Conceptualization, individuation and quantification

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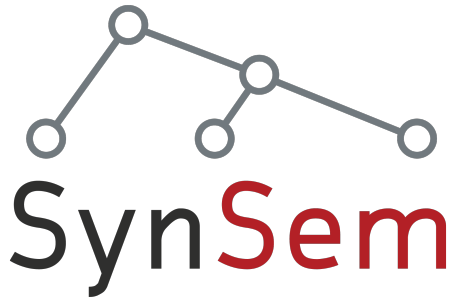

Outline

1. ‘Criteria of identity’ and ‘ways of judging’
2. A worked example: books
3. A possible extension: ships

‘Criteria of identity’ and ‘ways of judging’

Geach’s contention

a general term can occur as a name only if it makes sense to prefix the words “the same" to it. By no means all general terms satisfy this condition; and only in connection with such as do satisfy it can the question be asked how many so-and-so’s there are. […]

“The same F” does not express a possible way of judging as to identity for all interpretations of “F”.

(Geach 1962: 38–39)

- For Geach, a ‘criterion of identity’ is a necessary condition for quantification to be coherent.
- This is connected to a ‘way of judging’.

Chomsky's question

> *Suppose the library has two copies of Tolstoy's* War and Peace*, Peter takes out one, and John the other. Did Peter and John take out the same book, or different books? If we* **attend to the material factor of the lexical item***, they took out different books; if we* **focus on its abstract component***, they took out the same book. We can* **attend to both material and abstract factors simultaneously** *[…]*
>
> (Chomsky 2000: 16)

Again, the claim is that the notion of same/different is connected to what you 'attend to' or 'focus on'.

Situation 1

volume 1 | *Family Happiness*
The Kreutzer Sonata
The Cossacks

physically: one book
informationally: three books

Situation 2

volume 2 | *War and Peace*

volume 3 | *War and Peace*

volume 4 | *War and Peace*

physically: three books
informationally: one book

(1) Peter mastered three books.

Situation 1 ✓ Situation 2 × informational individuation

(2) Three books are heavy.

Situation 1 × Situation 2 ✓ physical individuation

(3) Peter mastered three heavy books. (cf. Asher 2011)

Situation 1 × Situation 2 × double distinctness required

Observations

- A ‘way of judging’ or notion of what ‘we attend to’ or ‘focus on’ is implicated in quantification in some cases.
- Some nouns allow for conceptualization in more than one way.
- For example, ‘book’ doesn’t determine a ‘criterion of identity’ on its own, but
  - there is a restricted number of such criteria associated with ‘book’, and
  - the criterion actually used can be, and most often is, determined by *predicational* context.

Ideas

- Conceptualizing *x* in a **particular** way can be ≈ *defined* as not distinguishing *x* from any *y* with which it stands in a **particular** relation.
- For example, conceptualizing books as informational objects (‘focusing on the abstract component’) *consists in* not distinguishing two copies of e.g. *War and Peace*—not *counting* them as separate books.
- Criteria of individuation can be defined extensionally in such a way that they interact with predicational context.

A worked example: books

Outline of an account

See (Gotham 2016) for details

- Physical books: volume 1, volume 2, volume 3…
- Informational books: *Family Happiness*, *The Kreutzer Sonata*, *The Cossacks*, *War and Peace*…
- Books *simpliciter*: physical objects $p + i$ such that p is a physical book and i is an informational book instantiated by p.
- So in situation 1 the books are volume 1 $+$ *Family Happiness*, volume 1 $+$ *The Kreutzer Sonata* and volume 1 $+$ *The Cossacks*,
- and in situation 2 the books are volume 2 $+$ *War and Peace*, volume 3 $+$ *War and Peace* and volume 4 $+$ *War and Peace*.

($p + i$ indicates that p and i are parts making up a single object)

$$books \mapsto \lambda x^{e}\left(^{*}\mathbf{book}(x)\ ,\ \lambda y^{e}.\lambda z^{e}.\mathbf{phys\text{-}equiv}(y)(z) \wedge \mathbf{info\text{-}equiv}(y)(z)\right)$$

x is physically (informationally) equivalent to y iff both x and y have a physical (informational) part and all and only the physical (informational) parts of x are physical (informational) parts of y.

So for example

$v_1 + FH$	is physically equivalent to	$v_1 + TKS$
	but not to	$v_2 + W\&P$
$v_2 + W\&P$	is informationally equivalent to	$v_3 + W\&P$
	but not physically equivalent to it.	

