Mereology and Spanish Copulas

LINGUIST 130A/230A

Adolfo Hermosillo, March 7th, 2023
There are things we cannot currently capture with set theory!
Attached
Functional

Attached

Detached
Self-connected

Attached

Detached

Demarcated
Homogenous or well-matched

Attached

Detached

Demarcated

Disconnected
Material

Attached

Detached

Demarcated

Disconnected

Gerrymandered
Extended

Attached

Detached

Demarcated

Disconnected

Gerrymandered

Imaterial
Spatial

Attached

Detached

Demarcated

Disconnected

Gerrymandered

Imaterial

Unextended
Spatio-temporal

Attached
Detached
Demarcated
Disconnected

Gerrymandered
Imaterial
Unextended
Temporal
Mereology
Overview

• Set theory is an attempt to lay down the principles underlying the relationships between a set and its members.

• Mereology lays down the general principles underlying the relationships between an entity and its constituent parts, whatever the nature of the entity.

• Does not distinguish between element-hood and subset-hood, and it does not assume abstract entities like sets. Consequently, it does not distinguish between singleton sets and their elements nor entertain the notion of the empty set.

• However, mereology and set theory can coexist!
Mereology
Core Principles

• **Reflexivity**: Everything is part of itself.

• **Transitivity**: Any part of any part of a thing is itself part of that thing.

• **Antisymmetry**: Two distinct things cannot be part of each other
Mereology

Parthood and Proper parthood

• Some entity $x$ is in a parthood relation ($\sqsubseteq$) with some entity $y$, if for all $x$ and $y$, the sum ($\oplus$) of $x$ and $y$ is equal to $y$.

• $x \oplus y = y$

• Some entity $x$ is in a proper parthood relation ($\sqsubsetneq$) with some entity $y$, if and only if for all $x$ and $y$, $x$ is a part of $y$ and $x$ is not equal to $y$.

• $x \sqsubseteq y \land x \neq y$
Applications: Nouns

Cumulativity

- A predicate $P$ is cumulative if and only if, whenever $P$ applies to any $x$ and $y$, it also applies to the sum of $x$ and $y$, assuming that $x$ and $y$ are two distinct entities.

Mass Nouns

- A is water
- B is water
- $A \oplus B$ is water

Bare Plural

- A are oranges
- B are oranges
- $A \oplus B$ are oranges

Singular Count Nouns

- A is an apple
- B is an apple
- $A \oplus B$ is an apple
Applications: Nouns

Divisivity

- A predicate $P$ is strictly divisive if and only if, whenever $P$ applies to $x$, then for all $y$ such that it is a proper part of $x$, $P$ applies to $y$.

<table>
<thead>
<tr>
<th>Mass Nouns</th>
<th>Bare Plural</th>
<th>Singular Count Nouns</th>
</tr>
</thead>
<tbody>
<tr>
<td>A is water</td>
<td>B ⊑ A</td>
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Copulas

English

- A copula is a type of linking verb that connects the subject of a sentence to a predicate or complement, typically denoting an identity or state of being.

- Erick is *a student*
- Mary is *in school*
- Shawn is *intelligent*
- Suzane is *tired*
- Pedro is *tall*
Other languages have a more complex copular system. Spanish, for example, has two copulas: ser and estar.

Each copula has certain selectional restrictions, that is, they can only combine with certain types of predicates.

- Erick es (*está) un estudiante → Erick is a student.
- Mary está (*es) en la escuela → Mary is in school.
- Shawn es (*está) inteligente → Shawn is intelligent
- Suzane está (*es) cansada → Suzane is tired
Copulas
Spanish

• A wide range of adjectives can combine with both copulas.

• There are subtle changes in interpretation. Particularly when these adjectives combine with estar, the predicate appears to be true only momentarily.

• Pedro es alto → Pedro is tall.

• Pedro está alto → Pedro is tall, currently.

• Sam es hermose → Sam is beautiful.

• Sam está hermose → Sam is beautiful, for this occasion.
Copulas
Incorporating parthood

• Here are two possible (though not necessarily empirically correct) definitions of the Spanish copulas ser and estar.

\[
[\text{ser}] = \lambda P(\lambda x( T \text{ if } P(x), \text{ else } F))
\]

\[
[\text{estar}] = \lambda P(\lambda x( T \text{ if } P(c) \& c \sqsubseteq x, \text{ else } F))
\]

• where \( P \) is a predicate, \( x \) is an entity, and \( c \) is a pragmatic free variable determined by the context.

• With our definition, the predicate that estar combines with does not necessarily need to hold of the whole subject, though it can.
Copulas
Adjectives as complements

• Case where the c is a spatial part: the road.
• La carretera es ancha → The road is wide
• La carretera está ancha → This section of the road is wide
**Copulas**

**Adjectives as complements**

- Case where $c$ is temporal: the banana.
- El platano es amarillo $\rightarrow$ The banana is yellow.
- El platano está amarillo $\rightarrow$ The banana is yellow for now.
Questions?
References


Champollion, L. (2012). Linguistic applications of mereology. Script to the ESSLLI.