Product- and source-oriented generalization over the (artificial) lexicon

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Aim of the present project:
Faced with an artificial lexicon, what is the shape of the grammar that learners extract?

Source-oriented or product-oriented generalizations?

Source-oriented generalizations define a mapping between a class of inputs and a class of outputs.
e.g., k# → tʃi# to form the plural from a singular

Product-oriented generalizations state what the outputs should be like.
e.g., plurals must end in tʃi

This poster:
- A method for distinguishing between (various kinds of) source-oriented and product-oriented generalizations.
- A learning task that should favor source-oriented generalizations.
- A typology of product-oriented generalizations and evidence against 2/3 types.

Models:

Source-oriented I: Maximally specific rules (Hale and Reiss 2008, Plag 2003)
The learners extract maximally specific rules, which reproduce the language perfectly.

Source-oriented II: Rules weighted by reliability (Albright and Hayes 2003)
Extract rules, weight them based on reliability.
Reliability – number of inputs to which the rule applies divided by the number of inputs to which the rule would apply if it had no exceptions

Product-oriented I: Simple positive (Bybee 2001)
Extract product-oriented schemas like 'plurals must end in {tʃ; dʒ}i'
Weight by ***type frequency*** – number of plurals supporting the schema

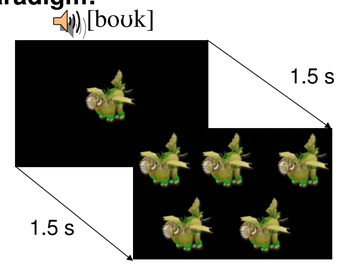
Product-oriented II: Simple negative
Extract product-oriented schemas like 'plurals cannot end in ki'
Decrease preference for the underobserved plurals whenever they are expected but not observed.

Product-oriented III: Conditional (Aslin et al. 1998)
Extract schemas like 'if the plural ends in –i, then the preceding consonant must be {tʃ; dʒ}'
Weight by reliability – number of plurals obeying the schema divided by the number of plurals meeting the if-clause

The languages:

	Language I		Language II
{k;g} → {tʃ; dʒ}i		30	
{p;t;b;d} → {p;t;b;d}i	8		24
{p;t;b;d} → {p;t;b;d}a	24		8

Paradigm:



Training: [boʊtʃi]
Learner says: [bouk boʊtʃi], clicks to continue

Testing:
Learner says [boʊtʃi], [bouki] or [bouka]

{tʃ; dʒ} → ?

Maximally Specific Source-oriented: -i and –a equally likely
no applicable rule acquired ✗

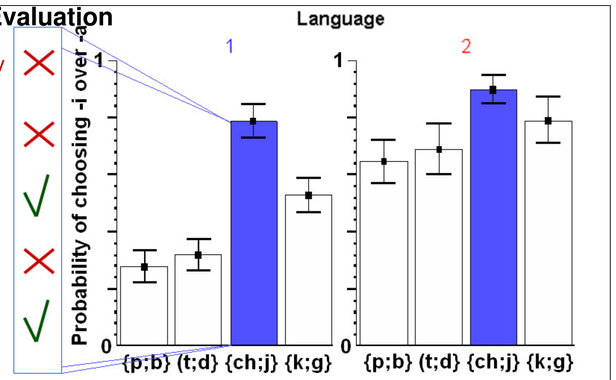
Reliability-weighted Source-oriented: -a in Lg 1, -i in Lg 2
due to 'just add –i' vs. 'just add –a' ✗

Simple Positive Product-oriented: -i regardless of Lg
due to 'plurals must end in {tʃ; dʒ}i' ✓

Simple Negative Product-oriented: -i, especially in Lg 1
due to -tʃa being expected but not observed ✗

Conditional Product-oriented: -i regardless of language
due to 'if the last C is {tʃ; dʒ}, the final V must be –i' ✓

Evaluation



What is predictive of {tʃ; dʒ} → {tʃ; dʒ} i?

