A Review of Intensions, Propositional Attitudes, Events, and Aktionsart

1. Intensions and Propositional Attitudes

The notes below summarize the key material found in:
- Heim & Kratzer (1998): Chapter 12

1.1 Intensional Semantics: The Key Ingredients

(1) Possible Worlds

- There is an infinite set W of possible worlds (‘alternative realities’), of which the actual world (our reality) is a member.
- The actual world is often designated with ‘w₀’

(2) Extensions and Possible Worlds

- The extension (i.e., truth-value) of a sentence depends upon what possible world it is evaluated in.
  - In the actual world, “Joe is the president” is true
  - In other possible worlds, it might be false
- Therefore, the extension of an expression should be calculated relative to a possible world (and a variable assignment)

a. \[[XP]\]^{w,g} = ‘the extension of XP relative to world w and variable assignment g’

(3) Intensions as Functions

- The intension of an expression maps a possible world onto the extension of that expression at that world

b. \[\lambda w' : [[XP]]^{w'-g}\] = ‘the intension of XP’
- If the extension of XP is type τ, then its intension is type <s,τ>

(4) Terminology for Frequently Encountered Intensional Types

<table>
<thead>
<tr>
<th>Term</th>
<th>Type</th>
<th>Intension of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposition</td>
<td>&lt;s,t&gt;</td>
<td>Sentence</td>
</tr>
<tr>
<td>Property</td>
<td>&lt;s,&lt;e,t&gt;&gt;</td>
<td>NP, VP, AP, …</td>
</tr>
<tr>
<td>Individual Concept</td>
<td>&lt;s,e&gt;</td>
<td>Name, Definite DP</td>
</tr>
</tbody>
</table>
1.2 Lexical Semantics of Propositional Attitude Verbs: The Key Ingredients

(5) Their Semantic Type

A propositional attitude verb (e.g., ‘believes’) has an extension of type \(<s,t>,<e,t>>\)
- Its first argument is a proposition (the attitude content)
- Its second argument is an entity (the attitude holder)

(6) The Notion of a ‘Doxastic Alternative’

The doxastic alternatives for an entity x at a world w (Dox-Alt(x,w)), are:
- The worlds consistent with the beliefs of x at w
- The worlds where all of x’s beliefs at w hold true
- The worlds which x thinks (at w) they might possibly be located in

(7) Proposed Truth-Conditions for Attitude Sentences with Believes / Thinks

\[
[[ \text{Dave believes that it is raining} ]]^{w,g} = T \iff \forall w' \in \text{Dox-Alt(Dave,w)} . \text{it is raining in } w'
\]

This Statement Seems Accurate:
After all, if Dave didn’t believe it was raining, then
Some worlds consistent with his beliefs are ones where it doesn’t rain

(8) A Lexical Semantics for Believes / Thinks That Uses These Ingredients

\[
[[ \text{believes / thinks} ]]^{w,g} = [ \lambda p_{<s,t>} : [ \lambda x_e : \forall w' \in \text{Dox-Alt(x,w)} \cdot p(w') = T ] ]
\]

(9) Computing the Truth-Conditions, Option 1: Intensional Function Application

Intensional Function Application (IFA):
If X is a structure consisting of two daughters – Y and Z – and if \([Y]^{w}\) is a function whose domain contains \(\lambda w' : [[Z]]^{w'}\), then \([[X]]^{w} = [[Y]]^{w} ( [ \lambda w' : [[Z]]^{w'} ] )

- \([[ \text{Dave [believes [it is raining]]} ]]^{w,g} = (\text{by FA})
- \([[ \text{believes [it is raining]} ]]^{w,g} ( [[\text{Dave}]^{w,g} ) = (\text{by IFA})
- (\text{by other rules})
- (\text{by TN})
- (\text{by LC x2})
- \(\forall w' \in \text{Dox-Alt(Dave,w)} \cdot \text{it is raining in } w'\)
Computing the Truth-Conditions, Option 2: Object-Language World-Abstraction

\[
[[ \lambda w \text{XP} ]]^{w,g} = \left[ \lambda w' : [[\text{XP}]]^{w'} \right] \quad \text{(where w' is any fresh world variable)}
\]

