Generalized quantifiers and copredication

Robin Cooper
University of Gothenburg

Jonathan Ginzburg
Univ. Paris–Diderot, Sorbonne Paris Cité

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Outline

Predication, polysemy and co-predication

Dynamic generalized quantifiers

A counting puzzle

Reference

Cooper (2011)

Outline

Predication and apparent polysemy

- The lunch was delicious (food)
- The lunch took forever (event)
- Pustejovsky (1995); Asher and Pustejovsky (2005); Asher (2011)
- John has memorized the score of the Ninth Symphony
- The score of the Ninth Symphony is lying on the piano
- McCawley (1968)

Predication and innovation

- The blancmange was delicious
- ^{i}IFK Göteborg's last game was delicious (coercion of *delicious*)
- ^{i}The blancmange took forever (coercion of *blancmange*)
- IFK's last game took forever

Copredication - an argument against polysemy

Pustejovsky (and Asher)

- The lunch was delicious but took forever
- [!]The bank specializes in IPO's and is being quickly eroded by the river

wrong – also an argument against polysemy

- ^{i}Sam went to the wrong bank (coercion of *bank* to be the join of two readings, common in jokes, Ritchie, 2004)
- Kim told me about the wrong lunch (#she told me about the conversation rather than the food)

The lunch frame type

$$\begin{bmatrix} x & : & \textit{Ind} \\ \text{event} & : & \textit{Event} \\ \text{food} & : & \textit{Food} \\ c_{\text{lunch}} & : & \text{lunch\_ev\_fd}(x, \text{event}, \text{food}) \end{bmatrix}$$

The content of *lunch*

$$\lambda r{:}\left[\mathrm{x}{:}\mathit{Ind}\right]\left(\begin{bmatrix}\mathrm{event}{:}\mathit{Event}\\ \mathrm{food}{:}\mathit{Food}\\ \mathrm{c}_{\mathrm{lunch}}{:}\mathrm{lunch\_ev\_fd}(r.\mathrm{x},\ \mathrm{event},\ \mathrm{food})\end{bmatrix}\right)$$

Outline

A donkey runs – non-dynamic

- $\left[\begin{array}{lll} \mathrm{c}_{\mathrm{exists}} & : & \mathrm{exists}(\lambda r{:}\left[\mathrm{x}{:}\mathit{Ind}\right](\left[\mathrm{c}_{\mathrm{donkey}}{:}\mathrm{donkey}(r.\mathrm{x})\right]), \\ & & \quad \lambda r{:}\left[\mathrm{x}{:}\mathit{Ind}\right](\left[\mathrm{c}_{\mathrm{run}}{:}\mathrm{run}(r.\mathrm{x})\right])) \end{array}\right]$
- $q(P_1, P_2)$ is non-empty just in case $q*$ holds between $[\downarrow P_1]$ and $[\downarrow P_2]$
- $q*$ is the classical generalized quantifier relation for q
- if $P{:}Ppty$, $[\downarrow P] = \{a \mid \exists r[r : \left[\mathrm{x}{:}\mathit{Ind}\right] \wedge\ r.\mathrm{x} = a \wedge \{b \mid b : P(r)\} \neq \emptyset]\}$ (the set of objects that have the property, the *property extension*)
- exists(P_1,P_2) is a non-empty type just in case $[\downarrow P_1] \cap [\downarrow P_2] \neq \emptyset$