Every book is (physically and informationally) equivalent to itself and nothing else.

$$be\ heavy_{pl} \mapsto \lambda x^{e}\left(^{*}\textbf{heavy}(x)\ ,\ \textbf{phys-equiv}\right)$$

$$heavy_{pl} \mapsto \lambda P.\lambda x^{e}\Bigg(\left(^{*}\textbf{heavy}(x) \wedge \pi_1(P(x))\right),$$

$$\lambda y^{e}.\lambda z^{e}.\textbf{phys-equiv}(y)(z) \vee \pi_2(P(x))(y)(z)\Bigg)$$

$$three \mapsto$$

$$\lambda P.\lambda Q\Bigg(\exists x^{e}\big(\#(x) = 3 \wedge \pi_1(P(x)) \wedge \pi_1(Q(x))$$

$$\wedge \neg\exists y^{e}.\exists z^{e}.y \neq z \wedge y \leq x \wedge z \leq x \wedge (\pi_2(P(x)) \vee \pi_2(Q(x)))\big),$$

$$\lambda v^{e}.\lambda u^{e}.\pi_2(P(x))(v)(u) \wedge \pi_2(Q(x))(v)(u)\Bigg)$$

$$\pi_1(a,b) = a \qquad \pi_2(a,b) = b$$

$$P, Q :: e{\rightarrow}(t{\times}(e{\rightarrow}(e{\rightarrow}t)))$$

$$\textit{heavy books} \mapsto$$

$$\lambda x^{e}\Big(\big(^{*}\textbf{heavy}(x) \wedge {}^{*}\textbf{book}(x)\big)\,,\ \lambda y^{e}.\lambda z^{e}.\textbf{phys-equiv}(y)(z) \vee (\textbf{phys-equiv}(y)(z) \wedge \textbf{info-equiv}(y)(z))\Big)$$

$$\Rightarrow_{\beta,\eta} \lambda x^{e}\big((^{*}\textbf{heavy}(x) \wedge {}^{*}\textbf{book}(x))\,,\ \textbf{phys-equiv}\big)$$

$$\lambda_1\,[\textit{Peter mastered } t_1]_{pl} \mapsto \lambda x^{e}\big(^{*}(\lambda y^{e}.\textbf{master}(y)(\textbf{p}))(x)\,,\ \textbf{info-equiv}\big)$$

Peter mastered three books $\mapsto$

$$\Big(\exists x^e \big(\#(x) = 3 \wedge {}^*\mathbf{book}(x) \wedge {}^*(\lambda y^e.\mathbf{master}(y)(\mathbf{p}))(x) \\ \wedge \neg \exists y^e.\exists z^e.y \neq z \wedge y \leq x \wedge z \leq x \wedge \mathbf{info\text{-}equiv}(y)(z) \big) , \\ \lambda v^e.\lambda u^e.\mathbf{phys\text{-}equiv}(v)(u) \wedge \mathbf{info\text{-}equiv}(v)(u) \Big)$$

Three books are heavy $\mapsto$

$$\Big(\exists x^e \big(\#(x) = 3 \wedge {}^*\mathbf{book}(x) \wedge {}^*\mathbf{heavy}(x) \\ \wedge \neg \exists y^e.\exists z^e.y \neq z \wedge y \leq x \wedge z \leq x \wedge \mathbf{phys\text{-}equiv}(y)(z) \big) , \\ \lambda v^e.\lambda u^e.\mathbf{phys\text{-}equiv}(v)(u) \wedge \mathbf{info\text{-}equiv}(v)(u) \Big)$$

Peter mastered three heavy books $\mapsto$

$$\Big(\exists x^{e} \big(\#(x) = 3 \wedge {}^{*}\mathbf{heavy}(x) \wedge {}^{*}\mathbf{book}(x) \wedge {}^{*}(\lambda y^{e}.\mathbf{master}(y)(\mathbf{p}))(x) \\ \wedge \neg \exists y^{e}.\exists z^{e}.y \neq z \wedge y \leq x \wedge z \leq x \\ \wedge (\mathbf{info\text{-}equiv}(y)(z) \vee \mathbf{phys\text{-}equiv}(y)(z))\big) , \\ \lambda v^{e}.\lambda u^{e}.\mathbf{phys\text{-}equiv}(v)(u) \wedge \mathbf{info\text{-}equiv}(v)(u) \Big)$$

A possible extension: ships

Objects and events

Example (4) is due to Krifka (1990: 487).

