Outline

1. Morphological Rules

2. Core Phenomena
   - Agreement
   - Modification
   - Argument Optionality
Morphological Rules

Formal Description

- \( Mruleentry \rightarrow \text{RuleID} \ Mgraph-spec-list \ Avm-def . \)
- \( Mgraph-spec-list \rightarrow Mgraph-spec \mid Mgraph-spec\ Mgraph-spec-list \)
- \( Mgraph-spec \rightarrow %\text{prefix} \ SPair-list \mid %\text{suffix} \ SPair-list \)
- \( SPair-list \rightarrow SPair \mid SPair\ SPair-list \)
- \( SPair \rightarrow ( \ast \text{Char-list}) \mid (\text{Char-list} \text{Char-list}) \)
- \( \text{Char-list} \rightarrow \text{letter} \mid \text{Macro} \mid \text{letter} \text{Char-list} \mid \text{Macro} \text{Char-list} \)
- \( \text{Letterset} \rightarrow \% (\text{letter-set} \text{(Macro letters)}) \)
- \( \text{Macro} \rightarrow !\text{letter} \)
- \( \text{Irregentry} \rightarrow \text{base Rulespec inflected} \)
Morphological Rules
Letter sets

Formal Description

- Letterset → % (letter-set (Macro letters) )
- Macro → !letter

%(letter-set (!c bdfglmnpqrstz))
%(letter-set (!s abcdefghijklmnopqrstuvwxyz))
%(letter-set (!t bcdfghjklmnpqrstuvwxyz))
%(letter-set (!v aeiou))
Morphological Rules

Inflectional rules

Formal Description

- \( \text{Mruleentry} \rightarrow \text{RuleID Mgraph-spec-list Avm-def} \)
- \( \text{Mgraph-spec-list} \rightarrow \text{Mgraph-spec} \mid \text{Mgraph-spec Mgraph-spec-list} \)
- \( \text{Mgraph-spec} \rightarrow \%\text{prefix} \text{SPair-list} \mid \%\text{suffix} \text{SPair-list} \)
- \( \text{SPair-list} \rightarrow \text{SPair} \mid \text{SPair SPair-list} \)
- \( \text{SPair} \rightarrow ( * \text{Char-list} ) \mid ( \text{Char-list Char-list} ) \)
- \( \text{Char-list} \rightarrow \text{letter} \mid \text{Macro} \mid \text{letter Char-list} \mid \text{Macro Char-list} \)

\[ \text{n_plur_infl_rule} := \]
\[ \%\text{suffix} ( !s !ss ) ( ss sses ) ( ch ches ) ( sh shes ) \]
\[ \text{infl-ltow-rule} \& \]
\[ [ \text{SYNSEM.LOCAL.CONT.HOOK.INDEX.PNG 3rd-pl, DTR noun-lex} ] . \]
Morphological Rules
Irregular forms

Formal Description

Irregentry → inflected Rulespec base

"seen PSP_VERB_INFL_RULE see
sheep N_PLUR_INFL_RULE sheep"

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Agreement

Syntactic agreement is distinct from semantic agreement

- *Someone brought their car* (gender-neutral)
- *[AmE] Google is releasing their new phone* vs. *[BrE] Google are releasing their new phone*

Agreement in English: subject/verb and determiner/noun
*Those dogs bark*

- Excluding pronouns, only ‘number’ is relevant
- Pronouns also agree with the verb *be* for ‘person’
- In tag questions, also see agreement for ‘gender’
  *She won the race, didn’t she?*
- Pronoun-antecedent agreement is semantic
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Mechanisms in the Matrix

- Syntactic agreement properties are constrained in SYNSEM.LOCAL.AGR
- Semantic agreement properties are constrained in SYNSEM.LOCAL.CONT.HOOK.INDEX.PNG
- Types for nouns specify inherent properties, e.g. [PERSON 3rd]
- Inflectional rules associate affixation on nouns with NUMBER
- Rules for present-tense verbs associate affixation with SUBJ number
- Modifiers in English don’t show agreement, but in other languages, modifiers impose constraints via the HEAD.MOD attribute
Syntax of Modification

- Modifiers select the heads they modify via the MOD feature (inside HEAD)
- The value of MOD is a list of synsems
- Head-modifier rules are cross-classified according to order (head-adj, adj-head) and the intersective/scopal distinction
Intersective Modifiers

- *head-compositional*: syntactic head is semantic head
- ARG1 is MOD’s INDEX (*individual*)
- LTOP = MOD’s LTOP (constraint on rule)
Scopal Modifiers

- Serve as semantic head daughters
- Identify their own INDEX with their MOD’s INDEX
- Take a handle-valued ARG1
- Insert a qeq between their ARG1 and their MOD’s LTOP
In General

- The phrase structure rules for intersective and scopal modifiers need to be different
- Use subtypes of *local* to constrain which rule gets used
scopal-mod-phrase

scopal-mod-phrase := head-mod-phrase-simple &
[ NON-HEAD-DTR.SYNSEM.LOCAL [
  CAT.HEAD.MOD < [ LOCAL scopal-mod ] >,
  CONT.HOOK #hook ],
  C-CONT [ HOOK #hook,
    HCONS <! !> ] ]].
isect-mod-phrase

\[
\text{isect-mod-phrase} := \text{head-mod-phrase-simple} \& \\
\text{head-compositional} \& \\
[ \text{HEAD-DTR.SYNSEM.LOCAL.CONT} [ \\
\text{HOOK.LTOP} \#\text{hand}, \\
\text{MSG no-msg} ], \\
\text{NON-HEAD-DTR.SYNSEM.LOCAL} [ \\
\text{CAT.HEAD.MOD} < [ \text{LOCAL intersective-mod} ] >, \\
\text{CONT.HOOK.LTOP} \#\text{hand} ], \\
\text{C-CONT.HCONS} <! !> ].
\]
Modifier Attachment

**VP/N-bar attachment**

- Attach to non-SPR-saturated phrases
- Correct grammatical results
  - The cat chased that fierce dog.
  - *The cat chased fierce that dog.*
- Spurious ambiguity
  - The fierce dog near the cat barked
  - ( ( fierce dog ) ( near the cat ) )
  - ( fierce ( dog ( near the cat ) ) )
Modifier Attachment (cont.)

NP/S attachment for (post-head) modifiers

+ Correct grammaticality and no spurious ambiguity
  - Asymmetry for adverb attachment
    - The dogs left quickly. (attaches to S)
    - The dogs quickly left. (attaches to VP)
  - Asymmetry for adjectival modifiers
    - The dogs angry at the cats bark. (attaches to NP)
    - The angry dogs bark. (attaches to N)
  - Difficult semantics: scope of negation
    - No dogs near the cat bark.
Modifier Attachment (cont.)

Alternative, using VP/Nbar attachment

- Use boolean feature - -PM (‘Post-Modified’)
  1. Modifier-head-rule says head-dtr must be \([- -PM -]\), but mother is unmarked (enabling *fierce fierce dog*)
  2. Head-modifier-rule says mother is \([- -PM +]\) so a post-modified phrase cannot be head-dtr in modifier-head rule
  3. Other rules preserve the - -PM feature from head-dtr to mother
Argument Optionality

- Define a boolean-valued feature OPT for synsems
- Either discharge an OPT + argument via unary rule, or
- Use a subtype of list called olist all of whose members are marked OPT +
- For example, the subject-head rule might simply require the head-daughter’s COMPS list to have the value olist