

Ling 566

Oct 30, 2006

Lexical Rules

Overview

- How lexical rules fit in
- Three types of lexical rules, constraints
- Example: Plural noun lexical rule
- Advice on writing lexical rules
- Constant lexemes
- ARG-ST & ARP
- The feature FORM
- Questions about homework?

Lexical Types & Lexical Rules

- Lexemes capture the similarities among *run*, *runs*, *running*, and *ran*
- The lexical type hierarchy captures the similarities among *run*, *sleep*, and *laugh*, among those and other verbs like *devour* and *hand*, and among those and other words like *book*.
- Lexical rules capture the similarities among *runs*, *sleeps*, *devours*, *hands*, ...

Parsimony & Plausibility

- Lexical rules capture **productive** generalizations.
- There may be some ‘precompiling’ going on as well.

Three Kinds of Lexical Rules

- Inflectional: *lexeme* to *word*

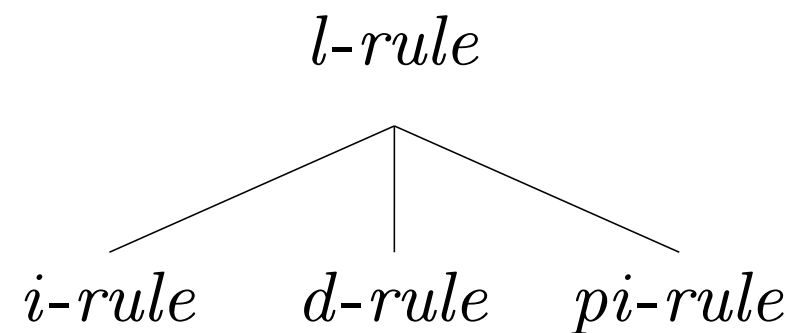
Examples?

- Derivational: *lexeme* to *lexeme*

Examples?

- Post-Inflectional: *word* to *word*
(Chapters 11, 13, 14)

Three Subtypes of *l-rule*



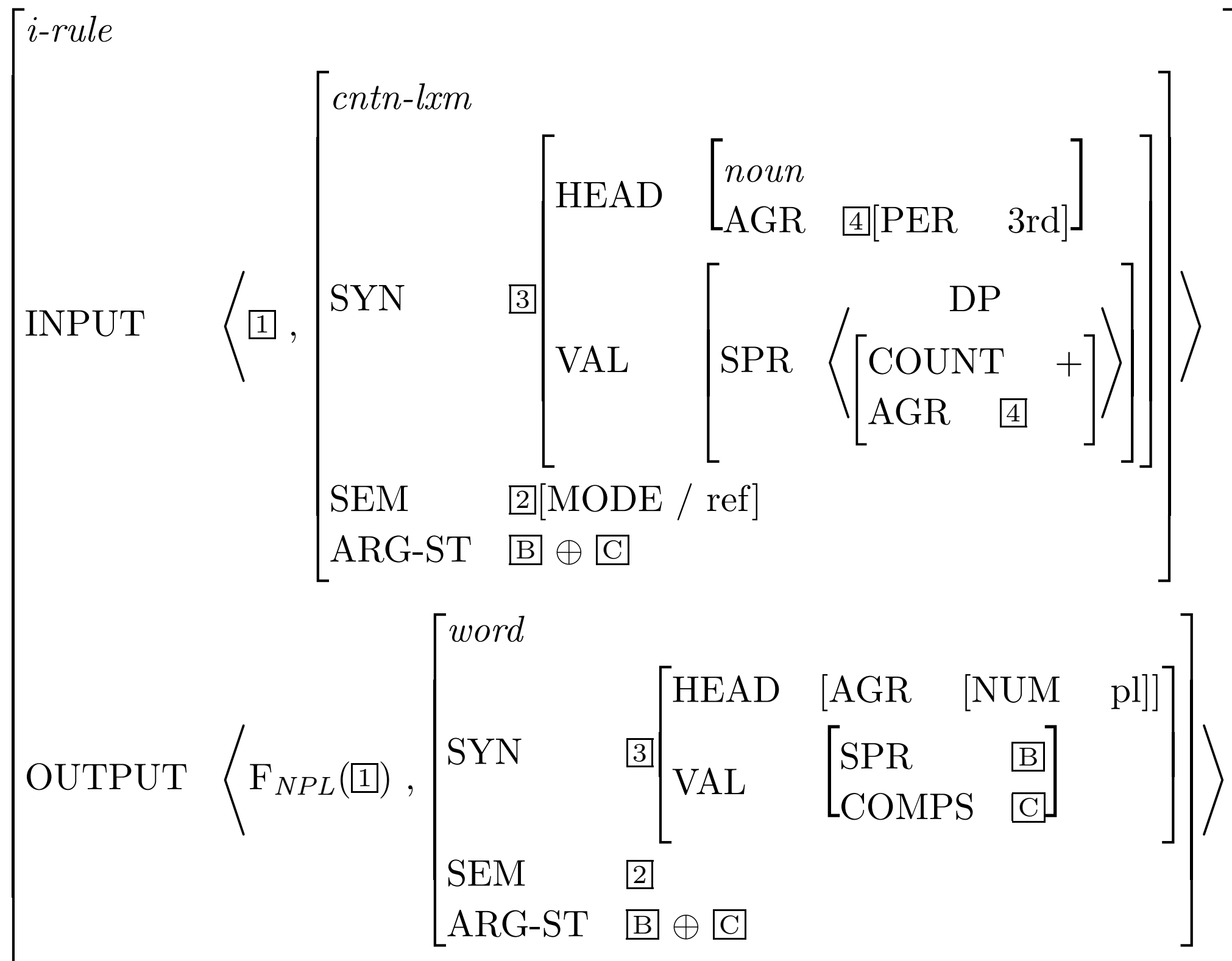
$$l\text{-rule} : \left[\begin{array}{l} \text{INPUT} \quad l\text{-sequence} \left\langle X, [\text{SEM} \quad / \boxed{2}] \right\rangle \\ \text{OUTPUT} \quad l\text{-sequence} \left\langle Y, [\text{SEM} \quad / \boxed{2}] \right\rangle \end{array} \right]$$

