A typological study of vowel interactions in Basque

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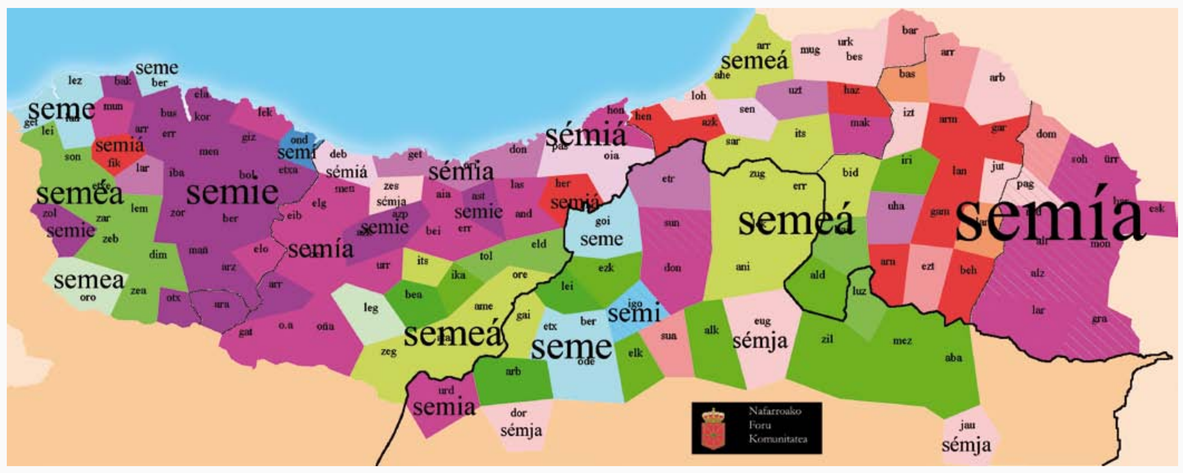
1. Summary

- The phonological micro-variation found in vowel interactions in Basque is studied.
- We combine formal phonological theories (Element Theory, Turbidity Theory [1]), corpora and computational tools.
- The account can generate grammars for all the robustly attested patterns but fails to generate the unattested ones.

2. Background: nominal inflection in Basque

- If stem ends in consonant:
  - uninflected NP: [gi̪son] 'man'
  - singular absolutive DP: [gi̪sona] 'the man' (no variation)
  - singular definite absolutive suffix = /-a/
- If stem ends in vowel, dialectal variation:
  - /alaba-a/ 'the daughter': alab**aa**, alab**ea**, alab**ia**, alab**ie**
  - /seme-a/ 'the son': sem**ea**, sem**ia**, sem**ie**
  - /idi-a/ 'the ox': id**ia**, id**ie**



- Disclaimers:
  - back vowels /o, u/ behave *roughly* as their front counterparts; our typology only considers stems ending in /a, e, i/.
  - consonant epenthesis has been ignored: e.g. we have coded [idiʃa] and [idia] as **ia**.
  - forms with second vowel deletion (/seme-a/ → [seme]) are excluded from the typology.
  - the processes are productive, but can get blocked under some morpho-syntactic conditions.

3. Data

- We combine data from two partially-overlapping sources [2, 3].
- Each of ca. 170 Basque-speaking locations is characterised as a set of 3 codes, which describe the behaviour of the vowels /a,e,i/ when followed by the suffix /-a/.
- From a logical point of view, the attested codes can be combined in 24 unique ways (i.e. 24 potential dialects).
- 9 are robustly attested; 4 are marginal; 11 are unattested.

