ROOT-FIRST DELETION IN HARMONIC SERIALISM

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1 Introduction

Harmonic Serialism (HS) is a serial-derivational variant of Optimality Theory (McCarthy 2016; Prince & Smolensky 1993/2004). Instead of mapping directly from the input to the output in a single, fully parallel step, HS has multiple steps, with only a single operation being permitted in each step. This is called Gradualness, and it can arguably be considered the defining characteristic of HS. One of the key consequences of Gradualness is that in HS, deletion is a two-step process: first the PLACE node is deleted, and only afterwards can the now-bare ROOT node be deleted.

Something which has not received much attention in the HS literature is the nature of this deletion process, in the sense that it has not been sufficiently discussed if there is a single deletion process which is simply incapable of deleting two feature nodes simultaneously, or if there are in fact two different deletion operations available. This could be framed as such: must PLACE deletion always come first, or is ROOT-first deletion possible? The evidence seems to support the latter proposition.

ROOT-first deletion is a somewhat difficult proposal to prove. A placeless segment is easy to conceive: it would simply be a bare glottal, all manner of articulation, no place. What, however, does a rootless segment look like? It should be all place of articulation, no manner. Such a segment seems to be unpronounceable in the face of it: how can frication, for example, be enacted if the articulators for it are unaccounted for? It thus seems that while a placeless segment can be observed overtly, a rootless segment could not. However, overt appearance is not the only method by which we can detect segments: their presence at some level or stage of a derivation can also be demonstrated through their effect on surrounding segments.

This is where the evidence for ROOT-first deletion can be found, in otherwise inexplicable phonological phenomena involving the influence of non-surface-overt segments, what are often called ‘floating PLACE nodes.’ Below are discussed two examples, found in Latin (Cser (2011) and Catalan (Hualde 2011). In Latin a diachronic process reduced historical [g], leaving behind a floating PLACE node which would attach to preceding placeless segments, and which would block the attachment of segments which had specified place. In Catalan, there is an opaque process wherein nasal place assimilation precedes final stop deletion, leading to /bank/→[baŋ], with the velar PLACE node shifting back onto the nasal while the /k/ is deleted. Both of these processes require a ROOT node to be deleted without any corresponding PLACE-deletion, thus demonstrating the validity of ROOT-first deletion as an independent operation.

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2 Theoretical Assumptions

The basis of this analysis rests on the assumption of Harmonic Serialism as its model (McCarthy 2016). More specifically, it adopts a variant which could be called Feature-Geometric Harmonic Serialism (Shaftoe, forthcoming). FGHS was developed as a means of integrating feature geometry in the style of Clements & Hume (1995) into Harmonic Serialism. The most relevant principles for the present analysis are as such: first, that only one feature can be changed per step, as the changing of feature specification is considered an operation; and second, that FGHS incorporates underspecification. Generally speaking, FGHS assumes that predictable features are left unspecified, with their values inserted after the phonology reaches its conclusion. FGHS does, however, acknowledge that sometimes predictable features are underlyingly specified. The general principle here is that is a feature is unpredictable or if it is active during the phonological derivation, then it is assumed to be specified underlyingly. If it is predictable and does not participate in any phonological process, it can be assumed to be underspecified. Post-phonological feature insertions are assumed to be the result of a set of language-specific feature-filling rules predicated on the featural definition of each segment as it is outputted from the phonology.

Otherwise, FGHS is identical to HS. The adoption of feature geometry into the system is a direct result of working out the implications of Gradualness, explained above. Each HS derivation applies one operation, and takes the winning candidate as the input of a new step. This cycle continues until the input of the current step is identical with the winning candidate, an event known as convergence. The convergence step provides the output.

3 Latin

At a certain stage of the history of Latin, there is evidence of a floating consonantal PLACE node (Cser 2011). Words which in the prehistory of Latin had initial [gn] sequences saw reduction of the [g], leaving the overt pronunciation of these words as only initial [n]: [gnoskere]→[noskere]. However, the [g] does not seem to have been fully deleted, as evidenced by two facts: first, that only prefixes which ended in coronal segments could be attached to these words; and second, that those morpheme-final coronals would assimilate to velar place when attached (Cser 2011). It is the second fact which is most interesting. From a surface perspective, these alternations make little, if any, sense. Consider the prefix *in-*: the concatenation of *in-* to [noskere], with two coronal nasals becoming adjacent, for some reason outputs [iŋ.noskere]. This could be argued to be an instance of dissimilation, but the grounds for such a claim would be vague outside of the obvious surface data. The key question is, of course, why the velar place should be selected over any other option.

