Computational Intelligence
696i
Language
Lecture 4
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• Homework 1 out today
  – reviewed in class today
    • so ask clarification questions!
  – due one week from today
  – submit to sandiway@email.arizona.edu
Last Time

– we talked about the paradigm shift from “rule-based” systems to the principles-and-parameters (P&P) framework
– the idea that we have UG, a system with some amount of pre-wiring + learning mechanism (including parameter setting)
Principles-and-Parameters

a system of interacting sub-modules
Today’s Lecture

• goal is to get you familiarized with PAPPI, a principles-and-parameters (P&P) parser
  – representing one possible instantiation of UG
  – universal part
    • a set of 20–30 principles
  – language-particular part
    • parameters settings instantiated for SVO, SOV, V2 languages
    • small lexicons for a certain number of languages
      – Turkish, Hungarian, Chinese, Japanese, Dutch, German, French, Spanish, Bangla, English
  – system is a parser only
    • there is no learning mechanism
Today’s Lecture

• Gotta get through 3 things today...
  1. explain the demo
  2. do one exercise
  3. present the homework

• Reading (optional) for discussion next time:
  – latest thinking on language and linguistic theory
  – download and read 1st 5–6 pages of
  – On Phases by N. Chomsky (m.s. 2005)
  – http://dingo.sbs.arizona.edu/~sandiway/mpp/onphases.pdf
Part (1)
Demo

• description available on webpage
  – http://dingo.sbs.arizona.edu/~sandiway/pappi/macosx/index.html#test

• example of how UG might be instantiated
  – one set of principles
  – three languages
    • English: SVO
    • Japanese: SOV
    • Dutch: V2-language
      – verb is 2nd phrase (roughly resembles SVO),
      – but in embedded clauses verb comes last (SOV)
Demo: English

- Example:
  - Which report did you file without reading?

- Word Order:
  - SVO

- Structure:
  - Which report did you file [the report] without [you] reading [the report]?

- Notes:
  - NP indicates noun phrase e-element
  - trace indicated by t
  - indices, e.g. [1], are used for coindexation
Parsing: which report did you file without reading

One parse found
Demo: English

• Example:
  – *Who does Mary wonder why John hit?*
• Ungrammatical
  – violates principle of subjacency
    • can’t displace too far in one hop
• However, you can still recover the meaning...
  – so it’s (considered) a mild violation
• Underlying structure:
  – Mary wonders why John hit **who**
  – **Who** does Mary wonders why John hit **trace**
• Explanation:
  – interaction with X’-theory:
  – *no intermediate position available as a landing site*
  – *cf. Who does Mary think John hit?*
Subjacency not active.

Parsing: who does Mary wonder why John hit

LF (1):

One parse found
Demo: English
Demo: Japanese

- Example:
  - neko-ga *koroshita* nezumi-ga *tabela* tiizu-wa *kusatte ita*
  - cat-NOM killed rat-NOM ate cheese-TOP rotten was
  - the cheese the rat the cat killed ate was rotten

- Word Order:
  - SOV

- Center-embedding (English)
  - [the cheese [the rat [the cat killed] ate] was rotten]
  - *resource limitation*

- Left-embedding (Japanese)
  - [cat killed] [rat ate] [cheese was rotten]
  - *no resource limitation*
Demo:
Japanese
Demo: Japanese

Parsing: the cheese the rat the cat killed ate was rotten

One parse found
Demo: Dutch

• Example:
  – Ik **weet** dat Hanneke haar oma **bezocht**
  – I know that Hanneke her grandma visited
  – *I know that Hanneke visited her Grandma*

• V2 word order:
  – [S Ik **weet** [S dat Hanneke haar oma **bezocht** ]]

• Pronoun binding ambiguity
  – **whose grandma**?
  – same ambiguity in Dutch as in English
  – determined by the rules of pronoun binding
Demo: Dutch

Parsing: ik weet dat Hanneke haar oma bezocht
LF (1):

[C2
  [NP[1] ik
    C
      C
        I(AGR)[1] NPt-A-P[1] I1
          VP I(AGR)t[1]
            C
              weet C2 Vt[2]
                  [NP[3] hanneke
                        N1 oma
                          bezocht
                  I(AGR)[1] V[2]
                I(AGR)[1]
              C
                dat
              I2]
          I2]}
  I2]}

[3] ≠ [5]
Part (2)
Using PAPPI

• description available on
  – *Introduction to the Theory of PAPPI*
    http://dingo.sbs.arizona.edu/~sandiway/pappi/mac
    osx/pgap.html

• how to use PAPPI to see what UG is doing
  – you will do a very similar exercise for homework 1

• let’s look at the parasitic gap sentence again
  • which report did you file without reading?
    – and look at Move-alpha (*displacement property*)
Using PAPPI

• Example:
  • which report did you file without reading?
• Move-alpha \((\text{displacement property})\)
  – you filed which report without reading
  – which report did you file \(trace\) without reading
• Why isn’t it?
  – you filed without reading \(\text{which report}\)
  – which report did you file \(trace\) without reading \(trace\)
• Why isn’t it?
  – you filed without reading \(\text{which report}\)
  – which report did you file without reading \(trace\)
• What rules out these derivation?
  – \(\text{PAPPI considers all possible derivations}\)
PAPPI: Computation

think of derivations running a gauntlet of constraints and only the grammatical ones make it
PAPPI: Computation

- 47 structures
- 1 admitted
- 46 ruled out
- including
  - which report did you file *trace* without reading *trace*
  - which report did you file without reading *trace*
PAPPI: Computation

• Why isn’t it?
  – you filed without reading
    which report
  – which report did you file
    trace without reading
    trace

• This is tree #8 out of 47
  – look at the chain feature
    – chain(NP[1], Type, Path)
      • Type = {head, medial, last}
      • Path = list of
        intermediate nodes to
        antecedent
PAPPI: Computation

- **Idea:**
- isolate tree #8
- and see what blocks it
PAPPI: *Computation*

- What blocks a derivation?
  - a principle that when turned off allows a parse to be generated
  - [this is not necessarily the same as the stopping principle reported by the parser]

- Let’s test this on #8...
  - Case Condition on Traces (*reported*)
  - Theta Criterion
Part (3)
Homework 1

• Minimal Pair:
  – (1) a. John is too stubborn to talk to
  –   b. John is too stubborn to talk to Bill

• It’s an interesting example:
  – just adding one word Bill provokes a big change in gap-filling

• PAPPI parses:

• Readings:
  – (3) a. John is too stubborn for some arbitrary person to talk to John
  –   b. John is too stubborn for John to talk to Bill
Homework 1

• Question 1: 2pts (giveaway)
  – how many structures did it consider for each sentence?

• Question 2: (6pts)
  – Consider the sentence:
    • (4) John is too stubborn [for John] to talk to himself
    • PAPPI parses both versions of this sentence
    • why is this interpretation unavailable for (1a)?
      – what principle(s) rules it out?
      – your answer should report which parse numbers and the steps required to
        drill down to the answer

• Question 3: (4 pts)
  – Think of another example of a minimal pair where the interpretation of a
gap in terms of reference must change when a noun (or preposition+noun)
is added