Ling 566
Nov 23, 2011
Auxiliaries cont: NICE
Overview

• Brief review of our analysis so far
• NICE properties of auxiliaries
• The auxiliary *do*
• NICE properties (lexical rules)
• Reading questions
Descriptive Summary of the NICE Properties

Negation
Sentences are negated by putting *not* after the first auxiliary verb; they can be reaffirmed by putting *too* or *so* in the same position.

Inversion
Questions are formed by putting an auxiliary verb before the subject NP.

Contraction
Auxiliary verbs take negated forms, with *n’t* affixed.

Ellipsis
Verb phrases immediately following an auxiliary verb can be omitted.
Negation (and Reaffirmation)

- Polar adverbs (sentential *not*, *so*, and *too*) appear immediately following an auxiliary

  *Pat will not leave*
  *Pat will SO leave*
  *Pat will TOO leave*

- What about examples like *Not many people left*?

- What happens when you want to deny or reaffirm a sentence with no auxiliary?

  *Pat left*
  *Pat did not leave*
  *Pat did TOO leave*
The Auxiliary *do*

- Like modals, auxiliary *do* only occurs in finite contexts:
  *Pat continued to do not leave*

- Unlike modals, *do* cannot be followed by other auxiliaries:
  *Pat did not have left*
The $\text{ADV}_{pol}$-Addition Lexical Rule

\[
\begin{align*}
\text{INPUT} \ & \ \langle X, \ \langle \framebox{1} \rangle \oplus \ \text{ADV}_{pol} \rangle \\
\framebox{pi-rule} \\
\text{SYN} & \quad \framebox{HEAD} \\
\ & \quad \begin{bmatrix}
\verb \\
\text{FORM} \\
\text{fin} \\
\text{POL} \\
\text{AUX} \\
\text{+}
\end{bmatrix} \\
\text{ARG-ST} & \quad \langle \framebox{1} \rangle \oplus \ \text{ADV}_{pol} \\
\text{SEM} & \quad \begin{bmatrix}
\text{INDEX} \\
\text{s}_1
\end{bmatrix}
\end{align*}
\]

\[
\begin{align*}
\text{OUTPUT} \ & \ \langle Y, \ \langle \framebox{1} \rangle \oplus \ \text{ADV}_{pol} \rangle \\
\framebox{pi-rule} \\
\text{SYN} & \quad \framebox{HEAD} \\
\ & \quad \begin{bmatrix}
\text{POL} \\
\text{+}
\end{bmatrix} \\
\text{VAL} & \quad \begin{bmatrix}
\text{SPR} \\
\langle Z \rangle
\end{bmatrix} \\
\text{ARG-ST} & \quad \langle \framebox{1} \rangle \oplus \ \begin{bmatrix}
\text{INDEX} \\
\text{s}_2
\end{bmatrix} \\
\text{SEM} & \quad \begin{bmatrix}
\text{INDEX} \\
\text{s}_2
\end{bmatrix}
\end{align*}
\]
What does the type \textit{pi-rule} mean?

- It maps words to words (hence, “post-inflectional”)
- It preserves MOD values, HEAD values as a default, and (like other lexical rule types) SEM values as a default

\[
\begin{align*}
\text{INPUT} & \quad \left\langle \left/ 0, \begin{array}{c}
\text{word} \\
\text{SYN} \\
\text{SEM}
\end{array} \right| \begin{array}{l}
\text{HEAD} / 1 \\
\text{VAL} \\
\text{MOD} [A]
\end{array}, 2 \right\rangle \\
\text{OUTPUT} & \quad \left\langle \left/ 0, \begin{array}{c}
\text{word} \\
\text{SYN} \\
\text{SEM}
\end{array} \right| \begin{array}{l}
\text{HEAD} / 1 \\
\text{VAL} \\
\text{MOD} [A]
\end{array}, 2 \right\rangle
\end{align*}
\]
Why doesn’t $\text{ADV}_{pol}$-Addition LR mention $\text{VAL}$?

