Eventualities and Differential Measurement

Marcin Morzycki
Michigan State University

Events workshop, Stuttgart
20 November 2015

Introduction

Degree achievements:

(1) a. The gap widened three inches.
b. The gap widened **by** three inches.

Other verbal measure phrases:

(2) a. Floyd ran three miles.
b. #Floyd ran **by** three miles.

Adjectival analogue of these facts:

(3) a. Floyd is six feet taller (than Clyde).
b. Floyd is taller (than Clyde) **by** six feet.
c. This paper is two weeks overdue.
d. This book is overdue **by** two weeks.

(4) a. Floyd is six feet tall.
b. #Floyd is tall **by** six feet.

Empirical points:

- differential measurement & differential degrees should be distinguished from other sorts (building on Kennedy & Levin 2008, Schwarzschild 2005)
- degree achievements are related to AP differentials
- differential constructions should be decomposed into smaller building blocks (Schwarzschild 2012, 2013) in a neo-Davidsonian style

Theoretical points:

- a concept of ‘differential eventualities’ (meaning events, states, or tropes [Moltmann 2009, 2015])
- natural if degrees are kinds of eventualities (Landman & Morzycki 2003, Anderson & Morzycki 2015)

Roadmap

- ✔ Introduction
- **Kennedy & Levin on degree achievements**
- Schwarzschild on the architecture of comparatives
- An analysis of differential constructions
- Measuring differentials
- Tentative extensions
- Final remarks

Kennedy & Levin on degree achievements

Deadjectival predicates of variable telicity (Abusch 1986 Kearns 2007, Kennedy & Levin 2008, others):

(5) a. **telic:** The soup cooled in 10 minutes.
'The soup was fully cooled in 10 minutes.'

b. **atelic:** The soup cooled for 10 minutes.
'The soup got cooler than before, and did so for 10 minute.'

Progressive as a diagnostic for telicity:

(6) a. **telic:** Floyd is killing Clyde.
entails: Floyd killed Clyde.

b. **atelic:** Floyd is looking at Clyde.
doesn't entail: Floyd looked at Clyde.

Diagnostic gives weird result for degree achievements:

(7) The soup is cooling.
does and doesn't entail: The soup has cooled.

Telic reading depends on scale structure of corresponding adjective:

(8) a. The soup cooled {for / in} five minutes.

b. The gap widened {for / #in} five minutes.

Cool has a closed scale (more or less?) and *wide* on open one (Kennedy & McNally 2005, Rotstein & Winter 2001):

(9) a. The soup is {?fully / completely} cool.

b. #The gap is {fully / completely} wide.

With measure phrase, necessarily telic:

(10) The soup cooled 6 degrees $\left\{ \begin{matrix} \text{in} \\ \#\text{for} \end{matrix} \right\}$ an hour.

Result is not measurement of the theme itself:

(11) $[\![(10)]\!] \neq$ **6-degrees**(**the-soup**)

K&L's intuition: we need a specialized way to measure change.

The core of the verb *cool* is a measure function, **cool**:

(12) $$\textbf{cool} = \lambda x \lambda t \left[\begin{array}{l} \text{the maximal degree to} \\ \text{which } x \text{ is cool at } t \end{array} \right]$$

Alongside **cool**, there is a **DIFFERENCE FUNCTION**: $\textbf{cool}^{\uparrow}_{d}$

- just like **cool**, except ...
- measures on a scale that begins at *d*

Alongside **cool** and $\mathbf{cool}^{\uparrow}_{d}$, there is a **MEASURE OF CHANGE FUNCTION**: $\mathbf{cool}_{\Delta}$

- maps an individual x and an event e to a measure of how much x changed in e
- $\mathbf{cool}_{\Delta} = \lambda x \lambda e \,.\, \mathbf{cool}^{\uparrow}_{\mathbf{cool}(x)(\mathbf{start}(e))}(x)(\mathbf{end}(e))$

Degree achievements denote measure of change functions:

(13) $[\![\textit{widen}]\!] = \mathbf{wide}_{\Delta}$

This is of type $\langle e, \langle s, d \rangle \rangle$, so can't combine with a subject to yield a truth value. Need one more ingredient.

A POS_V morpheme, verbal counterpart of the POS standardly assumed for adjectives (von Stechow 1984 and many others):

(14) $[\![\text{POS}_V]\!] = \lambda g_{\langle e, \langle s, d \rangle \rangle} \lambda x \lambda e \, . \, g(x)(e) \geq \textbf{standard}(g)$

So:

(15) $[\![\textit{the soup } \text{POS}_V \textit{ cooled}]\!]$
$= \exists e \, . \, \textbf{cool}_\Delta(\textbf{the-soup})(e) \geq \textbf{standard}(\textbf{cool}_\Delta)$

'The measure of the change in the coolness of the soup during *e* exceeds the contextual standard for changes in coolness.'

How does this provide a theory of variable telicity?

- Standard for **cool**$_{\Delta}$ can vary depending on the context.
- Sometimes, it is the maximum on the scale of **cool**$_{\Delta}$, which yields a telic reading.
- Otherwise, it is the minimum on the scale, which is the coolness at the start of the event. This yields an atelic reading.

To incorporate measure phrases, an abstract functional head, μ (Svenonius & Kennedy 2006):

(16) $[\![\mu]\!] = \lambda g_{\langle e, \langle s, d \rangle \rangle} \lambda d \lambda x \lambda e \, . \, g(x)(e) \geq d$

(17) $[\![$ *The soup* μ *cooled three degrees.* $]\!] =$
$\exists e[\textbf{cool}_{\Delta}(\textbf{the-soup})(e) \geq \textbf{3-degrees}]$

How to use this to help with *by* facts?

(18) a. The soup cooled three degrees.
b. The soup cooled by three degrees.

(19) a. Floyd ran six miles.
b. #Floyd ran by six miles.

Intuitively, it matters that degree achievements involve difference scales.

An MP can't determine if it's measuring on a difference scale, though.

The analytical approach in K&L:

- manipulate scales and measure functions
- divide up the work of doing so among functional heads and components of meaning

Roadmap

- ✔ Introduction
- ✔ Kennedy & Levin on degree achievements
- **Schwarzschild on the architecture of comparatives**
- An analysis of differential constructions
- Measuring differentials
- Tentative extensions
- Final remarks

Schwarzschild on the architecture of comparatives

- Unrelated to K&L in substance.
- Comparatives and other degree constructions are built up from smaller parts.
- Resembles neo-Davidsonian event semantics.
- Proposes degrees are actually **DIRECTED SCALE SEGMENTS** (cf. vector-space semantics; Zwarts 1997, Zwarts & Winter 2000, Faller 1998).