- \[ [[ \text{Dave [believes } \lambda w \text{ [it is raining]]} ]]^{w,g} = \quad \text{(by FA)} \]
- \[ [[ \text{believes } \lambda w \text{ [it is raining]]} ]]^{w,g} ([[\text{Dave}]]^{w,g}) = \quad \text{(by FA)} \]
- \[ [[\text{believes}]]^{w,g} ([[\lambda w \text{[it is raining]]} ]]^{w,g}) ([[\text{Dave}]]^{w,g}) = \quad \text{(by rule for ‘} \lambda w \text{’)} \]
- \[ [[\text{believes}]]^{w,g} ([[\lambda w' : [[\text{it is raining}]]^{w'}]]) ([[\text{Dave}]]^{w,g}) = \quad \text{(by other rules)} \]
- \[ [[\text{believes}]]^{w,g} ([[\lambda w' : \text{it is raining in w’}]])(\text{Dave}) = \quad \text{(by TN)} \]
- \[ \left[ \lambda p_{\leq \delta} : \forall w' \in \text{Dox-Alt}(x,w) . p(w') = T \right] \]
  \[ (\left[ \lambda w' : \text{it is raining in w’} \right])(\text{Dave}) = \quad \text{(by LC x2)} \]
- \[ \forall w' \in \text{Dox-Alt}(\text{Dave},w) . \text{it is raining in w’} \]

2. Event Semantics: The Key Ingredients

The notes below summarize the key material found in:
- [https://people.umass.edu/scable/LING610-FA18/Handouts/7.Adverbs&Events.pdf](https://people.umass.edu/scable/LING610-FA18/Handouts/7.Adverbs&Events.pdf)

Events

Like entities, events exist at possible worlds, but they are not entities.

- The event of Dave dancing ≠ Dave
  The time of the dancing
  The location of the dancing
  The time & location of the dancing
  The world where the dancing happens

- Semantic type for events: \( \varepsilon \) (epsilon)
  (some folks use ‘l’ or ‘v’)

- Meta-language variable for events: \( e \) (don’t confuse with type \( e \))
(12) Events, Entities, Times, Locations

While events are type-theoretically distinct from entities, times, etc., there is a family of important functions that relate events to entities, times, etc.

a. $T(e) = \text{The interval of time that } e \text{ takes place in 'The temporal trace of } e'$

b. $L(e) = \text{The physical space (location) that } e \text{ takes place in 'The path of } e'$

c. $Ag(e) = \text{The agent of } e \text{ (if any)}$

d. $Thm(e) = \text{The theme of } e \text{ (if any)}$

(13) Events and Verbs

Following Davidson (1967) *et multa alia*, we can model (some) verbs as having an argument place for events in their semantics.

a. $[[ \text{walk} ]]^{w,g} = [\lambda x_e : [\lambda e : \text{walk}(e) \& Ag(e) = x ]]$

   ‘$e$ is an event of walking and its agent is $x’$

b. $[[ \text{kick} ]]^{w,g} = [\lambda y_e : [\lambda x_e : \text{kick}(e) \& Ag(e) = x \& Thm(e) = y ]]$

   ‘$e$ is an event of kicking and its agent is $x$ and its theme is $y’$

(14) Existentially Closing the Event Argument

- Once the verb combines with its entity arguments, the resulting structure is type $<e, t>$
- Other operators in the sentence can introduce existential quantification over the remaining event argument

a. $[[ \exists ]]\ w,g = [\lambda P_{e<e,t>} : \exists e . P(e) = T ]$

b. (i) Sentence: Dave walked.

