

Singular 'Donkey' Pronouns Are Semantically Distributive, Not (Necessarily) Singular
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The goal of this paper is to provide a lexical entry for singular number morphology in English that: **(i)** allows for the 'plural' use of singular pronouns in 'donkey' sentences like (1) below, which (preferably) receive a *strong* reading, and **(ii)** derives the incompatibility between singular 'donkey' pronouns and *collective* predicates, as illustrated in (2) below (from [1]).

(1) Every farmer who owns a donkey beats it. (2) #Every farmer who owns a donkey rounds it up at night.

Bringing together insights from [3] and [5], I describe a new dynamic system formulated in many-sorted type logic in which: **(i)** (the LF's of) sentences like (1) are compositionally interpreted, **(ii)** a new analysis of the weak/strong ambiguity exhibited by (1) is provided in terms of two minimally different lexical entries for the indefinite article and **(iii)** singular number morphology is interpreted as a 'modifier' of a generalized quantifier (GQ) ensuring that the GQ applies to a nuclear scope built out of atomic entities. This requirement clashes with the fact that *round up* (usually) selects for a non-atomic direct object – hence the infelicity of (2).

The phenomenon and the basic proposal. As noted in [1], (1) and (2) raise the following problem: the most salient interpretation of (1) is that every farmer who owns a donkey beats *every* donkey he owns (and not *the* or *some* donkey he owns), so it seems that singular number morphology is neutral with respect to *semantic* number; however, the incompatibility of singular (but not plural) 'donkey' pronouns with collective predicates seems to indicate that singular number morphology is interpreted as semantically singular: it requires the cardinality of the set of entities X under consideration to be at most one. Semantic singularity is what [1] argues for.

However, I propose that singular 'donkey' pronouns are not semantically singular, but *semantically distributive*: for any property P predicated of the set of entities X denoted by the pronoun, singular morphology requires the property to be predicated distributively of X . To my knowledge, this hypothesis has never been pursued in the dynamic semantics literature.

More precisely: for any property P applying to pluralities (modeled as sets of entities), (3) below defines the corresponding *distributed* property δP as the atoms (i.e. singleton sets) in P or unions of such atoms. As in [2], pronouns are interpreted as the GQ-lift of a variable (see (4) below). Singular morphology, which is syntactically above the DP 'layer' (as in [4]), is interpreted as a GQ 'modifier', ensuring that the GQ applies to a distributed nuclear scope – see (5) below.

(3) $\delta P := \lambda X. \forall Y (Y \subseteq X \wedge |Y|=1 \rightarrow P(Y))$ (4) $it_x \rightsquigarrow \lambda P. P(X)$ (5) $sing \rightsquigarrow \lambda Q. \lambda P. Q(\delta P)$

As in [2], the transitive verb takes a GQ as its first argument and is interpreted by means of a non-logical constant *round_up*, i.e. $round_up \rightsquigarrow \lambda Q. \lambda X. Q(\lambda Y. round_up(X, Y) \wedge |Y|>1)$. For simplicity, the selectional restriction to non-atoms $|Y|>1$ is not modeled as a presupposition, but as an assertion. Given fairly standard assumptions about LF's and type-driven translation, the sentence *John round it_x up* is interpreted as $round_up(\{john\}, sing(it_x))$, i.e. as $\forall Y (Y \subseteq X \wedge |Y|=1 \rightarrow round_up(\{john\}, Y) \wedge |Y|>1)$, which is contradictory given that $X \neq \emptyset$.

The compositional dynamic system and the interpretation of singular number morphology. In a Fregean framework, the compositional aspect of the interpretation is largely determined by the types for the 'saturated' expressions, i.e. names and sentences. Let's abbreviate them as **e** and **t**. An extensional static logic without pluralities is the simplest: **e** is e (atomic entities) and **t** is t (truth-values); *own*, for example, is of type **(e(et))**, i.e. $(e(et))$, and the GQ *every man* is of type **((et)t)**, i.e. $((et)t)$. This basic setup can be complicated in various ways, e.g. we can add pluralities by resetting

e to (et) ; *own*, still of type $(e(et))$, relates pluralities now, its interpretation is by default collective and distributive interpretations are obtained by means of a distributive operator.

Going dynamic involves a similar procedure: following [3], we add another basic type s whose elements model dynamic info states (i.e. variable assignments). A sentence is interpreted as a relation between an input and an output info state, hence $t := (s(st))$; a name denotes a discourse referent (dref), i.e. $e := (se)$; *own* is of type $(e(et))$: it takes two dref's u and u' of type e and it relates two info states i and i' of type s if and only if $i=i'$ and the entities denoted by u and u' in state i (i.e. ui and $u'i$) stand in the *own* relation of type $(e(et))$ (i.e. the static 'own'-relation).

