past	Participle	Present	Future	Pattern
Persian	did	dide	bin	xahad did	AABA
German	gab	gegeben	gib	geben	ABCB



# Tense Syncretism

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- How to explain AABA and ABCB patterns?
- By using a partial hierarchy of tense based on Reichenbach's tense system (1947)

# The hierarchy

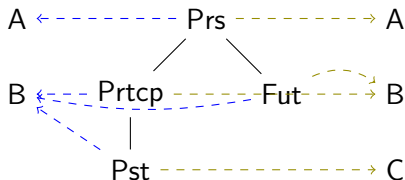
Suppose a partial order where:

- $\text{Present} \leq \text{Participle} \leq \text{Past}$ ,
- and  $\text{Present} \leq \text{Future}$ ,
- but Future is unordered with respect to Participle and Past.

Then Future can be syncretic with any one of the three tenses to the exclusion of the others, allowing for a limited range of ABA patterns.

# Only monotonic mappings are attested

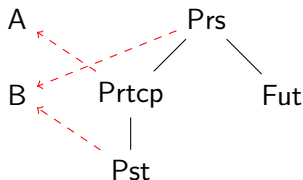
- **AABA** & **ABCB** violate \*ABA over a linear order of tense.
- + But they are monotonic over the partial order of tense.



# Only monotonic mappings are attested

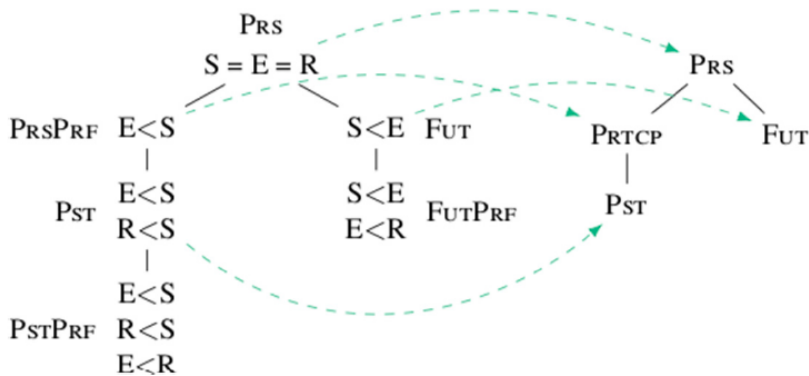
Out of 15 possible patterns for the 4-cell tense paradigm, 5 are not attested.

	Pattern Description	Linear Order
(1)	past = present; participle = future	ABAB
(2)	past = present = future; Separate root for participle	ABAA
(3)	past = present; Distinct roots for participle and future	ABAC
(4)	past = future; Distinct roots for participle and present	ABCA
(5)	past = future; participle = present	ABBA



# Semantic Motivation

The proposed hierarchy of temporal stems is independently motivated in terms of Reichenbach's (1947) tense system.



- The monotonicity account can be interpreted as a high-level description of a Bobaljik-style containment system.
- It does so by relating the tense syncretism to the conceptual space of tense as expressed by Reichenbach (1947).

# Gender: An Intro

## Gender in French

(4) un grand jardin  
a.MSC big.MSC garden.MSC

(5) une grande cour  
a.FEM big.FEM yard.FEM

(6) [le jardin et la cour] sont grand-s  
[the.MSC garden.MSC and the.FEM yard.FEM] are big.MSC-PL



# Resolution Rules: Icelandic

feminine + feminine = feminine

Mamma og amma eru glað-ar  
mother.F.SG and grandmother.F.SG be.PL happy-F.PL  
'Mother and grandmother are happy.'

masculine + masculine = masculine

Strákar-nir og bjálfari-nn eru ánægð-ir með leikinn  
boys-the.M.PL and coach-the.M.SG be.PL pleased-M.PL with game.the  
'The boys and the coach are pleased with the game.'

all gender combinations = neuter

Bók-in og dagblað-ið eru auðlesin-Ø  
book-the.F.SG and newspaper-the.N.SG be.PL easily-read.N.PL  
'The book and the newspaper are easy to read.'

