A Review of Intensions, Propositional Attitudes, and Events

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 ‘w_0’

(2) Extensions and Possible Worlds

- The truth of a sentence depends upon what possible world it is uttered in.
  - In the actual world, “Barack is the president” is true
  - In other possible world, 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,τ&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>
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</tbody>
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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**

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

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**

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

(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 $[[X]]^w = [[Y]]^w ( [ \lambda w' : [[Z]]^{w'} ]$)

- $[[\text{Dave believes [it is raining]}]]^{w,g} = (\text{by FA})$
- $[[\text{believes [it is raining]}]]^{w,g} ( [[\text{Dave}]]^{w,g} ) = (\text{by IFA})$
- $[[\text{believes}]]^{w,g} ( [\lambda w' : [[\text{it is raining}]]^{w,g} ] ) ( [[[\text{Dave}]]^{w,g} ] = (\text{by other rules})$
- $[[\text{believes}]]^{w,g} ( [\lambda w' : \text{it is raining in } w' ] ) (\text{Dave} ) = (\text{by Lex})$
- $[\lambda p_{<s,t>} : [\lambda x_e : \forall w' \in \text{Dox-Alt(x,w)} . p(w') = \text{T} ] ]$
- $((\lambda w' : \text{it is raining in } w' )) (\text{Dave} ) = (\text{by LC})$

- $\forall w' \in \text{Dox-Alt(Dave,w)} . \text{it is raining in } w'$
Computing the Truth-Conditions, Option 2: Object-Language World-Abstraction

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

- \([[\text{Dave believes } \lambda w \text{ [it is raining]]}]]^{w,g} = \text{(by FA)}
- \([[\text{believes } \lambda w \text{ [it is raining]]} ]^{w,g}([[\text{Dave}]]^{w,g}) = \text{(by FA)}
- \([[\text{believes}]]^{w,g} ([[\text{Dave}[\lambda w \text{ [it is raining]]}]]^{w,g}) = \text{(by rule for '\lambda w')}\)
- \([[\text{believes}]]^{w,g} ([\lambda w' :[[\text{it is raining]]]^{w',g}]([[[\text{Dave}]]^{w,g}) = \text{(by other rules)}
- \([[\text{believes}]]^{w,g} ([\lambda w' : \text{it is raining in } w' ])\text{(Dave)} = \text{(by Lex)}
- \( [\lambda p_{<t,t>} : [\lambda x : \forall w' \in \text{Dox-Alt}(x,w) . p(w') = T ] ]\)
  \(([[\lambda w' : \text{it is raining in } w' ]])(\text{Dave}) = \text{(by LC)}\)
- \(\forall w' \in \text{Dox-Alt(Dave,w)} . \text{it is raining in } w'\)

2. Event Semantics: The Key Ingredients

The notes below summarize the key material found in:
- [http://people.umass.edu/scable/LING610-FA14/Handouts/7.Adverbs&Events.pdf](http://people.umass.edu/scable/LING610-FA14/Handouts/7.Adverbs&Events.pdf)

(11) Events
Like entities, events exist at possible worlds, but they are not entities.

- The event of Dave dancing \(\neq\) Dave
  - The time of the smoking
  - The location of the smoking
  - The time & location of the smoking
  - The world where the smoking happens

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

- 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. $T(e) = \text{The interval of time that } e \text{ takes place in} \quad \text{‘The temporal trace of } e\text{’}$

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

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

\[
\text{‘} e \text{ is an event of walking and its agent is } x \text{’}
\]

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

\[
\text{‘} e \text{ is an event of kicking and its agent is } x \text{ and its theme is } y \text{’}
\]

(14) **Existentially Closing the Event Argument**

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

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

b. (i) Sentence: Dave walked.

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

(iii) Semantic Computation
- $[[ \varnothing_\downarrow [ \text{Dave walked} ] ]]^{w,g} = \quad \text{(by FA)}$
- $[[ \varnothing_\downarrow ]]^{w,g} ( [[\text{Dave walked}]^{w,g} ] ) = \quad \text{(by FA, Lex, LC)}$
- $[[ \varnothing_\downarrow ]]^{w,g} ( [ \lambda e : \text{walk}(e) \& Ag(e) = \text{Dave} ] ) = \quad \text{(by Lex)}$
- $[ \lambda P_{<\varepsilon, t>} : \exists e. P(e) = T ] ( [ \lambda e : \text{walk}(e) \& Ag(e) = \text{Dave} ] ) = \quad \text{(by LC)}$

\[
\exists e. \text{walk}(e) \& Ag(e) = \text{Dave}
\]

\[
\text{‘There exists an event of walking whose agent is Dave’}
\]