Technologies for Storing and Accessing Information about Syntactic and Prosodic Structures: the Potential Utility of CorpusSearch and the like.

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Issue at hand: storage and access of syntactic and prosodic data.

- Researches in syntax-phonology interface need to address the data on multiple tiers.
- Structural data can be viewed under different perspectives.

Examples:

S V OBJ ADV -> $(S)_{IP}((V\ OBJ)_{ip}\ (ADV)_{ip})_{IP}$

NP V NP AdvP -> $(NP)_{IP}((V\ NP)_{ip}\ (AdvP)_{ip})_{IP}$

NP-S V NP-DO ADV-MNR -> $(NP\text{-}S)_{IP}((V\ NP\text{-}DO)_{ip}(ADV\text{-}MNR)_{ip})_{IP}$

Issue at hand: storage and access of syntactic and prosodic data.

- Structures with differ in syntactic arrangement can be parsed into same prosodic structures.

Examples:

S V OBJ ADV -> $(S)_{IP}(V\ OBJ\ ADV)_{IP}$

S V ADV OBJ -> $(S)_{IP}(V\ ADV\ OBJ)_{IP}$

S V DO -> $(S)\ (V\ DO)_{IP}$

V DO S -> $(V\ DO\ S)_{IP}$

Issue at hand: storage and access of syntactic and prosodic data.

- Prosodic parsing can change as a result of specific lexical items.

  Example:

  Short S V O -> (Short S V)(O)

  Long S V O -> (Long S)(V O)

- Same stimuli are elicited from more several participants.
- End result: large amount of syntactic structure/prosodic structure pairs.

Issue at hand: storage and access of syntactic and prosodic data.

- Database: labeled bracketing records of syntactic and prosodic matching configurations.
- Linear encoding: an utterance is one string.
  Example:
  IP[NP[I] V[saw] NP[him] GER[running]]

- Type of queries: noun phrase followed by a gerund.
- Impossible: V c-commanding NP

Issue at hand: storage and access of syntactic and prosodic data.

- Accounting for depth of embedding?
- Separate storage of labels/codes for additional aspects of the utterance: *eg.* complement of *think/believe verbs.*
- Need to predict in advance the type of structures that would be queried for.
- Types of queries are limited.

Software Overview:

- CorpusSearch and TregEx – software that search for patterns inside parsed corpora.
- Input: files containing parsed sentences: each word is labeled for its part of speech and surrounded by brackets.
- Queries: syntactic relations. *eg*. V c-commands PP; NP is a sister to a CP; VP directly dominates a CP and is preceded by a NP.

Software: Overview

- Output :list of sentences that match the syntactic query criteria.
- Output: can be used as an input to other queries.
- The syntactic parsing storage is not bound to any theory or analysis and is defined by user.
- Names of syntactic categories are user defined. *Eg.* NP, NP-OBJ, NOAM-CHOMSKY.

Software: Overview

- Obligatory: 1:1 pairing of category and the lexical item.

  Examples:

  *[NP the girl]

  [NP [DET the [N girl]]]

- Cost: none.

CorpusSearch: specifics

- Source: http://sourceforge.net/projects/corpussearch/
- Input: parsed corpora in Penn Treebank format.
- Environment: Java under Windows/Mac/Unix/Linux.
- Operation mode: command line.
- Knowledge of Unix/Dos commands is required.
- Queries are written in a command file; the output results are also written into a file.

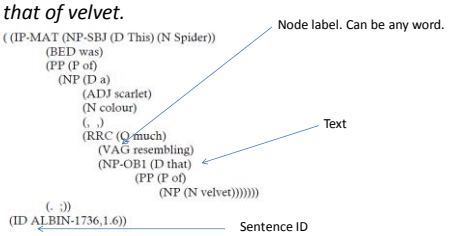
CorpusSearch: execution

- java -classpath "CS.jar" csearch/CorpusSearch query.q input.psd –o output.out
- java -classpath -> invoking Java environment
- "CS.jan" -> name of the file containing the CorpusSearch program
- csearch/CorpusSearch -> invoking the search command
- query.q -> file containing a search criteria command
- input.psd -> file containing parsed corpus sentences
- output.out -> file containing sentences which will match the search criteria
- Query and output file extensions are obligatory.

CorpusSearch: sentence parsing

- Input sentence:

  This spider was of a scarlet colour, much resembling that of velvet.



