A theory of phonologically-derived environment effects - Benjamin Storme (CNRS)

1. Background. Phonologically-derived environment effects (PDEEs) describe patterns where a phonological process applies only if fed by another phonological process. For example, in Campidanian Sardinian, lenition applies to voiced stops derived from underlyingly voiceless stops via intervocalic voicing (1-a), but not to underlyingly voiced stops (1-b) (Bolognesi 1998). PDEEs give rise to ‘saltations’ (Hayes & White 2015), i.e. alternations where an underlying string ‘leaps’ over an intermediary form (2).

(1) Campidanian Sardinian lenition

a. \(/k/ \rightarrow [y]/V\_V\)

\(/\text{kua}t\text{ru}/\quad [\text{kuatru}] \text{‘four’}\)

\([\text{dr k}\text{uatru}] \text{‘of four’}\)

b. \(/g/ \rightarrow [g]/V\_V\)

\(/\text{g}\text{oma}/\quad [\text{goma}] \text{‘rubber’}\)

\([\text{dr g}\text{oma}] \text{‘of rubber’}\)

Saltations have been argued to be problematic for the idea that alternations between more similar sounds are preferred over alternations between less similar sounds (Hayes & White 2015). This idea is at the center of the P-map (Steriade 2009), a theory which predicts that if two dissimilar sounds alternate then two sounds that are less dissimilar should also alternate. Campidanian Sardinian lenition, where \([k]\) alternates with \([y]\) but \([g]\) does not, is problematic for this prediction.

2. Proposal. This paper proposes a theory that reconciles the analysis of PDEEs and the P-map, based on the idea that a feature change might be less noticeable in the context of another feature change. If the perception of the input-output distance is logarithmic, it is expected that a change in an input-output pair will be perceived as less noticeable if accompanied by another change. The same lenition is perceived as smaller in case it is preceded by voicing (upper figure) than in case it is not preceded by voicing (lower figure).

On the grammatical side, the proposal is implemented using context-sensitive faithfulness constraints that penalize a feature change differently depending on whether or not it is accompanied by another feature change. For Campidanian Sardinian, Ident(cont) is split into Ident(cont)/nochange(voice) and Ident(cont)/change(voice).

(3) Splitting Ident(cont) into two context-sensitive variants:

a. Ident(cont)/nochange(voice) = Ident(cont)&¬Ident(voice)

Assign a violation to an input-output segment pair violating Ident(cont) if it does not also violate Ident(voice).

b. Ident(cont)/change(voice) = Ident(cont)&Ident(voice)

Assign a violation to an input-output segment pair violating Ident(cont) if it also violates Ident(voice).

By the P-map, the fact that changing continuancy has a smaller perceptual impact if accompanied by a change in voicing than if not accompanied by a change in voicing translates into the following ranking: Ident(cont)/nochange(voice) \(\gg\) Ident(cont)/change(voice). The interaction of these faithfulness constraints with Ident(voice) and markedness constraints that motivate intervocalic voicing and lenition derives the Campidanian Sardinian pattern (4).

(4) a. \(/\text{dr kua}t\text{ro}/\quad *\text{VC}_{[\text{voice}]}\_V\)

Ident(voice) | Ident(cont)/nochange(voice) | *\text{VC}_{[\text{cont}]}\_V | Ident(cont)/change(voice)
---|---|---|---
\(\text{dr kua}t\text{ro}\) | * | | |
\(\text{drxua}t\text{ro}\) | * | | |
\(\text{dr g}\text{u}a\text{tro}\) | * | | *!
\(\text{dr g}\text{u}a\text{tro}\) | * | | |
3. Consequences. (i) Avoiding bizarre feature interactions. Allowing any features to interact in PDEEs predicts unattested patterns like the following voicing feeds labialization pattern: /aku/ → [aq"]u] vs. /agu/ → [agu]. Under a P-map account, it is conceivable that not all feature changes will be able to interact perceptually, but only changes which (i) involve features sharing a perceptual cue and (ii) can be understood as summing up monotonically along a single underlying continuum. Voicing and lenition satisfy these conditions (closure duration decreases and intensity increases going from voiceless to voiced stops and from voiced stops to voiced approximants), but voicing and labialization do not. Other PDEE patterns are discussed and argued to also satisfy these conditions. To our knowledge, the present theory is the only one that provides a rationale for constraining feature interactions in PDEEs.

(ii) Avoiding gratuitous violations of faithfulness. The *Map approach to saltations proposed by Hayes & White (2015) predicts that it could be harmonically improving to do two changes in response to a single markedness constraint: in the tableau above, satisfying the markedness constraint against intervocalic stops results in both lenition and devoicing, due to the high-ranked faithfulness constraint against mappings from /g/ to [ɣ]. This prediction is problematic because intervocalic devoicing is not attested. If the P-map plays a role, a ranking of faithfulness constraints that satisfies the principle of minimal modification is preferred. There is such a ranking. If Ident(voice) is required to be ranked at least as high as Ident(cont)/nochange(voice) whenever Ident(cont)/nochange(voice) ≫ Ident(cont)/change(voice) (see (4)), then this effectively predicts that voicing and continuancy changes must be motivated by two markedness constraints. The implication Ident(cont)/nochange(voice) ≫ Ident(cont)/change(voice) ⇒ Ident(voice) ≫ Ident(cont) also turns out to have a perceptual interpretation. By the P-map, it implies that the difference between changing continuancy alone vs. changing continuancy with voicing is significant only if changing voicing is at least as big a change as changing continuancy. This intuitively makes sense: the larger the first change with respect to the second one, the less noticeable the second one.

4. Testing the predictions. The predictions that the two features involved in PDEEs must share a cue and that the conditioning change must not be smaller than the conditioned change are tested in Romanian, where stressed [a] alternates with [A] but unstressed [a] does not. The results of a small acoustic study support the hypotheses: both destressing and raising involve vowel shortening, and the shortening induced by destressing is (slightly) larger than the shortening induced by raising.

5. Discussion and conclusion. The fact that PDEEs are typologically marked and hard to learn (White 2013) is explained as resulting from an anti-complexity bias: the faithfulness constraints involved in PDEEs are more complex than the simple faithfulness constraints involved in patterns of contrast and allophony. The anti-complexity bias also accounts for the marked status of synchronic chain shifts, which involve the same complex faithfulness constraints, but ranked differently (Ident(cont)/change(voice) ≫ Ident(cont)/nochange(voice)). Chain shifts correspond to another type of feature interaction, where the overall input-output distance along a phonetic scale matters (see Distantial faithfulness; Kirchner 1996). To summarize, this paper makes two contributions: (i) it reconciles the analysis of PDEEs and the P-map and (ii) by doing so, it allows for a more restrictive theory of PDEEs than alternative accounts.