$$
\begin{align*}
\text{INPUT} \quad & \begin{cases}
\text{SYN} & \left\langle X, \begin{bmatrix}
\text{HEAD} & \begin{bmatrix}
\text{verb} \\
\text{FORM} & \text{fin} \\
\text{POL} & - \\
\text{AUX} & + 
\end{bmatrix}
\end{bmatrix}\rightangle \\
\text{ARG-ST} & \left\langle \begin{bmatrix}
\text{INDEX} & s_1 
\end{bmatrix}\rightangle \oplus \text{A}
\end{cases} \\
\text{SEM} & \left\langle \begin{bmatrix}
\text{INDEX} & s_1 
\end{bmatrix}\rightangle
\end{align*}
$$

$$
\begin{align*}
\text{OUTPUT} \quad & \begin{cases}
\text{SYN} & \left\langle \begin{bmatrix}
\text{POL} & + 
\end{bmatrix}\rightangle \\
\text{VAL} & \left\langle \begin{bmatrix}
\text{SPR} & \langle Z \rangle 
\end{bmatrix}\rightangle \\
\text{ARG-ST} & \left\langle \begin{bmatrix}
\text{INDEX} & s_2 
\end{bmatrix}\rightangle \oplus \text{A}
\end{cases} \\
\text{SEM} & \left\langle \begin{bmatrix}
\text{INDEX} & s_2 
\end{bmatrix}\rightangle
\end{align*}
$$

\text{pi-rule}
What is the role of these indices?

\[
\text{pi-rule}
\]

\[
\begin{align*}
\text{INPUT} & \quad \langle X, \rangle \\
\text{ARG-ST} & \quad \langle \emptyset \rangle \oplus \langle A \rangle \\
\text{SEM} & \quad [\text{INDEX } s_1] \\
\text{SYN} & \quad [\text{HEAD}] \quad \text{FORM fin} \\
\text{POL} & \quad \text{VERB} \quad \text{AUX} + \\
\text{AUX} & \quad \\
\end{align*}
\]

\[
\begin{align*}
\text{OUTPUT} & \quad \langle Y, \rangle \\
\text{ARG-ST} & \quad \langle \emptyset \rangle \oplus \langle \text{ADV}_{pol} s_2 \rangle \\
\text{SEM} & \quad [\text{INDEX } s_2] \\
\end{align*}
\]
Which *nots* does the rule license?

Andy must *not* have been sleeping? ✓
Andy must have *not* been sleeping? ✗
Andy must have been *not* sleeping? ✗
Kleptomaniacs cannot *not* steal. ✓
Kleptomaniacs cannot *not* steal. ✗
Negation and Reaffirmation: A Sample Tree

S

NP

Leslie

VP

V

did

ADV\textsubscript{pol}

so

VP

eat the whole pizza
Inversion

• Yes-no questions begin with an auxiliary:
  
  *Will Robin win?*

• The NP after the auxiliary has all the properties of a subject
  
  • Agreement:  *Have they left?* vs. *Has they left?*
  
  • Case:  *Have them left?*

  • Raising:  *Will there continue to be food at the meetings?*

• What happens if you make a question out of a sentence without an auxiliary?
  
  *Robin won*

  *Did Robin win?*
The Inversion Lexical Rule

\[ \text{pi-rule} \]

INPUT \[ \langle W, \right \rangle \]
\[
\begin{align*}
\text{SYN} & \quad \text{HEAD} \quad [\text{verb}] \\
\text{ARG-ST} & \quad \text{FORM} \quad [\text{fin}] \\
\text{VAL} & \quad \text{AUX} \quad [+] \\
\text{SEM} & \quad \text{SPR} \quad [\langle X \rangle] \\
\text{MODE} & \quad \text{prop} \\
\end{align*}
\]

OUTPUT \[ \langle Z, \right \rangle \]
\[
\begin{align*}
\text{SYN} & \quad \text{HEAD} \quad [\text{INV} \quad [+] \\
\text{ARG-ST} & \quad \text{SPR} \quad [\langle \rangle] \\
\text{VAL} & \quad \text{MODE} \quad \text{ques} \\
\text{SEM} & \quad \text{A} \\
\end{align*}
\]
How the Rule Yields Inverted Order

...plus the ARP
The Feature INV

- What is the INV value of inputs to the Inversion LR?
  - Perhaps surprisingly, the input is [INV +]
  - Word-to-word rules (*pi-rules*) have default identity of HEAD features, and no INV value is given on the input

- Then what work is the feature doing?
  - It’s used to mark auxiliaries that can’t or must be inverted
    
    \[
    \text{You better watch out} \quad \text{vs.} \quad \text{*Better you watch out} \\
    \text{I shall go (shall ~ ‘will’) vs. Shall I go? (shall ~ ‘should’)}
    \]
Other Cases of Inversion

• Inversion is not limited to questions
  • Preposed negatives: *Never have I been so upset!*
  • Conditionals: *Had we known, we would have left.*
  • Exclamations: *May your teeth fall out!*

• Does our rule account for these?
  • No. Our rule’s output says [MODE ques]. And each construction has slightly different idiosyncrasies.