$$i\text{-rule} : \left[\begin{array}{l} \text{INPUT} \quad \left\langle X, \left[\begin{array}{l} \text{lexeme} \\ \text{SYN} \quad \boxed{3} \\ \text{ARG-ST} \quad \boxed{A} \end{array} \right] \right\rangle \\ \text{OUTPUT} \quad \left\langle Y, \left[\begin{array}{l} \text{word} \\ \text{SYN} \quad \boxed{3} \\ \text{ARG-ST} \quad \boxed{A} \end{array} \right] \right\rangle \end{array} \right] \quad d\text{-rule} : \left[\begin{array}{l} \text{INPUT} \quad \left\langle X, \left[\begin{array}{l} \text{lexeme} \\ \text{SYN} \quad / \boxed{3} \end{array} \right] \right\rangle \\ \text{OUTPUT} \quad \left\langle Y, \left[\begin{array}{l} \text{lexeme} \\ \text{SYN} \quad / \boxed{3} \end{array} \right] \right\rangle \end{array} \right]$$

Plural Noun LR

$$\left[\begin{array}{l} i\text{-rule} \\ \text{INPUT} \quad \langle \boxed{1}, \textit{cntn-lxm} \rangle \\ \text{OUTPUT} \quad \left\langle F_{NPL}(\boxed{1}), \left[\begin{array}{l} \textit{word} \\ \text{SYN} \left[\text{HEAD} \left[\text{AGR} \left[\text{NUM} \text{ pl} \right] \right] \right] \right] \right\rangle \end{array} \right. \right]$$