Approximately Schwarzschild (2012, 2013):

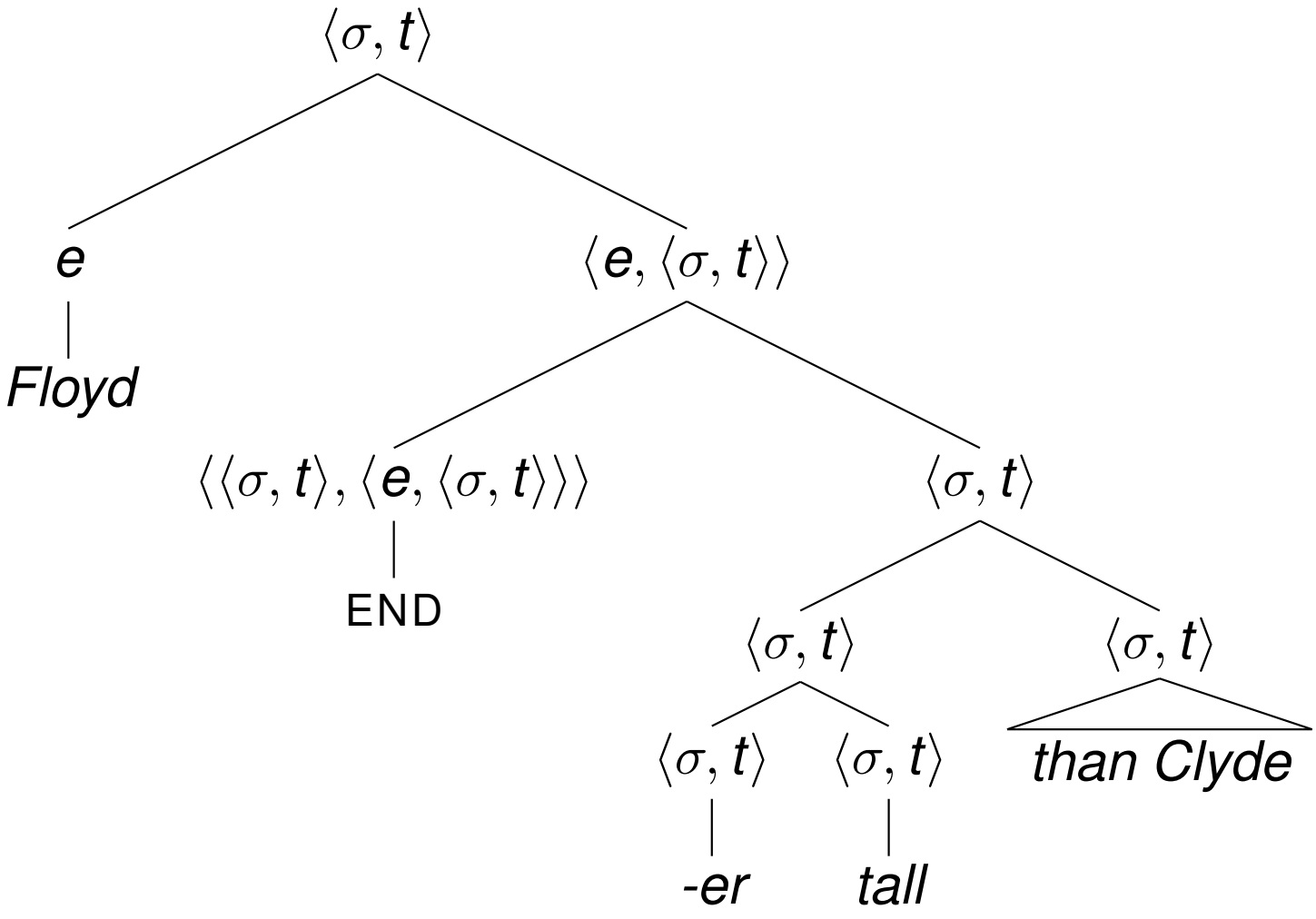
(20) $[\![$ *Floyd is taller than Clyde* $]\!]$

$$= \exists\sigma \left[\begin{array}{l} \mu_\sigma = \textbf{height} \wedge \\ \textbf{upward}(\sigma) \wedge \\ \textbf{start}(\sigma) = \mu_\sigma(\textbf{Clyde}) \wedge \\ \textbf{end}(\sigma) = \mu_\sigma(\textbf{Floyd}) \wedge \end{array} \right]$$

Where σ is a scale segment and μ_σ is a measure function associated with it.

Composition is mostly intersective:

(21)



(22) a. $[\![\textit{tall}]\!] = \lambda\sigma[\mu_\sigma = \textbf{height}]$

b. $[\![\textit{-er}]\!] = \lambda\sigma[\textbf{upward}(\sigma)]$

c. $[\![\textit{than Clyde}]\!] = \lambda\sigma[\textbf{start}(\sigma) = \mu_\sigma(\textbf{Clyde})]$

d. $[\![\textsc{end}]\!] = \lambda f_{\langle\sigma,t\rangle}\lambda x\lambda\sigma \begin{bmatrix} \textbf{end}(\sigma) = \mu_\sigma(x) \wedge \\ f(\sigma) \end{bmatrix}$

e. $[\![\textsc{end}]\!]([\![\textit{[-er tall] [than Clyde]}]\!])([\![\textit{Floyd}]\!])$

$$= \lambda\sigma \begin{bmatrix} \mu_\sigma = \textbf{height} \wedge \\ \textbf{upward}(\sigma) \wedge \\ \textbf{start}(\sigma) = \mu_\sigma(\textbf{Clyde}) \wedge \\ \textbf{end}(\sigma) = \mu_\sigma(\textbf{Floyd}) \end{bmatrix}$$

This can handle typologically different comparatives elegantly.

(23) **Hindi**

anu raaj se lambii hai
Anu Raj FROM tall.FEM PRES.SNG
'Anu is taller than Raj.'

Roughly, *Anu*$_1$ *[[from Raj] [t*$_1$ *tall]]*. Denotation in this spirit (not actually Schwarzschild's):

(24) a. $[\![\textit{tall}]\!] = \lambda x \lambda \sigma [\textbf{end}(\sigma) = \mu_\sigma(x) \wedge \mu_\sigma = \textbf{height}]$

b. $[\![\textit{from Raj}]\!]$

$$= \lambda\sigma \begin{bmatrix} \textbf{upward}(\sigma) \wedge \\ \textbf{start}(\sigma) = \mu_\sigma(\textbf{Raj}) \end{bmatrix}$$

c. $[\![\textit{from Raj Anu tall}]\!]$

$$= \exists\sigma \begin{bmatrix} \textbf{upward}(\sigma) \wedge \\ \textbf{start}(\sigma) = \mu_\sigma(\textbf{Raj}) \wedge \\ \textbf{end}(\sigma) = \mu_\sigma(\textbf{Anu}) \wedge \\ \mu_\sigma = \textbf{height} \end{bmatrix}$$

The analytical approach in Schwarzschild (2012, 2013):

- build up properties of an object incrementally
- divide up work among many distinct building blocks
- do things intersectively

Roadmap

- ✔ Introduction
- ✔ Kennedy & Levin on degree achievements
- ✔ Schwarzschild on the architecture of comparatives
- **An analysis of differential constructions**
- Measuring differentials
- Tentative extensions
- Final remarks

Differential eventualities

Aim:

- combine aspects of Kennedy & Levin (2008) and Schwarzschild (2012, 2013)
- yield a general analysis of what I'll call **DIFFERENTIAL CONSTRUCTIONS**

Standard, uncontroversial claim:

- a change of state is a sort of event

Possibly more controversial claim:

- being taller than someone, cooler than something, etc., is a sort of state

So let's recognize **DIFFERENTIAL EVENTUALITIES**.

