The relevance of predicate argument structure to temporal annotation

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Chinese Temporal/Discourse Annotation Workshop
Los Angeles, CA
June 1, 2010
Outline

- PropBank as a possible starting point
- Contributions of Lexical Resources
  - VerbNet
  - FrameNet
- Summary
Goal of PropBank

- Supply consistent, simple, general purpose labeling of semantic roles for predicating expressions → **Events**!
- Provide consistent argument labels across different syntactic realizations
- Support the training of automatic semantic role labelers
“1. PB seeks to provide consistent argument labels across different syntactic realizations”

**Syntax:**

**Jin broke the projector.**

$\text{Jin} \ \text{broke} \ \text{the projector.}$

**Thematic Roles:**

$\text{Arg0} \ \text{REL} \ \text{Arg1}$

**Syntax:**

$\text{The projector broke.}$

$\text{The projector} \ \text{broke.}$

**Thematic Roles:**

$\text{Arg1} \ \text{REL}$

$\text{NP}_{\text{SUB}} \ \text{V} \ \text{NP}_{\text{OBJ}}$
“1. PB seeks to provide consistent argument labels across different syntactic realizations”

REQUIRES EVENTUALITIES

\[ \text{Jin} \text{ broke the projector.} \]

\[ \text{NP}_{\text{SUB}} \quad \text{V} \quad \text{NP}_{\text{OBJ}} \]

\[ \text{Arg0} \quad \text{REL} \quad \text{Arg1} \]

\[ \text{Event: broke.01} \]

\[ \text{: Arg1} \quad \text{REL} \]

\[ \text{NP}_{\text{SUB}} \quad \text{V} \]

\[ \text{Event: broke.01} \quad \text{The projector broke.} \]
Remaining complexities

- Events vs states
- Main events vs subordinate events
- Different types of subordinate events
Examples of main events in odd places...

- Complex predicates: nominalizations with and without light verbs
  - “China has threatened to slap sanctions on American companies that sell arms to its rival Taiwan as part of a range of punitive actions Beijing is taking to protest the deal...‘China will make further judgments as appropriate,’ Xinhua reported.”
  - Light verb/nominalization examples: slap sanctions, taking actions, make judgments

- PropBank structures for eventive nouns
  - sanction(China, US companies),
  - act(China),
  - judge(China, US companies)

Hwang, et al, LAW2010
“1. PB seeks to provide consistent argument labels across different syntactic realizations”

- Uuuuuusually…
  - Arg0 = agent
  - Arg1 = patient
  - Arg2 = benefactive / instrument / attribute / end state
  - Arg3 = start point / benefactive / instrument / attribute
  - Arg4 = end point
“2. PB seeks to assign functional tags to all modifiers or adjuncts to the verb”

- **Variety of ArgM’s:**
  - **TMP** - when? *yesterday, 5pm on Saturday, recently*
  - **LOC** - where? *in the living room, on the newspaper*
  - **DIR** - where to/from? *down, from Antartica*
  - **MNR** - how? *quickly, with much enthusiasm*
  - **PRP/CAU** - why? *because … , so that …*
  - **REC** - himself, themselves, each other
  - **GOL** - end point of motion, transfer verbs? *To the floor, to Judy*
  - **ADV** - hodge-podge, miscellaneous, “nothing-fits!”
  - **PRD** - this argument refers to or modifies another: *…ate the meat raw*
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  - **PRD - this argument refers to or modifies another:** *…ate the meat raw*
PropBank can aid temporal annotation by providing:

- Identification of Eventuality ID’s
  - Some might not be relevant for temporal relations
- Prior marking of multitudes of temporal adjuncts

Are we done?