(4) Four thousand ships passed through the lock last year.

(4) has two readings:

R1: There are 4000 ships such that each of them passed through the lock last year.

R2: 4000 times last year, a ship passed through the lock.

R2 (the 'event-related reading') could be true, and R1 (the 'object-related reading') false, if there are 1000 ships in total, and last year each of them passed through the lock four times each.

Some existing proposals

(4) is true under the event-related reading iff …

(Krifka 1990) …there is an event e such that

- e is an event of passing through the lock,
- e can be partitioned into sub-events $\{e_1, \ldots, e_n\} = E$ such that for every $e_i \in E$:
  - e_i is an event of passing though the lock
  - there are no two distinct sub-events of e_i such that they are both events of passing through the lock by the same thing
- $\sum_{i=1}^{n}$ the number of ships passing through the lock in $e_i = 4000$

(Doetjes & Honcoop 1997) …

$$\left|\left\{ \begin{array}{l} \langle s, e\rangle : s \text{ is a ship and } e \text{ is an event of } s \text{ passing through} \\ \text{the lock last year} \end{array} \right\}\right| \geq 4000$$

Both accounts attribute the difference in meanings (compositionally) at least partly to different determiners.

Stages

Barker suggests that, rather than measure functions on events (or event-object pairs), what is going on the the R2 reading is quantification over *stages*:

> *In both cases there must be 4000 ship entities present in the model—but several of those discourse entities (stages, if you prefer) may correspond to the same ship in the world of experience.*
>
> (Barker 1999: 688)

One reason for this view is that the event-related reading appears to be blocked in (5), which is difficult to explain if the ambiguity resides in the determiner (Barker 2010).

(5) Four thousand different ships passed through the lock last year.

Suggestion

Mapping from (traditional) individuals to stages not straightforward.
Suggestion:

- Take stages as basic entities
- Implement a stage as an individual-at-a-time (however you incorporate times in the model)
- Implement identity through time by means of a pseudo-equivalence relation

$$\textit{ships} \mapsto \lambda x^{e}\left(^{*}\textbf{ship-stage}(x)\ ,\ R\right)$$

Where R is a contextually-specified pseudo-equivalence relation.

$$\textit{different} \mapsto \lambda P.\lambda x^{e}\left(\pi_1(P(x))\ ,\ \lambda y^{e}.\lambda z^{e}.\textbf{ent-equiv}(y)(z) \vee \pi_2(P(x))(y)(z)\right)$$

four thousand ships $\mapsto$

$$\lambda P\Big(\ \exists x^e\big(\#(x) = 4000 \wedge {}^*\textbf{ship-stage}(x) \wedge \pi_1(Q(x))$$
$$\wedge \neg\exists y^e.\exists z^e.y \neq z \wedge y \leq x \wedge z \leq x \wedge (R(y)(z) \vee \pi_2(Q(x))(y)(z))\big)\ ,$$
$$\lambda y^e.\lambda z^e.R(y)(z) \wedge \pi_2(Q(x))(y)(z)\Big)$$

four thousand different ships $\mapsto$

$$\lambda P\Big(\ \exists x^e\big(\#(x) = 4000 \wedge {}^*\textbf{ship-stage}(x) \wedge \pi_1(Q(x))$$
$$\wedge\neg\exists y^e.\exists z^e.y \neq z \wedge y \leq x \wedge z \leq x$$
$$\wedge (R(y)(z) \vee \textbf{ent-equiv}(y)(z) \vee \pi_2(Q(x))(y)(z))\big)\ ,$$
$$\lambda y^e.\lambda z^e.R(y)(z) \wedge \wedge\textbf{ent-equiv}(y)(z)\pi_2(Q(x))(y)(z)\Big)$$

Discussion

- Given the different individuation puzzles there are, it seems to make sense to incorporate into our semantic theory a notion of things counting as identical for certain purposes and/or in certain contexts.
- Information about what things are to be counted as identical can be provided lexically and contextually.
- The general approach taken here has been to make the domain of quantification as ‘big’ as necessary to get the weakest readings available, and then to derive stronger readings by means of statements about pluralities, using equivalence relations on subsets of the domain of quantification.

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