A Review of the Basics of Aspectual Semantics

1. Introducing Aspect

Tense isn’t the only morpho-semantic category that affects the understood ‘predication time’…

• There is also the cross-cutting category known as ‘(grammatical) aspect’

(1) Unfortunate Complication for Us

Illustrating grammatical aspect in English is rather difficult, since there isn’t a clean one-to-one mapping between morphological forms and the semantic categories of aspect

○ Indeed, the mapping from verbal forms to aspeactive interpretations is complex…

○ But we can observe that the aspeactive categories below receive the indicated morphological realizations…

(2) Combinations of Tense and Aspect in English (Eventive Verbs)

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Tense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past</td>
<td>Present</td>
</tr>
<tr>
<td>Imperfective (Progressive)</td>
<td>was dancing</td>
</tr>
<tr>
<td>Imperfective (Habitual)</td>
<td>danced</td>
</tr>
<tr>
<td>Perfect</td>
<td>danced</td>
</tr>
<tr>
<td>Perfect</td>
<td>had danced</td>
</tr>
</tbody>
</table>

(3) Combinations of Tense and Aspect in English (Stative Verbs)

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Tense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past</td>
<td>Present</td>
</tr>
<tr>
<td>Imperfective (Ongoing State)</td>
<td>loved</td>
</tr>
<tr>
<td>Perfect</td>
<td>loved</td>
</tr>
<tr>
<td>Perfect</td>
<td>had loved</td>
</tr>
</tbody>
</table>

(4) Important Features of Note, Part 1

• So-called ‘imperfective aspect’ is divided up into three different subcategories, which in many languages are realized by the same morphology:

○ (i) progressive (ongoing event), (ii) habitual, (iii) ongoing state

• In English, however, the ‘progressive (ongoing event)’ meaning is realized by a special ‘progressive construction’

• However, the other subtypes/meanings of the imperfective are realized by simple verbal forms

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1 The material in this handout is based upon the following course readings: Ogihara 2011: Sections 1-2, 4-5; von Stechow 2009: Sections 1-11.2.
Important Features of Note, Part 2

- So called ‘perfective’ aspect is also realized by simple verb forms in English

- However, across languages, perfective aspect is incompatible with present tense, so simple presents in English are always (some variety) of imperfective aspect
  - With eventive verbs, it’s a ‘habitual’ imperfective reading
  - With stative verbs, it’s an ‘ongoing state’ imperfective reading

- ‘Perfect’ aspect is a distinct category (semantically and morphologically) from perfective; in English it’s realized by the combination of ‘have’ and the past participle

Now that we know these labels, let’s see what the value of them is!...

Key, Overarching Fact: Aspect Affects the Understood ‘Predication Time’

a. When Bill was in the kitchen, Dave was eating a sandwich.

b. When Bill was in the kitchen, Dave ate a sandwich.

c. When Bill was in the kitchen, Dave had (just) eaten a sandwich.

Observations:

- Sentences (6b)-(6c) [perfective and perfect] entail that the eating is not still going on
  - Sentence (6a) [(progressive) imperfective] does not have this entailment.

- Sentence (6b) [perfective] places the time of the eating inside the time of Bill being in the kitchen.

- Sentence (6a) [(progressive) imperfective] seems to do the opposite; it puts the time of Bill being in the kitchen inside the time of the sandwich eating.

- Sentence (6c) [perfect] places the time of the eating before Bill being in the kitchen

Since sentences (6a)-(6c) are all past tense, the contrasts in their meaning is not contributed by tense, but rather by the aspect...
2. Towards a Semantics for Aspect (and Tense): The Neo-Reichenbachian Perspective

Most of the formal semantic literature on aspect assumes a perspective that is often referred to as ‘Neo-Reichenbachian’ (or sometimes as ‘Kleinian’).

- While these approaches trace their roots back to Reichenbach (1947), the general approach was mostly developed in the 80s and 90s (Kamp & Reyle 1993, Klein 1994)

*I will first introduce the general ‘Neo-Reichenbachian’ perspective informally... We will then see how we can incorporate these informal notions into a formal semantics...*

(7) Introducing ‘Topic Times’

A Neo-Reichenbachian approach to aspect assumes (informally) that there are (at least) three times at play in the meaning of a (tensed) sentence.

a. Utterance Time (UT) The time a sentence is asserted. The matrix evaluation time.

b. Event Time (ET) The time of the event/state described in the sentence The ‘predication time’ of the VP

c. Topic Time (TT) The time ‘under discussion’ in the sentence The time that the sentence is about

**Note:** In our pronominal semantics for tense, the time denoted by the T-head plays the role of both the ET and the TT.