What about verb classes, as embodied in VerbNet and FrameNet?
VerbNet – *Karin Kipper*

- **Class entries:**
  - Capture generalizations about verb behavior
  - Organized hierarchically
  - Members have common semantic elements, semantic roles and syntactic frames

- **Verb entries:**
  - Refer to a set of classes (different senses)
  - Each class member linked to WN synset(s) (not all WN senses are covered)
### give-13.1-1

**Members:**

- **GIVE** (FN 1; WN 1, 3, 8, 14, 17, 19, 24, 29)
- **SELL** (FN 1; WN 1, 4)
- **HOCK** (WN 1)
- **LEASE** (FN 1, 2; WN 1, 3)
- **PAWN** (WN 1)
- **RENT** (FN 1, 2; WN 1, 2)

### Roles

- Asset

### Frames

**NP-PP Asset-PP**

- **Example:** "He leased the car for $200 a week."
- **Syntax:** Agent V Theme {For At} Asset
- **Semantics:**
  - Has Possession (start(E), Agent, Theme)
  - Transfer (during(E), Theme)
VerbNet example – Begin 55.1

- go_on
- *pledge*
- proceed
- begin
- commence
- recommence
- resume
- start

- start_off
- undertake
VerbNet – *Stop 55.4*

- Halt
- Repeat
- Terminate
- Cease
- End
- Finish
- Stop
Aspectual classes in VerbNet

- 55.1: begin-55.1
- 55.2: complete-55.2
- 55.3: continue-55.3
- 55.4: stop-55.4
- 55.5: establish-55.5
- 55.6: sustain-55.6
Verbs of “saying” in VerbNet

37.1.1: transfer_mesg-37.1.1
37.1.2: inquire-37.1.2
37.1.3: interrogate-37.1.3
37.2: tell-37.2
37.3: manner_speaking-37.3
37.4: instrCommunication-37.4
37.5: talk-37.5
37.6: chit_chat-37.6
37.7: say-37.7
37.8: complain-37.8
37.9: advise-37.9
37.10: confess-37.10
37.11: lecture-37.11
37.12: overstate-37.12
37.13: promise-37.13
FrameNet
(Baker, et. al., Coling98, Fillmore & Baker, NAACL01)

FrameNet records information about English words in the general vocabulary in terms of

1. the frames (e.g. Compliance) that they evoke,
2. the frame elements (semantic roles) that make up the components of the frames (in Compliance, Norm is one such frame element), and
3. each word’s valence possibilities, the ways in which information about the frames is provided in the linguistic structures connected to them (with observe, Norm is typically the direct object).
Examples from the **Compliance** Frame

In one of its senses, the verb *observe* evokes a frame called **Compliance**: this frame concerns people’s responses to norms, rules or practices. Examples:

- *Our family* **observes** the Jewish dietary laws.
- *You have to* **observe** the rules or you’ll be penalized.
- *How do you* **observe** Easter?
- *Please* **observe** the illuminated signs.
Frame Elements for Compliance

The frame elements that figure in the Compliance frame are called

- **Norm** (the rule, practice or convention)
- **Protagonist** (the person[s] reacting to the Norm)
- **Act** (something done by the Protagonist that is evaluated in terms of the Norm)
- **State_of_affairs** (a situation evaluated in terms of the Norm)
FrameNet – Activity_start Frame

Verbs (8)
- begin.v
- commence.v
- enter.v
- initiate.v
- launch_(into).v
- start.v
- swing_(into).v
- take_up.v

Nouns (2)
- beginner.n
- neophyte.n
Process_start Frame

Verbs (5)
- begin.v
- break out.v
- commence.v
- erupt.v
- start.v

Nouns (3) & Adjectives (2)
- commencement.n
- eruption.n
- onset.n
- incipient.a
- nascent.a
Cause_to_start Frame (23 verbs)

- actuate
- arouse
- bring about
- call forth
- create
- elicit
- engender
- generate
- incite
- instigate

- kindle
- motivate
- produce
- prompt
- provoke
- set off
- spark
- stimulate
- stir up
Resume Frames

Process_resume Frame (resume.v)

Cause_to_resume Frame
- reinstate.v
- restart.v
- revive.v

Activity_resume Frame
- renew.v
- restart.v
- resume.v
Summary

- PropBank can contribute
  - Annotation with events and many temporal adjuncts already marked
  - Does not solve hard problems of determining unusual main events (might help a little w/ light v)

- Lexical Resources (VerbNet and FrameNet) can contribute
  - Semantic classes of verbs that are likely to indicate particular types of temporal relations
Acknowledgments

- We gratefully acknowledge the support of NSF 0551615CISE-CRI Towards a Comprehensive Linguistic Annotation of Language
- and DARPA-GALE via a subcontract from BBN.