(25) Floyd is taller than Clyde.

conceptually: 'Floyd is in a state of being taller than Clyde'

(26) $$\exists s \left[\begin{array}{l} \textbf{tallness}(s) \wedge \textbf{bearer}(s) = \textbf{Floyd} \wedge \\ \textbf{differential}(s) \wedge \ \ldots \\ \\ \end{array} \right]$$

Not clear that **differential**(s) means anything other than **start-state**(s) is defined.

(25) Floyd is taller than Clyde.

conceptually: 'Floyd is in a state of being taller than Clyde'

(26)
$$\exists s \left[\begin{array}{l} \textbf{tallness}(s) \wedge \textbf{bearer}(s) = \textbf{Floyd} \wedge \\ \textbf{differential}(s) \wedge \\ \exists s' \left[\begin{array}{l} \textbf{bearer}(s') = \textbf{Clyde} \wedge \\ \textbf{start-state}(s) = s' \end{array} \right] \end{array} \right]$$

Not clear that **differential**(s) means anything other than **start-state**(s) is defined.

(27) The gap widened.

(28) $$\exists e \left[\begin{array}{l} \textbf{theme}(e) = \textbf{the-gap} \wedge \\ \textbf{differential}(e) \wedge \ \ldots \\ \\ \\ \end{array} \right]$$

(27) The gap widened.

(28)
$$\exists e \left[\begin{array}{l} \textbf{theme}(e) = \textbf{the-gap} \wedge \\ \textbf{differential}(e) \wedge \\ \exists s \left[\begin{array}{l} \textbf{width}(\textbf{the-gap})(s) \wedge \\ \textbf{start-state}(e) = s \wedge \\ \textbf{bearer}(s) = x \end{array} \right] \end{array} \right]$$

Building a comparative

Adjectives relate individuals and eventualities:

(29) $[\![\textit{tall}]\!] = \lambda x \lambda s[\textbf{tallness}(s) \wedge \textbf{bearer}(s) = x]$

Not too shocking. More or less standard (neo-)Davidsonian approach (Parsons 1990).

Comparative morpheme imposes the requirement that a state be differential:

(30) $[\![\textit{-er}]\!] = \lambda g_{\langle e, st \rangle} \lambda x \lambda s \,.\, g(x)(s) \wedge \textbf{differential}(s)$

(31) $[\![\textit{Floyd -er tall}]\!] =$

$$\lambda s \left[\begin{array}{l} \textbf{tallness}(s) \wedge \textbf{bearer}(s) = \textbf{Floyd} \wedge \\ \textbf{differential}(s) \end{array} \right]$$

The comparative phrase (in a phrasal comparative):

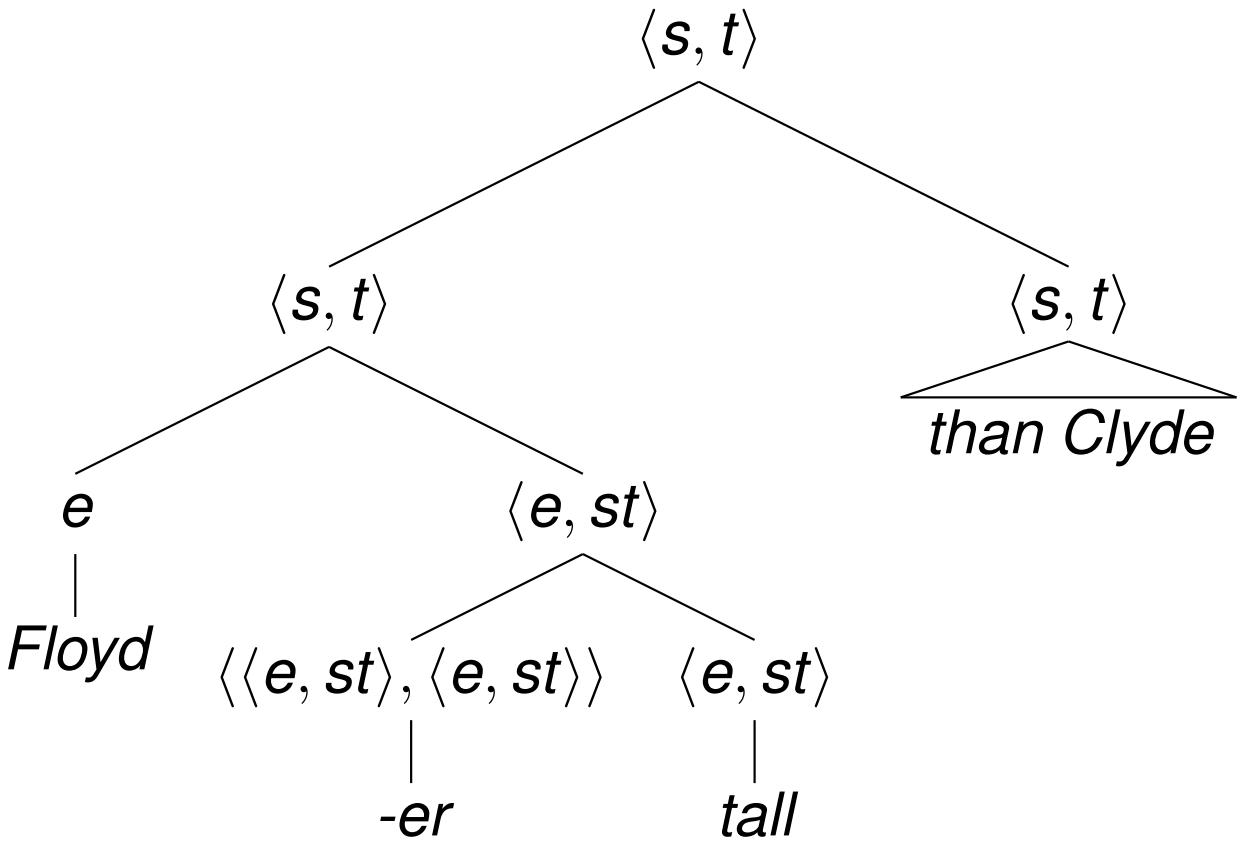
(32) $$[\![\textit{than Clyde}]\!] = \lambda s \,.\, \exists s' \left[\begin{array}{l} \textbf{start-state}(s) = s' \wedge \\ \textbf{bearer}(s') = \textbf{Clyde} \end{array} \right]$$

Introduces a start state, of which Clyde is the bearer.

No independent indication that the start state is a tallness.

- If s has s' and s is a tallness state, s' must be too.
- How to state this as a general principle?

(33)



Combine intersectively at top. Then existential closure.