A Neo-Reichenbachian theory says this is wrong; we need to separate out those two time spans in the truth-conditions of the sentence...

(8) More on the (Informal) Notion of a ‘Topic Time’

Every sentence of natural language (in context) makes reference to – or ‘is about’ – a particular span of time.

- This ‘Topic Time’ is often implicit in the sentence, and understood via context.
- It can, however, also be directly signaled via temporal adverbs
Illustration of Topic Times

a. At 3PM, I was washing my car.  
   (TT = 3PM)

b. When Bill was in the kitchen, Dave ate a sandwich.  
   (TT = the time Bill was in kitchen)

c. I didn’t turn off the stove!  
   (TT = the time between removal of cookies and when I left the house)

First Key Component of Neo-Reichenbachian Perspective

- Contrary to our semantics in the last handout, tense does not provide any direct information about the location of the ET.
- Rather, tense provides information about the location of the TT (and its relation to the UT)

a. ‘Past’  
   TT precedes the UT  
   (TT < UT)

b. ‘Present’  
   TT surrounds the UT  
   (TT ⊇ UT)

c. ‘Future’  
   TT follows the UT  
   (UT < TT)

Illustration:

a. At the time of our wedding, Dave was in New York.  
   - Past tense indicates that the TT (time of wedding) precedes the UT

b. At the time of our wedding, Dave is in New York.  
   - Present tense indicates that the TT (time of wedding) surrounds the UT

c. At the time of our wedding, Dave will be in New York.  
   - Future tense indicates that the TT (time of wedding) follows the UT

Second Key Component of Neo-Reichenbachian Perspective

Aspect provides the (crucial) information about the ET, by relating it to the TT

a. ‘Imperfective’  
   ET surrounds the TT  
   (TT ⊆ ET)

b. ‘Perfective’  
   TT surrounds the ET  
   (ET ⊆ TT)

c. ‘Perfect’  
   ET precedes the TT  
   (ET < TT)
(13) **Some Notes on the Informal Semantics for Imperfective**

- The informal semantics in (12a) doesn’t distinguish between the three subtypes of imperfective (ongoing state, progressive, and habitual)

- However, as we’ll see, each of these three ‘subtypes’ of imperfective share the key feature of placing the Topic Time *within* the event (or state) time
  - This is the semantic motivation for grouping these different meanings / constructions together under the label ‘imperfective’

- We will therefore (in this intro discussion) continue to not distinguish between these three subtypes of imperfective (which are morphologically distinguished in English)

(14) **Illustration of the Key (Informal) Ideas**

a. When Bill was in the kitchen, Dave *was eating* a sandwich.

(i) Past Tense: \[ \text{TT} < \text{UT} \]
(ii) Imperfective Aspect: \[ \text{TT} \subseteq \text{ET} \]

*Thus, we capture the observations that:*
  * (6a) places Bill’s being in the kitchen *inside* the sandwich-eating
  * (6a) is consistent with the sandwich-eating still continuing at present

b. When Bill was in the kitchen, Dave *ate* a sandwich.

(i) Past Tense: \[ \text{TT} < \text{UT} \]
(ii) Perfective Aspect: \[ \text{ET} \subseteq \text{TT} \]

*Thus, we capture the observations that:*
  * (6b) places the sandwich-eating *inside* Bill’s being in the kitchen
  * (6b) entails that the sandwich eating does not continue into the present

c. When Bill was in the kitchen, Dave *had (just) eaten* a sandwich.

(i) Past Tense: \[ \text{TT} < \text{UT} \]
(ii) Perfect Aspect: \[ \text{ET} < \text{TT} \]

*Thus, we capture the observations that:*
  * (6c) places the sandwich-eating *before* Bill’s being in the kitchen
  * (6c) entails that the sandwich eating does not continue into the present
3. Formalizing The Neo-Reichenbachian Perspective

Happily the tense semantics developed in the previous handout provides a solid foundation on which to build a formalization of this ‘Neo-Reichenbachian’ perspective…

The following ingredients can be grafted onto either the ‘pronominal’ or the ‘indefinite’ semantics for tense...