Plural Noun LR with Inherited Constraints



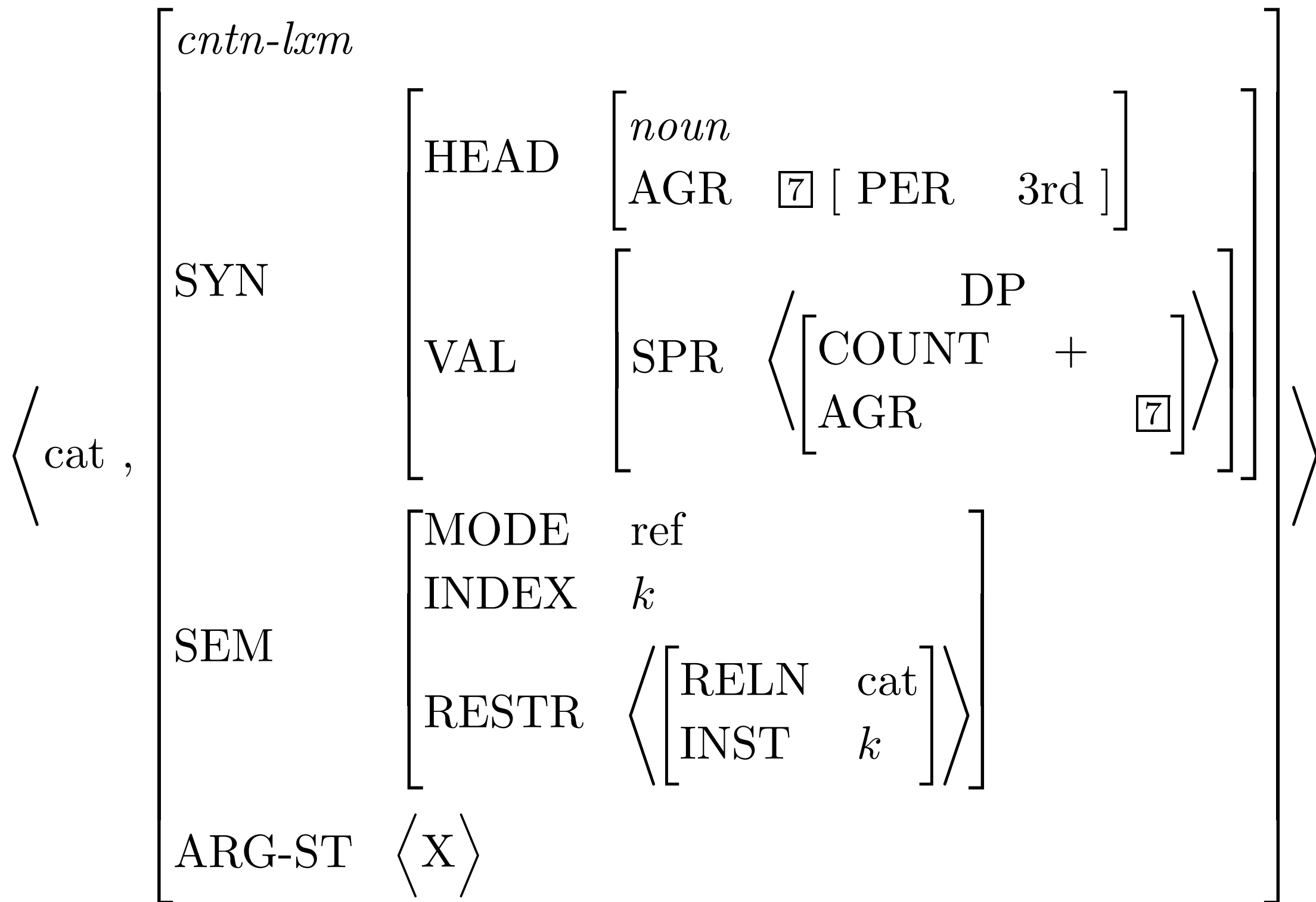
Practicalities - Applying Lexical Rules

- INPUT is a family of lexical sequences.
- OUTPUT is another family of lexical sequences.
 - ...usually a smaller family
 - ...usually a disjoint one
- The only differences between the families are those stipulated in the rule (or the rule's type).
- Similarities are handled by the constraints on *l-rule* and its subtypes.
- If we've written the LR's correctly, nothing is left unconstrained.