(34) $[\![\textit{[Floyd -er tall] [than Clyde]}]\!] =$

$$\exists s \left[\begin{array}{l} \textbf{tallness}(s) \wedge \textbf{bearer}(s) = \textbf{Floyd} \wedge \\ \textbf{differential}(s) \wedge \\ \exists s' \left[\begin{array}{l} \textbf{start-state}(s) = s' \wedge \\ \textbf{bearer}(s') = \textbf{Clyde} \end{array} \right] \end{array} \right]$$

Building a degree achievement

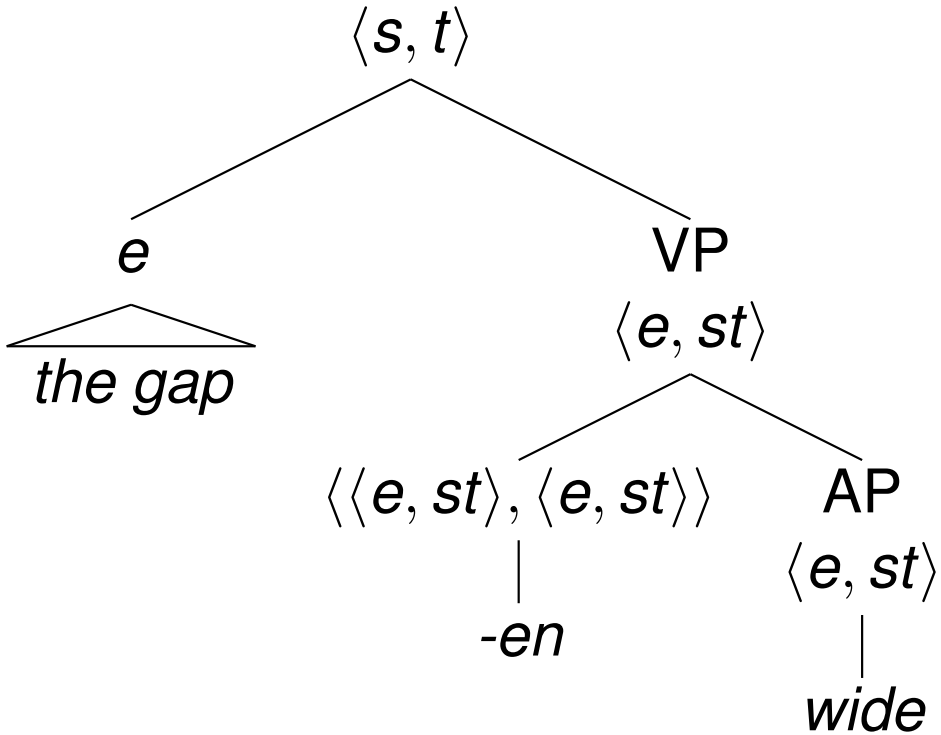
(35) The gap widened.

Begin with a bare adjective:

(36) $[\![\textit{wide}]\!] = \lambda x \lambda s[\textbf{width}(s) \wedge \textbf{bearer}(s) = x]$

A verbalizing morpheme *-en* (common in degree achievements; *blacken*, *darken*, *dampen*, etc.):

(37)



(38) $[\![\textit{-en}]\!]([\![\textit{wide}]\!])([\![\textit{the gap}]\!])$

$$= \lambda e \ . \ \textbf{differential}(e) \wedge \exists s \begin{bmatrix} \textbf{width}(\textbf{the-gap})(s) \wedge \\ \textbf{start-state}(e) = s \wedge \\ \textbf{bearer}(s) = \textbf{theme}(e) = x \end{bmatrix}$$

Atelic reading only. The telic reading is yet to come.

Roadmap

- ✔ Introduction
- ✔ Kennedy & Levin on degree achievements
- ✔ Schwarzschild on the architecture of comparatives
- ✔ An analysis of differential constructions
- ■ **Measuring differentials**
- ■ Tentative extensions
- ■ Final remarks

Measure phrases

The facts we began with:

(39) a. The gap widened three inches.
b. The gap widened **by** three inches.

(40) a. Floyd ran three miles.
b. #Floyd ran **by** three inches.

Two questions:

- How do measure phrases work?
- How does *by* work?

MPs denote properties of eventualities (states or events):

(41) $[\![\textit{three inches}]\!] = \lambda s \,.\, \textbf{3-inch}(s)$

Contra the standard idea that MPs denote degrees directly.

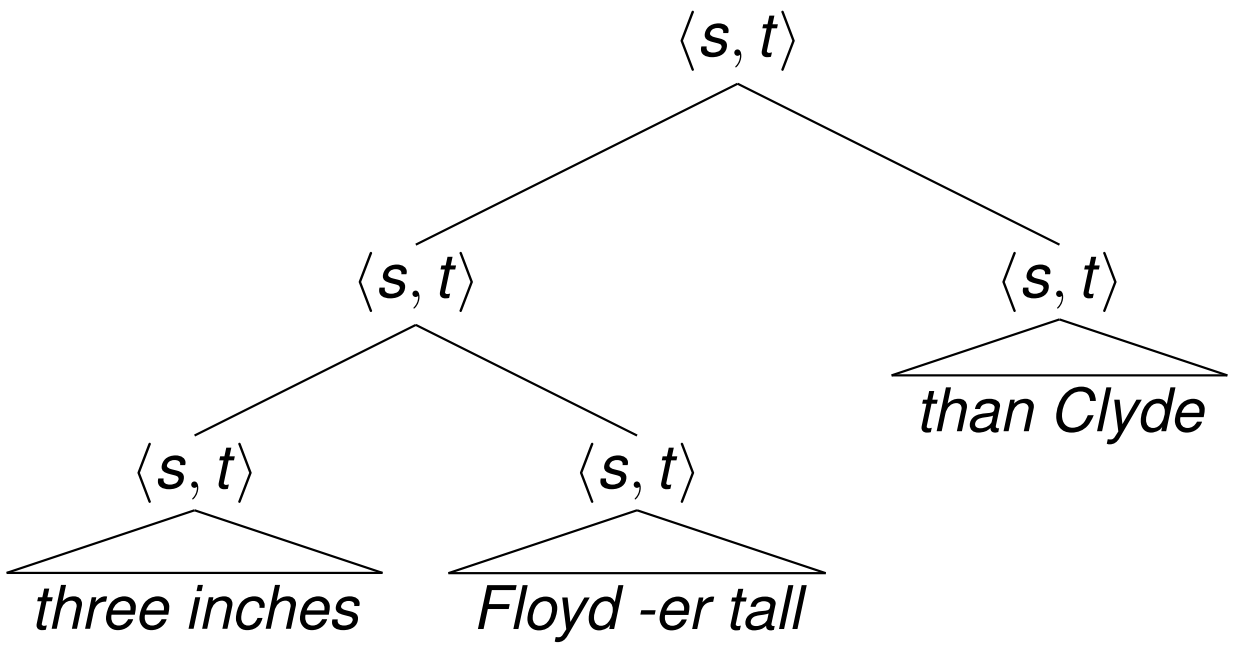
Why believe MPs denote properties? Schwarzschild (2005).

(42) Floyd is { six feet / over a meter / #the height of a bear / #this height / #every height } tall

Why believe they involve eventualities? Landman & Morzycki (2003), Anderson & Morzycki (2015).

(43) Floyd is three inches taller than Clyde.

