

Homework #3: Phonological Variation in Hiroshima Japanese

Due in class Thursday, February 3

1. The facts

The Hiroshima Japanese problem you already did (based on research by Kawahara and Hara) involved two idealizations.

- First, as Kawahara and Hara note, hiatus resolution is in fact *optional*. It is always an option to utter the faithful candidate, as in /sore-o/ → [soreo].
- Second, the apparent *lexical exceptions* were left out. The list of exceptions given by Kawahara and Hara in footnotes are given below. These exceptions involve alternative ways of resolving hiatus.

| | <i>Stem</i> | <i>Accusative</i> | <i>gloss</i> | |
|----|--------------|-------------------|----------------|--------------------------------|
| 1. | [sore] | [soree] | ‘that’ | (not *sorjoo) |
| 2. | [are] | [aree] | ‘that’ | (similarly) |
| 3. | [sake] | [sakee] | ‘sake’ | (similarly) |
| 4. | [hanaʃi] | [hanaʃii] | ‘conversation’ | (not *hanaʃuu) |
| 5. | [sarabakari] | [sarabakariii] | ‘libra’ | (not *sarabakarjuu) |
| 6. | [ʃooʒi] | [ʃooʒii] | ‘shooji’ | (similarly) |
| 7. | [terebi] | [terebii] | ‘TV’ | (similarly) |
| 8. | [matsuri] | [matsurjoo] | ‘festival’ | (yet a third outcome for /iu/) |

For purposes of this assignment, let us suppose that the “Law of Frequency Matching” (class lectures, Zuraw readings) holds good here, and thus that were Hiroshima speakers to be tested on novel forms, they would respond with frequencies matching what is in the lexicon and the speech community as a whole. So, the ultimate goal of this exercise is to propose a grammar describing the behavior of Hiroshima speakers in this hypothetical experiment. In other words: create a frequency-matching grammar.

For this purpose, I have **concocted** some frequencies, justified (I hope) by the purpose of pedagogy. Specifically, I counted the regular examples in the Kawahara/Hara paper, multiplied by the arbitrary value of four, and split this number evenly between the outputs seen in the previous homework and the faithful outputs. I also counted the number of irregular examples. This yielded the pseudofrequencies given below.

| | | |
|-----|-----|----|
| e-o | joo | 14 |
| | oo | |
| | eo | 14 |
| | ee | 3 |
| i-o | juu | |
| | juu | 16 |
| | joo | 1 |
| | io | 16 |
| | uu | |
| | oo | |
| a-o | ii | 2 |
| | ee | |
| | aa | 36 |
| | ao | 36 |
| u-o | oo | |
| | woo | |
| | uu | 14 |
| | uo | 14 |
| | woo | |
| o-o | oo | 12 |

To keep things simple, I've left out the candidates with /ʃ/ in the input.

2. Problem directions

2.1 Part I: scrutiny of your old analysis

Take the grammar you used for the previous homework. If necessary, fix it up a bit (that is, make sure all the constraints are intelligible to me and that you're using features in standard ways). Verify that after any changes you make, your grammar still works for the non-stochastic data of the last problem.

Next, replace the one-winner learning data with the quantitative pseudo-data given above. Create two new grammars, as follows. First, run the Gradual Learning Algorithm to create a grammar in Stochastic OT, then run the maxent option to create a maxent grammar. These algorithms are available in OTSoft 2.3.1.

Details of running the algorithms: I recommend about 500,000 learning trials, with plasticity ranging from 2 to .001 (fill in these values on the interface).

Next, evaluate the performance of these two new grammars in two different ways:

i. *Statistics*. Using Excel or other software, produce some sensible quantitative measure of how well your grammar fits the data. You can use correlation, summed error, summed percentage error, or whatever you like. Report what you find for both the GLA and the maxent versions of your grammar. If you're stuck on how to do this, get help from me. Note that

OTSoft produces a little file called “FileNameTabbedOutput.txt”; this would be the most convenient file for Excel use.

Excel hints: be sure to replace blanks with 0 first if you are computing a correlation; else they are treated as missing values. The Excel function for correlation is CORREL(); you fill in the two ranges of cells you’re correlating. Correlations scores range from zero (randomness) to one (perfect fit).

ii. *Qualitative assessment.* Discuss any serious errors (for example, failure to generate a candidate that has a positive observed frequency, or assigning a large predicted value to an unattested candidate). Try to diagnose the errors; this may turn out to be quite difficult, but give it a try. (Example diagnosis: if attested harmonically bounded candidates win, stochastic OT will necessarily err in predicting zero frequency.)

iii. Note and comment on any differences between the GLA and Maxent grammars based on your constraints.

2.2 Part II: changing the analysis

Unless your constraint produced excellent performance at the start,¹¹ improve it by changing or adding constraints. Sample strategy: if a candidate is winning too often, try finding a plausible constraint that specifically penalizes it. Report your improved grammar, how well it did (use the same statistic you used before), and discuss why the grammar got better. Where there are differences between GLA and Maxent, comment and try to diagnose.

¹¹ My guess is that this is unlikely. For instance, both my own grammar and the Kawahara/Hara grammars did poorly when extended to the variation data, and required supplementary constraints to get a reasonable fit.