Example: Lexical Entry for *cat*

$$\left\langle \text{cat} , \left[\begin{array}{l} \text{cntn-lxm} \\ \text{SEM} \end{array} \left[\begin{array}{l} \text{INDEX} \quad k \\ \text{RESTR} \quad \left\langle \left[\begin{array}{l} \text{RELN} \quad \text{cat} \\ \text{INST} \quad k \end{array} \right] \right\rangle \end{array} \right] \right] \right\rangle$$

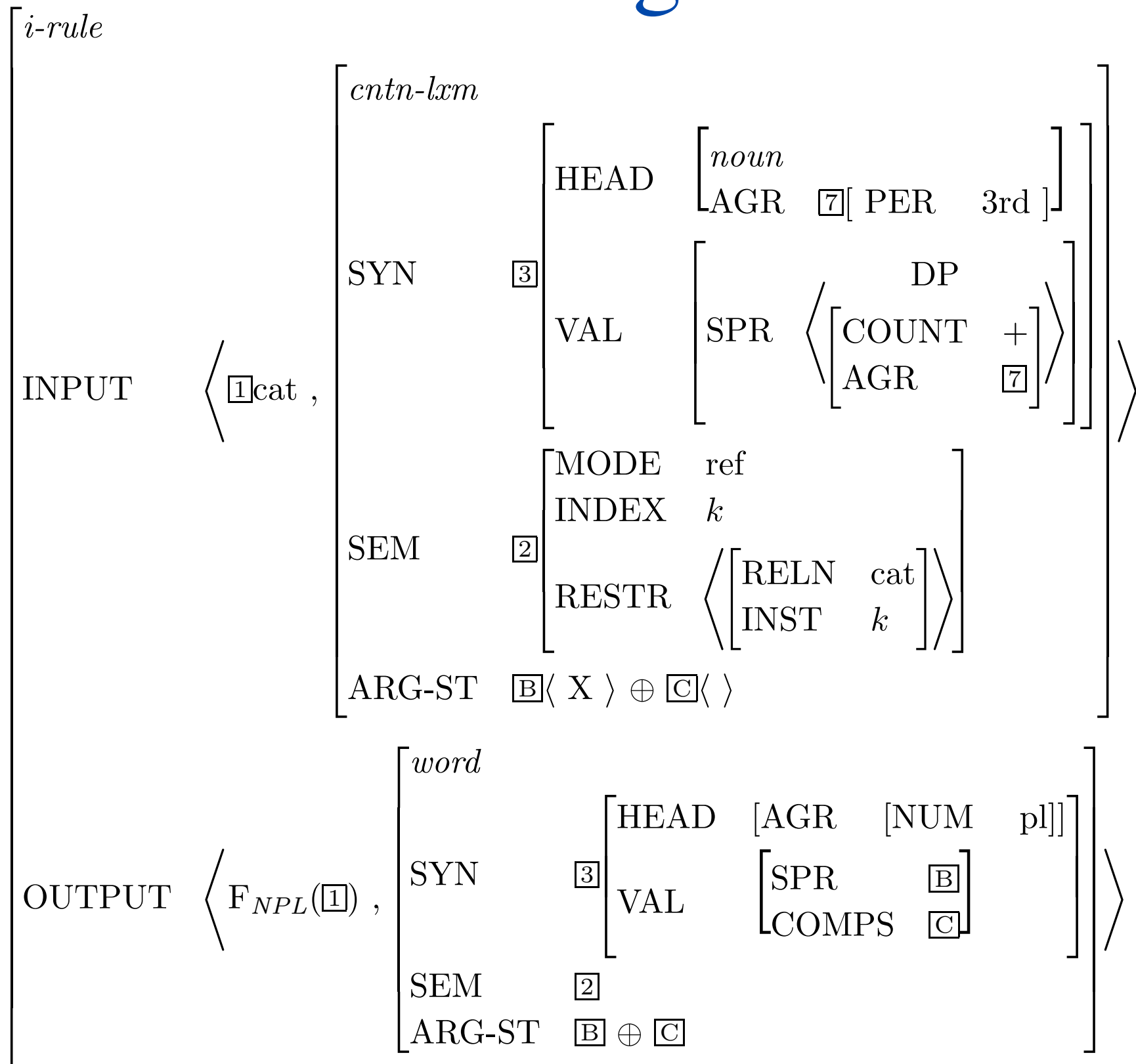
Example: *cat*, with inheritance



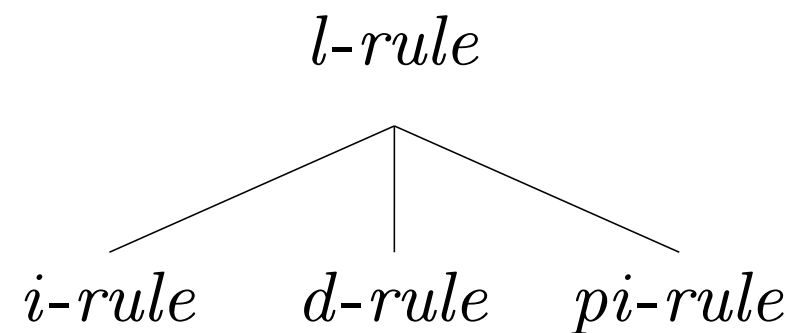
Plural Noun LR

$$\left[\begin{array}{l} i\text{-rule} \\ \text{INPUT} \quad \langle \boxed{1}, \textit{cntn-lxm} \rangle \\ \text{OUTPUT} \quad \left\langle F_{NPL}(\boxed{1}), \left[\begin{array}{l} \textit{word} \\ \text{SYN} \left[\text{HEAD} \left[\text{AGR} \left[\text{NUM} \text{ pl} \right] \right] \right] \right] \right\rangle \end{array} \right. \right]$$

