Segmental Strength: A Typology of Unstable Segments

Eva Zimmermann

Special Session 'Inside Segments'

LSA 2019, New York
January 06, 2019

﹡ Ghost segments are **weakly active segments** and thus

1. both **phonological and lexical** factors can contribute to the (non)realization of a ghost segment (�, Catalan).

2. ghost segments can only **gradiently contribute to markedness** if they surface. (➸ Nuu-chah-nulth).

3. different **types** of ghost segments exist and can coexist in one language (➸ Welsh).

Gradient Representations: Assumptions

Background: Gradient Symbolic Representation (=GSR)

❉ All linguistic symbols have **activity** that can **gradiently** differ with 1=fully active. (Smolensky and Goldrick, 2016; Rosen, 2016)

❉ Any change in activity is a faithfulness violation – different activities result in **gradient violations of faithfulness**.

❉ Elements can be weakly active in the output and thus violate **markedness gradiently**. (Zimmermann, 2017a,b; Faust and Smolensky, 2017)

❉ Grammatical computation modeled inside **Harmonic Grammar** where constraints are weighted. (Legendre et al., 1990; Potts et al., 2010)

GSR: Gradient Constraint Violations

❋ Weakly active segments:

- they are **easier to delete** than 'normal' segments
  (=Max-S violated to a lesser degree)
- it is **costly to realize** them
  (=activity inserted (1-a) or weak activity in the output (1-b+c))
- they **violate/satisfy** markedness constraints to a lesser degree

(1)　　Gradient Activity=gradient constraint violations

$b_1a_1t_1$-$p_{0.5}$	Full	Max-S	Dep-S	*CC		
	10	10	10	10		
a.　　$b_1a_1t_1p_1$			**-0.5**	**-1**	-15	Only fully active S
b.　　$b_1a_1t_1p_{0.5}$	**-0.5**			**-0.75**	-12.5	Faithful realization of weak S
c.　　$b_1a_1p_{0.5}$	-0.5	**-1**			-15	Deletion of fully active S
☞ d.　　$b_1a_1t_1$		**-0.5**			-5	Deletion of weakly active S

(2)　　Full: Assign violation 1-X for every output element with activity X.

Ghost segments: Three case studies

Ghost segments 👻

(3)   'Segments that only surface in certain contexts.' (Yang, 2004, 71)
      (Archangeli, 1984; Hyman, 1985; Rubach, 1986; Kenstowicz and Rubach, 1987;
      Szypra, 1992; Yearley, 1995; Tranel, 1995, 1996; Zoll, 1996)

(4)

	/pan👻/	/tump/
Phonological context 1:	pan	tump
Phonological context 2:	pan**k**-u	tump-u

➙ GSR: Ghost segments are underlyingly weak segments

❅ weak activity is a lexical property of certain segments inside certain
   morphemes

❅ their activity might be too low to be realized without further 'support'

1. Relevance of Lexical and Phonological factors: Catalan

(5)

	Sɢ	Pʟ	
a.	gɔ́t	gɔ́ts	'glass(es)' (masc.)
	tákə	tákəs	'stain(s)' (fem.)
b.	pás	pás**u**s	'step(s)' (masc.)
	gɾás	gɾás**u**s	'fat' (masc.)
c.	mos**u**	mos**u**s	'lad' (cf. fem. /mos[ə]/)
	monj**u**	monj**u**s	'monk/nun' (cf. fem. /monj[ə]/)

(Fabra, 1990; Wheeler, 1999; Hualde, 2002; Bonet et al., 2007)

❋ sibilant-final masc. N's show /u/ (≠epen. /ə/) before plural-/s/ (6-b)
  ➙ ghost V **avoids a marked structure** /*SibSib/

