A processing model of the strong and weak island distinction

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CUNY Conference, Stanford University
March 24-26, 2011

Strong and weak islands...

This work demonstrates that varying difficulties in activation and interference explain strong and weak islands, confirming previously argued processing accounts [7].

Strong islands, like complex noun phrases (CNPs), do not permit extraction [10,12,6]:

What do you really need to find someone you can intimidate with?

Weak islands, like wh-islands (WHIs), permit some extraction [10,12,5]:

Which employee did Albert learn whether they dismissed?

Although exceptions exist [12], experimental data confirms this pattern for standard cases. A computational model tests these results.

...Vary cross-linguistically.

In Swedish, extractions from strong islands are not difficult [2]:

Ett som jag ser en hood som snorer på.

Other languages, like German, confirm the English pattern [1]:

Wen trifft Petra die Leute, die entlassen?

A parser attributes difficulty...

A Nivre dependency parser [9] builds non-projective analyses of experimental sentences (Figure 1).

[Figure 1: Parser states include a, r, l, and d. Shift, Left, Right, and Swap transitions lead to new states.]

Aspects of the parser’s memory state (Figure 2) determine probabilities and surprisal values [4] for analyses (Figure 3).

[Figure 2: Feature definitions.]

[Figure 3: Probabilities based on activation or interference produce different surprisals.]

Hypothesis: Increased surprisal at the verb indicates increased processing difficulty integrating the wh-filler and verb across an island for that memory theory.

...To Activation and Interference...

Surprisals from probability models that incorporate activation theories exhibit human-like (non)difficulty patterns for English [6] and Swedish [2] strong islands. For weak islands [5,11], combination theories provide better models (Figure 4).

[Figure 4: Activation and combination theories model acceptability and reading times.]

This result holds for German and other English results [1,11], confirming processing accounts like [7,5].

...But Embedding Calls this into Question.

Alexopoulou & Keller [1] find that increased island embedding produces less processing difficulty in English and strong German islands. This result is not modeled by either activation or combination theories (Figure 5).

[Figure 5: A parallel architecture models this result, but the strong/weak island distinction breaks down.

Increasing parallelism within the parser allows activation, interference, and combination theories to exhibit this behavior.

Conclusion

A computational model recasts the strong and weak island distinction in terms of activation and interference, challenging the assumption that strong and weak islands are only distinguished via overt grammatical constraints.

However, this result breaks down if increased embedding of islands reduces processing difficulty for humans.
