The social meaning of phonology: A formal modeling of the creole continuum in Hawai'i Creole English

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Phonological variation is the key empirical phenomenon in (variationist) sociolinguistics. However, HPSG approaches to social meaning and/or register almost exclusively look at morphological and syntactic variation, and, in particular, do not handle phonologically-conditioned social meaning. In this paper, I will present the phonological variation found in Hawai'i Creole English. I will extend the proposal of Asadpour et al. (2022) to model this variation.

1 Hawai'i Creole English vowels

Hawai'i Creole English (HCE) is an English-based creole language which is generally considered the language of identification for local Hawaiians independently of their ethnic background (Roberts, 2004). With Standard American English (SAE) being the dominant language in the State of Hawai'i, HCE speakers can be considered (at least) bilingual. In spontaneous speech, there is a continuum in the use of SAE and HCE features (Odo, 1970), analogous to dialect continua. Odo identifies features that are distinct to HCE and proposes a compatibility hierarchy of HCE and SAE features. She investigates HCE possessive *get* vs. SAE *have got*, the HCE indefinite article *wan* vs. SAE *a*, and the HCE *be*-less progressive vs. the *be*-full progressive in SAE. She observes that the HCE indefinite article *wan* is compatible with all HCE features and the SAE possessive *have got*, but not with the use of progressive *be*. The HCE possessive *get*, on the other hand, is not compatible with any of Odo's SAE features.

An HCE/SAE continuum is found at all levels of the grammatical system of HCE users. While this continuum is generally acknowledged, Sakoda & Siegel (2008) characterize HCE, including its phonology, in terms of the traditional three-way distinction of *basilect*, *mesolect*, and *acrolect*, with the *basilect* being the most opposite pole from SAE in the HCE/SAE continuum. Instead of such distinct variety labels, Grama (2015) uses a *Pidgin Density Measure*, which is an adaptation of the *Dialect Density Measure* from Craig & Washington (2006). This is the ratio of occurrence of distinctive morpho-syntactic features of HCE in a speaker's production, based on 19 such features established in the literature on HCE. While this measure avoids an arbitrary labeling of varieties (with a potential stigmatization of its speakers by the mere choice of terminology), it ignores information on the compatibility of HCE and SAE features observed in Odo (1970).

In this paper, I will focus on phonological variation in the HCE/SAE continuum. Grama (2015) shows that phonological variation correlates with his morpho-syntactically defined Pidgin Density Measure. This indicates that the social meaning effect of phonology should be treated within the same model of social meaning as lexically and morpho-syntactically expressed social meaning. I will look at two phonological properties that involve vowels, as there are some empirical studies on HCE vowels, such as Sakoda & Siegel (2008), Grama (2015), Kritley et al. (2016). The chosen phenomena are similar to the features discussed in Odo (1970) in that there is an HCE-specific and an SAE-specific realization, and that some realizations can co-occur whereas others are not reported to co-occur in natural speech situations.

First, Sakoda & Siegel (2008, 222) mention that the contrast between the vowels [ɪ/i] and [ʊ/u] respectively is merged in what they call *basilect* HCE. This means that the words *fit* and *feet* are pronounced identically, and so are the words *look* and *Luke*. They state that the pronunciation is more tensed than SAE [ɪ/ʊ]. While [i/u] are said to be uttered less tensed than in SAE, they refer to the phenomenon as "raising" of high lax vowels and use [i/u] in transcribing *basilect* realizations of all high vowels. According to Sakoda & Siegel (2008), the merger of lax and tense high vowels is strongly marked as *basilect* HCE and avoided in the *mesolect*. Grama (2015) shows that, indeed, the frequency of the neutralization of the contrast between tense and lax high vowels positively correlates with the ratio of use of HCE-specific morpho-syntactic features.

Second, vowel reduction to schwa in unstressed syllables is absent in *basilect* HCE and optional in *mesolect* HCE. The absence of schwa has consequences for the overall phonological properties of HCE: non-stressed syllables receive secondary stress, and p/t/k aspiration can occur in syllables that are unstressed in SAE, i.e., the word *kitten* can be uttered as [ˈkʰiˌtʰen] (Sakoda & Siegel, 2008, 227).