❋ other N's always show /u/ (6-c)
  ➙ same ghost V is **lexically determined**

1. Catalan Ghost segments: GSR Account

(6)   /-u$_\text{Ⓞ}$/ unrealized without further support: **0.5x**Dᴇᴘ-V $\gg$ **0.5x**Mᴀx-V

g$_1$ɔ$_1$t$_1$–u$_{0.5}$–s$_1$	Mᴀx-C 50	*SS 40	Fᴜʟʟ! 30	Dᴇᴘ-V 26	Mᴀx-V 20	Iɴᴛ-V 5	
☞ b. g$_1$ɔ$_1$t$_1$s$_1$					-0.5		-10
c. g$_1$o$_1$t$_1$u$_1$s$_1$				-0.5			-13

(7)   /-u$_\text{Ⓞ}$/ realized if markedness avoided: *ss +**0.5x**Mᴀx-V $\gg$ **0.5x**Dᴇᴘ-V

p$_1$a$_1$s$_1$–u$_{0.5}$–s$_1$	Mᴀx-C 50	*SS 40	Fᴜʟʟ! 30	Dᴇᴘ-V 26	Mᴀx-V 20	Iɴᴛ-V 5	
b. p$_1$a$_1$s$_1$s$_1$		-1			-0.5		-50
☞ c. p$_1$a$_1$s$_1$u$_1$s$_1$				-0.5			-13

(8)   /-u$_\text{Ⓞ}$/ realized if it can coalesce with another /−u$_\text{Ⓞ}$/

m$_1$o$_1$s$_1$u$_{0.5}^\text{a}$–u$_{0.5}^\text{b}$	Mᴀx-C 50	*SS 40	Fᴜʟʟ! 30	Dᴇᴘ-V 26	Mᴀx-V 20	Iɴᴛ-V 5	
a. m$_1$o$_1$s$_1$					-1		-20
☞ b. m$_1$o$_1$s$_1$u$_1^\text{a,b}$						-1	-5

2. Gradient Markedness: Nuuchahnulth

⁂ some suffix-initial C's only surface post-vocalically (Kim, 2003, 178)

(9) a. V__   ʔatɬa–(q)umɬ   ʔatɬa**q**qumɬ   'two dollars'
         C__   tɬ'is–(q)umɬ   tɬ'is**.s**umɬ   'sth. white and round'
    b. V__   ʔu–(k)ɬaː–siʃ Eun-Sook   ʔu**kk.ɬ**aːsiʃ   'My name is Eun-Sook'
         C__   kʷis–(k)ɬaː–k'uk–ʔiʃ   kʷisɬaːk'ukʔiʃ   'It seems like he has a different name'

⁂ a ghost C only surfaces if it does **not create a marked structure**:
  • Avoidance of a coda for /–C⌂V (9-a): *VC.**C**⌂V
  • Avoidance of a cluster for –C⌂CV (9-b): *VC**C**⌂.CV

But realization in (9-b) creates the marked structure (=Coda) that
non-realization in (9-a) avoids!

➜ a ranking paradox for OT emerges:
  *Coda ≫ Max⌂ for (9-a) but
  Max⌂ ≫ *Coda for (9-b)

2. Nuuchahnulth Ghost segments: GSR Account

(10)   /−$C_{\cap}$V/: $C_{\cap}$ not realized after a C (=$C_{\cap}$ forces C into coda position)

tɬ$_1$i$_1$s$_1$−q$_{0.5}$u$_1$	Max-S 20	Full! 12	*CC 10	*Coda 7	
a. tɬ$_1$i$_1$s$_1$.q$_{0.5}$u$_1$		-0.5	-1	**-1**	-30
☞ b. tɬ$_1$i$_1$.s$_1$u$_1$	-0.5		-1		-27

0.5x Full! + *Coda ≫ **0.5x**Max-S

(11)   /−$C_{\cap}$CV/: $C_{\cap}$ realized after a V (=$C_{\cap}$ is itself in coda position)