Going dynamic *and* plural seems to be straightforwardly cumulative, i.e. $e := (s(et))$ and $t := (s(st))$. However, I will let $e := (se)$ and, following [5], I will build the plurality into the info states, i.e. I will use plural info states I of type st . Sentences are relations between them, i.e. $t := (st)((st)t)$. A dref u (type se) stores a plurality (a set of entities) with respect to an info state I , abbreviated $uI := \{u_{se}i_s : i_s \in I_{st}\}$. There are two reasons for this design choice. First, we account for *structured* cross-sentential plural anaphora, e.g. (1) above can be followed by *Moreover, they_u feed them_{u'} poorly*, which is interpreted as saying that each farmer feeds every donkey he owns (and not some other donkey) poorly, i.e. the owning and the feeding are structured in the same way. We encode the owning structure in an info state I , i.e. for each $i \in I$, ui is a farmer owning donkey $u'i$, and pass it on to the next sentence, where we test that the feeding structure is the same. Second, we can give a new and simple account of the weak/strong 'donkey' ambiguity.

A sentence is represented as a 'box' [**new dref's** | **conditions**], which is the abbreviation of a term of type $t : \lambda I_{st} J_{st}. I[\text{new dref's}]J \wedge \text{conditions}J$, i.e. the output state J differs from the input state I at most with respect to the **new dref's** and each **condition** is satisfied in the output state J . In addition, we need two operators over 'boxes', defined in the spirit of [5]: a *distributivity operator* $\text{dist}_u(B)$, which means that 'box' B is interpreted distributively with respect to the dref u , and a *maximizing operator* $\text{max}^u(B)$, which introduces the dref u and makes sure that it stores the maximal set of entities that satisfies 'box' B (a kind of dynamic λ -abstraction).

(6) $\text{dist}_u(B) := \lambda I J. uI = uJ \wedge \forall x \in uI (BI_{u=x}J_{u=x})$, where $I_{u=x} := \{i \in I : ui=x\}$

(7) $\text{max}^u(B) := \lambda I J. \exists H (I[u]H \wedge BHJ) \wedge \forall K (\exists H (I[u]H \wedge BHK) \rightarrow uK \subseteq uJ)$

The lexical entries for the relevant items are given below. The symbol ';' stands for dynamic conjunction, defined as $B;B' := \lambda I J. \exists H (BIH \wedge B'HJ)$. The indefinite article is ambiguous: the entry without **max** yields the weak 'donkey' reading; the one with **max** yields the strong reading.

(8) $\delta P := \lambda v_e. \text{dist}_v(P(v))$ (9) $it_u \rightsquigarrow \lambda P_{et}. P(u)$ (10) $sing \rightsquigarrow \lambda Q_{(et)t}. \lambda P_{et}. Q(\delta P)$ (cf. (3),(4),(5) above)

(11) $every^u \rightsquigarrow \lambda P'_{et}. \lambda P_{et}. \text{max}^u(\delta P'(u)); P(u)$ (12) $a^{\text{wk}/\text{str}:u} (\text{weak}) \rightsquigarrow \lambda P'_{et}. \lambda P_{et}. [u \mid]; \delta P'(u); P(u)$

(13) $a^{\text{str}:u} (\text{strong}) \rightsquigarrow \lambda P'_{et}. \lambda P_{et}. \text{max}^u(\delta P'(u); P(u))$

Based on these lexical entries, (1) is compositionally assigned the intuitively correct strong and weak interpretations and (2) is ruled out as contradictory. Finally, the account extends to the following more complex example from [1]: *Every^u man who brought a^{wk/str:u} friend to the party introduced him_{u'} to at least four^u people* – given the plausible assumption that *at least four* introduces a dref for groups of four people.

References: [1] Kanazawa, M. 2001. Singular Donkey Pronouns Are Semantically Singular, *L&P* 24. [2] Montague, R. 1974. The Proper Treatment of Quantification in Ordinary English, *Formal Philosophy*, R. Thomason (ed.), Yale UP. [3] Muskens, R. 1996. Combining Montague Semantics and Discourse Representation, *L&P* 19. [4] Sauerland, U. 2003. A New Semantics for Number, *SALT* 13. [5] Van den Berg, M. 1994. A Direct Definition of Generalized Dynamic Quantifiers, *9th Amsterdam Colloquium*.