Making quantifiers dynamic

- We make quantifiers dynamic by passing the information from the first property to the second property, thus making the second property more restricted
- instead of exists("donkey","runs") we have exists("donkey","runs restricted to donkeys")
- If f is a function $\lambda v : T_1(\phi)$, then the *restriction of f by the type T_2*, $f \upharpoonright T_2$, is $\lambda v : T_1 \dot{\wedge} T_2(\phi)$
- $q(P_1, P_2)$ is a non-empty type just in case $q*$ holds between $[\downarrow P_1]$ and $[\downarrow P_2 \upharpoonright \mathcal{F}(P_1)]$
- $\mathcal{F}(\lambda r{:}\left[\mathsf{x}{:}\mathit{Ind}\right](\left[\mathsf{c}_{\mathrm{donkey}}{:}\mathrm{donkey}(r.\mathsf{x})\right])) = \begin{bmatrix}\mathsf{x}{:}\mathit{Ind}\\ \mathsf{c}_{\mathrm{donkey}}{:}\mathrm{donkey}(\mathsf{x})\end{bmatrix}$

Fixed point types of properties

- a *fixed point* of a property P is an a such that $a : P(a)$
- a *fixed point type* of P is a type such that anything of that type will be a fixed point of P. $\mathcal{F}(P)$ is such a fixed point type (one with the minimal number of required fields).

Copredication

- $\lambda r{:}\begin{bmatrix}\mathsf{x} & :\mathit{Ind}\\ \mathsf{event} & :\mathit{Event}\end{bmatrix}(\left[\mathsf{c}_{\mathrm{forever}}{:}\mathsf{take\_forever\_ev}(r.\mathsf{x},r.\mathsf{event})\right])$
- $\lambda r{:}\begin{bmatrix}\mathsf{x} & :\mathit{Ind}\\ \mathsf{food} & :\mathit{Food}\end{bmatrix}(\left[\mathsf{c}_{\mathrm{delicious}}{:}\mathsf{be\_delicious\_fd}(r.\mathsf{x},r.\mathsf{food})\right])$
- $\lambda r{:}\begin{bmatrix}\mathsf{x} & :\mathit{Ind}\\ \mathsf{food} & :\mathit{Food}\\ \mathsf{event} & :\mathit{Event}\end{bmatrix}(\begin{bmatrix}\mathsf{c}_{\mathrm{delicious}}{:}\mathsf{be\_delicious\_fd}(r.\mathsf{x},r.\mathsf{food})\\ \mathsf{c}_{\mathrm{forever}}{:}\mathsf{take\_forever\_ev}(r.\mathsf{x},r.\mathsf{event})\end{bmatrix})$
- $\lambda r{:}\left[\mathsf{x}{:}\mathit{Ind}\right](\begin{bmatrix}\mathsf{food} & : & \mathit{Food}\\ \mathsf{c}_{\mathrm{blancmange}} & : & \mathsf{blancmange}(r.\mathsf{x},\mathsf{food})\end{bmatrix})$
- $\lambda r{:}\left[\mathsf{x}{:}\mathit{Ind}\right](\begin{bmatrix}\mathsf{event} & : & \mathit{Event}\\ \mathsf{c}_{\mathrm{game}} & : & \mathsf{game}(r.\mathsf{x},\mathsf{event})\end{bmatrix})$
- $\lambda r{:}\left[\mathsf{x}{:}\mathit{Ind}\right](\begin{bmatrix}\mathsf{event}{:}\mathit{Event}\\ \mathsf{food}{:}\mathit{Food}\\ \mathsf{c}_{\mathrm{lunch}}{:}\mathsf{lunch\_ev\_fd}(r.\mathsf{x},\ \mathsf{event},\ \mathsf{food})\end{bmatrix})$

Dynamic interpretation of *the game took forever*

- $\text{the}(\lambda r{:}\left[\text{x}{:}\mathit{Ind}\right](\left[\begin{array}{lcl}\text{event} & : & \mathit{Event}\\ \text{c}_{\text{game}} & : & \text{game\_ev}(r.\text{x},\text{event})\end{array}\right]),$

  $\lambda r{:}\left[\begin{array}{l}\text{x}:\mathit{Ind}\\ \text{event}:\mathit{Event}\\ \text{c}_{\text{game}}:\text{game\_ev}(\text{x},\text{event})\end{array}\right](\left[\text{c}_{\text{forever}}{:}\text{took\_forever\_ev}(r.\text{x},r.\text{event})\right]))$
- OK – the information passed on is a subtype of the domain type of the predicate

