Number features and constraints on meaning

Ann Copestake

Department of Computer Science and Technology
University of Cambridge

July 19, 2021

What does it mean if a noun is singular or plural?

- Simple!

  (1) The dog barked.
  (2) The dogs barked.

  (1) is felicitous if there is exactly one individual, (2) implies two or more. So translate the NUM feature into an appropriate bit of formal semantics.
- Not so simple:
  1. Real world ‘stuff’ can be individuated in different ways: ‘grounding’ formal model.
  2. Various types of mismatch between plurality and reference.

What does it mean if a noun is singular or plural?

- Simple!

  (1) The dog barked.
  (2) The dogs barked.

  (1) is felicitous if there is exactly one individual, (2) implies two or more. So translate the NUM feature into an appropriate bit of formal semantics.
- Not so simple:
  1. Real world ‘stuff’ can be individuated in different ways: ‘grounding’ formal model.
  2. Various types of mismatch between plurality and reference.

Aim of session

- Start a discussion about capturing the meaning of number?
- Assume we're looking to translate MRS into formal semantics with some form of denotation/reference and inference capability: intro is a rapid tour of some issues.
- Many languages have more categories than sg/pl (e.g., Corbett 2000).
- My examples mainly English, but especially interested in other cases where there's some form of mismatch.

Outline.

Individuals and plurals

- Intuitive meaning (e.g. Corbett, 2000:p4): ‘the plural refers to more than one distinct real world entity’.
- Formal semantics classically takes a notion of individuals as basic.
  $\exists x[\text{dog}'(x) \wedge \text{bark}'(x)]$
  There is a thing, that thing is a dog and that thing barks.
- But what is a real world entity?
- Is there a clear notion once we go beyond dog and cat examples?

How many?

Photo courtesy photos-public-domain.com

How many what?

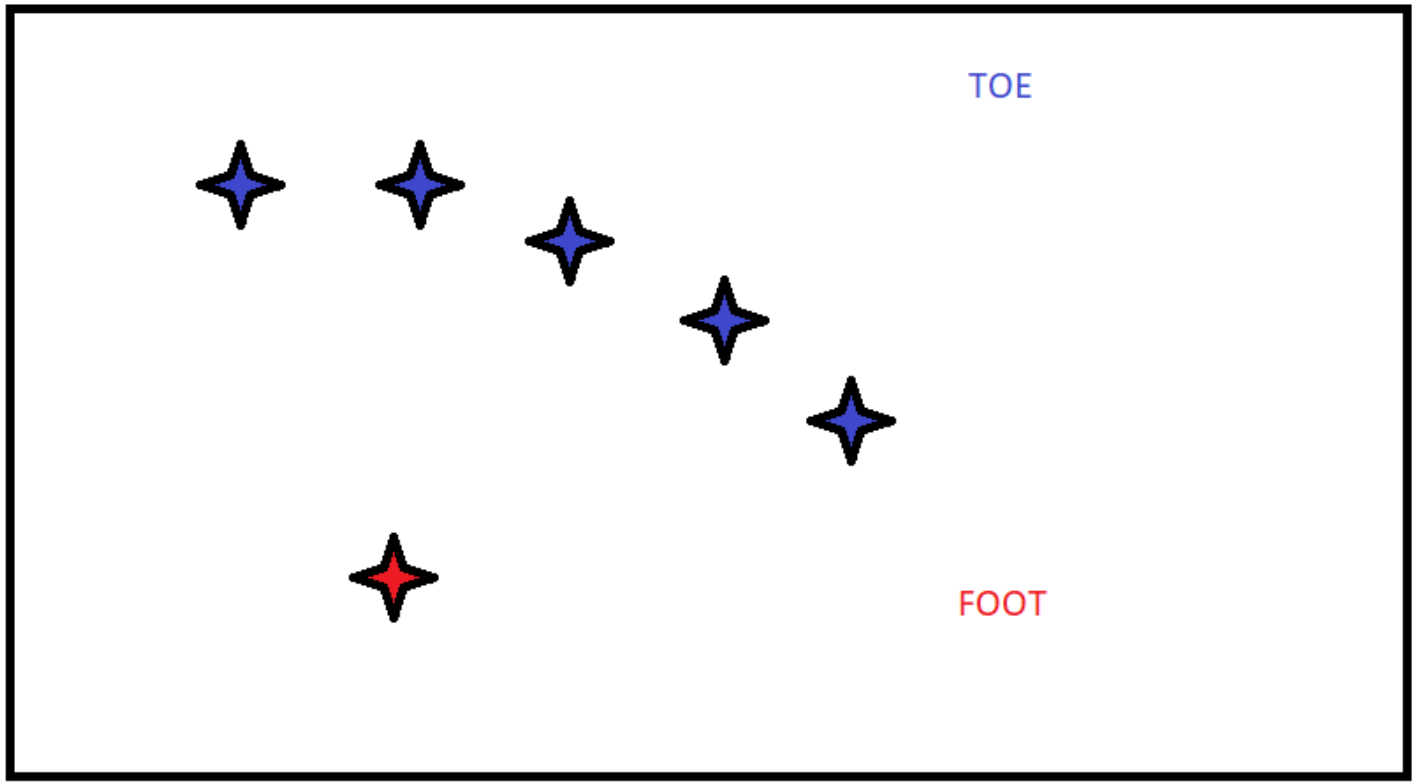
Can’t just count without saying what you’re counting.