# Agreement Patterns: 2-gender systems

- With two genders, there are 6 possible resolution rules.

$$\begin{array}{ll} (1) C_f + C_m \rightarrow C_f & (2) C_f + C_m \rightarrow C_m \\ (3) C_f + C_f \rightarrow C_f & (4) C_f + C_f \rightarrow C_m \\ (5) C_m + C_m \rightarrow C_m & (6) C_m + C_m \rightarrow C_f \end{array}$$

- There are 8 ways for grouping these resolution rules for any language.
- Yet only two patterns are attested (Lang 1 and Lang 5).

Lang 1: (1), (3), (5)    Lang 2: (1), (3), (6)

Lang 3: (1), (4), (5)    Lang 4: (1), (4), (6)

Lang 5: (2), (3), (5)    Lang 6: (2), (3), (6)

Lang 7: (2), (4), (5)    Lang 8: (2), (4), (6)

# Agreement Patterns: 2-gender systems

- $3^9 = 19,683$  possibilities for a 3-gender system
  - $3^6 = 729$  actual options
  - Only 6 are attested

<b>Icelandic</b>	<b>msc</b>	<b>fem</b>	<b>neut</b>
<b>msc</b>	M	N	N
<b>fem</b>	N	F	N
<b>neut</b>	N	N	N

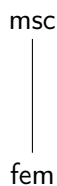
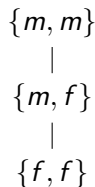
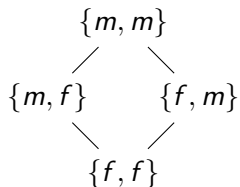
# Resolved Agreement

- There is a substantial literature on many aspects of grammatical gender
  - typology (e.g., Corbett 1991), sociolinguistics (e.g., Hellinger & Bußmann 2001–2015), psycholinguistics (e.g., Schiller 2014), morphosyntax (e.g., Kramer 2015), coordination rules (Dalrymple & Kaplan 2000, Wechsler 2008), etc.
- None discusses the reason behind the limited number of attested patterns of resolved gender agreement
- I studied a wide range of languages with resolved agreement, including: Archi, Chibemba (similar to other Bantu languages), Serbo-Croatian, Rumanian, Polish, Latin, French (representative of many languages, e.g., Hindi, Latvian, Modern Hebrew, Panjabi, Spanish, etc.), German, Tamil, Telugu, Icelandic, Slovene, Qafar.

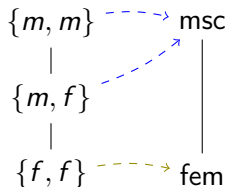
# Resolved Agreement: French

sg	pl
msc	msc
fem	fem

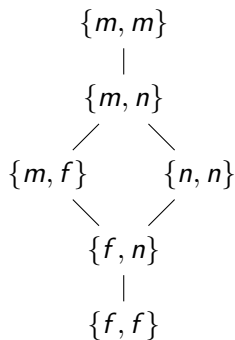
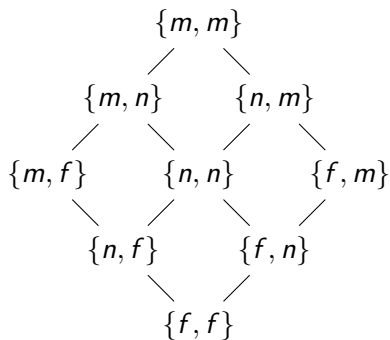
	msc	fem
msc	M	M
fem	M	F



- (7) Resolution Rules in French
- a. Feminine is used if all conjuncts are feminine (F)
  - b. Otherwise masculine is used. (M)



