The Impacts of Bilingual Production Monitoring on Non-Dominant Language Lexica

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Abstract

In 1785, James Hutton proposed that we can (and should) account for historical change only using forces we see at work in the present time. Hutton's proposal was addressed to geology, but later Darwin applied the same reasoning to give a gradualist account of biology. This gradualism, applied to language, seeks explanations of language change in everyday processes of language interpretation, internalisation and production.

In this talk, we use a model of bilingual lexical selection (see [1]). This model combines Grosjean's account of bilingual lexical selection in terms of language activation and mode with the use of a language monitor to ensure that only within-language terms are expressed. The key finding concerns vocabulary items shared between a bilingual's languages, items we call *doppels* (in the psycholinguistic literature these are called *cognates* confusing them with the overlapping category of the same name in historical linguistics). We find that speakers in bilingual mode, but engaging strong monitoring, avoid doppels in comparison to monolinguals speaking the same language.

Arnal [2] describes an avoidance of doppels in Catalan by native speakers of Spanish who learn the language as adults. These non-dominant speakers of Catalan revive archaic terms for, e.g. bustía (not buzón) for 'letter-box', in place of forms identical. Arnal suggests that the lexicon is more consciously accessible than other aspects of language structure, making it an easy prop for maintaining the distinction between the bilinguals' two languages. We suggest this is implemented via the language monitor, and that the conscious accessibility of the lexicon correlates highly with our ability to monitor for the language-appropriateness of word forms. Arnal notes that the large proportion of learner-speakers of Catalan (upto 40% of the language community) means that peculiarities in bilingual speech can become the linguistic norms for the language.

The Model

Mathematically, our model takes the form of an assessment of the probability $P(f|s,t;b,m)$ of using a form f while trying to express semantics s in a target language t. The other two parameters are the language mode b expressing how much activation is shared between the target and non-target languages, and m the effort expended in monitoring lexical selections to ensure they come from the target language. As shown in (1), this probability is derived from two values: the activation $P_{Assoc}(f|s,t;b)$ from associative memory alone, which reflects form distribution in past experience and the impact of priming, along with $P_{Mon}(l|f,s,t;b,m)$ which is the probability assigned by the monitor that this form should be ascribed to language l. When monitoring for our target language, we are of course only interested in the probability that the form originates in our target language. k, here as elsewhere, is a normalising constant, depending on the subscripted parameters.

$$P(f|s,t;b,m) = k_{s,t;b,m} P_{Mon}(t|f,s,t;m) P_{Assoc}(f|s,t;b) \quad (1)$$

The definitions for P_{Mon} and P_{Assoc} are given in (3) and (2) respectively. In (2) $F(f,s,l)$ is the raw frequency with which the speaker has encountered f to express semantics s in language context l, L is the set of languages the bilingual speaks, and δ is the Kronecker delta ($\delta^l_t = 1$ if $l = t$, and 0 otherwise).

$$P_{Assoc}(f|s,t;b) = \sum_{l \in L} \left(\frac{b}{|L|} + (1-b)\delta^l_t \right) \frac{F(f,s,l)}{\sum_{s,l} F(f,s,l)} \quad (2)$$

We assume that the monitor implements Bayesian reasoning, with a flat prior over the languages they might be speaking. In (3), the strength m of monitoring acts as a linear coefficient combining an agnostic distribution with the Bayesian estimation of the source language responsible for the meaning-form pairing.

$$P_{Mon}(l|f,s,t;m) = \frac{1-m}{|L|} + m k_{s,f} P_{Assoc}(f|s,l;0.0) \quad (3)$$

This model is given strong support over a 2-monolinguals-in-one-head model in the results of a bilingual lexical selection task (Bayes' Factor $> 10^6$).

In the following sections, we consider the predictions of the model for four different scenarios. We assume that speakers of a non-dominant language will perforce always be in bilingual mode to some extent. In what follows, we consider the impact of the bilinguals level of L2 frequency on their lexical selection, and - if there are enough of these bilinguals in the language community - their impact on the language at large.