Values of HCE-hood and SAE-hood

	no [ɪ/ʊ]	no [ə]	[i/u]	V red.
HCE	+	0	0	0
SAE	−	−	+	+

Register preferences of HCE-hood and SAE-hood

	basilect	mesolect	acrolect	Stand.E.
HCE	+ or 0	0	0 or −	0 or −
SAE	−	any	any	0 or +

Figure 1: HCE-hood and SAE-hood values to model the HCE/SAE continuum

I propose the following **encoding of the data:** Since we look at the HCE/SAE continuum, a form can be marked for HCE-hood or SAE-hood. There are three possible values: distinctive (+), compatible (0), and incompatible (−). For the two phonological phenomena, the values of these features are as in the left table in Fig. 1. The raising of lax high vowels is distinctive for HCE. The absence of schwa, the lax realization of high vowels, and vowel reduction are compatible with HCE. As for SAE-hood, the absence of lax high vowels and schwa is incompatible with SAE, whereas the presence of all those vowels is a distinctive property of SAE. These values lead to three constellations: (i) Raising of high vowels is marked as HCE+ and SAE−, (ii) the absence of schwa as HCE+ and SAE−, and (iii) the other two properties as HCE0 and SAE+.
With these feature combinations we can model what Sakoda & Siegel (2008) describe as *basilect* vs. *mesolect* HCE, as indicated in the right table in the figure. The *basilect* can be characterized as a variant that gives preference to non-SAE properties and to properties that are distinctive or at least compatible with HCE. Consequently, we tend to have no lax high vowels and no schwa in this variety. The *mesolect* avoids clearly HCE-distinctive features, but also HCE-incompatible ones. At the same time, it is compatible with any degree of SAE-hood. Therefore, the raising of [ɪ/ʊ] is avoided, but vowel reduction is optional. The limitations of the small set of phenomena looked at here does not require to consider *acrolect* and purely SAE realizations. These can, however, be modeled straightforwardly as indicted in the table: the *acrolect* allows for forms that are compatible as well as incompatible with HCE (but not for distinctive HCE forms). Finally, SAE would only allow for forms that are compatible with or distinctive for SAE-hood and disallows distinctive HCE forms.
The sketched characterization by degree of distinctiveness for the hypothetical endpoints of the HCE/SAE continuum not only avoids arbitrary (sub)variety labels, it also enables us to encode both the HCE-distinctive grammatical properties and the compatiblity of HCE and SAE features.[1]

2 Social meaning/register in HPSG

There are only a handful of papers in HPSG addressing issues of social meaning or register. We can put these in two groups. First, the pragmatic school treats social meaning/register as non-at-issue information that is conventionally associated with linguistic signs. Each sign with impact on the social meaning/register within a larger utterance contributes an independent non-at-issue content. The concrete contextual interpretation of this conventional meaning is conversational, based on the contributions made by the individual signs. This approach goes back to Green (1994), and has been adapted in some form or other in Paolillo (2000), Asadpour et al. (2022), and Sailer & Lamoure (2023).
The second school includes register information directly in the linguistic sign. This can be found in Wilcock (1999), Bender (2007), and Machicao y Priemer et al. (2022). In Wilcock (1999) and Bender (2007) this is done by unification of REGISTER values of all signs contained in an utterance. As a consequence, all register information contributed by the signs in an utterance must be compatible, as otherwise the utterance would be ungrammatical. Contrary to this, Machicao y Priemer et al. (2022) propose a complex REGISTER value with one attribute for each assumed register. Each register attribute expresses the likelihood of a sign to belong to that register. Instead of unifying register values, each complex sign may change the register values. While this is more flexible than the other register approaches, it presupposes knowledge of which registers are under investigation. Nonetheless, one might exploit the complex register values to model continua.
What is common to all HPSG approaches is that they link social meaning/register to the entire sign and do not have any means to link individual phonological realizations to social meaning/register. Only Bender (2007) addresses the issue of the sociolinguistic relevance of phonology. Bender (2007, 366–367) sketches a sign-based analysis of t/d-deletion in English. Following Kemmer & Israel (1994), she assumes that each relevant word has two phonological representation, each associated with the appropriate social meaning.