• How might we extend our analysis to cover them?
  • Define a type of inversion lexical rules, sharing certain properties, but with some differences.
Inversion: A Sample Tree

S

V
Did

NP
Leslie

VP
eat the entire pizza?
Contraction

• There are several types of contraction in English, but we’re only talking about words ending in *n’t*

• It may seem like just *not* said fast, but there’s more to it
  • Only finite verbs can take *n’t*:
    *Terry must haven’t seen us*

• There are morphological irregularities:
  *won’t*, not *willn’t*  
  %shan’t*, not *shalln’t*  
  *mustn’t* pronounced *mussn’t*  
  *don’t* pronounced *doesn’t*, not *dewn’t*  
  *amn’t*
The Contraction Lexical Rule

\[ \text{pi-rule} \]

INPUT \( \langle 2, \text{ARG-ST } [\Box], \text{SEM } [\text{INDEX } s_1, \text{RESTR } [\Box]] \rangle \)

OUTPUT \( \langle F_{\text{NEG}}(2), \text{ARG-ST } [\Box], \text{SEM } [\text{INDEX } s_2, \text{RESTR } \langle \text{RELN } \text{not } s_2, \text{SIT } s_2 \rangle \rangle \oplus [\Box] \rangle \)
Most of the work is in the semantics

Why?
What does POL do?

*We can’tn’t stop
*They won’t TOO mind
Contraction: Sample Tree

S

NP  VP

Leslie  V

wouldn’t  eat the entire pizza
Ellipsis

• Ellipsis allows VPs to be omitted, so long as they would have been preceded by an auxiliary

* Pat couldn’t have been watching us, but Chris

• Unlike the other NICE properties, this holds of all auxiliaries, not just finite ones.

• What is the elliptical counterpart to a sentence with no auxiliary?

Whenever Pat watches TV, Chris watches TV
Whenever Pat watches TV, Chris does
The Ellipsis Lexical Rule

\[
\begin{align*}
\text{INPUT} & \quad \left\langle 1, \left[ \begin{array}{c}
\text{auxv-lxm} \\
\text{ARG-ST} \left\langle 2 \right\rangle \oplus A 
\end{array} \right] \right\rangle \\
\text{OUTPUT} & \quad \left\langle 1, \left[ \begin{array}{c}
\text{dervv-lxm} \\
\text{ARG-ST} \left\langle 2 \right\rangle 
\end{array} \right] \right\rangle
\end{align*}
\]

- Note that this is a derivational LR (\textit{d-rule}) -- that is, lexeme-to-lexeme

- This means that SYN and SEM are unchanged, by default
Ellipsis: A Sample Output

\[
\langle \text{could} , \langle \text{NP} \rangle \rangle
\]

\[
\langle \text{SEM} \rangle
\]

\[
\langle \text{ARG-ST} \rangle
\]

\[
\langle \text{SYN} \rangle
\]

\[
\langle \text{auxv-lxm} \rangle
\]

\[
\langle \text{FORM} \quad \text{fin} \rangle
\]

\[
\langle \text{AUX} \quad + \rangle
\]

\[
\langle \text{POL} \quad - \rangle
\]

\[
\langle \text{AGR} \quad 1 \rangle
\]

\[
\langle \text{SPR} \quad \langle \text{AGR} \quad 1 \rangle \rangle
\]

\[
\langle \text{RELN} \quad \text{could} \rangle
\]

\[
\langle \text{SIT} \quad s_1 \rangle
\]

\[
\langle \text{ARG} \quad s_2 \rangle
\]

\[
\langle \text{prop} \rangle
\]

\[
\langle \text{INDEX} \rangle
\]

\[
\langle \text{s}_1 \rangle
\]
Ellipsis: A Sample Tree

NP

| Kim

V

could

VP

could have been attending the conference
Semantics of Ellipsis

What is the SEM value of the S node of this tree?

\[
\begin{align*}
\text{INDEX} & \quad s_1 \\
\text{MODE} & \quad \text{prop} \\
\text{RESTR} & \quad \left\langle \left[ \begin{array}{c} \text{RELN} \\
\text{name} \\
\text{NAME} \\
\text{Kim} \\
\text{NAMED} \\
\text{i} \end{array} \right], \\
\left[ \begin{array}{c} \text{RELN} \\
\text{could} \\
\text{SIT} \\
\text{s}_1 \\
\text{ARG} \\
\text{s}_2 \end{array} \right] \right\rangle
\end{align*}
\]

Note: \( s_2 \) has to be filled in by context.
Infinitival to Revisited

• VP Ellipsis can occur after to:

  *We didn’t find the solution, but we tried to.*

• This is covered by our Ellipsis LR if we say *to* is [AUX +].

