

Issue

- ▶ Almost every sentence feature **Tense**, and often **Aspect**
- ▶ Additional semantic phenomena = additional difficulties
- ▶ No analysis in **wide-coverage** semantics
- ▶ *i.e.* no wide-coverage of sequences-of-tense like (factual) narratives

Contribution

- ▶ **Syntax-semantic interface** between wide-spread frameworks
- ▶ **Compositionality**: not featured in DRT textbook treatment
- ▶ **Optionality**: smooth integration of Tense and Aspect account
- ▶ Spot problematic temporal and aspectual conditions



Tense

- ▶ **Future**, utterance **Present**, **Past**
- ▶ **Split** verb into auxiliary and infinitive
- ▶ **Time** role for better location time

Perfect

- ▶ Specific **CONS** instead of loose \supset
- ▶ VP-modifier **PERF** introduces **CONS**
- ▶ Future: auxiliary verbs get **PERF**

Progressive

- ▶ **Embedding** for imperfective paradox
- ▶ Embed the verb symbol **and** its roles
- ▶ Object/complement out of embedding

Motivational Example

- ▶ Adapted from DRT textbook

Mary wrote a letter.
Mary **did** write a letter.

Mary has met John.

Mary is writing a letter.

Syntactic Parsing

- ▶ Theory: **CCG**
- ▶ Tool: C&C, EasyCCG

[[wrote]] ([[a]] [[letter]]) [[Mary]]
[[did]] ([[write]] ([[a]] [[letter]])) [[Mary]]

[[has]] ([[met]] [[John]]) [[Mary]]

[[is]] ([[writing]] ([[a]] [[letter]])) [[Mary]]

Lexical Entries

- ▶ Theory: λ -DRT
- ▶ Method of *continuation*:
[[S]] := $(e \rightarrow t) \rightarrow t$
- ▶ **Untensed** verb entry:

[[write]] := $\lambda o, s, p. s (\lambda x. \left(\begin{array}{c} e \\ \text{write}(e) \\ \text{Agent}(e, x) \\ \text{Result}(e, y) \end{array} \right) + p(e))$

- ▶ Tool: Boxer

[[will]] := **FUT** :=
 $\lambda v, n, p. v n \left(\lambda e. \begin{array}{c} t \\ \text{Time}(e, t) \\ \text{now} < t \end{array} \right) + p(e)$

[[do-es]] := **NOW** :=
 $\lambda v, n, p. v n \left(\lambda e. \begin{array}{c} t \\ \text{Time}(e, t) \\ \text{now} \subseteq t \end{array} \right) + p(e)$

[[did]] := **PST** :=
 $\lambda v, n, p. v n \left(\lambda e. \begin{array}{c} t \\ \text{Time}(e, t) \\ \text{now} > t \end{array} \right) + p(e)$

[[VERB+en]] := [[VERB]]

[[have]] := **PERF** := $\lambda v, n, p. v n \left(\lambda e. \begin{array}{c} s \\ \text{CONS}(e, s) \end{array} \right) + p(s)$

[[have/has]] = $\lambda v. \text{NOW} (\text{PERF } v)$

[[had]] := $\lambda v. \text{PST} (\text{PERF } v)$

[[writing]] := $\lambda o, t, q. t (\lambda x. \left(\begin{array}{c} s \ p \\ e \\ \text{write}(e) \\ \text{Agent}(e, x) \\ \text{Result}(e, y) \\ \text{PROG}(s, p) \end{array} \right) + q(s))$

[[be]] := $\lambda v. v$

[[am/is/are]] := **NOW**

[[was/were]] := **PST**

Representation of Meaning

- ▶ Theory: **Discourse Representation Theory**

- ▶ Style: **neo-Davidsonian**

- ▶ Tool: VerbNet roles

e	x	y	t
person(x)	write(e)		
named(x, Mary)	Agent(e, x)		
letter(y)	Result(e, y)		
	Time(e, t)		now > t

e	s	x	y	t
person(x)	named(x, Mary)			
person(y)	named(y, John)			
meet(e)	CONS(e, s)			
Agent(e, x)	Time(s, t)			
CoAgent(e, y)	now \subseteq t			

p	s	x	y	t
person(x)	named(x, Mary)			
letter(y)				
	e			
p:	write(e)			
	Agent(e, x)	Result(e, y)		
	PROG(s, p)	Time(s, t)		now \subseteq t

Take-Home Message

- ▶ Auxiliaries are meaningful **VP-modifiers**
- ▶ New **conditions** for no discrepancy
- ▶ Make it yours! Easy to season to your taste/framework:
 - ▷ Davidsonian, neo-Davidsonian (or hyper-Davidsonian)
 - ▷ Textbook condition set, present one, your special mix
 - ▷ Tools already available to make it real

What is Next?

- ▶ Short paper submitted to IWCS
- ▶ To be integrated into Parallel Meaning Bank
- ▶ Interaction with Negation (Projective DRT)
- ▶ Extend to temporal adverbs (*often*) and presuppositions (*on Sunday*)
- ▶ Method of delay: [[S]] := $e \rightarrow t$