Licensing *cats*



Three Subtypes of *l-rule*

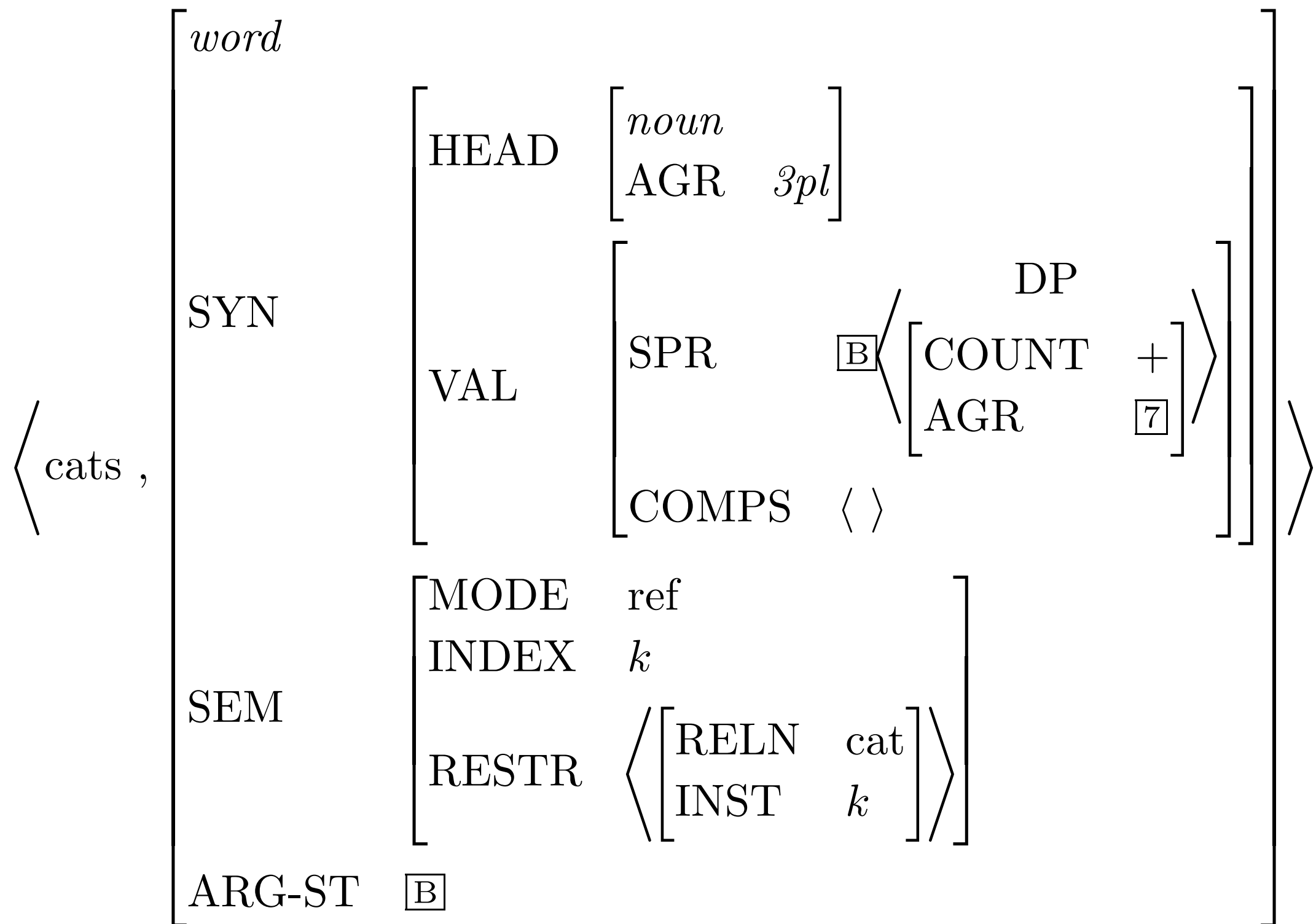


$$l\text{-rule} : \left[\begin{array}{l} \text{INPUT} \quad l\text{-sequence} \left\langle X, [\text{SEM} \quad / \boxed{2}] \right\rangle \\ \text{OUTPUT} \quad l\text{-sequence} \left\langle Y, [\text{SEM} \quad / \boxed{2}] \right\rangle \end{array} \right]$$

$$i\text{-rule} : \left[\begin{array}{l} \text{INPUT} \quad \left\langle X, \left[\begin{array}{l} \text{lexeme} \\ \text{SYN} \quad \boxed{3} \\ \text{ARG-ST} \quad \boxed{A} \end{array} \right] \right\rangle \\ \text{OUTPUT} \quad \left\langle Y, \left[\begin{array}{l} \text{word} \\ \text{SYN} \quad \boxed{3} \\ \text{ARG-ST} \quad \boxed{A} \end{array} \right] \right\rangle \end{array} \right]$$

$$d\text{-rule} : \left[\begin{array}{l} \text{INPUT} \quad \left\langle X, \left[\begin{array}{l} \text{lexeme} \\ \text{SYN} \quad / \boxed{3} \end{array} \right] \right\rangle \\ \text{OUTPUT} \quad \left\langle Y, \left[\begin{array}{l} \text{lexeme} \\ \text{SYN} \quad / \boxed{3} \end{array} \right] \right\rangle \end{array} \right]$$

cats: The Lexical Sequence



Practicalities -- Writing Lexical Rules

- Determine the type of the LR.
- Determine the class of possible inputs.
- Determine what should change.
 - If INPUT and OUTPUT values are identified (by default or otherwise) and only OUTPUT value is mentioned, then...
information is added.

(Lexical sequences incompatible with that value are not possible inputs)