The solution is, as argued by Cser (2011), to analyze the reduction of [g] not as full deletion, but as reduction to a floating PLACE node: that is, as the deletion of the ROOT node. If the PLACE node remains behind after a ROOT-deletion operation, then both the above facts are to be expected. Non-coronal consonants and vowels cannot properly link with the floating PLACE node, and due to an apparent refusal by Latin to delete it, the resultant output would cause a crash: therefore, the affixation is simply banned. As regards the assimilation of morpheme-final coronals, it is well-attested that coronal place is ‘weaker’ than dorsal and labial. This weakness often manifests as underspecification of coronal

PLACE, though it can also be represented as constraints which ban coronal PLACE. Either way, the product would be a segment which lacks a native PLACE node, and could therefore provide an easy home for the floating velar node. The result would of course be a velar segment, as is attested in the data.

The historical sequence can be represented as such: [#gn]→[#[DORSAL]n]→ [in+[DORSAL]n]→[iŋ.n]. The derivation to follow must take place in two stages. The first will cover the reduction of initial [gn], while the second will demonstrate the various derivations which demonstrate the persistence of the floating PLACE node. A summary of the first step is reproduced below from Cser (2011).

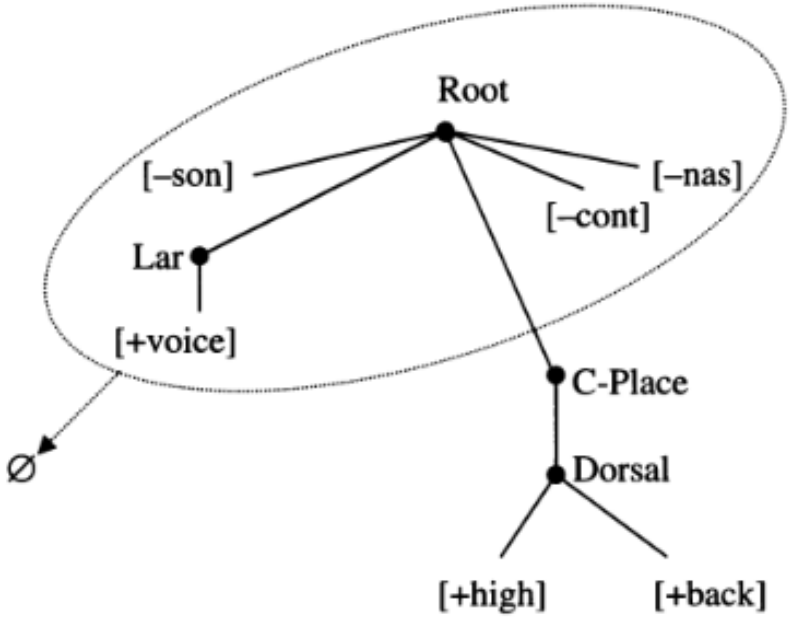

Figure 1: Diagram of ROOT-deletion in Latin (Cser 2011)

The requisite constraints for these derivations are as follows:

(1) *#gn: assign a violation mark for every instance of word-initial [gn]
- According to Cser (2011), [g] was lost as a full segment word-initial sometime in the prehistory of Latin; due to a lack of information on this change, it has been represented by the above temporary constraint

(2) MaxROOT: do not delete the ROOT node
(3) MaxC-PLACE: do no delete the C-PLACE node
(4) HaveRoot: assign a violation mark for every segment which does not have a ROOT node
(5) HavePlace: assign a violation mark for every segment which does not have a PLACE node
(6) NoLink[PLACE]: do not add an association line to a PLACE node
   a. Note: identical to NoLink[C-PLACE]
(7) CodaCond: do not have PLACE in the coda

a. Note: this does not ban segments having PLACE while in coda, just that the PLACE node be in an onset (McCarthy 2008)

(8) *FinalStop: assign a violation mark for every word-final stop

With these constraints established, the derivation is almost ready to proceed. Before it can begin, one last note must be made: the <n> depicted here as following *g is more of an convenient symbol choice than an analysis. For whatever reason that <n> will not permit the floating C-DORSAL node to dock with it, whether due to having an organic place node or due to some ban on [ŋ] in onset position. This paper does not have the data to take a firm stance on this matter. The key point is that it seems that linear order prevents the N from assimilating to <n>, with the floating PLACE node intervening between them. Thus the further nature of <n> will be left to future research, being beyond the scope of this present analysis.

Now on to the derivation itself. As noted above, the first derivation concerns the actual deletion of the ROOT node in prehistoric Latin.

(9) Step 1: ROOT-deletion

/#gn/	Max[C-Place]	*#gn	MaxRoot	HaveRoot
a. #ʔn	*!			
→b. #[C-DORSAL]n			*	*
c. #gn		*!		

