Parasitic Scope: The Case of *Same* and *Different*

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A Multiplicity of Same/Different (S/D) Constructions

1. Anaphora
   a. Chris saw a pangolin in Westerville. Then Michael saw the (very/exact) same pangolin in Hilliard.
   b. Chris saw a pangolin in Westerville. Then Michael saw a (completely) different pangolin in Hilliard.
2. Associate-Remnant
   a. MANJUAN saw the same pangolin as TYLER.
   b. MANJUAN saw a different pangolin than/from TYLER.
3. Ellipsis
   a. Michelle patted the same pangolin that/as Murat kicked.
   b. Michelle patted a different pangolin than Murat kicked.
4. Plural Associate (Parasitic Scope)
   a. MAX AND ALEX saw the same pangolin.
   b. MAX AND ALEX saw different pangolins.

S/D Expression and Associate in Different Positions

5. YUSUKE AND BOB reviewed the same abstract/different abstracts.
6. The same donkey/different donkeys kicked PEDRO AND JUAN.
7. Kerry voted FOR AND AGAINST the same bill/different bills.
8. The same professor/different professors WROTE AND REVIEWED this hoax article.
9. The same pangolin/different pangolins PAWED CRAIGE AND LICKED JUDITH.
10. Ambiguity
    a. KIM AND SANDY gave the same present/different presents to Kevin and Dana.
    b. Kim and Sandy gave the same present/different presents to KEVIN AND DANA.

SD Construction with Plural Plurals

11. [KIM AND SANDY] AND [KEVIN AND DANA] met on the same day/different days.

SD Construction with Exotic Coordinations

12. Nonconstituent Coordination
    The same pangolin/different pangolins pawed JUSTIN TIMBERLAKE ON MONDAY AND JUSTIN BIEBER ON TUESDAY.
13. Right Node Raising
    KIM SUBMITTED, AND SANDY REVIEWED, the same grant proposal/different grant proposals.
14. Gapping
    $*$ KIM gave the same present/different presents TO SANDY, AND KEVIN TO DANA.

The Gist of the Analysis (1/3)

As an example, we analyze

16. Mo and Jo saw the same cat.

- Every S/D sentence is made up of three pieces:
  - the **S/D expression**, here *the same cat*, which in turn is made up of *the same* (treated as a single lexical item) and its (first) argument N *cat*
  - the **associate**, always a plural (or a quantifer ranging over plurals), here the plural NP *Mo and Jo*.
  - the **continuation**, a functional abstraction of the rest of the sentence, i.e. a constituent of type NP $\multimap$ NP $\multimap$ S formed by introducing traces (hypothetical NPs) in the positions of the S/D expression and the associate) and then binding them using hypothetical proof.

    Here, the transitive verb *saw* is already such a constituent to begin with.

The Gist of the Analysis (2/3)

- The analysis is driven by the lexical entry for *the same*, which takes as arguments, in this order:
  - the N *cat*
  - the NP $\multimap$ NP $\multimap$ S continuation *saw*
  - the plural associate NP *Mo and Jo*
- This is the lexical entry:

  $\vdash \lambda_{srt}.r\ t\ \mathrm{the} \cdot \mathrm{same} \cdot s; \mathrm{N} \multimap (\mathrm{NP} \multimap \mathrm{NP} \multimap \mathrm{S}) \multimap \mathrm{NP} \multimap \mathrm{S}; \mathbf{same}$

  where s and t are variables of type s (string) and r is a variable of type $\mathrm{s} \to \mathrm{s} \to \mathrm{s}$.
- Here **same** is a semantic term of type

  $(\mathrm{e} \to \mathrm{t}) \to (\mathrm{e} \to \mathrm{e} \to \mathrm{t}) \to \mathrm{e}' \to \mathrm{t}$

  where e' is the type of plural entities (for each semantic type A there is a type A' for the A-pluralities).

The Gist of the Analysis (3/3)

- In our example, the three arguments taken by *the same* are:

  $\vdash$ cat; N; cat

  $\vdash \lambda_{st}.s \cdot \text{saw} \cdot t; \text{NP} \multimap \text{NP} \multimap \text{S}; \mathsf{see}$

  $\vdash$ mo $\cdot$ and $\cdot$ jo; NP; $\mathsf{m} + \mathsf{j}$

- Successively applying *the same* to these three arguments by three modus ponens steps results in the sign

  $\vdash$ mo $\cdot$ and $\cdot$ jo $\cdot$ saw $\cdot$ the $\cdot$ same $\cdot$ cat; S; $\mathsf{same\ cat\ see\ m} + \mathsf{j}$

- All that remains is to provide the right definition of the term same.