(44)



Intersective interpretation:

(45) $[\![\textit{Floyd -er tall}]\!] =$

$$\lambda s \left[\begin{array}{l} \textbf{tallness}(s) \wedge \textbf{bearer}(s) = \textbf{Floyd} \wedge \\ \textbf{differential}(s) \end{array} \right]$$

(46) $[\![\textit{three inches Floyd -er tall}]\!] =$

$$\lambda s \left[\begin{array}{l} \textbf{tallness}(s) \wedge \textbf{bearer}(s) = \textbf{Floyd} \wedge \\ \textbf{differential}(s) \end{array} \right] \wedge$$
$$\textbf{3-inches}(s)$$

(47) $[\![\textit{[[three inches] [Floyd -er tall]] [than Clyde]}]\!] =$

$$\lambda s \left[\begin{array}{l} \textbf{tallness}(s) \wedge \textbf{bearer}(s) = \textbf{Floyd} \wedge \\ \textbf{differential}(s) \wedge \\ \textbf{3-inches}(s) \wedge \\ \exists s' \left[\begin{array}{l} \textbf{start-state}(s) = s' \wedge \\ \textbf{bearer}(s') = \textbf{Clyde} \end{array} \right] \end{array} \right]$$

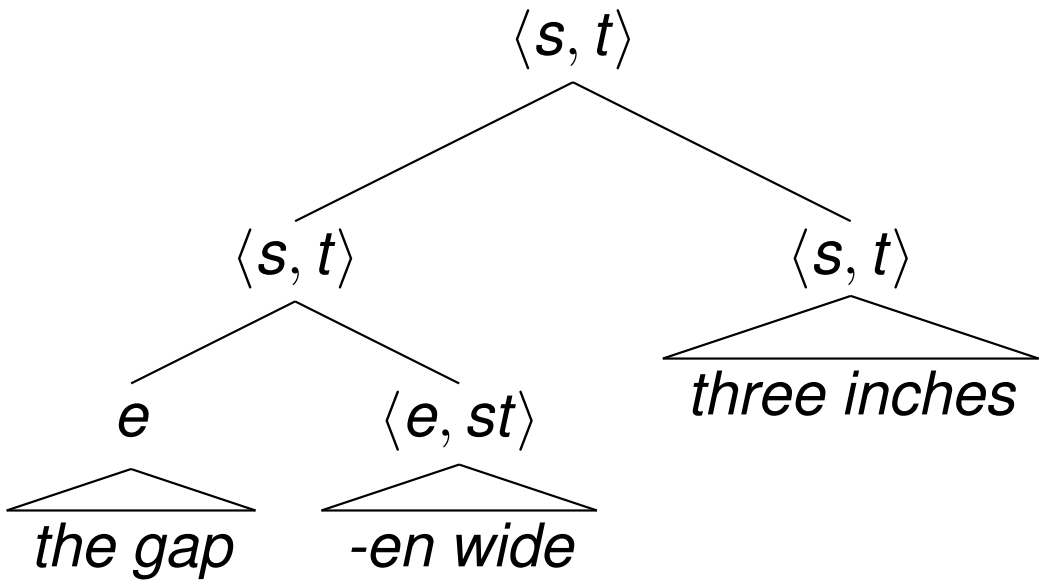
(47) $[\![\textit{[[three inches] [Floyd -er tall]] [than Clyde]}]\!] =$

$$\lambda s \left[\begin{array}{l} \textbf{tallness}(s) \wedge \textbf{bearer}(s) = \textbf{Floyd} \wedge \\ \textbf{differential}(s) \wedge \\ \textbf{3-inches}(s) \wedge \\ \exists s' \left[\begin{array}{l} \textbf{start-state}(s) = s' \wedge \\ \textbf{bearer}(s') = \textbf{Clyde} \end{array} \right] \end{array} \right]$$

Correctly, measurement is differential.

Degree achievements:

(48)



Simple intersective interpretation again:

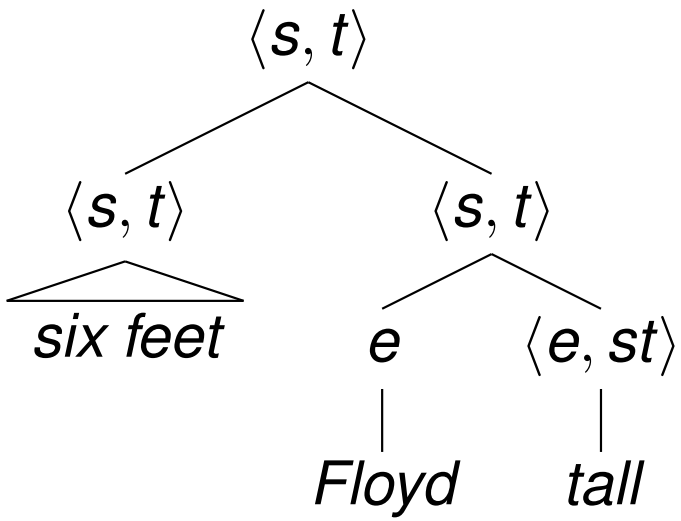
(49) $[\![\textit{[the gap -en wide] [three inches]}]\!] =$

$$\lambda e \left[\begin{array}{l} \textbf{differential}(e) \wedge \\ \exists s \left[\begin{array}{l} \textbf{width}(\textbf{the-gap})(s) \wedge \\ \textbf{start-state}(e) = s \wedge \\ \textbf{bearer}(s) = \textbf{theme}(e) = x \end{array} \right] \wedge \\ \textbf{3-inches}(e) \end{array} \right]$$

Non-differential constructions:

(50) a. Floyd is six feet tall.
b. Floyd ran six miles.

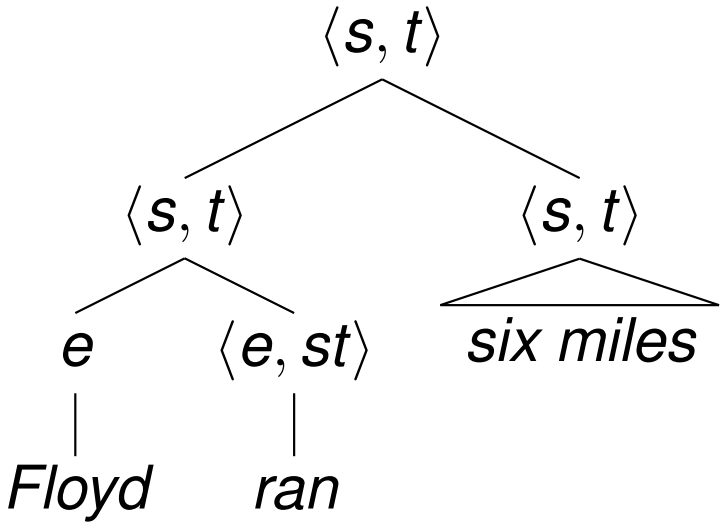
(51)



(52) a. $[\![\textit{Floyd tall}]\!] = \lambda s[\textbf{tallness}(s) \wedge \textbf{bearer}(s) = \textbf{Floyd}]$

b. $[\![\textit{six feet Floyd tall}]\!] = \lambda s \begin{bmatrix} \textbf{tallness}(s) \wedge \\ \textbf{bearer}(s) = \textbf{Floyd} \wedge \\ \textbf{6-feet}(s) \end{bmatrix}$

(53)



(54) a. $[\![\textit{Floyd ran}]\!] = \lambda e[\textbf{running}(e) \wedge \textbf{agent}(e) = \textbf{Floyd}]$

b. $[\![\textit{Floyd tall six miles}]\!] = \lambda e \begin{bmatrix} \textbf{running}(e) \wedge \\ \textbf{agent}(e) = \textbf{Floyd} \wedge \\ \textbf{6-miles}(e) \end{bmatrix}$

Inherently differential MPs

By just imposes a presupposition that an eventuality is differential:

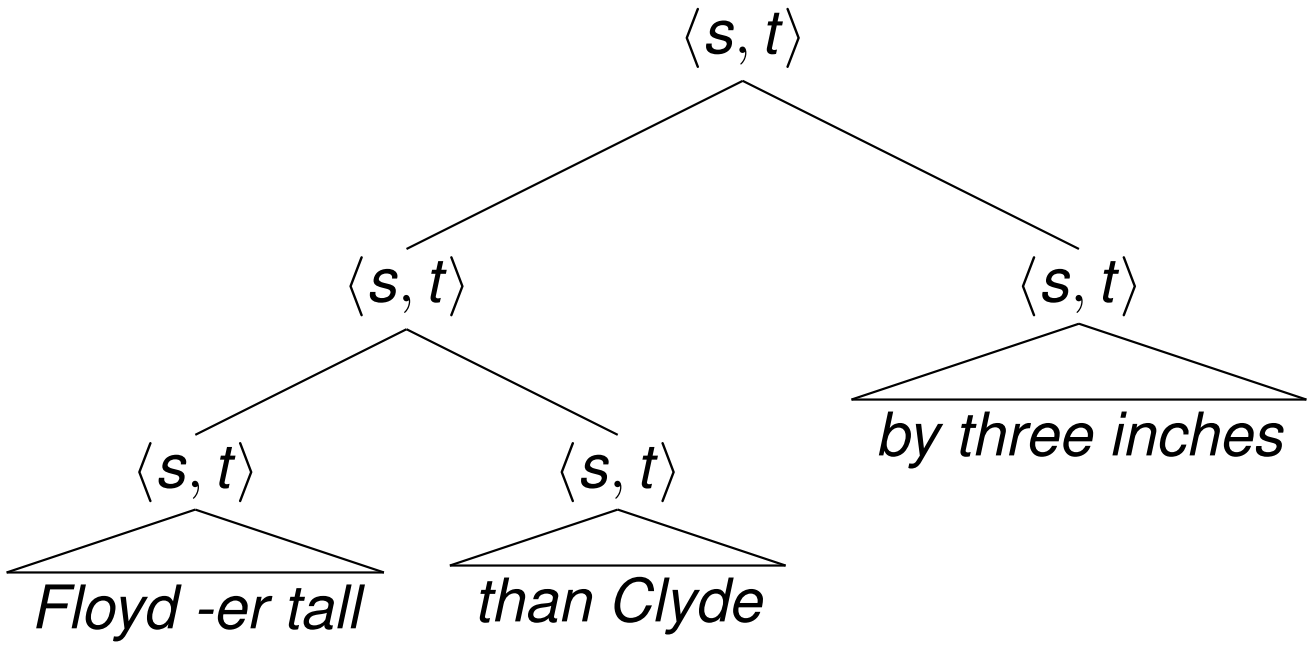
(55) a. $[\![\textit{by}]\!] = \lambda m_{\langle s, t \rangle} \lambda s : \textbf{differential}(s) \,.\, m(s)$

b. $[\![\textit{by 3 inches}]\!] = \lambda s : \textbf{differential}(s) \,.\, \textbf{3-inches}(s)$

(The variable s here is for both events or states.)

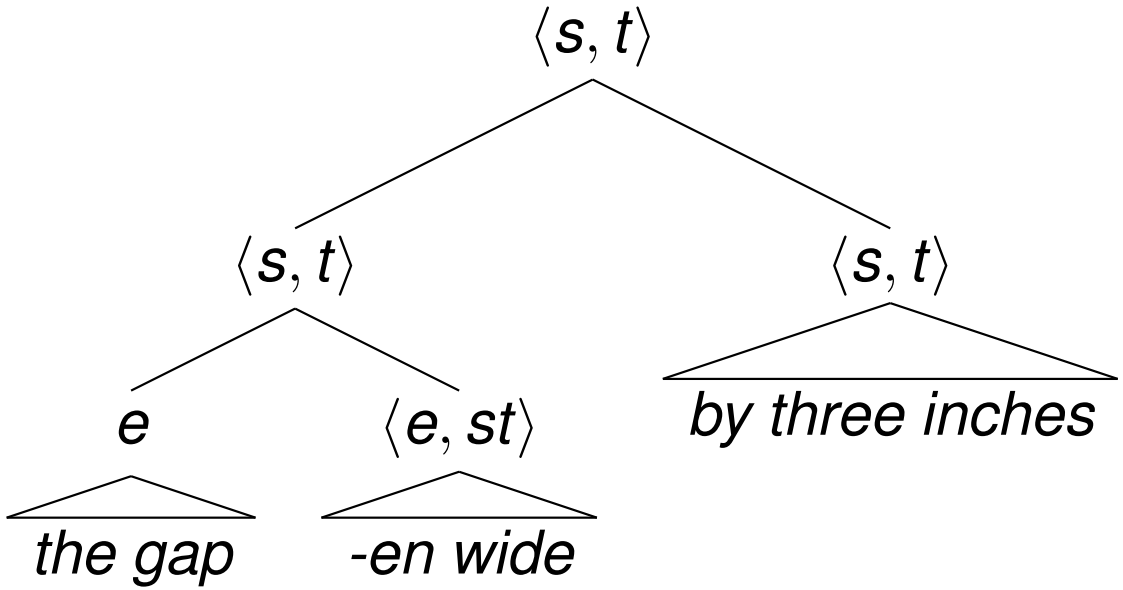
(56) Floyd is taller than Clyde by three inches.

(57)



Interpretation is, again, intersective, so same reading as the bare MP version.

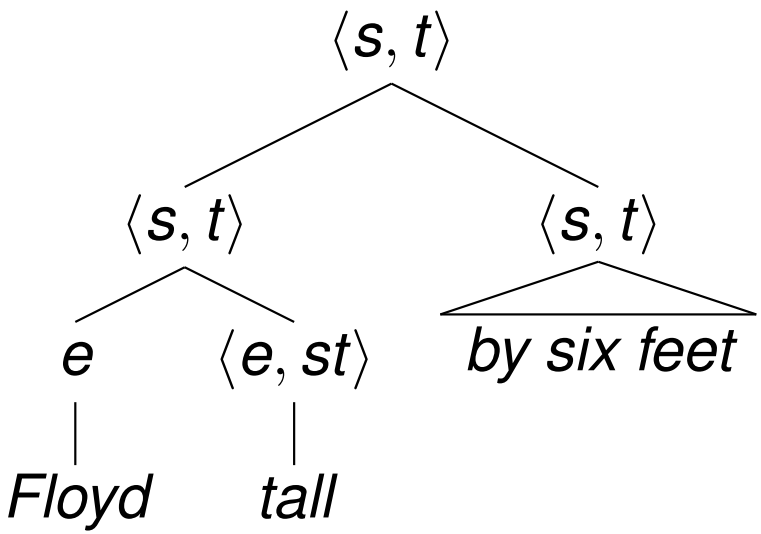
(58)



Interpretation is still intersective, so still the same reading as the bare MP version.

(59) #Floyd is tall by six feet.