ʔ$_1$u$_1$−k$_{0.5}$ɬ$_1$aː$_1$	Max-S 20	Full! 12	*CC 10	*Coda 7	
☞ a. ʔ$_1$u$_1$k$_{0.5}$.ɬ$_1$aː$_1$		-0.5		**-0.5**	-9.5
b. ʔ$_1$u$_1$.ɬ$_1$aː$_1$	-0.5				-10

0.5x Max-S ≫ **0.5x**Full! + **0.5x***Coda

3. Different ghost segments within one language: Welsh

❋ some C's only surface before a vowel (12-a)

❋ definite marker alternates: /yr/ (__ V), /y/ (__ C), /'r/ (V__) (12-b)

(12)   a.   guda**g** eraill   'with others'
            guda gwên   'with a smile'

     b.   **yr** afon   'the river'   yr (=ər) __ V
            y llyfr   'the book'   y (=ə) __ C
            o**'r** afon   'from the river'
            o**'r** llyfr   'from the book'   /'r/ (=r) V__, overriding a.+b.

     c.   guda**'r** nod   'with the aim'   (*guda**g** **y** nod)

      (Hannahs and Tallerman, 2006)

❋ combination of both shows **different default states** for ghost C's:

- /**g**ₐ/ only realized if it does not avoid a hiatus (='appearing ghost')
- /**y**ₐ**r**ₐ/ only deleted if they create a hiatus/coda (='disappearing ghosts')

3. Welsh Ghost segments: GSR Account

❋ different realization thresholds:
- **$g_{0.2}$** is never realized unless it avoids a *Hɪᴀᴛ violation
- **$y_{0.6}r_{0.6}$** are always realized unless they create a *Hɪᴀᴛ/*Cᴏᴅᴀ violation

(13)

$g_1u_1d_1a_1$**$g_{0.2}$ $y_{0.6}r_{0.6}$** $C_1V_1\ldots$		RM 100	Mᴀx-S 10	Dᴇᴘ-S 10	*[CC 8	*Hɪᴀᴛ 7	*Cᴏᴅᴀ 5	
a.	$g_1u._1d_1a_1.$**$g_1y_1r_1$**$.C_1V_1$			-1.6			-1	-21
b.	$g_1u._1d_1a_1.$**y_1r_1**$.C_1V_1$		-0.2	-0.8		-1	-1	-22
☞ c.	$g_1u._1d_1a_1$**r_1**$.C_1V_1$		-0.8	-0.4			-1	-17
d.	$g_1u._1d_1a_1.$**g_1y_1**$.C_1V_1$		-0.6	-1.2				-18

❋ vs. (13-d): /$g_{0.2}$/ is never realized to avoid a *Cᴏᴅᴀ violation (0.8×Dᴇᴘ-S ≫ *Cᴏᴅᴀ)
❋ vs. (13-a): /$g_{0.2}$/'s default state is to not be realized (0.8×Dᴇᴘ-S ≫ 0.2×Mᴀx-S)

Discussion

Discussion

❋ the GSR assumption that segments differ in their underlying presence
  allows to account for the typology of ghost segments

❋ in contrast to accounts where weakness is autosegmental defectivity:
  (e.g. Spencer, 1986; Szypra, 1992; Tranel, 1995, 1996; Faust, 2013)
  - it predicts **gradient markedness** (cf. Nuu-chah-nulth)
  - it predicts **true gradience** (cf. Welsh)

❋ future research: Weakness in the output predicts **phonetic effects** that
  correlate with phonological weakness (=possible but not necessary!)

References

Archangeli, Diana (1984), Underspecification in Yawelmani Phonology and Morphology, PhD thesis, MIT.

Bonet, Eulàlia, Maria-Rosa Lloret and Joan Mascaró (2007), 'Allomorph selection and lexical preferences: Two case studies', *Lingua* **117**(6), 903–927.

Fabra, Pompeu (1990), *Gramàtica catalana*, Teide, Barcelona.

Faust, Noam (2013), 'Decomposing the feminine suffixes of Modern Hebrew', *Morphology* **23**, 409–440.