[1] Our vowel data do not require three values. However, modeling the compatibility hierarchy of Odo (1970) does.

Such an exemplar-based approach might face the following problems: First, the rule-like character of the phenomenon might be missed, i.e., if we have lexical doublets with a d/t-full variant with social marking *A* and a d/t-less variant with marking *B*, why do we not find a d/t-full variant with social marking *B*? Second, the same deletion process applies to new or nonce words. Third, the number of lexical versions of a word would multiply with the number of socially relevant processes that may apply to it.
I will base my analysis on the model introduced in Asadpour et al. (2022). This has two reasons: First, collecting social meaning information on each instance of a HCE or SAE specific property will allow for a calculation of some quantitative measure such as the Pidgin Density Measure or individual Labov-style variables at the level of the utterance or text. Second, in their modelling of different varieties, Asadpour et al. use marking that a form is compatible or incompatible with a given variety. Therefore, this is relatively close to the description of the HCE/SAE continuum at the end of Section 1.

3 Phonology in HPSG

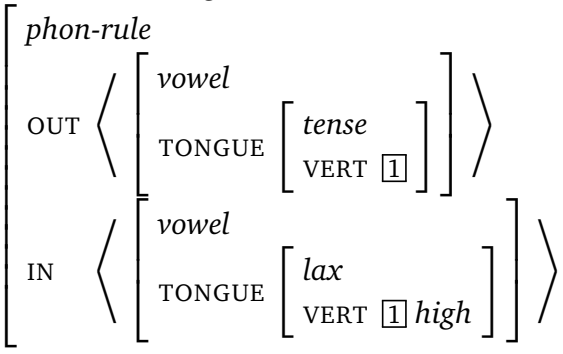
Bird & Klein (1994) and Höhle (2019) are the most prominent approaches to (segmental) phonology in HPSG. I will use the structure in Höhle (2019).
I assume that both phenomena considered here, (non-)raising of high vowels and (non-)reduction of vowels to schwa, can be treated as post-lexical phonological processes, i.e., as processes that apply to segments within full utterance strings.[2] Höhle (2019) assumes that the phonological representation of a sign contains a list of phonological segments, its S(EGMENTAL)-STRING feature. Utterances are modelled as signs of a particular subtype, *unembedded-sign*. He defines a feature UTT(ERANCE) on unembedded signs, with a feature S-STRING in its value. Post-lexical phonological processes are encoded as (non-trivial) mappings between the PHON|S-STRING and the UTT|S-STRING values. This mapping can have the following effects: (i) an articulatory property of a phoneme that is left underspecified in the characterization of the phoneme can be constrained to have a certain value (for example aspiration in the case of a plosive), (ii) a phoneme can be exchanged by another one (in Höhle's analysis of Russian final devoicing), (iii) segments can be added and probably removed.
Technically, the mapping could be incorporated into some functional constraint that takes the PHON|S-STRING and the UTT|S-STRING as its arguments. But such an implicit encoding would leave no way to attach social meaning to phonological processes themselves. We could only assign social meaning to the output, but with the PHON|S-STRING and the UTT|S-STRING potentially having a different number of segments, it is not trivial to identify which underlying segment is related to which surface segment. However, this information is important for the phenomena at hand: while the mere occurrence of a schwa might be indicative of SAE, the absence of a schwa where it would be expected is equally socially meaningful. Similarly, a raised high vowel only caries social meaning when it is the realization of an underlying lax vowel.