(60)

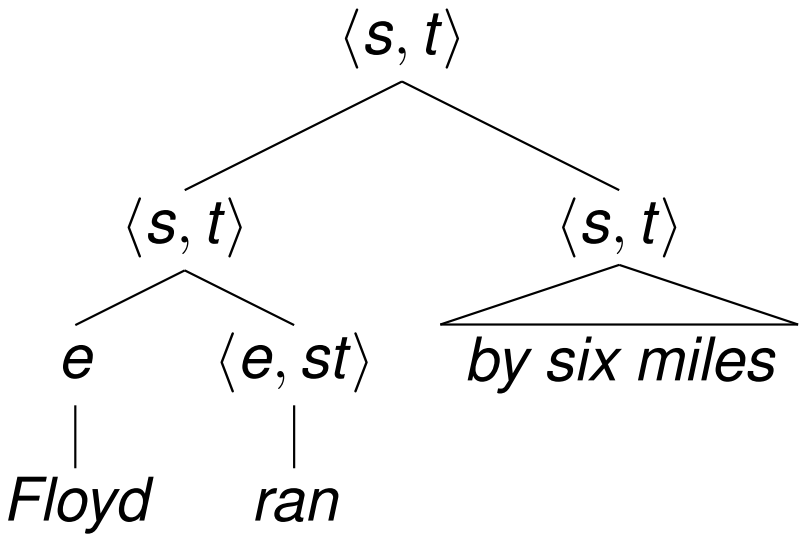


(61) $[\![\textit{Floyd tall by six feet}]\!] =$

$$\lambda s \left[\begin{array}{l} \textbf{tallness}(s) \wedge \\ \textbf{bearer}(s) = \textbf{Floyd} \wedge \\ [\lambda s' : \textbf{differential}(s') \,.\, \textbf{6-feet}(s')](s) \end{array} \right]$$

(62) #Floyd ran by six miles.

(63)



(64) $[\![\textit{Floyd ran by six miles}]\!] =$

$$\lambda s \left[\begin{array}{l} \textbf{running}(e) \wedge \\ \textbf{agent}(e) = \textbf{Floyd} \wedge \\ [\lambda s' : \textbf{differential}(s') \,.\, \textbf{6-miles}(s')](e) \end{array} \right]$$

Stipulative?

- Not really. *For* and *in* may need similar stipulations wrt telicity.
- Accords with intuitions about what *by* means.
- But a deeper explanation might be available . . .
  - MPs might be by default differential (Schwarzschild 2005)
  - The outliers may be MPs that ***lack*** *by*.

Degrees as state kinds

In all this, no role for degrees.

- That's striking.
- But we can't do without them completely.
- How to do it in a neo-Davidsonian style?

Anderson & Morzycki (2015): degrees can be understood as kinds of states.

Some languages use the same morphemes . . .

- . . . for kinds when in NP
- . . . for degrees when in AP

(65) **German *so***

a. so einen Hund
such a dog
'a dog of that kind'

b. so groß
such tall
'this tall'

(66) **German *wie***

a. so ein Hund wie dieser
such a dog WH this
'a dog such as this'

b. so groß wie Peter
such tall WH Peter
'as tall as Peter'

(67) **Polish *tak***

a. taki pies
such-MASC dog
'a dog of that kind'

b. taki wysoki
such-MASC tall
'this tall'

(68) **Polish *jak***

a. taki pies jak ten
such-MASC dog WH this
'such a dog as this'

b. taki wysoki jak Clyde
such-MASC tall WH Clyde
'as tall as Clyde'

(69) **French *comme* (Desmets & Moline 2007)**

a. un chien comme Hildy
   a dog like Hildy
   'a dog like Hildy'

b. Comme il travaille!
   like he works
   'How he works!'

Older forms of English too: *such* is cognate with the *so* of *so tall*.

Anderson & Morzycki (2015):

- Degrees can be understood as kinds of states.
- Modeled using Chierchia (1998)-style kinds. A degree is a plurality of possible states.
- This amounts to an equivalence-class notion of degrees (Cresswell 1976).
- To be six feet tall is to be in a state that realizes the kind SIX FEET TALL.
- German *so* and its analogues are just kind anaphors across domains (individuals and eventualities).

TELICITY

Can recapitulate Kennedy & Levin (2008)'s insights in this framework using degrees as state kinds.

(70) The gap widened.

(71) $[\![\textit{-en}]\!]([\![\textit{wide}]\!])([\![\textit{the gap}]\!])$

$$= \lambda e \,.\, \textbf{differential}(e) \wedge \exists s \left[\begin{array}{l} \textbf{width}(\textbf{the-gap})(s) \wedge \\ \textbf{start-state}(e) = s \wedge \\ \textbf{bearer}(s) = \textbf{theme}(e) = x \wedge \ \ldots \end{array} \right]$$

TELICITY

Can recapitulate Kennedy & Levin (2008)'s insights in this framework using degrees as state kinds.

(70) The gap widened.

(71) $[\![\textit{-en}]\!]([\![\textit{wide}]\!])([\![\textit{the gap}]\!])$

$$= \lambda e \,.\, \textbf{differential}(e) \wedge \exists s \left[\begin{array}{l} \textbf{width}(\textbf{the-gap})(s) \wedge \\ \textbf{start-state}(e) = s \wedge \\ \textbf{bearer}(s) = \textbf{theme}(e) = x \wedge \\ \exists d \in \textbf{deg-kinds}(s) \left[\begin{array}{l} \textbf{realize}(e, d) \wedge \\ d \geq \textbf{standard}_c(\textbf{scale}(e)) \end{array} \right] \end{array} \right]$$

But what about the telic reading?

(72) The soup cooled.

(73) $[\![\textit{-en}]\!]([\![\textit{cool}]\!])([\![\textit{the soup}]\!])$

$$= \lambda e \,.\, \textbf{differential}(e) \wedge \exists s \left[\begin{array}{l} \textbf{cool}(\textbf{the-soup})(s) \wedge \\ \textbf{start-state}(e) = s \wedge \\ \textbf{bearer}(s) = \textbf{theme}(e) = x \wedge \\ \exists d \in \textbf{deg-kinds}(s) \left[\begin{array}{l} \textbf{realize}(e, d) \wedge \\ d \geq \textbf{standard}_c(\textbf{scale}(e)) \end{array} \right] \end{array} \right]$$

(74) $[\![\textit{-en}]\!]([\![\textit{cool}]\!])([\![\textit{the soup}]\!])$

$$= \lambda e \,.\, \textbf{differential}(e) \wedge \exists s \left[\begin{array}{l} \textbf{cool}(\textbf{the-soup})(s) \wedge \\ \textbf{start-state}(e) = s \wedge \\ \textbf{bearer}(s) = \textbf{theme}(e) = x \wedge \\ \exists d \in \textbf{deg-kinds}(s) \left[\begin{array}{l} \textbf{realize}(e, d) \wedge \\ d \geq \textbf{standard}_c(\textbf{scale}(e)) \end{array} \right] \end{array} \right]$$

This inherits the Kennedy & Levin (2008) reasoning:

- Scale of *cool* bounded on both ends.
- If $\textbf{standard}_c(\textbf{scale}(e)) = \textbf{min}(\textbf{scale}(e))$, atelic.
- If $\textbf{standard}_c(\textbf{scale}(e)) = \textbf{max}(\textbf{scale}(e))$, telic.

Roadmap

- ✔ Introduction
- ✔ Kennedy & Levin on degree achievements
- ✔ Schwarzschild on the architecture of comparatives
- ✔ An analysis of differential constructions
- ✔ Measuring differentials
- ■ **Tentative extensions**
- ■ Final remarks

Lexical differentials

Some expressions inherently differential:

(75) a. Floyd overstayed his welcome by twenty minutes.
b. Floyd's score exceeded Clyde's by 20%.