   (ii) LF: $[\exists [ \text{Dave walked } ] ]$

(iii) Semantic Computation

   • $[[ \exists [ \text{Dave walked } ] ]]^{w,g} = \text{(by FA)}$
   • $[[ \exists ]]^{w,g} ([[ \exists [ \text{Dave walked} ] ]^{w,g}) = \text{(by FA, TN, LC)}$
   • $[[ \exists ]]^{w,g} ([\lambda e : \text{walk}(e) \& Ag(e) = \text{Dave } ] ) = \text{(by TN)}$
   • $[\lambda P_{e<e,t>} : \exists e . P(e) = T ] ([\lambda e : \text{walk}(e) \& Ag(e) = \text{Dave } ] ) = \text{(by LC)}$
   • $\exists e . \text{walk}(e) \& Ag(e) = \text{Dave}$

   ‘There exists an event of walking whose agent is Dave’
(15) Extending the Semantics to ‘Stative’ Verbs

- As we’ll review in the next section, some predicates intuitively denote ‘states’ rather than ‘events’ (e.g., ‘love’, ‘tall’, ‘be home’)

- We can extend our general approach in (13) to these ‘stative’ verbs by assuming that they have an argument place for *states*.

  a. **Introducing States into the Ontology**

     Like entities and events, states exist *at* possible worlds, but they are distinct from entities, times, and events.

     o The state of Dave loving Tom ≠ Dave

     The time of the loving

     The location of the loving

     The time & location of the loving

     The world where the love holds

     o Semantic type for states: σ (sigma)

     o Meta-language variable for states: s (don’t confuse with type s)

  b. **States and Verbs:**

     Following Parsons (1994)\(^1\) *et multa alia*, we can model (some) verbs as having an argument place for states in their semantics.

     (i) \([\text{[ sick ]}]^w.g = [\lambda x : [\lambda s : \text{ sick}(s) \& \text{Exp}(s) = x ] ] \]

        ‘s is a state of being sick and its experiencer is x’

     (ii) \([\text{[ love ]}]^w.g = [\lambda y : [\lambda x : [\lambda s : \text{ love}(s) \& \\

              \text{Exp}(s) = x \& \text{Thm}(s) = y ] ] ] \]

        ‘s is a state of love whose experiencer is x and whose theme is y’

---

Generalizing Over Events and States: Eventualities

- People often find it convenient to introduce a superordinate type, which encompasses both events (type $e$) and states (type $\sigma$).

- This broader type is generally referred to as ‘eventualities’, which we could take to be type $v$.

\[
\text{Eventualities (type } v) \supseteq \text{Events (type } e) \cup \text{States (type } \sigma)\]

Note:
Under this way of thinking, everything of type $e$, <$e,t$>, <$e,<e,t>$>, etc. is also of type $v$, <$v,t$>, <$v,<e,t>$>, etc.

- The same is true for everything of type $\sigma$, <$\sigma,t$>, <$\sigma,<e,t>$>, etc.

3. Introducing Aktionsart

It has long been noted that English VPs can be categorized according to certain correlated semantic and grammatical properties. That is:

- There are certain semantic properties that VPs (in English) can be observed to have, relating to the ‘internal structure’ of the eventualities they describe.

- These semantic properties appear to be ‘grammatically relevant’; they appear to coincide with other (combinatorial) properties that the VPs have.

The Hierarchy of ‘Aktionsart’ Categories (a.k.a. ‘Eventuality Types’)

\[
\text{All VPs} \rightarrow \text{Statives} \rightarrow \text{Eventives} \rightarrow \text{Telic} \rightarrow \text{Achievements} \quad \text{Accomplishments} \quad \text{Atelic} \rightarrow \text{Semelfactives} \rightarrow \text{Activities}\]
The Category of ‘Statives’

a. **Examples:** ‘loves Italian Food’, ‘is tall’, ‘fears death’

b. **Key Semantic Property:**
The VP can hold true at a single (infinitesimally small) moment/instant

- If we were to freeze time/motion, there would still be entities that (e.g.) ‘love Italian food’, ‘are tall’, ‘fear death’, etc., though things would no longer be ‘dancing’, ‘eating a sandwich’, ‘jumping’, etc.

c. **Key Grammatical Property:**
The VP ‘sounds funny’ or ‘gets a special interpretation’ when put into the English progressive construction (‘be V-ing’)

(i) Dave is dancing / eating a sandwich / jumping /
    ?? loving Italian food / ?? being tall / ?? fearing death

**Important Note:** In English, the ‘semantic property’ in (18b) appears to correlate with the ‘grammatical property’ in (18c).