4 Modelling within a pragmatic approach to social meaning

The formalization of the phonological variation faces two interconnected challenges: First, the underlying representation and the surface realization should be connectable at the level of the utterance. Second, social meaning inferences should be attached to the relevant pairings, such as the pairing of an underlying lax vowel with a surface raised one, or an underlying unstressed vowel with a surface schwa.
While the **first challenge** is not at the heart of my concerns, I will present one possibility for the sake of concreteness. First, I propose objects of type *phon(ological)-rule* that express a version of traditional phonological rules. However, instead of using a format like "Input ↦ Output / Context," I will relate an input string with an output string, i.e., there are just two features on each *phon-rule* object, IN and OUT, but these features are list valued. Some phonological rules relevant here are given in Fig. 2. First, the "raising" of high vowels is encoded in Höhle's feature geometry as a change of the TONGUE value from *lax* to *tense*. Second, the vowel reduction rule just maps any input vowel to a central, mid lax vowel (aka schwa).
Second, I add a feature PHON-RULE-INSTANTIATIONS (PR-INST) to Höhle's UTT value on unembedded signs. The value of this feature is a list of *phon-rule* objects. These *phon-rule* objects are the phonological rules that govern the relation between the s-string and the p-string. In order for the list to be complete but not redundant, I impose the following constraint on the elements of the PR-INST value of an unembedded sign.

[2] Not too much hinges on this assumption, though. However, as I will attach social meaning to this mapping, it cannot happen merely at the level of the physical interpretation of an utterance's phonological representation, i.e., at Höhle's function Φ, because this function is outside the domain of an HPSG grammar.

a. Raising of lax vowels



b. Vowel reduction to schwa

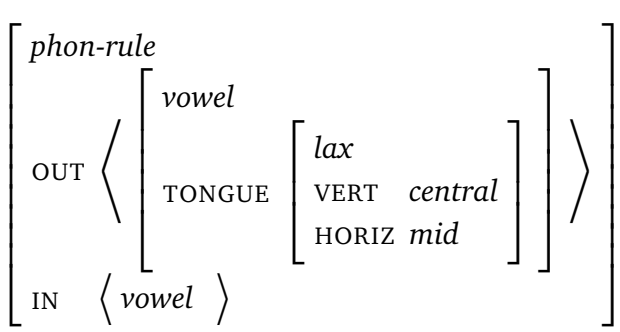


Figure 2: Example phonological rules

Constraints (i) and (ii) relate the elements of the PHON|S-STRING and the UTT|S-STRING to the phonological rules. Constraints (iii) and (iv) guarantee that all elements on the PR-INST list actually play a role in the mapping between the underlying and the surface representation.

(i) Each segment *s* on the PHON|S-STRING must occur in an IN value of an element on the PR-INST list.

(ii) Each segment *s* on the UTT|S-STRING must occur in an OUT value of an element on the PR-INST list.

(iii) Each segment on an IN value of a *phon-rule* object on the PR-INST list must either be on the PHON|S-STRING or on an OUT value of another *phon-rule* object.

(iv) Each segment on an OUT value of a *phon-rule* object on the PR-INST list must either be on the UTT|S-STRING or on an IN value of another *phon-rule* object.

The phonological rule for vowel reduction in Fig. 2-b is very general. It needs to be restricted to unstressed syllables. The UTT value contains information on the syllables as well, in its HIERARCHY|SYLLABLES value (Höhle, 2019, 572). A syllable is marked for its stress status and indicates which segments of the PHON|S-STRING it comprises. Simplifying SAE vowel reduction, we will say that whenever a vowel segment occurs as a segment in an unstressed syllable, we may have a vowel reduction *phon-rule* object on the PR-INST list with that vowel as only element of the IN value.

We can now turn to the **second challenge**. The PR-INST list provides us with the necessary information to express our social meaning constraints. The social meaning inferences of Asadpour et al. (2022) take the form of statements on mutual belief of the conversation partners about what is commonly believed within a relevant (not necessarily real) speech community about the appropriateness of a particular form within a particular register. For conciseness sake, I will only depict these final "register assessments." They are expressed in objects that come in various subsort of *approp(riateness)-mark(ing)*: *pos(itive)-mark(ing)* and *anti-mark(ing)* for a particular register. To model the marking from Fig. 1, I introduce a third sort, *neutr(al)-mark(ing)*. These *approp-mark* objects have two attributes, C(OMMUNICATIVE)-SIT(UATION) and UTT(ERANCE). The C-SIT value specifies the speech occasion or communicative situation for which the appropriateness statement holds, as elaborated in Wiese (2023) and also used in Sailer & Lamoure (2023). Here, I will assume the possible values *hce* (for communicative situations in which HCE is appropriate) and *sae* (for analogous SAE situations). These values together with the subsort of *approp-mark* express exactly the feature possibilities that I introduces in Section 1, i.e., HCE+ corresponds to a *pos-mark* object with C-SIT value *hce*.