(15) The Functional Structure of the Clause

The TP takes an Asp(ect) Phrase as complement, which in turn takes VP as complement.

\[
\begin{array}{c|c|c}
\text{TP Tense} & \text{AspP Aspect} & \text{VP} \\
\{\text{Past, Pres, Fut}\} & \{\text{PRV, IMPRV, PERF}\} & \\
\end{array}
\]

(16) Event Semantics for Verbs

Instead of projecting a temporal argument, verbs project an event argument.

\[
[[\text{dance}]]^{w,t,g} = [\lambda x : [\lambda e : \text{dance}(e,w) \& \text{Ag}(e,w) = x ]] \quad \text{‘in world } w, e \text{ is an event of dancing whose agent is } x' \]

(17) Formal Neo-Reichenbachian Semantics for Aspect

- Aspect heads are of type \(\langle e,t, i, t\rangle\)
- They take as argument a predicate of events (denotation of the VP), and return a predicate of times (that goes on to combine with the Tense head)

a. \([[\text{IMPRV}]]^{w,t,g} = [\lambda P_{<e,t>} : [\lambda t' : \exists e . t' \subseteq T(e) \& P(e) = T ]] \]

   ‘the time \(t'\) is contained within the temporal trace of an event of \(P'\)

b. \([[\text{PRV}]]^{w,t,g} = [\lambda P_{<e,t>} : [\lambda t' : \exists e . T(e) \subseteq t' \& P(e) = T ]] \]

   ‘the time \(t'\) is contains the temporal trace of an event of \(P'\)

c. \([[\text{PERF}]]^{w,t,g} = [\lambda P_{<e,t>} : [\lambda t' : \exists e . T(e) < t' \& P(e) = T ]] \]

   ‘the time \(t'\) is after the temporal trace of an event of \(P'\)

Note: In this system, the Asp heads serve to existentially quantify over the event argument of the VP
- *Remember how we placed that quantifier just above VP in our earlier event semantics?*
(18) Putting the Ingredients Together

a. Sentence: “Dave was dancing”

b. LF: $\text{TP}_{\text{Dave}} [\text{TP}_1 \text{ Past}_2 [\text{IMPRV}_1 \text{ t}_1 \text{ dance} \ldots ]]$

c. Predicted Truth-Conditions: (Calculations Left as an Exercise)

(i) Indefinite Semantics for Tense

$$\exists t', t' < t \& t' \in g(2) \& \exists e. t' \subseteq T(e) \& \text{dance}(e, w) \& \text{Ag}(e, w) = \text{Dave}$$

(ii) Pronominal Semantics for Tense

$$[((14b))]^{w, g} \text{ is defined only if } g(2) < t. \text{ If defined, } ((14b))^{w, g} = T \iff \exists e. g(2) \subseteq T(e) \& \text{dance}(e, w) \& \text{Ag}(e, w) = \text{Dave}$$

(19) Relating the Formal Truth-Conditions to the Informal Neo-Reichenbachian Theory

a. In (18ci) [the ‘indefinite tense’ semantics]:

- The ‘UT’ is time $t$, the matrix evaluation time
- The ‘TT’ is time $t'$, which is contextually restricted to the interval $g(2)$.
- The ‘ET’ is $T(e)$, the temporal trace of the event

Thus, our truth-conditions in (18ci) do indeed place:

- The TT before the UT $(t' < t)$
- The TT within the ET $(t' \subseteq T(e))$

b. In (18cii) [the ‘pronominal tense’ semantics]

- The ‘UT’ is time $t$, the matrix evaluation time
- The ‘TT’ is time $g(2)$, the denotation of the Tense head
- The ‘ET’ is $T(e)$, the temporal trace of the event

Thus, our truth-conditions in (18cii) do indeed place:

- The TT before the UT $(g(2) < t; \text{presupposition})$
- The TT within the ET $(g(2) \subseteq T(e))$

The reader is encouraged to similarly explore other possible combinations of tense and aspect in our formalized system...

(20) An Important Note

- When we combine the ingredients in (15)-(17) with our pronominal semantics for tense, we get a system where the Tense head serves to denote/introduce the ‘topic time’

- This notion that ‘tense denotes Topic Time’ was (to my knowledge) first explicitly proposed by Kratzer (1998); it has since become a rather popular (though controversial) notion...
4. **The Problem of the ‘Imperfective Paradox’**

There’s a significant problem with our semantics in (17a) for ‘imperfective’. Consider, for example, the truth-conditions predicted for (21a)…

(21) **Major Problem with Our Semantics for IMPRV**

a. **Sentence:** Dave was eating the cookie.

b. **LF:** \[[TP Dave [TP 1 [TP Pst2 [AspP IMPRV [VP t1 eat the cookie ] … ]]]]]

c. **Predicted Truth-Conditions:**

\[
\text{If defined, } [[(21b)]]^{w,t,g} = T \text{ iff } \exists e . g(2) \subseteq T(e) \& \text{eat}(e,w) \& Ag(e,w) = \text{Dave} \& \text{Thm}(e,w) = \text{the cookie}
\]

The past time \(g(2)\) is surrounded by an event of Dave eating the cookie

\[
\exists e . g(2) \subseteq T(e) \& \text{eat}(e,w) \& Ag(e,w) = \text{Dave} \& \text{Thm}(e,w) = \text{the cookie}
\]

The past time \(g(2)\) is surrounded by an event of Dave eating the cookie

d. **Observation:**

- The truth-conditions in (21c) clearly entail the following:

  \[
  \exists e . \text{eat}(e,w) \& Ag(e,w) = \text{Dave} \& \text{Thm}(e,w) = \text{the cookie}
  \]
  ‘There is in the actual world a (completed) event of Dave eating the cookie’

- Therefore, our semantics predicts that (21a) should entail that Dave eventually does eat the entire cookie…

- **However, it clearly doesn’t!**
  - (21a) is consistent with Dave stopping his cookie-eating at a later time, and never actually finishing the cookie!