Faust, Noam and Paul Smolensky (2017), 'Activity as an alternative to autosegmental association', talk given at mfm 25, 27th May, 2017.

Hannahs, S. J. and Maggie Tallerman (2006), 'At the interface: selection of the Welsh definite article', *Linguistics* **44**, 781–816.

Hualde, José Ignacio (2002), *Catalan*, Routledge, New York.

Hyman, Larry (1985), *A theory of phonological weight*, Foris Publications, Dordrecht.

Kenstowicz, Michael and Jerzy Rubach (1987), 'The phonology of syllabic nuclei in Slovak', *Language* **63**, 463–497.

Kim, Eun-Sook (2003), Theoretical issues in Nuu-chah-nulth phonology and morphology (British Columbia), PhD thesis, University of British Columbia.

Legendre, Geraldine, Yoshiro Miyata and Paul Smolensky (1990), 'Harmonic grammar – a formal multi-level connectionist theory of linguistic well-formedness: Theoretical foundations', *Proceedings of the 12th annual conference of the cognitive science society* pp. 388–395.

Potts, Christopher, Joe Pater, Karen Jesney, Rajesh Bhatt and Michael Becker (2010), 'Harmonic grammar with linear programming: From linear systems to linguistic typology', *Phonology* pp. 77–117.

Rosen, Eric (2016), Predicting the unpredictable: Capturing the apparent semi-regularity of rendaku voicing in Japanese through Harmonic Grammar, *in* E.Clem, V.Dawson, A.Shen, A. H.Skilton, G.Bacon, A.Cheng and E. H.Maier, eds, 'Proceedings of BLS 42', Berkeley Linguistic Society, Berkeley, pp. 235–249.

Rubach, Jerzy (1986), 'Abstract vowels in three-dimensional phonology: The yers', *The Linguistic Review* **5**, 247–280.

Smolensky, Paul and Matthew Goldrick (2016), 'Gradient symbolic representations in grammar: The case of French liaison', Ms, Johns Hopkins University and Northwestern University, ROA 1286.

Spencer, Andrew (1986), 'A non-linear analysis of vowel-zero alternations in Polish', *Journal of Linguistics* **22**, 249–280.

Szypra, Jolanta (1992), 'Ghost segments in nonlinear phonology: Polish yers', *Langage* pp. 277–312.

Tranel, Bernard (1995), The representation of French final consonants and related issues, *in* J.Amastae, G.Goodall, M.Phinney and M.Montalbetti, eds, 'Contemporary Research in Romance Linguistics: Papers from the XXII Linguistic Symposium on Romance Languages'.

Tranel, Bernard (1996), Exceptionality in optimality theory and final consonants in French, *in* K.Zagona, ed., 'Grammatical Theory and Romance Languages: Selected papers from the 25th Linguistic Symposium on Romance Languages (LSRL XXV)', John Benjamins, Amsterdam, pp. 275–291.

Wheeler, Max (1999), *Catalan: a comprehensive grammar*, Routledge, London. Includes index.
URL: *http://swbplus.bsz-bw.de/bsz075012650inh.htm*

Yang, So-Young (2004), 'Latent segments in the English indefinite article', *Language and Information Society* pp. 68–83.

Yearley, Jennifer (1995), Jer vowels in Russian, *in* J.Beckman, L.Walsh Dickey and S.Urbanczyk, eds, 'Papers in Optimality Theory', GLSA Publications, Amherst, Mass., pp. 533–571.

Zimmermann, Eva (2017*a*), 'Being exceptional is being weak: tonal exceptions in San Miguel el Grande Mixtec', poster, presented at AMP 2017, New York, September 16, 2017.

Zimmermann, Eva (2017*b*), 'Gradient symbols and gradient markedness: a case study from Mixtec tones', talk, given at the 25th mfm, 27th May, 2017.

Zoll, Cheryl (1996), Parsing below the segment in a constraint-based framework, PhD thesis, UC Berkeley.

Eva.Zimmermann@uni-leipzig.de