In Step 1 the restriction against word-initial [gn] sequences must be satisfied in some manner. Putting aside the discussion of why the [n] is not reduced instead, there are two options for achieving this: either reducing the [g] to [ʔ] by deleting its C-PLACE node or reducing it to a C-PLACE node by deleting its ROOT node. If this environment is to trigger velar place assimilation in prefixes, and block the affixation of prefixes which cannot so assimilate, then it cannot be the C-PLACE node which is deleted. Rather, the ROOT node must be deleted here, leaving behind a floating C-PLACE node. This is represented by the high ranking of Max[C-PLACE], which prevents candidate (a) from winning. Candidate (c) obviously does nothing to satisfy *#gn, and so is eliminated in favour of Candidate (b).

(10) Step 2: Convergence

/#[C-DORSAL]n/	MaxC-Place	*#gn	MaxRoot	HaveRoot
a. #n	*!			
→b. #[C-DORSAL]n				*

The derivation converges in the second step, as nothing further happens when dealing with this process. While not directly analyzed here, it remains something of an open question as to how the ROOTless C-PLACE node was handled in actual speech: it was obviously left unpronounced, but whether this was due to it being deleted by some process before production, or simply being left unparsed, is not clear. Do note that this change seems to have eventually affected the lexical entry: it does not seem that the ROOT node was continually re-deleted, but that it was absent from the underlying representation (Cser 2011). Thus, the structure would resemble the diagram below:

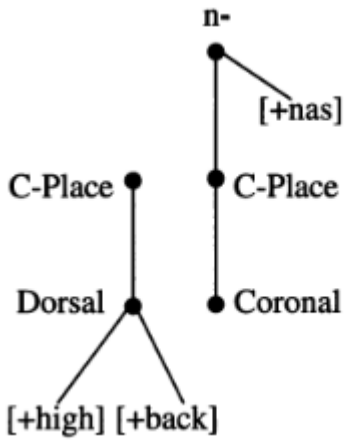

Figure 2: Structure of *gn* after ROOT-deletion (Cser 2011)

After the ROOT-deletion had occurred, its reflexes continued to trigger place assimilation to velar in prefixes. As noted above, a situation would thus arise in which a prefix ending in a coronal nasal, such as *in-*, could attach to a word which began phonetically with another coronal nasal, such as *gnoscere* [noskere], and be pronounced [iŋnoskere]. This clearly shows the persistence of the velar C-PLACE node. This is demonstrated in the following derivation.

(11) Step 1: Place Assimilation

/iN+[C-DORSAL]n/	Max[C-PLACE]	HaveRoot	HavePlace	NoLink[C-PLACE]
→ a. iŋ.n				*
b. iN.[C-DORSAL]n		*!	*!	
c. iN.n	*		*!	

In Step 1 the ROOTless C-DORSAL node must be resolved. It is a standard assumption that coronal segments are underlyingly placeless, since coronal is the default place and will be inserted automatically. There are therefore three options for resolving this situation: the C-DORSAL can be deleted, which would violate Max[C-PLACE]; the situation can be left as is, with a placeless nasal and a rootless C-PLACE node; for the C-PLACE node can attach to the preceding nasal, making it velar. Since Max[C-PLACE], HaveRoot, and HavePlace outrank NoLink[C-PLACE], Candidate (a) wins out: it avoids deleting the C-PLACE node, and provides a place for the nasal and a root for the C-PLACE node, all in a single operation.

(12) Step 2: Convergence

iŋ.n	Max[C-PLACE]	HaveRoot	HavePlace	NoLink[C-PLACE]
→ a. iŋ.n				
b. iŋ.N	*		*!	

With the C-PLACE reassociated there is no need for further changes, and the derivation reaches convergence at step 2. Note that HS nasal place assimilation follows a similar pattern to two-step deletion, with PLACE-deletion followed by reassociation. The PLACE-deletion has been omitted here despite the conventional analysis and despite Cser (2011) including it in his analysis. Since the assimilation only occurs with coronal segments, it is reasonable to adopt the common assumption that the coronal segments are underlyingly underspecified for PLACE. This accounts for the 'weakness' of the coronal place which Cser references, and makes for a more elegant analysis when combined with the derivation below.