(22) **The Imperfective Paradox (Bennett & Partee 1972, Dowty 1979)**

A sentence of the form ‘\[T [IMPFV VP]]’ does not (always) entail that there is event \(e\) in the actual world such that \([[VP]]^{w,t,g}(e) = T\)

- **Note:** Despite the popular name, this isn’t actually a ‘paradox’, just a fact…

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So, how do we revise our semantics for IMPFV so that it avoids this prediction and is harmonious with the ‘paradox’?
The Prevailing View (Dowty 1979, Landman 1992)

There is a ‘modal’ aspect to the meaning of IMPFV; it introduces quantification over (other) possible worlds.

a. **Key Ingredient: ‘Inertia Worlds’:** \( w \) is an **inertia world** for \( w \) at \( t \) iff

\[ \begin{align*}
(i) & \quad w \text{ and } w' \text{ are exactly the same up to time } t \\
(ii) & \quad \text{After time } t, \text{ everything that is ‘going on’ in } w \text{ (and } w') \text{ at } t \text{ continues in } w' \text{ until it is ‘normal’ for it to stop on the basis of its ‘internal properties’}
\end{align*} \]

b. **Illustration of Inertia World:**

\( \begin{align*}
& \text{o} \quad \text{Suppose that in } w \text{ at } t, \text{ Dave is in the process of eating the cookie.} \\
& \text{o} \quad \text{Suppose that at a later time } t' \text{ in } w, \text{ Dave accidentally drops the cookie down a storm drain.} \\
& \text{o} \quad \text{Now, consider a world } w' \text{ such that it’s just like } w \text{ up to time } t, \text{ but at time } t'' \text{ in } w', \text{ Dave doesn’t actually drop the cookie.} \\
& \quad \text{\quad Instead, he eventually finishes the cookie in } w' \\
& \text{o} \quad \text{We would say that } w' \text{ is an **inertia world** for } w \text{ at } t
\end{align*} \]

c. **Notation:** \( \text{Inert}(w,t) \) = ‘the set of inertia worlds for \( w \) at \( t \)

d. **Key Fact:** \( w \) need **not** be a member of \( \text{Inert}(w,t) \)

e. **Modal Semantics for Imperfective**

\[ [\text{IMPFV VP }]^{w,t,g} = \]

\[ [\lambda t' : \forall \exists w' \in \text{Inert}(w,t') \cdot \exists e . t' \subseteq T(e) \& [\text{VP}]^{w',t,g}(e) = T ] \]

‘In all the inertia worlds stemming from \( w \) at \( t' \), \( t' \) is surrounded by a VP-event’

f. **Predicted Truth-Conditions for LF (21b):**

\[ \text{If defined, } [\text{(21b)}]^{w,t,g} = T \text{ iff} \]

\[ \forall w' \in \text{Inert}(w, g(2)), \exists e . g(2) \subseteq T(e) \& \\
\text{ eat(e,w') } \& \text{ Ag(e,w') } = \text{ Dave } \& \text{ Thm(e,w') } = \text{ the cookie.} \]

\[ \text{In all the inertia worlds stemming out from } w \text{ at past time } g(2), \]

\[ \text{There is an event } e \text{ of Dave eating the cookie whose time surrounds } g(2) \]

g. **PROBLEM SOLVED:**

Given (23d), the truth-conditions in (23f) do not entail that Dave actually goes on to eat the (entire) cookie in the actual world…
Important Note:
Since the inertia worlds for $w$ at $t$ must be the same as $w$ up to time $t$…

The truth-conditions in (23f) do entail that ‘cookie-eating’ is going on in the actual world at time $g(2)$…

(24) **An Obvious Shortcoming: The Definition of ‘Inertia Worlds’**

- The definition in (23a) is presently just ‘programmatic’…

- We’d like to spell out some objective criteria for saying when it’s ‘normal’ for something to stop on the basis of its ‘internal properties’…

- There *is* a significant amount of literature that wrestles with this problem… (Dowty 1979, Landman 1992, Kagan 2011, *inter multa alia*)