The UTT value of an *approp-mark* object is the part of the sign that triggers the social meaning inference. I will exemplify this with the social meaning effect of the raising of high vowels, see (1), and the absence of schwa in reduced syllables, see (2). The constraint in (1) says that for each application of the raising rule in Fig. 2, a positive marking inference for SAE-hood and an anti-marking inference for HCE-hood will be added to the background (BGR) inferences.

(1) For each *phon-rule* object 1 on the PR-INST list that is an instance of a lax vowel raising rule, the BGR list contains: $\begin{bmatrix} \textit{pos-mark} \\ \text{C-SIT } \textit{sae} \\ \text{UTT } \boxed{1} \end{bmatrix}$ and $\begin{bmatrix} \textit{anti-mark} \\ \text{C-SIT } \textit{hce} \\ \text{UTT } \boxed{1} \end{bmatrix}$.

The constraint in (2) models the effect of the absence of a change, i.e., a non-reduction of an underlying vowel. Here, the non-reduced vowel is the UTT value of the *approp-mark* objects.

(2) For each occurrence of a segment $\boxed{1}$ in a non-stressed syllable on the UTT|HIERARCHY|SYLL value of the form $\left[\begin{array}{l} \textit{vowel} \\ \\ \text{TONGUE} \neg \left[\begin{array}{ll} \textit{lax} & \\ \text{VERT} & \textit{central} \\ \text{HORIZ} & \textit{mid} \end{array}\right] \end{array}\right]$, the BGR list contains: $\left[\begin{array}{l} \textit{neutr-mark} \\ \text{SOA } \textit{hce} \\ \text{UTT } \boxed{1} \end{array}\right]$ and $\left[\begin{array}{l} \textit{anti-mark} \\ \text{SOA } \textit{sae} \\ \text{UTT } \boxed{1} \end{array}\right]$

With these constraints we get the markings for HCE-hood and SAE-hood as specified in the left hand table in Fig. 1. It is important that in our multi-variant grammar, any cooccurrence of HCE or SAE forms is possible, but enforces the indicated HCE/SAE-hood inferences.

It is the strength of the present approach that the linguistic form determines the number of social meaning inferences, but does not provide us with a fixed indication of a particular register. Instead, the concrete speech situation will determine how exactly these inferences will be conversationally interpreted. For example, with HCE being a marking of a local Hawaiian identity, local Hawaiians my interpret even a small percentage of HCE+ inferences as inappropriate if a speaker is not assumed to be local Hawaiian themself. Similarly, in formal settings (or in TV shows that address a non-local Hawaiian audience such as *Hawaii Five-O*), even a small number of such inferences might be interpreted as strongly HCE. Inversely, in an informal, local Hawaiian communicative situation with local Hawaiian conversation partners, even a small number of HCE− inferences might be perceived as odd. This modelling is in line with third-wave sociolinguistics (Eckert, 2012): The concrete situational interpretation is not conventionally associated with the linguistic form but conversationally constructed. However, the HCE-hood or SAE-hood of a pronunciation (or of lexical or grammatical choices) is part of the conventionalized linguistics knowledge of a language user.

