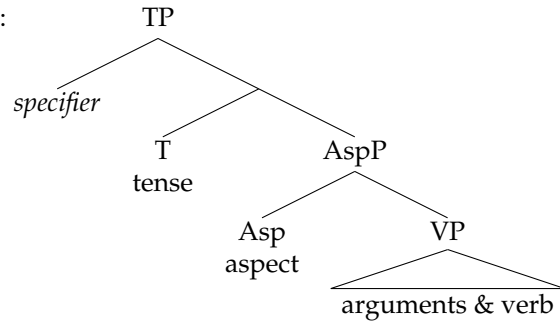


V06 Formalizing tense and aspect

Course in Semantics · Ling 531 / 731
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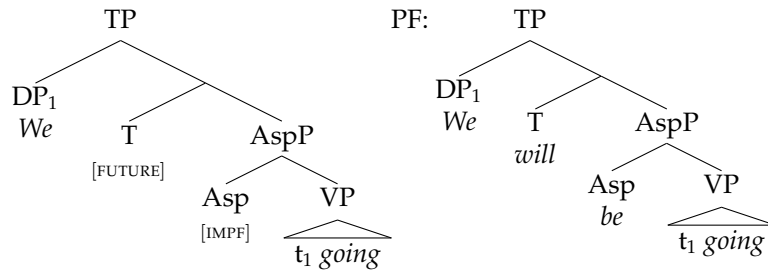
1 Tense and Aspect at LF

A rather cross-linguistic structure:



We can see it in English

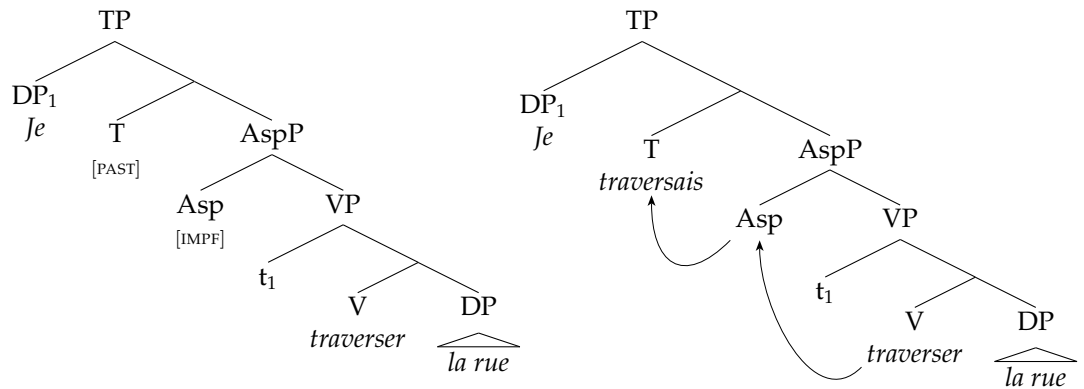
- (1) *We will be going* : future (at T), imperfective



There might be languages where head movement scrambles or mixes T and Asp.

- (2) *Je travers-ais la rue*
I cross-IMPARFAIT.1SG the street
'I was crossing the street' (French)

French *imparfait* = past + imperfective



Why would this be universal? The semantics explains why.

2 Times in the ontology

Aspect relates the event time to the topic time. How do we express times in the grammar? We need to introduce times to our ontology.

- Let D_t be the set of all truth-values, i.e. $\{ 1, 0 \}$. Truth-values are of are type t .
- Let D_e be the set of all individuals, i.e. $\{ x \mid x \text{ is an individual} \}$. Individuals are of type e .
we use variables $x, y, z \dots$ or x, x_1, x_2, \dots to refer to individuals
- Let D_s be the set of all events, i.e. $\{ e \mid e \text{ is an event} \}$. Events are of type s .
we use variables $e, e', e'' \dots$ or e, e_1, e_2, \dots to refer to events
- Let D_i be the set of all times, i.e. $\{ t \mid t \text{ is a time interval} \}$. Times of are type i .
we use variables $t, t', t'' \dots$ or t, t_1, t_2, \dots to refer to times
- For any types σ and τ , Let $D_{\sigma, \tau}$ be the set of all functions $\{ f \mid f \text{ is a function from } D_\sigma \text{ to } D_\tau \}$.
Functions are of type $\langle \sigma, \tau \rangle$.
We use variables P, Q, R, \dots , or f, g, \dots to refer to functions.