Individual and categories

One idea:

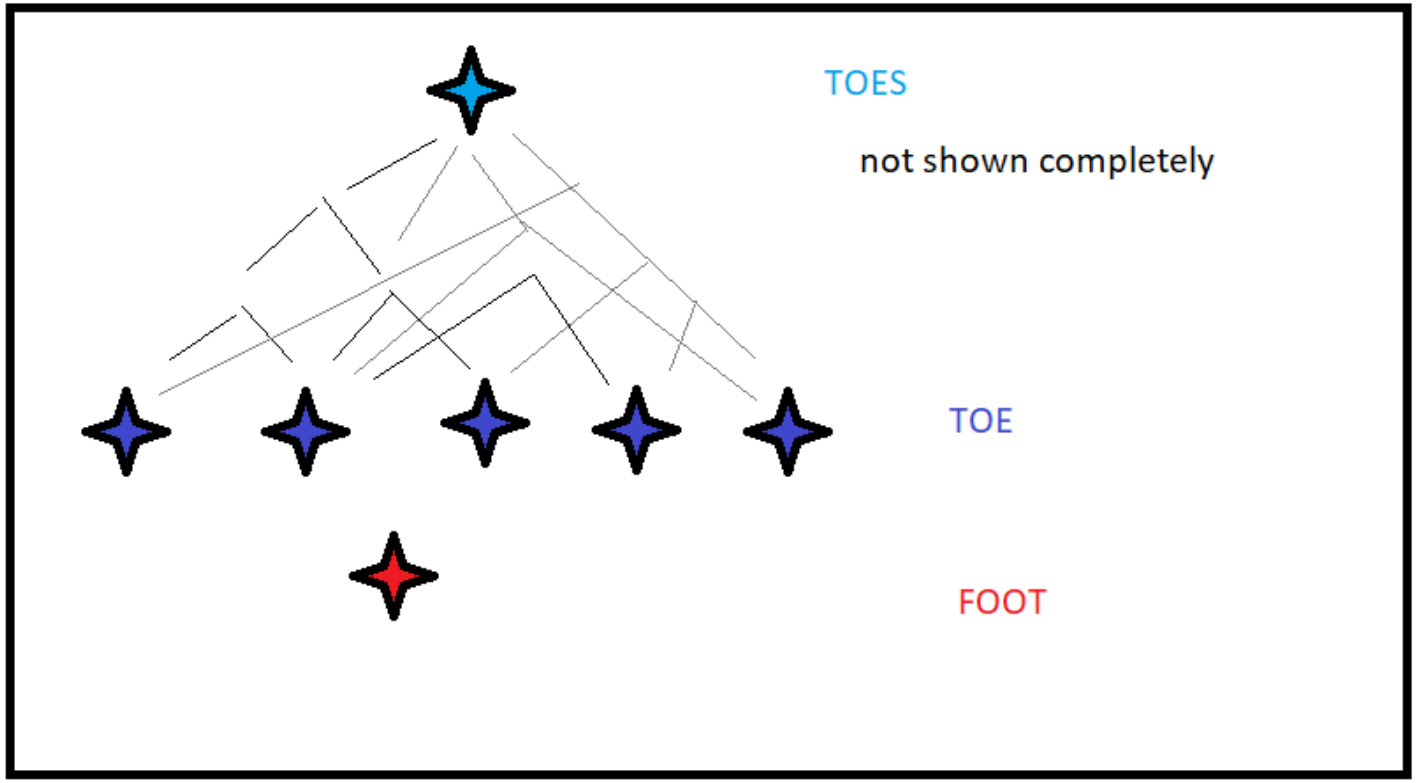
- Instead of assuming basic individuals, always talk about individuals with respect to a category.
- cf sorts in formal semantics:
  Instead of:
  $\exists x[\text{dog}'(x) \wedge \text{bark}'(x)]$
  make sure that entities have a sort/type:
  $\exists x_{\text{dog}'}[\text{bark}'(x)]$
  There is a dog and that dog barks.