PatternID	/a-a/	/e-a/	/i-a/	Frequency
3	aa	ia	ia	70
24	ie	ie	ie	23
1	aa	ea	ia	18
2	aa	ea	ie	18
15	ia	ia	ia	15
8	ea	ea	ie	12
16	ia	ia	ie	5
4	aa	ia	ie	4
6	aa	ie	ie	4
7	ea	ea	ia	1
14	ia	ea	ie	1
18	ia	ie	ie	1
20	ie	ea	ie	1

PatternID	/a-a/	/e-a/	/i-a/	Frequency
5	aa	ie	ia	0
9	ea	ia	ia	0
10	ea	ia	ie	0
11	ea	ie	ia	0
12	ea	ie	ie	0
13	ia	ea	ia	0
17	ia	ie	ia	0
19	ie	ea	ia	0
21	ie	ia	ia	0
22	ie	ia	ie	0
23	ie	ie	ia	0

4. Constraints

(1) PROJ(E): Assign a violation mark for every pronounced E that does not correspond to a projection of E.

(2) PRON(E): Assign a violation mark for every projected E that does not correspond to a pronunciation of E.

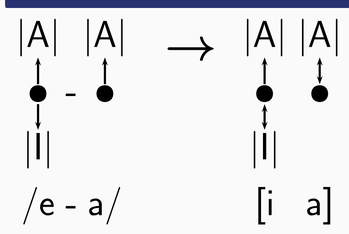
(3) OCP(E): Assign a violation mark for every pair of adjacent root nodes that pronounce E.

(4) OCP(root): Assign a violation mark for every pair of adjacent root nodes that pronounce the same set of E's.

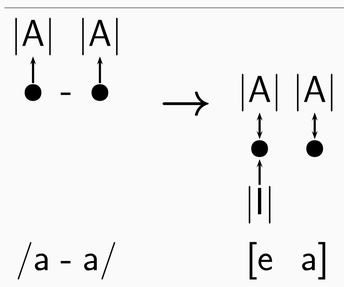
(5) SPREAD(E): Assign a violation mark for every pronounced E that does not spread (i.e. that is not pronounced by a neighboring root node).

(6) SPREAD(E)': Let the set S of projected E's by a root node be identical to the set {E}, i.e. $\{E\} \subseteq S \wedge S \subseteq \{E\}$. Assign a violation mark for every pronounced $E \in S$ that does not spread.

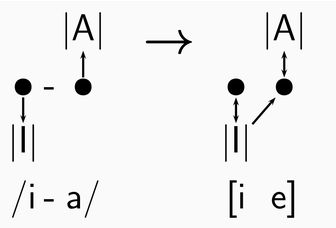
5. Rankings



Mid vowel raising:
- underpronunciation of an underlying |A|.
- OCP(|A|) ≫ PRON(|A|)



Low vowel raising:
- pronunciation of a non-projected |I| together with the projected |A|.
- OCP(root) ≫ PROJ(|I|)



Low vowel assimilation:
- pronunciation of |I| by both its own root node and the suffixal root node.
- SPREAD(|I|) ≫ OCP(|I|)

- The **opaque dialects** are formalized as the outranking of SPREAD(|I|) by the less stringent SPREAD(|I|)':

PatternID	/a-a/	/e-a/	/i-a/	Constraint ranking
16	ia	ia	ie	OCP(root) ≫ PROJ(|I|) OCP(|A|) ≫ PRON(|A|) SPREAD(|I|)' ≫ OCP(|I|) ≫ SPREAD(|I|)
4	aa	ia	ie	PROJ(|I|) ≫ OCP(root) OCP(|A|) ≫ PRON(|A|) SPREAD(|I|)' ≫ OCP(|I|) ≫ SPREAD(|I|)

6. References

[1] M Goldrick. Turbid output representations and the unity of opacity. In M. Hirotani, A. Coetzee, N. Hall, and J.-Y. Kim, editors, *Proc. of the North East Linguistic Society*, volume 30, pages 231–245. GLSA, Amherst, MA, 2001.

[2] J-I Hualde and I Gaminde. Vowel interaction in basque: A nearly exhaustive catalogue. *Studies in the Linguistic Sciences*, 28(1):41–77, 1998.

[3] G Aurrekoetxea and X Videgain, editors. *Euskararen herri hizkeren atlasa, 5. Izen morfologia*. Euskaltzaindia, Bilbo (EH, Spain), 2013.