 - If INPUT and OUTPUT values are identified by default, but different values are given on the INPUT and OUTPUT of the rule, then...
information is changed.
 - If INPUT and OUTPUT values are identified by an inviolable constraint, but different values are given on the INPUT and OUTPUT of the rule, then...
there is no well-formed output

Constant lexemes

- What kinds of words are constant lexemes in our grammar?
- Why do we need a rule for these words?
- What would be an alternative analysis?

Constant Lexeme LR

$$\left[\begin{array}{l} i\text{-rule} \\ \text{INPUT} \quad \langle \boxed{1}, \text{const-lxm} \rangle \\ \text{OUTPUT} \quad \left[\text{FIRST} \quad \boxed{1} \right] \end{array} \right]$$

- What keeps this from applying to, say, verb lexemes?
- Why is this an *i-rule*?

ARG-ST & ARP

- Given the ARP, what do we need to specify about the valence properties of words?
- Why isn't the ARP a constraint on the type *lexeme*?

The Feature FORM

- Different inflected forms of verbs show up in different syntactic environments. Examples?
- These different forms are syntactically distinguished by the feature FORM, as assigned by lexical rules.
- FORM is also useful in our analyses of coordination and PP selection.

What rules these out?

- *Kim eat pizza.
- *Kim seems to eats pizza.
- *Dana helped Leslie pack and moved.
- *Kim relies for Sandy.
- *Dana walked and Kim.

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