A property of times is of type $\langle i, t \rangle$. It takes a time and returns a truth-value

$$(3) \quad \llbracket \textit{two hours ago} \rrbracket = \lambda t. t \text{ is two hours before now}$$

What about the event time? It's the time that an event takes to complete. That is, if you feed it an event, it gives you the time that event took. That means, it's a function from events to times.

- (4) a. $\llbracket \text{time} \rrbracket = \lambda e \in D_s. \text{ the run-time of } e : \langle s, i \rangle$
 b. $\llbracket \text{time}(e) \rrbracket = \text{the run-time of } e : i$

Aspect quantifies over the event, and relates it temporally to the topic time.
 Let's use t as a variable of topic times.

- (5) $\llbracket \text{perfective (PF)} \rrbracket = \lambda f_{st} \lambda t_i. \exists e [\text{time}(e) \subseteq t \ \& \ f(e) = 1]$
 READ: *there is an event e such that the run-time of e is in t and $f(e) = 1$*

- (6) *Alissa fell (in t_2): try it!*

- (7) $\llbracket \text{imperfective (IMPF)} \rrbracket = \lambda f_{st} \lambda t_i. \exists e [\text{time}(e) \supseteq t \ \& \ f(e) = 1] : \langle \langle s, t \rangle, \langle i, t \rangle \rangle$
 READ: *there is an event e such that t is in the run-time of e and $f(e) = 1$*

- (8) *Alissa was running*

Aspect takes a property of events and returns a property of times. It thus serves as a kind of bridge between verbs and tense. The $\exists e$ operator in the definition of aspect takes care of existential closure; instead of EC, we can just use FA with aspect.

The result of aspect is a property of times. So what do we do with that?

3 Tense is a pronoun

We use existential quantification to bind event arguments. What about times?

It was thought that times could be created the same way, but we later found out they couldn't.

Barbara Partee

- Pioneered linking Montague grammar with Generative grammar
- Interaction of logic, linguistics, cog sci
- Tense as a pronoun
- Type-shifting
- Semantic typologies of quantification
- Currently linking US and Russian linguists

Partee (1973): 'Structural Analogies between Tenses and Pronouns'

1. Tense is often deictic

(9) *I didn't turn off the stove*
 not 'there was a time in the past where I didn't turn off the stove',
 but 'at a particular interval in time, I didn't turn off the stove'

2. It is often redundant, the way pronouns sometimes are

(10) *We climbed Mount Baker three weeks ago*
 (11) *The lady in the house next door, she almost ran over me*

3. Times co-vary like other pronouns

(12) *[Every student]₁ spoke to the student in front of him₁*
 Every student λx [spoke to the student in front of x]
 \llbracket *the student in front of x* \rrbracket varies with each student
 (13) *When you eat Chinese food, you're always hungry an hour later.*
 \llbracket *an hour later* \rrbracket varies with each time of eating Chinese food

If we get co-variation using a quantifier binding a variable, then times must be variables, too, which means they must be pronouns: $\forall t$ [you eat Chinese food(t) \rightarrow you're hungry an hour after t]

4. Of course, we have topic times

So what does tense mean? (Heim 1994, Kratzer 1998)

The topic time is a pronoun (i.e., a variable with an index). It is thus interpreted with the Traces & Pronouns rule.

$$(14) \quad t_3 \text{ I left} = \text{I left at } t_3 \llbracket t_3 \rrbracket^g = g(3) : i$$

But how do we distinguish past from present in, say, English? Just like with ϕ -features on personal pronouns, tense pronouns have features that introduce presuppositions. This presupposition is the relation between the topic time (the pronoun) and the utterance time.

$$(15) \quad \llbracket t_u \rrbracket^u = \text{the utterance time}$$

$$(16) \quad \llbracket \text{PAST}_i \rrbracket^{g,u} = g(i). \text{ } g(i) \text{ is only defined if } g(i) < t_u$$

$$(17) \quad \llbracket \text{PRES}_i \rrbracket^{g,u} = g(i). \text{ } g(i) \text{ is only defined if } g(i) \circ t_u$$

$$(18) \quad \llbracket \text{FUT}_i \rrbracket^{g,u} = g(i). \text{ } g(i) \text{ is only defined if } g(i) > t_u$$

You can probably see how we can 'decompose' each of these into a pronoun and a separate feature.