# Resolved Agreement: 3 genders



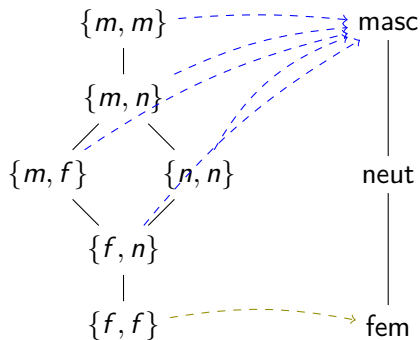
# Resolved Agreement: Slovene

	sg	du	pl		msc	fem	neut
msc	∅	a	i	<b>msc</b>	M	M	M
fem	a	i	e	<b>fem</b>	M	F	M
neut	o	i	a	<b>neut</b>	M	M	M

- (8) Resolution Rules in Slovene
- Feminine is used if all conjuncts are feminine (F)
  - Otherwise, the masculine is used (M).



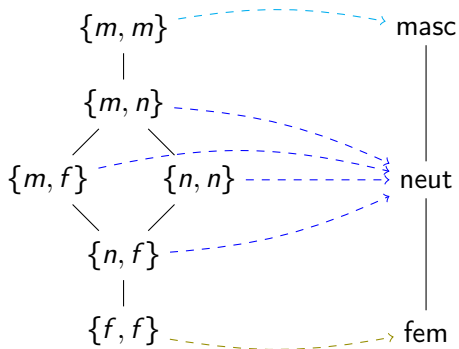
# Resolved Agreement: Slovene



- (9) Resolution Rules in Icelandic
- a. Masculine is used if all conjuncts are masculine (M)
  - b. Feminine is used if all conjuncts are feminine (F)
  - c. Otherwise, the neuter is used (N).

	msc	fem	neut
msc	M	N	N
fem	N	F	N
neut	N	N	N

# Resolved Agreement: Icelandic



# Resolved Gender Agreement: Summary

- Even though gender assignment systems in different languages vary greatly, the emerging gender hierarchies are substantially the same and directly motivated by typological data.
- Here I showed examples of syntactic gender systems, but the same method of analysis holds for semantic systems.
- The nature of mappings remains the same as long as the feminine and masculine values reside on the two end nodes of the gender hierarchy.
- All the mappings from the gender hierarchy to output forms are monotonic in nature.

# Conclusion

- Monotonicity is a general constraint attested in different morphosyntactic phenomena  
e.g., adjectival gradation, case syncretism, pronoun syncretism, Person Case Constraint, Gender Case Constraint.
- I showed that it can be extended to include the paradigmatic relations resulting in systematic gaps in tense syncretism and resolved agreement.
- Thus, monotonicity offers a strong upper bound on the range of typological variation in morphosyntax.

# References



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# Appendix: Semantic motivation for tense hierarchy

## The Locus of Participle

There are three reasons for identifying Prtcp with present perfect in:

1. Semantically, present perfect is the default as the semantics of the past/future perfect follow from the semantics of the former combined with an account of past/future tense.

“Present refers to the default situation from which other tenses represent deviations.” Bybee et al. (1994:152)

“The semantics of the past perfect and the future perfect follow from the semantics of the present perfect combined with an account of the past tense and the future tense.” (Musan 2001: 356)

# Semantic motivation for tense hierarchy

## The Locus of Participle

There are three reasons for identifying Prtcp with present perfect in:

1. Semantically, present perfect is the default as the semantics of the past/future perfect follow from the semantics of the former combined with an account of past/future tense.
2. Based on the Diachronic Corpus of Present-day Spoken English, **the present perfect is the most frequent perfect construction** in this language.

Bowie and Aarts (2012)



# Semantic motivation for tense hierarchy

## The Locus of Participle

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1. Semantically, present perfect is the default as the semantics of the past/future perfect follow from the semantics of the former combined with an account of past/future tense.
2. The present perfect is the most frequent perfect construction (Bowie and Aarts 2012).
3. The hierarchy of tense is an implicational hierarchy.

**If a language has a past perfect or a future perfect, it is most likely that it also has a present perfect (but not the reverse).**