The final matter in this analysis is to demonstrate the continued existence of the C-DORSAL node from the other direction: that of what could not happen. So far the analysis has demonstrated how the floating C-DORSAL node came to be, and how its residue can be seen in its assimilatory effects on attached prefixes. Now is the time to more fully consider

the fact that, for a period in Latin, certain prefixes were simply banned from attaching to words with historical *gn (Cser 2011). Cser analyzed this as further evidence of the floating PLACE node's continued existence, in that without a licit dock, the C-DORSAL node would, in essence, trigger a crash, as seen in the tableau below. Note that the <?> used below stands in for whatever segment would result from attaching a C-DORSAL node to /e/. According to Cser's feature theory, this should result in a secondarily articulated consonant, though as obviously there was no such output in Latin, the specific identity of this segment is presently unclear. Thankfully, the specific identity of that segment does not matter for the present analysis: rather, all that matters is there was some potential output, and it was never permitted to surface.

(13) Step 1: Non-Starter

/re+[C-DORSAL]n/	MAX [C-PLACE]	*?	DEP [ROOT]	*#gn	Have Root	Have Place	NoLink [C-PLACE]
a. r?.n		*!					*
←b. re.[C-DORSAL]n					*		
c. re.gn			*	*			
d. re.n	*!						

As seen in this tableau, the same ranking which led Latin to possessing the floating C-DORSAL node also prevents it from neatly solving the issue of prefixes with final coronals. Candidate (a) proposes the kind of dorsalized secondary-articulation consonant discussed briefly above. Since this segment does not emerge in Latin, it is reasonable to assume that there is some constraint, represented here by *?, which bans the configuration. At this stage of Latin's development, the floating PLACE node was not being deleted, and thus MAX[C-PLACE] bans Candidate (d). Candidate (c) reinserts the historical ROOT node, recreating *_regnoscere_, which by this stage of the language is no longer attested, as the reinsertion is banned by DEP[ROOT], and *#gn. Candidate (d) thus should win at this stage, simply leaving the floating C-DORSAL node. The resultant form, which would resemble *_renoscere_, is also unattested, and thus while it wins this derivation, it should not. A feature-geometric representation of the relevant structure is given below, taken from Cser (2011).

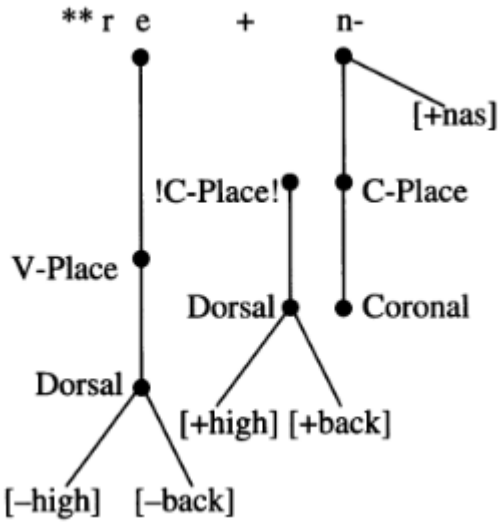

Figure 3: Diagram of non-assimilation in *re+gn* (Cser 2011)

It seems that Latin solved the issue of what to do with the floating PLACE node in these situations by simply not permitting the situation to arise. The lack of **renoscere* or **regnoscere* in this period of Latin is established, the same as with other words which would have attached a prefix without a final coronal to a word which historically began with [gn] (Cser 2011). The only explanation for this phenomenon is that there remained a floating PLACE node in that position, and it blocked the morphological application of the prefixes.

It can thus be seen both from where prefixation succeeded, and saw place-assimilation of the final coronal, and where it did not succeed, that there was a floating PLACE node in that position. Knowing that historically this PLACE node descended from a full [g] segment, there is only one logical conclusion: that the ROOT node of the [g] was deleted and the PLACE node left behind. This could only arise if a process of ROOT-deletion could apply without prior application of PLACE-deletion, as of course otherwise there would be no PLACE node left behind to float.

4 Catalan

Another set of data which demonstrates the need for an independent ROOT-deletion operation can be found in Catalan, as per Hualde (1992). Catalan has no phonemic /ŋ/, but does have nasal place assimilation (Hualde 1992). This leads to allophonic [ŋ] emerging before velar stops. This process interacts opaquely with word-final stop deletion, which can leave orphaned [ŋ] in word-final position. This process violates the conventional HS deletion method, and requires instead ROOT-first deletion. This demonstrates both the necessity of feature-geometric HS, as without accurate awareness of the feature-geometric structure of the segments (and intersegmental interactions) the theory would make incorrect predictions about the progression of the derivation, and the need for ROOT-deletion to be its own operation.

The constraints required for this analysis are as follows:

(14) HavePlace: assign a violation mark for every segment which does not have a PLACE node
(15) NoLink[Place]: assign a violation mark for every association line in the candidate which is not present in the input
(16) *FinalStop: assign a violation mark for every word-final stop

The analysis will follow the example of /bank/→[baŋ], beginning with nasal PLACE assimilation.