- Once that (and many lambda conversions) are done, it will be clear that (16) is true just in case there is a constant function f from the doubleton set of Mo and Jo to the set of cats such that for each member x of the former set, x saw $f(x)$.

The Meaning of *the same* (1/3)

Here and henceforth, A and B are metavariables ranging over semantic types.

- By an **(extensional) relation** between A and B, we mean something of type $A \to B \to \mathrm{t}$.
- For expository simplicity, we consider only relations between e and e.
- The functions defined below are all polymorphic with respect to the type parameters A and B, but (again for expository simplicity) we give the definitions only for the case $A = B = \mathrm{e}$.
- In these definitions, the variable s is of type $A \to B \to \mathrm{t}$ (here, $\mathrm{e} \to \mathrm{e} \to \mathrm{t}$).

The Meaning of *the same* (2/3)

$\mathbf{parfun} =_{\text{def}} \lambda_S.\forall_{xyz}.((S\ x\ y) \wedge (S\ x\ z)) \rightarrow (y = z))$

parfun S says that the relation S is (curry of the characteristic function of the graph of) a (partial) function.

$\mathbf{dom} =_{\text{def}} \lambda_{Sx}.\exists_y.S\ x\ y$

dom S is the (characteristic function of the) domain of S.

$\mathbf{ran} =_{\text{def}} \lambda_S.\lambda_y.\exists_x.S\ x\ y$

ran S is the (characteristic function of the) range of S.

$\mathbf{const} =_{\text{def}} \lambda_S.\exists_z.(\mathbf{ran}\ S) = \lambda_x.x = z$

const S says that S is constant, i.e. its range is a singleton.

$\mathbf{inj} =_{\text{def}} \lambda_S.\forall_{xyz}.((S\ x\ z) \wedge (S\ y\ z)) \rightarrow (x = y)$

inj S says that S is injective, i.e. each member of the range is related to exactly one member of the domain.

The Meaning of *the same* (3/3)

- We assume there is a polymorphic function $\mathbf{at}_A : A' \rightarrow A \rightarrow \mathrm{t}$ that maps each plurality to the (characteristic function of) the set of its atoms.
- For example:

$$\vdash (\mathbf{at}\ \mathsf{m} + \mathsf{j}) = \lambda_x.(x = \mathsf{m}) \vee (x = \mathsf{j})$$

- $\mathbf{same} =_{\mathrm{def}} \lambda_{PRX}.\exists_S.(\mathbf{parfun}\ S) \wedge (\mathbf{const}\ S) \wedge ((\mathbf{dom}\ S) = (\mathbf{at}\ X)) \wedge \forall_{xy}.(S\ x\ y) \rightarrow ((P\ y) \wedge (R\ x\ y))$

  Here the types of the variables are: $x, y : \mathrm{e}$; $X : \mathrm{e}'$; $P : \mathrm{e} \rightarrow \mathrm{t}$; and $R, S : \mathrm{e} \rightarrow \mathrm{e} \rightarrow \mathrm{t}$.
- It's easy to verify that the meaning term $(\mathsf{same\ cat\ see\ m} + \mathsf{j})$ reduces to:

  $\exists_S.(\mathbf{parfun}\ S) \wedge (\mathbf{const}\ S) \wedge (\mathbf{dom}\ S) = (\lambda_x.x = \mathsf{j} \vee x = \mathsf{m})$
  $\wedge\ \forall_{xy}.(S\ x\ y) \rightarrow ((\mathsf{cat}\ y) \wedge (\mathsf{see}\ x\ y))$

Extensions (1/2)

- The other *the same* examples in (5—9) are handled by varying the type B for the plurality type B'.
- Examples with *different* instead of *the same* are analyzed analogously, with the following lexical entry for *different*:
  $\vdash \lambda_{srt}.r\ t\ \text{different} \cdot s; \mathrm{N}' \multimap (\mathrm{NP} \multimap \mathrm{NP} \multimap \mathrm{S}) \multimap \mathrm{NP} \multimap \mathrm{S}; \mathbf{diff}$
  where N′ is the category of plural common nouns and
  $\mathbf{diff} =_{\text{def}} \lambda_{PRX}.\exists_S.(\mathbf{parfun}\ S) \wedge (\mathbf{inj}\ S) \wedge ((\mathbf{dom}\ S) = (\mathbf{at}\ X)) \wedge \forall_{xy}.(S\ x\ y) \rightarrow ((P\ y) \wedge (R\ x\ y))$
- This is the same as the definition of **same** with **const** (constant) replaced by **inj** (injective).

Extensions (2/2)

- Smith and Pollard (2012) show how to adapt this analysis to cover internal readings of superlatives such as

  (Of all the dogs) FIDO chased the most cats.

  where the *Fido* is the member of the contextually determined set of alternatives that maximizes the function mapping each member to the number of cats that it chased.