CorpusSearch: search options

CCommands
Column
Dominates
DomsWords
DomsWords<
DomsWords>
Exists
HasSister
iDominates
iDomsFirst
iDomsLast
iDomsMod
iDomsNumber
iDomsOnly
iDomsTotal
iDomsTotal<
iDomsTotal>
InID
iPrecedes
IsRoot
Precedes
SameIndex

CorpusSearch: search options

- Query: (NP-SBJ* idoms PRO$) AND (PRO$ ccommands NP*)
- Result:

```
(NP-SBJ (PRO$ his)
        (ADVR+Q ouermoch)
        (N fearinge)
        (PP (P of)
            (NP (PRO you))))
```

CorpusSearch: search options

- (NP-SBJ* precedes NP-OB1*)
  AND (NP-SBJ* iDominates ![1]PRO*))
  AND (NP-OB1* iDominates ![2]PRO*))

```
/~*
& +tat schal be a good hors.
(CMHORSES,85.9)
*~/

/*
    1 IP-MAT: 3 NP-SBJ, 7 NP-OB1, 4 D +tat, 10 N hors
*/

(0
   (1 IP-MAT (2 CONJ &)
             (3 NP-SBJ (4 D +tat))
             (5 MD schal)
             (6 BE be)
             (7 NP-OB1 (8 D a) (9 ADJ good) (10 N hors))
             (11 E_S .))
      (ID CMHORSES,85.9))
```

Matched sentence unparsed

Relevant nodes

CorpusSearch: search options

- (C iDominates that|That)

```
/~*
and he shalle do yow remedy, that youre herte shal be pleasyd. '
(CMMALORY,3.47)
*~/

/*
    12 CP-ADV: 13 C that
*/

(
      (12 CP-ADV (13 C that)
                 (14 IP-SUB
                             (15 NP-SBJ (16 PRO$ youre) (17 N herte))
                             (18 MD shal)
                             (19 BE be)
                             (20 VAN pleasyd)))
      (ID CMMALORY,3.47))
```

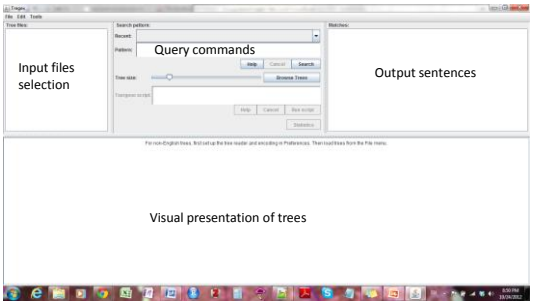
CorpusSearch: summary

- Pros:
  - Intuitive query language
  - Id for each sentence
  - Searches for nodes and labels
- Cons:
  - Inconvenient interface
  - Need to know OS specifics of command line workings
  - Not trivial to install
  - No graphical representation of parsed sentences

TregEx: specifics

- From: http://nlp.stanford.edu/software/tregex.shtml
- Input: parsed corpora in labeled bracketing format.
- Environment: Java under Windows/Mac/.
- Operation mode: graphic interface.
- Source files/Query commands: entered through a form.
- Results: presented visually.

TregEx: specifics



TregEx: sentence parsing

- Input sentence:
  This spider was of a scarlet colour, much resembling that of velvet.

```
(IP-MAT (NP-SBJ (D This) (N Spider))
        (BED was)
        (PP (P of)
          (NP (D a)
              (ADJ scarlet)
              (N colour)
              (RRC (Q much)
                (VAG resembling)
                (NP-OB1 (D that)
                    (PP (P of)
                        (NP (N velvet)))))))
        )
```

TregEx: search options

```
A << B
  A dominates B
A >> B
  A is dominated by B
A < B
  A immediately dominates B
A > B
  A is immediately dominated by B
A $ B
  A is a sister of B (and not equal to B)
A .. B
  A precedes B
A . B
  A immediately precedes B
A ,, B
  A follows B
A , B
  A immediately follows B
A <<, B
  B is a leftmost descendent of A
A <<- B
  B is a rightmost descendent of A
A >>, B
  A is a leftmost descendent of B
A >>- B
  A is a rightmost descendent of B
A <, B
  B is the first child of A
A >, B
  A is the first child of B
A <- B
  B is the last child of A
A >- B
  A is the last child of B
```

TrigEx: summary

- Pros:
  - Easy to install.
  - Convenient graphic interface
  - Graphic presentation of the trees.
  - Easy storage and retrieval of queries.
- Cons:
  - Encoding non lexical data as the leafs will be presented at the tree.
  - No convenient user manual.
  - Query language is not so intuitive.

Software: storage of prosody

- Both tools would allow parsing, storage and accessing of prosodic structures.

Example:

```
(IP (ip (PWd This) (PWd Spider))
        (ip (PWd wasofa)
                (PWd scarlet)
                (PWd colour))
                (ip (PWd much)
                   (PWd resembling)
                   (PWd thatof)
                              (PWd velvet)))
```

Software: storage of prosody

- Issues: matching with syntactic parsing; convenience of side-by-side comparisons.
- CorpusSearch: one could query for the utterances with syntactic relations. Then the ids of each utterance could be queried for their phonological structure.
- TregEx: one could append the phonological parsing to the syntactic one and view them side by side. The upper node would be the id of the particular sentence.

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