(17) Step 1: Nasal PLACE assimilation

/baNk/	HavePlace	NoLink[Place]	*FinalStop
→a. baŋk		*	*
b. baNʔ	*!*		*
c. baN[C-DORSAL]	*!		
d. baNk	*!		*

At this step HavePlace needs to be satisfied on the nasal [N]. This blocks any application at this step of PLACE-deletion for [k], as deleting that C-DORSAL node only adds a new violation of HavePlace without improving on any relevant constraint. As well, at this stage deleting the ROOT node off the [k] fails to resolve the HavePlace violation, as [k] was not an offending segment. Thus the solution is to link the velar C-DORSAL to [N], producing a [ŋ] which shares its C-DORSAL node with following [k]. This violates NoLink[Place], but as HavePlace outranks it the assimilation still wins.

(18) Step 2: ROOT deletion

baŋk	HavePlace	NoLink[Place]	*FinalStop
→a. baŋ			
b. baNʔ	*!*		*
c. baŋk			*!

It is thus at Step 2 that ROOT deletion becomes a viable option. With HavePlace satisfied, the derivation must now resolve the violation of *FinalStop. There are two options: the derivation can either initiate conventional HS deletion, by deleting the C-DORSAL node, or delete the ROOT node first. Something which FGHS predicts which is missed by regular HS is that at this stage, PLACE-deletion (the conventional first step in full deletion) would not only reduce [k] to [ʔ], but would also reduce [ŋ] to [N]. These two segments share a C-DORSAL node as a result of Step 1. Therefore, the deletion of PLACE for one automatically deletes C-DORSAL for the other. While this would satisfy CodaCond (not here depicted), it

would fail to satisfy *FinalStop due to the continued presence of [ʔ]. Instead, [k] must have its ROOT node deleted. The result of this would be to leave the C-DORSAL node still attached to [ŋ].

(19) Step 3: Convergence

baŋ	HavePlace	NoLink[Place]	*FinalStop
→a. baŋ			
b. baN	*!		

At this step no further improvements can be made, as all relevant constraints have been satisfied. Thus the derivation reaches convergence. This process clearly demonstrates the need for ROOT-deletion as an independent operation, as otherwise the process here cannot be analyzed.

Overall, the process can be summarized with the diagram below.

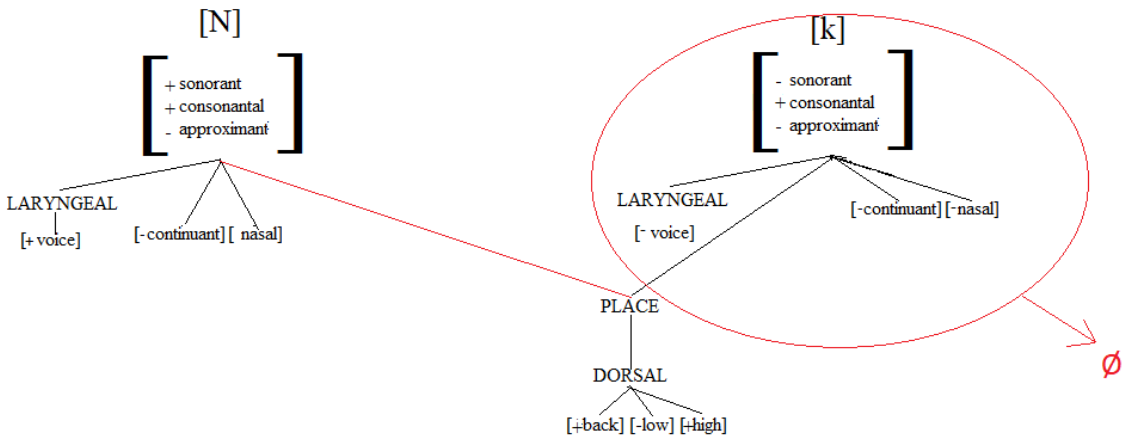

Figure 4: Diagram of Velarization in Latin

5 Conclusion

The analyses of the Latin and Catalan both demonstrate, as different examples, the need for a ROOT-deletion operation independent of PLACE-deletion. Floating PLACE nodes are by definition PLACE nodes which lack an underlyingly attached ROOT node. For one to develop, it must undergo the deletion of its ROOT node without any preceding deletion of the PLACE node. Similarly, the opaque nasal place assimilation interaction with final stop deletion must have the ROOT node of the [k] deleted without any corresponding deletion of the velar PLACE node, as otherwise there would be no velar PLACE node left to velarize the nasal.

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