(76) a. The paper is overdue by six weeks.
b. The paper is six weeks overdue.

(77) $[\![\textit{Floyd overstayed his welcome by twenty minutes}]\!]$

$$= \exists s \left[\begin{array}{l} \textbf{differential}(s) \wedge \\ \exists s' \left[\begin{array}{l} \textbf{start-state}(s) = s' \wedge \\ \textbf{bearer}(s') = \textbf{Floyd} \wedge \\ \textbf{welcome}(s') \end{array} \right] \wedge \\ \textbf{20-minutes}(s) \end{array} \right]$$

(78) $[\![$ *The paper is overdue by six weeks.* $]\!]$

$$= \exists s \left[\begin{array}{l} \textbf{differential}(s) \wedge \\ \exists s' \left[\begin{array}{l} \textbf{due}(x)(s') \wedge \\ \textbf{start-state}(s') = s \wedge \\ \textbf{bearer}(s) = \textbf{the-paper} \wedge \\ \textbf{bearer}(s') = \textbf{the-paper} \end{array} \right] \wedge \\ \textbf{6-weeks}(s) \end{array} \right]$$

HINDI COMPARATIVES

Hindi comparative:

(79) a. $[\![\textit{tall}]\!] = \lambda x \lambda s[\textbf{tallness}(s) \wedge \textbf{bearer}(s) = x]$

b. $[\![\textit{Anu tall}]\!] = \lambda s[\textbf{tallness}(s) \wedge \textbf{bearer}(s) = \textbf{Anu}]$

c. $[\![\textit{from Raj}]\!] = \lambda s \,.\, \exists s' \left[\begin{array}{l} \textbf{start-state}(s) = s' \wedge \\ \textbf{bearer}(s') = \textbf{Raj} \end{array} \right]$

d. $[\![\textit{from Raj Anu tall}]\!]$

$$= \lambda s \left[\begin{array}{l} \textbf{tallness}(s) \wedge \textbf{bearer}(s) = \textbf{Anu} \wedge \\ \exists s' \left[\begin{array}{l} \textbf{start-state}(s) = s' \wedge \\ \textbf{bearer}(s') = \textbf{Raj} \end{array} \right] \end{array} \right]$$

Roadmap

- ✔ Introduction
- ✔ Kennedy & Levin on degree achievements
- ✔ Schwarzschild on the architecture of comparatives
- ✔ An analysis of differential constructions
- ✔ Measuring differentials
- ✔ Tentative extensions
- ■ **Final remarks**

Final remarks

Summary:

- bring together insights of Kennedy & Levin (2008) and Schwarzschild (2005, 2012, 2013):
  - measurement of difference
  - decomposition
  - intersective interpretation
- let's recognize differential eventualities
- allows a simple neo-Davidsonian analysis of degree achievements
- also, a neo-Davidsonian analysis of comparatives
- may be extendable to typologically diverse comparatives à la Schwarzschild

Big-picture observations:

- bears on what kind of information is encoded in an eventuality
- if eventualities are crucial to degree semantics, we might expect it to resemble neo-Davidsonian intersective modification
- . . . and indeed it may

Gratitude

Thanks!

Also, thanks to Ai Taniguchi, Anne-Michelle Tessier, Cara Feldscher, Curt Anderson, Gabriel Roisenberg Rodrigues, Josh Herrin, and Kay Ann Schlang.

References

Abusch, Dorit. 1986. ‘Verbs of change, causation, and time’. Ms. CSLI–86–50, Center for the Study of Language and Information, Stanford University, Stanford.

Anderson, Curt & Marcin Morzycki. 2015. ‘Degrees as kinds’. *Natural Language and Linguistic Theory* **33**(3), 791–828.

Chierchia, Gennaro. 1998. ‘Reference to kinds across languages’. *Natural Language Semantics* **6**(4), 339–405.

Cresswell, Max J. 1976. ‘The semantics of degree’. In Barbara H. Partee (ed.), *Montague Grammar*, pp. 261–292. Academic Press, New York.

Desmets, Marianne & Estelle Moline. 2007. ‘Manner and degree in French comparison and in exclamative constructions’. Abstract, ‘Manner’ in the Theory of Language. Symposium held at the University of Tampere, Finland.

Faller, Martina. 1998. ‘A vector space semantics for dimensional adjectives’. In *ESSLLI 1998 Student Session Proceedings*.

Kearns, Kate. 2007. ‘Telic senses of deadjectival verbs’. *Lingua* **117**, 26–66.

Kennedy, Christopher & Beth Levin. 2008. ‘Measure of change: The adjectival core of degree achievements’. In Louise McNally & Christopher Kennedy (eds.), *Adjectives and Adverbs: Syntax, Semantics, and Discourse*, Studies in Theoretical Linguistics, pp. 156–182. Oxford University Press, Oxford.

Kennedy, Christopher & Louise McNally. 2005. ‘Scale structure, degree modification, and the semantics of gradable predicates’. *Language* **81**(2), 345–381.

Landman, Meredith & Marcin Morzycki. 2003. ‘Event-kinds and the representation of manner’. In Nancy Mae Antrim, Grant Goodall, Martha Schulte-Nafeh, & Vida Samiian (eds.), *Proceedings of the Western Conference on Linguistics (WECOL) 2002*, vol. 14, pp. 136–147. California State University, Fresno.

Moltmann, Friederike. 2009. ‘Degree structure as trope structure: a trope-based analysis of positive and comparative adjectives’. *Linguistics and Philosophy* **32**(1), 51–94.

Parsons, Terence. 1990. *Events in the Semantics of English: A Study in Subatomic Semantics*. MIT Press.

Rotstein, Carmen & Yoad Winter. 2001. ‘Partial adjectives vs. total adjectives: Scale structure and higher-order modification’. In *Proceedings of the Amsterdam Colloquium*.

Schwarzschild, Roger. 2005. ‘Measure phrases as modifiers of adjectives’. In *L’adjectif*, *Recherches Linguistiques de Vincennes*, vol. 34, pp. 207–228. Presses universitaires de Vincennes, Paris.

Schwarzschild, Roger. 2012. ‘Directed scale segments’. In Anca Chereches (ed.), *Proceedings of Semantics and Linguistic Theory (SALT) 22*. eLanguage.

Schwarzschild, Roger. 2013. ‘Degrees and segments’. In Todd Snider (ed.), *Proceedings of Semantics and Linguistic Theory (SALT) 23*. eLanguage.

von Stechow, Arnim. 1984. ‘Comparing semantic theories of comparison’. *Journal of Semantics* **3**, 1–77.

Svenonius, Peter & Christopher Kennedy. 2006. ‘Northern Norwegian degree questions and the syntax of measurement’. In Mara Frascarelli (ed.), *Phases of Interpretation*, *Studies in Generative Grammar*, vol. 61, pp. 133–161. Mouton de Gruyter, Berlin.

Zwarts, Joost. 1997. ‘Vectors as relative positions: A compositional semantics of modified PPs’. *Journal of Semantics* **14**(1), 57–86.

Zwarts, Joost & Yoad Winter. 2000. ‘Vector space semantics: A model-theoretic analysis of locative prepositions’. *Journal of Logic, Language and Information* **9**, 171–213.