Formal model



Sorted entities, but no internal model structure.

Formal model with plurals



Plural entities in model structure (Link 1983), but no other meronymy directly encoded.

Discrepancies in individuation

Same “stuff” in the world, counted (or not) in different ways:

- one bikini : two items of clothing
- garments : clothes : clothing
- furniture : two pieces of furniture : zwei Möbel (de)
- Kim hopped across the room three times for the test.
  one test : three crossings : 93 hops (say)
- one group : six people
- Those students are a great team.

Implies that the identity copula can’t equate entities if cardinality and number are properties. But could have entities that are counted differently by different predicates: e.g., Krifka (1987).

How many leaves?

How many leaves?

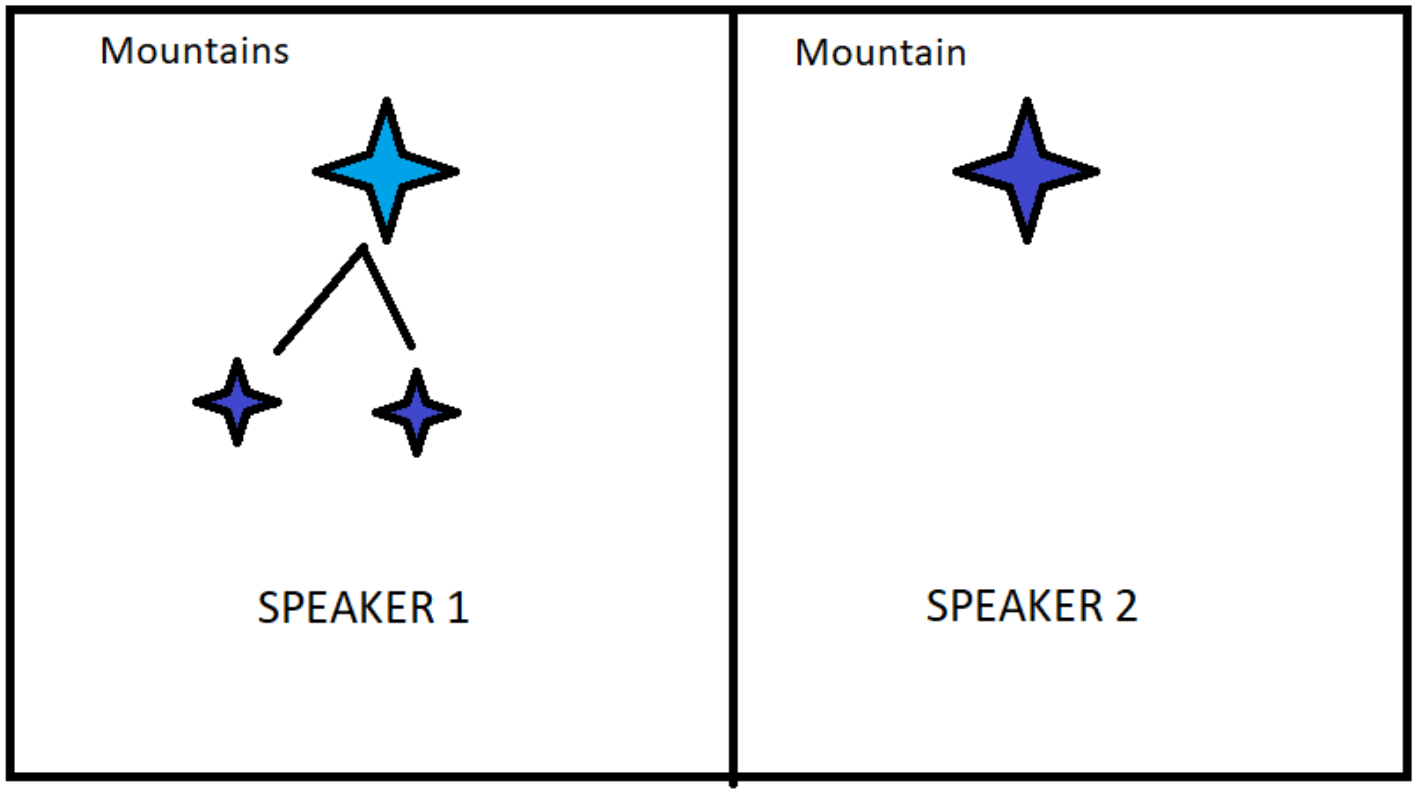
How many mountains?