• Since AUX is declared on type *verb*, it follows that *to* is a verb.
do Revisited

- Chomsky’s old analysis: in sentences w/o auxiliaries...
  - Tense can get separated from the verb in various ways
    - Negation/Reaffirmation inserts something between Tense and the following verb
    - Inversion moves Tense to the left of the subject NP
    - Ellipsis deletes what follows Tense
  - When this happens, *do* is inserted to support Tense

- Our counterpart:
  - NICE properties hold only of auxiliaries
  - *do* is a semantically empty auxiliary, so negated, reaffirmed, inverted, and elliptical sentences that are the semantic counterparts to sentences w/o auxiliaries are ones with *do*. 

Summary

• Our analysis employs straightforward mechanisms
  • Lexical entries for auxiliaries
  • 3 new features (AUX, POL, INV)
  • 4 lexical rules

• We handle a complex array of facts
  • co-occurrence restrictions (ordering & iteration)
  • the NICE properties
  • auxiliary *do*
  • combinations of NICE constructions
Overview

• Brief review of our analysis so far
• NICE properties of auxiliaries
• The auxiliary *do*
• NICE properties (lexical rules)
• Reading questions
• If \textit{dervv-lxm} doesn't apply any constraints beyond those inherited from \textit{verb-lxm}, why can't we just call the result a \textit{verb-lxm}? Is it simply because \textit{verb-lxm} is not a leaf node? Or are there derivational rules that we don't want to accidentally apply to a \textit{dervv-lxm} that would apply to \textit{verb-lxms}?
Reading Questions

• In (51) on p. 406 (ADVpol-Addition LR), why does the output have SPR <Z> instead of SPR<[1]> to match the ARG-ST?
The ADV$_{pol}$-Addition Lexical Rule

\[
\begin{align*}
\text{pi-rule} & \quad \begin{array}{l}
\text{INPUT} \quad \langle X, \rangle \\
\text{ARG-ST} \quad \langle 1 \rangle \oplus \langle A \rangle \\
\text{SEM} \quad \langle \text{INDEX } s_1 \rangle
\end{array} \\
\text{SYN} & \quad \langle \text{HEAD } \begin{bmatrix} \text{verb} \\ \text{FORM fin} \\ \text{POL } - \\ \text{AUX } + \end{bmatrix} \rangle
\end{align*}
\]

\[
\begin{align*}
\text{OUTPUT} & \quad \langle Y, \rangle \\
\text{ARG-ST} & \quad \langle 1 \rangle \oplus \langle \text{INDEX } s_2 \rangle \\
\text{SEM} & \quad \langle \text{INDEX } s_2 \rangle
\end{align*}
\]

\[
\begin{align*}
\text{SYN} & \quad \langle \text{HEAD } \begin{bmatrix} \text{POL } + \end{bmatrix} \rangle \\
\text{VAL} & \quad \langle \text{SPR } \langle Z \rangle \rangle
\end{align*}
\]

\[
\begin{align*}
\text{ADV}_{pol} & \quad \langle \text{INDEX } s_2 \rangle \\
\text{RESTR} & \quad \langle \text{ARG } s_1 \rangle \\
\end{align*}
\]
• In (57) on p. 410, what happened to the VP node that formerly dominated the VP tapdance and of which "can" was formerly the head daughter? Similarly, when "be" is the head verb of a sentence, whathappens to its original mother VP (and its complements) when it undergoes the Inversion Lexical Rule?
Inversion: A Sample Tree

S
  /\  \\
 /   \ \\
V    NP
|    |
Did  Leslie

VP
  |   |
eat the entire pizza?
Reading Questions

• If *better* is an auxiliary verb, then doesn't that violate (5e) on iteration?
  • The twins had better have gone to bed.
• Or is that a different *have* or a different *better*?
Reading Questions

• Footnote 11 describes what I was thinking when I sent the reading question forwarded below, when I figured there was a difference between a VP with an NP COMPS and a VP with an adverb. Turns out they're COMPS either way. :) "He loves easily and often."

• Examples from fn 11:
  • This book reads (easily).
  • They treated Sandy (contemptuously).
Reading Questions

• Let me see if I'm following: it looks like we could apply the Ellipsis Lexical Rule and then later the Inversion Lexical Rule to end up with something like this, right?

• A: I've been reading the papers.

• B: Have you?