Therefore, these properties together appear to distinguish an important class of VPs in English

The Category of ‘Eventives’

VP is ‘eventive’ iff it is not a state

- The class of ‘eventive’ VPs is further divided into ‘atelic’ and ‘telic’ VPs

The Category of ‘Telics’

a. **Example:** ‘build a house’, ‘cross the street’, ‘eat the cookie’

b. **Key Semantic Property:**
The past progressive form of the VP (‘was VP-ing’) does not entail the simple past form of the VP (‘VP-ed’)

(i) Telic VP: **Dave was building** a house --/--> **Dave built** a house
(ii) Atelic VP: **Dave was dancing** ➞ **Dave danced**

c. **Key Grammatical Property:**
When in the simple past, easily combines with the adverbial ‘in an hour’

(i) Telic VP: **Dave built a house in an hour**
(ii) Atelic VP: ?? **Dave danced in an hour**
The Category of ‘Atelics’
VP is ‘atelic’ iff it is not telic

a. Additional Grammatical Property of Atelics
   When in the simple past, easily combine with the adverbial ‘for an hour’

(i)  Dave danced for an hour
(ii) ?? Dave built a house for an hour

Both telic and atelic VPs can be divided up into further subclasses based upon whether the events in question are ‘punctual’ or ‘durative’...

The Category of ‘Semelfactives’


b. Key Semantic Property:
   VP is atelic and the events in question take place in a very short span of time; they are ‘virtually’ (though not entirely) instantaneous.

c. Key Grammatical Property:
   The progressive form of the VP entails that there are multiple events e such that $[[\text{VP}]]^{\text{w,IS}}(e) = T$

(i)  Dave was sneezing / jumping / kicking
    (entails multiple sneezes, jumps, kicks)

(ii) Dave was dancing / eating cookies
    (does not entail multiple dancings or eatings)

The Category of ‘Activities’
VP is an ‘activity’ iff it is atelic and it is not semelfactive

The Category of ‘Achievements’


b. Key Semantic Property:
   VP is telic and the events in question take place in a very short span of time; that is, they are basically a quick transition from one state into another

c. Key Grammatical Property:  (Left open for now)
(25) **The Category of ‘Accomplishments’**

VP is an ‘accomplishment’ iff it is telic and it is not an achievement.

(26) **The Hierarchy of ‘Aktionsart’ Categories (Redux)**

```
All VPs
/   \
|     |
Statives          Eventives
/   \               /   \\
|     |             |     |
(true at an instant) (true only over a span of time)
{ loves Italian food } { die, build a house, sneeze, run }
```

```
Telic
|     |
( build towards a ‘culmination’ )
{ die, build a house }
```

```
Atelic
|     |
( no ‘culmination’ )
{ sneeze, run }
```

```
Achievements          Accomplishments          Semelfactives          Activities
/   \               /   \               /   \               /   \\
|     |             |     |             |     |             |     |
( punctual )          ( durative )          ( punctual )          ( durative )
{ die }               { build a house }       { sneeze }         { run }
```

(27) **Important Fact**

These same categories in (26) are identifiable in many other languages of the world.

- That is, while the ‘grammatical properties’ can vary from language to language, it is common for the ‘semantic properties’ noted above to be ‘grammatically relevant’ (i.e., to correlate to with particular grammatical properties).

- For example, we will see that in certain ‘tenseless’ languages, the Aktionsart category of the VP affects the (default) temporal interpretation of the sentence…