Japanese Q-Particles & Predictive Parsing

1 A Motivating Question

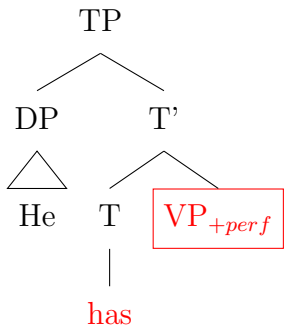
Consider the following sentence:

"He has (really) (never) (...) gone/*go/*went to Europe."

Let's say you observe reading speedup at *gone*.
Why?

One possibility = You predicted it

- What = VP_{+perf}
- When = Reaching "has"
- How = TBD



Implications: You have to know **a lot** to make good predictions

- Parser is defined on categorical constituents (VP, DP, etc.) (a *knowledge* claim)
- Parser has access to relations between those constituents (X controls Y) (a *knowledge* claim)
- When seeing one part of a relation, it has a subprocess to predict the unseen part (a *behaviour* claim)
- And more...

Is the above (or something like it) the case?

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2 Some Japanese Data

In Japanese, whs must be c-commanded by -ka or -no (a question particle) in the C position.

(1) a. No c-commanding QP → BAD

*Dare-ga [Hanako-ga ringo-o tabeta-ka] tazuneta.
Who-nom Hanako-nom apple-acc ate-Q asked

Intended: Who asked if Hanako ate an apple?

b. (Matrix Wh) Wh is c-commanded by QP → GOOD

Dare-ga [Hanako-ga ringo-o tabeta-ka] tazuneta-no.
Who-nom Hanako-nom apple-acc ate-Q asked-Q

Who asked if Hanako ate an apple?

c. (Embedded Wh) Wh is c-commanded by QP → GOOD

Hanako-ga [Keiko-ga nani-o tabeta-to] itta-no.
Hanako-nom Keiko-nom what-acc ate-Q said-Q

What did Hanako say that Keiko ate?

Two wh-questions (matrix and embedded) can be licensed by a single matrix QP!

(2) Dono gakusei-ga [kyoushi-ga nani-o chuumon-shita-to] kuwashi-ku tazunemashita-ka
Which student-nom teacher-nom what-acc order-did-dec in-detail asked-Q
Which student asked what the teacher ordered in detail?

Example 2 presents an ambiguity to the parser.

"Dono gakusei-ga kyoushi-ga nani-o..." → is it 1 or 2 QPs coming?

chuumon-shita-to kuwashi-ku tazunemashita-ka"
(Just matrix QP)

chuumon-shita-ka kuwashi-ku tazunemashita-ka"
(Both matrix and embedded QP)

We can use this ambiguity to test for prediction.

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3 An Experiment

Using the data from above we can make an experiment to test for predictive effects. Assume the following conditions and an example item. Wh questions and QPs are highlighted red.

		# QP	
		1	2
Matrix Wh	Yes	Cond. A	Cond. B
	No (Control)	Cond. C	Cond. D

Table 1: Conditions for Experiment

(3) a. Dono gakusei-ga [kyoushi-ga nani-o chuumon-shita-(to)] kuwashi-ku tazunemashita-ka
Which student-nom teacher-nom what-acc order-did-dec in-detail asked-Q
Which student asked what the teacher ordered in detail?

b. Dono gakusei-ga [kyoushi-ga nani-o chuumon-shita-(ka)] kuwashi-ku tazunemashita-ka
Which student-nom teacher-nom what-acc order-did-Q in-detail asked-Q
Which student asked what the teacher ordered in detail?

c. Sono gakusei-ga [kyoushi-ga nani-o chuumon-shita-to] kuwashi-ku tazunemashita-ka
That student-nom teacher-nom what-acc order-did-dec in-detail asked-Q
What did that student ask in detail that the teacher ate?

d. Sono gakusei-ga [kyoushi-ga nani-o chuumon-shita-ka] kuwashi-ku tazunemashita-ka
That student-nom teacher-nom what-acc order-did-Q in-detail asked-Q
What did that student ask in detail that the teacher ate?

Prediction Hypothesis:

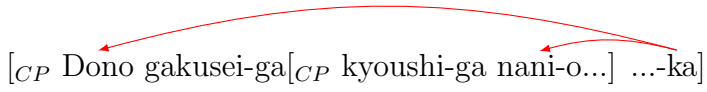
- When? → Upon reaching Wh (dono, nani-o)
- What? → A upcoming licensing QP

4 Expected Results

Under predictive hypothesis, we hypothesize that the parser will do the following for conditions A/B. Red arrows indicate licensor → licensee relation.

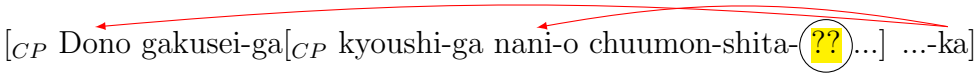
1. Matrix "Dono" triggers prediction of upcoming QP licensor. First possible position is in Matrix C position.

2. Embedded "nani-o" triggers prediction of upcoming licensor QP. First possible position is embedded C. However, given matrix QP predicted in step 1, least effort is to assume nani-o is *also* licensed by it. We assume parser will not predict new QPs if one can already be licensor.



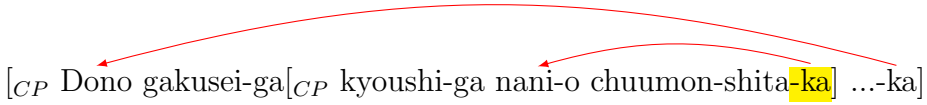
3. Parser continues onward through the sentence with this hypothesis.

4. Parser reaches critical point, embedded C.
   Whatever comes up will confirm or deny its previous prediction (-to = not QP, -ka = QP)



5. If **Condition A**, the embedded C has "-to", which is not a QP. Keep the same analysis as in 4.

6. If **Condition B**, the embedded C has "-ka", which *is* a QP. We should observe slowdown at its appearance due to reanalysis.



In condition B, a second (embedded) QP shows up.
Reanalysis of embedded WH licensing causes slowdown compared to A.

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5 Concluding Thoughts

Showing significant slowdown at the embedded QP in Condition B is in support of a structurally predictive parsing model.

More Questions:

- What other hypotheses could claim slowdown at embedded QP in Condition B?
- What about the *how*?
  - Hypothesis generation method?
  - Stopping point?
- Other Knowledge: Integrating frequency-based knowledge too?
- Limitations: Assuming what relations do we *not* see predictive behavior?
- Acquisition: Learning to predict and predicting to learn?