Semantic Parsing

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Overview

- **Goals**
  - Assign semantic roles to words in a given parse tree
  - Construct MetaPAR structure with given roles
  - Extract queries for Question Answering system

- **Semantics pipeline**
  - Parse Tree Splitting
    - Clause splitting
    - Conjunction splitting
  - Semantic Interpretation
    - Keyword searching
    - or-
      - Verbnet
Clause Splitting

- Take parse tree and split into separate clauses
- Used for separating subordinating conjunctions (if, while, until…)
- Conditionals separate PAR inputs and outputs:
  - Inputs (see bomb, see hostage, get flipped)
  - Outputs (call Commander, defuse bomb)
Clause Splitting

“Output”

“Input”
Conjunction Splitting

- Separate clauses that contain coordinating conjunctions (and, or…)
- Duplicate the rest of the clause for each phrase
- Used to create multiple PARs (one for each input)
Conjunction Splitting

(BadGuy, CallCommander) (Hostage, CallCommander)
Keyword Searching

- Extract verbs from the sentence
  - For each verb, find parameters in its tree
    - See → bomb, hostage, bad guy
    - Go → room 1, room 2...
    - Call/Tell → bomb, hostage, bad guy, commander

- Advantages
  - Easy to program
  - Can handle relatively complex structure
    - Captures the ‘gist’ of the sentence

- Disadvantages
  - Only handles programmed words
  - Only provides simple, specified relationships
VerbNet

- Expert maintained database that maps verb frames to semantic roles
- Search, Scout, Scavenge, Check
  - NP V NP PP theme
  - "I SEARCHED THE CAVE FOR TREASURE."
  - Agent V Location {for} Theme

Process:
- Find the verbs in the tree
- Fit the parsed and split sentence to the frame for each verb
- Choose the match that expresses the most semantic roles
VerbNet Results

“While I kill the bad guys in the hallway, you search the rooms for bombs.”

- search
  - {'Theme': 'bombs', 'VERB': 'search', 'Location': 'rooms', 'Agent': 'you', 'for': 'for'}

- kill
  - {'VERB': 'kill', 'Patient': 'the bad guys in the hallway', 'Agent': 'I'}
VerbNet Advantages/Disadvantages

- **Advantages**
  - Richer semantics captured
  - Can extract semantics from a large database of verbs (over 5000 verb senses)

- **Disadvantages**
  - Gaps in the database
    - Verbs – ‘defuse’ is not in the database
    - Frames – certain verb usages are not covered by frames
    - We are looking into ways of adding verbs and frames to the database
  - No implementation standard
    - Syntactic restrictions are not well-defined, and difficult to program
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