How many linguists?

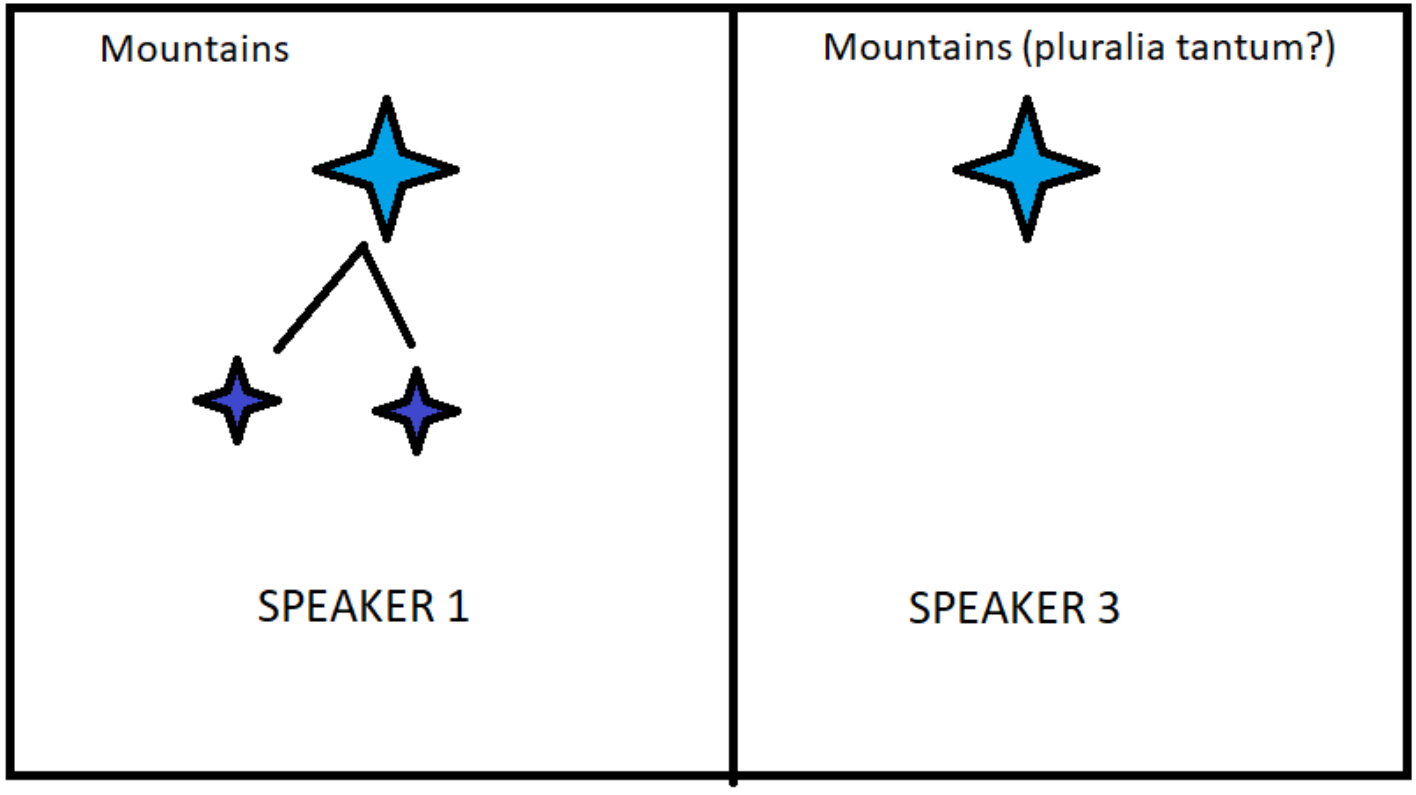
Difficulties in individuation

- Generally consistency in prototypical individuals (humans, most animals).
- Physical separation usually implies individuation, but not necessary (e.g., toes).
- Sometimes individuation by function (using the term broadly).
- Often some degree of arbitrariness: e.g., ‘expert’ definition for leaves and mountains.
- ‘Defective countability’: defective plurals (tweezers etc); pluralia tantum; mass terms. In all these cases, cannot count without a classifier, unless there’s recategorization (e.g., ‘two beers’ — portion or kind).

Formal models of a mountain scene



Formal models of mountains



Discrepancies in individuation between individuals for some nouns (as well as possibly other sorts of partial meaning mismatch: e.g., that's just a hill).

Individuation in the brain

- The parallel individual system (also known as the object tracking system or the object file system) allows animals to keep track of up to four objects moving independently.
- Believed to exist in many animals, including fish (guppies).
- Allows animals to keep track of members of same species.
- Also track/count physically separate non-animate objects — e.g., pieces of food.
- Hypothetically, languages use this notion of individuation as basic, other individuation by analogy.
- Personification/naming of mountains etc: culturally-specific but then consistent individuation.

MRS and plurals

MRS behaviour is reasonable given what we've seen so far:

- MRS individuals always have an associated nominal, so could be sorted. Not equated by copula.
- Translation of number feature into 'real world' could be category specific.
- Keeping sg/pl distinction associated with individuals is correct for anaphora:
  My binoculars are on the kitchen table. Could you get them, please?

Meaning of singular and plural features?

- (1) The dog barked.
  (2) The dogs barked.
  (1) implies a single dog individual, (2) implies more than one.
- Translate number feature into sorted plurality, allowing for countability deficiencies of some nouns (e.g., binoculars, clothes, furniture).
- But 'weird' uses . . . (see Ojeda 1993 for description and formal issues).
- Also, need to allow for inference: binoculars are a device, but the following won't work simply with sorted entities: $\forall x[\text{binocular}'(x) \implies \text{device}'(x)]$

Outline.

Weird singulars

Examples where singular noun has non-singular referent:

- They have more than one cat.
- drei Glas Wein (de): three glasses of wine
  In some, but not all, German measure phrases, the measure noun is sg.
- Also We saw lion by the watering hole.
  but this is plural agreement:
  There are lion by the watering hole.

Weird plurals

Examples where plural noun has non-plural referent:

- They have no/zero cats.
- The average family has 1.2 dogs and 1.0 cats. Plural with 1.0 also in German and Polish.
- There are too many errors in this paper. True even if only one error.
- Exaggerative plural (Corbett, p234). Finnish. English (?): Alice didn't like being ordered about by rabbits.
- Bare plurals with existential reference (general number?) Deer ate the roses.
- Dependent plural, possibly: The students all got their graduation certificates from the principal.

Aims for discussion

- Could we develop a precise account of the mapping of MRS to formal semantics?
- Could we develop a set of inferences we want to support in principle?
- More weird examples? Are there some generalizations? Various options for the examples we've seen, but what's least ad hoc?
- Other languages?