

Recall: 3 uses of pronouns

- Deictic (1) and Anaphoric (2)
 - represented by free variables

(1) (pointing) He shouldn't be here

(2) a. The woman in the house next door, she's here

b. Three guys came in. They sat down

- Bound

- represented by bound variables

(3) a. If one of the arrows hits the target, it's mine

b. Every boy spoke to his neighbor

Interlude: tense logic with operators

(4a) John grew \Rightarrow (4a') Past (grow(j))

(4b) John grows \Rightarrow (4b') Present (grow(j))

- Try an action sentence:

(5a) I didn't turn off the stove

(5a') Past (not(turn-off(speaker,stove)))

(5a'') not (Past(turn-off(speaker,stove)))

- The truth-conditions don't come out right!

Tense in Montague Grammar

- Bach's Lecture II

(6) a. John walks in the park

b. John walked in the park

c. John will walk in the park (perhaps)

– These are different-time version of the proposition $walk(j) \&in(p,j)$.

Tense in Montague Grammar

- Bach's Lecture II

- Worlds enough and time: think of each world as having earlier and later versions.

A convenient way to think about it is

- to *distinguish* a set of *times*,
 - **ordered** in the natural way, and just align all the worlds along the resulting timeline.

Montague grammar

- Our semantic inventory so far:
 - A set of entities (possibly including events), type e
 - Two truth-values, 1 and 0, type t
 - A set of possible worlds (frozen in time), type s
 - A timeline with times, type τ (*Greek “tau”*)
- What meanings are like:
 - The truth of a sentence is evaluated with respect to a particular world at a particular time, so
sentence meanings have type $\langle s\tau \ t \rangle$

Three uses of tenses

- Deictic
 - represented by free “time” variables

(7) a. I forgot to turn off the stove.

b. We climbed Mt. Baker.

c. I love you

Three uses of tenses

- Anaphoric (or cataphoric)

- represented by free “time” variables?

(8) a. We climbed Mt. Baker three weeks ago

b. Sheila had a party last Friday and Sam got drunk

c. When Susan came in, Peter left

Three uses of tenses

- Bound

- represented by bound “time” variables?

- (9) a. If Susan comes in, John will leave at once
- b. When you eat Chinese food, you're always hungry an hour later
- c. John never answers when I call his home
- d. Most of the time, if I write John a letter, he answers within a week
- e. Richard always gave assignments that were due the next day

More complex examples

(10) If John had married Susan, he would have had everything he wanted

(10') If John has at time t married Susan, he would have had at time t_1 everything he wanted at time t_2

(10'') If John had at time t married Susan, he would have had at time t_2 everything he wanted at time t_2

Times and Events

- Connecting Davidsonian semantics with tense
 - Each event has its duration and location in time.
 - The letter τ is also used for the “time trace” function
 - The tense locates the events on the timeline with respect to the current time t_0
 - Present tense means event-time overlaps with t_0
 - Past tense means event-time precedes t_0

(11) Jones buttered the toast

(11') $\exists e[\text{Buttered}(j,ixT(x),e) \ \& \ \tau(e) < t_0$

The meaning of the English perfect

(12) But Philip ceased to think of her a moment after he had settled down in his carriage.

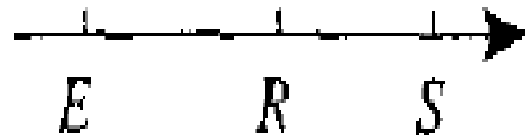
Somerset Maugham *'Of Human Bondage'*

- S – Speech time, now, t_0
- R – Reference point, from the perspective of which the event is viewed
- E – Event time, $\tau(e)$

Reichenbach's theory of tenses

Past Perfect

I had seen John



Simple Past

I saw John



Present Perfect

I have seen John



Present

I see John



Simple Future

I shall see John



Future Perfect

I shall have seen John



A correction: time intervals

- Since time traces of events are *intervals* rather than *points* of time,
 - we'll think of our set of **times** in general as set of *intervals* (*portions of the timeline*)
- There two possible relations between intervals
 - Precedence: $t_1 < t_2$
 - Overlap: $t_1 \cap t_2$
- This allows us to think of relationships between S, R, and E more precisely