Lexical Gaps - Non-Maximal Monitoring

At the lowest level of proficiency, non-dominant speakersoften find themselves lacking a form in their L2 for the semantics they wish to express. As they are in bilingual mode, the corresponding word-form in their L1 is activated. What is realised depends on their level of monitoring. At anything less than maximum monitoring effort, the form from the bilinguals' L1 (if there is only one activated) is selected. If more than one L1 available for this meaning, then the most activated is selected.

With non-maximal monitoring, we predict that large numbers of non-dominant speakersat low levels of proficiency are likely to introduce nonce-loans or borrings from their L1 into their L2. Figure 1, blue line shows how the rate of intrusions responds to synset size.

Lexical Gaps - Maximal Monitoring

Maximal monitoring is likely to occur when the non-dominant speakerand their interlocutors do not share their L1. This maybe because social dynamics strongly encourage asymmetric acqusition, or because the speakers are interacting in their L2 with bilinguals with a range of dominant languages.

At maximum monitoring effort, all forms from the non-target language are blocked, and consequently the speaker must resort to circumlocutions or other devices - other than their L1 - to express their meaning. With this level of monitoring, and large numbers of non-dominant speakers, we expect many forms in the richer target language to be replaced by compositional periphrastic constructions.

Doppel Synonyms

Strong monitoring has a very different effect in non-dominant speakerswhen they are selecting between a number of synonyms for a particular situation, and one of the options is a doppel. Assuming that their frequencies are similar, the model predicts (and the effect has been seen directly in experiment) that bilinguals will avoid the shared vocabulary item in favour of one which is distinctive to the target language.

Over time, with enough non-dominant speakerswho are this proficient, the target language can expect to see a differential loss in frequency of shared forms and increase in frequency of distinctive forms within synsets. Over generations, this is likely to lead to a relatively rapid divergence in lexical forms between the two languages.

Even between unrelated languages, we may see this effect. If there is a mix of proficiency levels among the non-dominant speakers, then low-proficiency speakers with lexical gaps may introducing borrowings into their *L* discourse. Monitoring among strong speakers may result on these forms being filtered, so that even if often exposed to them, they do not use these forms frequently themselves (compare red and green lines in Figure 1).

Conclusion

In summary, based on our model, we see two very different effects of non-dominant speakerson a language, depending on their level of proficiency. If the non-dominant speakersare weak in their second language, then we expect many borrowings into the target language or periphrastic expressions introduced into it. In contrast, if they are strong speakers, and command polyvalent synsets for many meanings, we expect a loss of doppels (shared lexical forms) between the two languages.

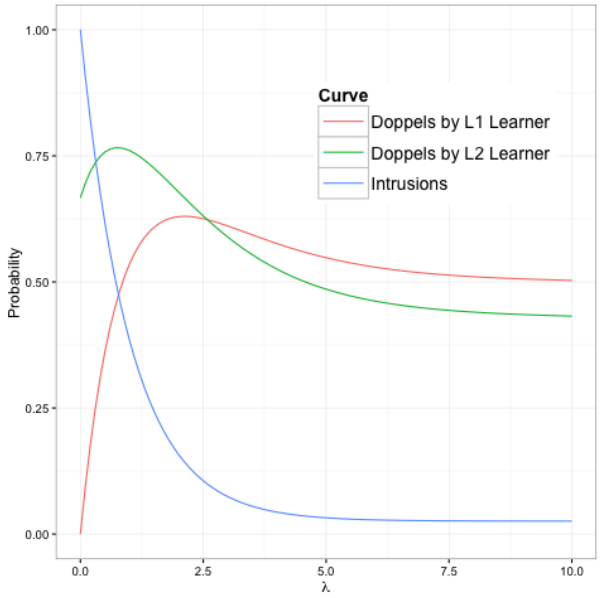

Figure 1. The x-axis shows the parameter λ defining a Poisson distribution over synset size. The blue curve shows the expected proportion of intrusions for a given distribution of synset size - as λ increases, there are fewer empty synsets, and so fewer intrusions from the dominant language. The green curve shows the frequency of use of doppels (which may be lucky intrusions) from the dominant language into the non-dominant language, in contrast to their expected rate of use by first-language acquirers with a similar distribution of synset size (red). The bilingual simulations assumed a language mode of 0.667 and monitoring effort at 90%; synsets had Zipf distribution; doppels were assumed to be the most frequent elements of their synsets.

References

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