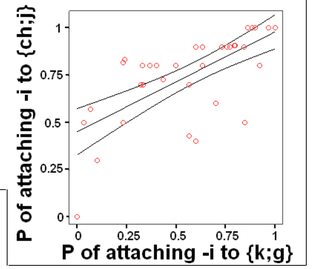
Final consonant of the singular

Simple Positive Product-oriented: how many outputs ending in {tʃ; dʒ}i the subject produced ✗ (r=-.02)

Rather, rate of attaching –i to {tʃ;dʒ} predicted only by rate of attaching –i to {k;g} r=.61, p<.001

- {tʃ;dʒ} are categorized with {k;g}: '{k;g;tʃ;dʒ} take / correspond to plurals ending in –i' or 'if the last C is {tʃ;dʒ;k;g}, the final V must be –i'
- But a bias against stem changes makes -i easier to attach to {tʃ;dʒ}.

With these assumptions, **Reliability-weighted Source-oriented** **Conditional Product-oriented** ✓



Productivity of {k;g} → {tʃ; dʒ} before -i

Maximally Specific Source-oriented I: Language 1 = Language 2 ✗
Triggered by {k;g} → {tʃ; dʒ}i, which is supported by the same number of words in both languages

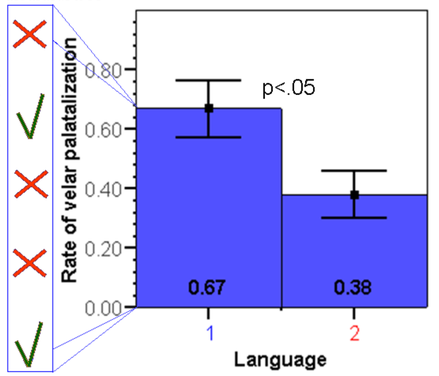
Reliability-weighted Source-oriented II: Language 1 > Language 2 ✓
Triggered when {k;g} → {tʃ; dʒ}i outcompetes 'just add –i'. more reliable in Language 2 than in Language 1.

Simple Positive Product-oriented: Language 1 = Language 2 ✗
Triggered by 'plurals must end in {tʃ; dʒ}i', which is supported by the same number of words in both languages.

Simple Negative Product-oriented: Language 1 < Language 2 ✗
Triggered by 'plurals cannot end in {k;g}i'. There are more Ci plurals in Language II thus {k;g}i is unexpectedly absent more often in Language 2

Conditional Product-oriented: Language 1 > Language 2 ✓
Triggered by 'if the plural ends in –i, the preceding C must be {tʃ; dʒ}', which is more reliable in Language 1.

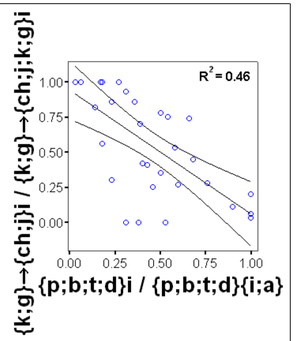
Evaluation



Reliability-weighted Source-oriented, Conditional Product-oriented:
velar palatalization is favored if 'just add –i' is inferred to be unreliable / -i mostly follows alveopalatals in a subject's productions. ✓

Thus a subject's tendency to change {k;g} into {tʃ;dʒ} before –i should be inversely related to his/her tendency to add –i to {p;b;d;t}.

This negative correlation in fact explains all the variance in rate of velar palatalization attributable to Language (ANCOVA).



Conclusion:

Conditional product-oriented generalizations ✓ **Reliability-weighted rules**

Simple product-oriented ✗ **Maximally specific rules**

Future directions: Would examples of tʃ→tʃi disfavor velar palatalization (because they exemplify 'just add –i') or favor it (because they exemplify 'if the plural ends in –i, the preceding consonant must be tʃ')?. Would changing the training task change the shape of the resulting grammar depending on: 1) whether the learners are asked to learn words or how to form plurals from singulars, 2) whether all plural wordforms can be memorized, and 3) whether learners experience singular-plural pairs or words in sentences. Are alveopalatals categorized with velars because of phonetic factors or being allophones in the artificial language?