5 Conclusion

I have shown how the social meaning of phonological variation can be integrated into an overall model of social meaning in a formal constraint-based grammar framework. This result is particularly important because: (i) Sound variation is the most salient object of study in sociolinguistics. Not being able to model it in a formal framework makes it impossible to connect that framework to sociolinguistic research. (ii) Since we find socially meaningful variation at all levels of linguistic description, we cannot adequately describe social meaning without being able to express all of its facets within a single unifying framework. (iii) The description of variation continua as attested for dialects, creole continua, and possibly other types of contact situations calls for a framework that goes beyond one-dimensional categorical ordering of named varieties (such as *basilect, mesolect, acrolect*). The present proposal captures accounts for the gradient nature of variety continua by modelling the linguistic competence of a language user and provides a clear output for a situation-dependent interpretation. (iv) Since such contact continua are prominent in natural data of under-resourced languages, the present framework can prospectively help with the integration and annotation of natural, non-puristic data and, as such, facilitate the creation of resources without having to give up on standards of documenting the linguistic phenomena specific to the targeted under-resourced language.

References ♦ Asadpour, Hiwa et al. 2022. Non-*wh* relatives in English and Kurdish. In St. Müller & E. Winckel (eds.), *Proceedings of HPSG22*, 6–26. Frankfurt/Main: University Library. ♦ Bender, Emily M. 2007. Socially meaningful syntactic variation in sign-based grammar. *ELL* 2(11). 347–381. ♦ Bird, Steven & Ewan Klein. 1994. Phonological analysis in typed feature systems. *Computational Linguistics* 20(3). 455–491. ♦ Craig, Holly K. & Julie A. Washington. 2006. *Malik goes to school: Examining the language skills of African American students from preschool-5th grade*. Mahwah, New Jersey: Lawrence Erlbaum Associates. ♦ Eckert, Penelope. 2012. Three waves of variation study: The emergence of meaning in the study of variation. *Annual Review of Anthropology* 41. 87–100. ♦ Grama, James M. 2015. *Variation and change in Hawai'i Creole vowels*: University of Hawai'i at Mānoa dissertation. ♦ Green, Georgia M. 1994. The structure of CONTEXT. *Studies in the Linguistic Sciences* 24(1/2). 215–232. ♦ Höhle, Tilman N. 2019. An architecture for phonology. In St. Müller et al. (ed.), *Beiträge zur deutschen Grammatik. Gesammelte Schriften von Tilman N. Höhle*, 571–607. Berlin: LSP 2nd edn. Originally published 1998. ♦ Kemmer, Suzanne & Michal Israel. 1994. Variation and the usage-based model. *Chicago Linguistic Society* 30. 165–179. ♦ Kritley, M. Joelle et al. 2016. An acoustic analysis of the vowels of Hawai'i English. *Journal of the International Phonetic Association* 1–19. doi:

10.1017/S0025100315000456. ♦ Odo, Carol. 1970. English patterns in Hawaii. *American Speech* 45(3/4). 234–239. ♦ Paolillo, J. C. 2000. Formalizing formality: An analysis of register variation in Sinhala. *Journal of Linguistics* 36(2). 215–259. ♦ Machicao y Priemer, Antonio et al. 2022. Towards a treatment of register phenomena in HPSG. In St. Müller & E. Winckel (eds.), *Proceedings of HPSG29*, 86–101. Frankfurt/Main: University Library. doi: 10.21248/hpsg.2022.5. ♦ Roberts, Sarah. 2004. The role of style and identity in the development of Hawaiian Creole. In Geneviève Escure & Armin Schwegler (eds.), *Creoles, contact, and language change: Linguistic and social implications*, 331–350. Amsterdam: John Benjamins. ♦ Sailer, Manfred & Nicolas Lamoure. 2023. Superlative *ever* in Dutch, French, German, and Spanish. In St. Müller & E. Winckel (eds.), *Proceedings of HPSG30*, 80–100. Frankfurt/Main: University Library. doi: 10.21248/hpsg.2023.5. ♦ Sakoda, Kent & Jeff Siegel. 2008. Hawaii Creole: Phonology. In K. Burridge & B. Kortmann (eds.), *Varieties of English 3: The Pacific and Australasia*, 210–233. Berlin and New York: Mouton de Gruyter. ♦ Wiese, Heike. 2023. *Grammatical systems without language borders: Lessons from free-range language*. Berlin: LSP. ♦ Wilcock, Graham. 1999. Lexicalization of context. In G. Webelhuth et al (ed.), *Lexical and constructional aspects of linguistic explanation*, 373–387. CSLI.