Requiring coercion, lexical innovation: *the game was delicious*

- $\mathsf{the}(\lambda r{:}\left[\mathsf{x}{:}\mathit{Ind}\right](\begin{bmatrix}\mathsf{event}{:}\mathit{Event}\\ \mathsf{c}_{\mathrm{game}}{:}\mathsf{game\_ev}(r.\mathsf{x},\mathsf{event})\end{bmatrix}),$

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- *not* OK – the information passed on is not a subtype of the domain type of the predicate. It does not provide a food aspect. Something needs to be changed!

Outline

A puzzle posed by Tim Fernando

- Suppose that on the shelf there are
  - exactly two copies of *War and Peace*
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  - cf. physical vs informational objects as discussed in the Generative Lexicon by Pustejovsky

More complications for the Fernando puzzle

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- Two different editions of the Bible may contain the same basic text but different annotations by different biblical scholars
- For some purposes that will count as one book and for others as two

FrameNet frame for *book*

Frame elements:

- Author
- Components
- Genre
- Text
- Title
- Topic

A frame type for *book*

- $$\begin{bmatrix} x & : & \mathit{Ind} \\ \text{physobj} & : & \mathit{PhysObj} \\ \text{infobj} & : & \mathit{InfObj} \\ c_{\text{book}} & : & \text{book\_ph\_inf(x,physobj,infobj)} \end{bmatrix}$$

The property *is a book*

$$\lambda r{:}\left[\mathrm{x}{:}\mathit{Ind}\right]\ \left(\left[\begin{array}{lcl} \mathrm{physobj} & : & \mathit{PhysObj} \\ \mathrm{infobj} & : & \mathit{InfObj} \\ \mathrm{c}_{\mathrm{book}} & : & \mathrm{book\_ph\_inf}(r.\mathrm{x},\mathrm{physobj},\mathrm{infobj}) \end{array}\right]\right)$$

Relativized property extensions

The *P-extension of P relative to label* ℓ (in the body of P), $[\downarrow_\ell P]$, is $\{a \mid \exists r[r : \left[\text{x:}\mathit{Ind}\right] \wedge \exists r'[r' : P(r) \wedge\ r'.\ell = a\}]]\}$

Counting books on the shelf

- $P = \lambda r{:}\left[\mathrm{x}{:}\mathit{Ind}\right]$
$$\left(\begin{bmatrix} \mathrm{physobj} & : & \mathit{PhysObj} \\ \mathrm{infobj} & : & \mathit{InfObj} \\ \mathrm{c}_{\mathrm{book}} & : & \mathrm{book\_ph\_inf}(r.\mathrm{x},\mathrm{physobj},\mathrm{infobj}) \\ \mathrm{c}_{\mathrm{on\_shelf}} & : & \mathrm{on\_shelf}(r.\mathrm{x}) \end{bmatrix}\right)$$

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- $|\,[\downarrow_{\mathrm{physobj}} P]\,|$ – the number of books (physical objects) on the shelf
- $|\,[\downarrow_{\mathrm{infobj}} P]\,|$ – the number of books (informational objects) on the shelf

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  - Do we mark attributes as suitable for counting or is there something more general we can say?

Conclusions: Counting and identity conditions

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Conclusions: Counting and identity conditions

- attributes which can be used for counting are the same as those which can be used to uniquely identify objects
- is there a general theory which will tell us for any property what the identity conditions of objects falling under that property are?
- we have developed a way of accounting for different ways of counting objects falling under a single property
- we have raised the possibility of indicating which (sets of) attributes are "identifying" attributes which can be used for counting

Summary

- We showed how to analyze co-predication using record types
- We related this to the treatment of dynamic quantifiers
- We showed how this enables to identify the need for coercion
- We addressed a puzzle concerning the way we count objects, suggesting that we count objects in terms of aspects

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