WEAK NOUN PHRASES: SEMANTICS AND SYNTAX

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В работе рассматриваются современные семантические анализы слабых ИГ (*a unicorn*, *more than one unicorn*, *no unicorn*). Главным свойством этого типа ИГ является возможность обозначать свойства, т.е. интенсиализированные множества индивидов.

1. NPs as Generalized Quantifiers.

Classic formal semantics adopted Montague's proposal (Montague 1973) for the semantics of Noun Phrases (NPs). Every NP was interpreted as denoting a set of sets (strictly, a set of properties; we return to the distinction later.) In Montague's type theory, the semantic type corresponding to NPs is $(e \rightarrow t) \rightarrow t$: characteristic functions for sets of sets of entities.

Some NP interpretations:

John $\lambda\boldsymbol{P}[\boldsymbol{P}(\mathbf{j})]$
(the set of all of John's properties)

John walks $\lambda\boldsymbol{P}[\boldsymbol{P}(\mathbf{j})]\,(\mathbf{walk}) \equiv \mathbf{walk\,(j)}$
(function-argument application)

every student $\lambda\mathbf{P}\forall\boldsymbol{x}[\mathbf{student}(\boldsymbol{x}) \rightarrow \boldsymbol{P}(\boldsymbol{x})]$
(the set of all of properties that every student has)

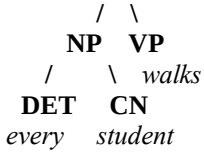
every student walks
$\lambda\boldsymbol{P}\forall\boldsymbol{x}[\mathbf{student}(\boldsymbol{x}) \rightarrow \boldsymbol{P}(\boldsymbol{x})]\,(\mathbf{walk}) \equiv$
$\equiv \forall\boldsymbol{x}[\mathbf{student}(\boldsymbol{x}) \rightarrow \mathbf{walk}(\boldsymbol{x})]$
(function-argument application)

a student $\lambda\boldsymbol{P}\exists\boldsymbol{x}[\mathbf{student}(\boldsymbol{x}) \,\&\, \boldsymbol{P}(\boldsymbol{x})]$
(the set of all of properties
that at least one student has)

the king
$\lambda\boldsymbol{P}\,[\exists\boldsymbol{x}[\mathbf{king}(\boldsymbol{x}) \,\&\, \forall\boldsymbol{y}\,(\,\mathbf{king}(\boldsymbol{y}) \rightarrow \boldsymbol{y} = \boldsymbol{x}) \,\&\, \boldsymbol{P}(\boldsymbol{x}))]$
(the set of properties
which the one and only king has)

The meaning of a Determiner like *the, a, every* is then a relation between sets, or a function which applies to one set (the interpretation of the common noun CN) to give a function from sets to truth values, or equivalently, a set of sets (the interpretation of the NP).

Typical case:



CN: type $e \rightarrow t$
VP: type $e \rightarrow t$

DET: interpreted as a function which applies to CN meaning to give a generalized quantifier, a function which applies to VP meaning to give truth value), type: $(e \rightarrow t) \rightarrow ((e \rightarrow t) \rightarrow t)$
NP: type $(e \rightarrow t) \rightarrow t$

Sometimes it is simpler to think about DET meanings in relational terms:

Every: as a relation between sets A and B ("Every A B"): $A \subseteq B$
So 'Every man walks' means: $\| \textit{man} \| \subseteq \| \textit{walk} \|$

Some, *a*: $A \cap B \neq \varnothing$.

No: $A \cap B = \varnothing$.

Most (not first-order expressible):
$| A \cap B | > |A - B|$.

From the relational view, it is a small step to determiners as functions. For example, applying the function interpreting *every* to argument set A gives as result $\{B|\ A \subseteq B\}$: the set of all sets that contain A as a subset. Equivalently: $\|\textit{Every}\|(A) = \{B|\ \forall x\ (\ x \in A \rightarrow x \in B)\}$. Equivalently: $\|\textit{Every}\| = \lambda Q[\lambda P[\forall x\ (\ Q(x) \rightarrow P(x)\ )]]$.

Some, a: takes as argument a set A and gives as result $\{B|\ A \cap B \neq \varnothing\ \}$.
$\|a\| = \lambda Q[\lambda P[\exists x\ (\ Q(x) \,\&\, P(x)\ )]]$

Given this background, we consider the interpretation of NPs as "weak" or "strong".

2. "Weak" determiners and existential sentences.

Data: OK, normal:

There is a new problem. (1)

There are three semantics textbooks. (2)

There are many unstable governments. (3)

Anomalous, not OK, or not OK without special interpretations:

#There is every linguistics student. (4)

#There are most democratic governments. (5)

#There are both computers. (6)

#There is the solution. (# With "existential" there ; OK with locative there.) (7)

Semantic explanation, with roots in (Milsark 1977), formal development by (Barwise and Cooper 1981) and by Keenan.

Definition (Keenan 1987)**:** A determiner D is a *basic existential determiner* if for all models **M** and all A,B $\subseteq$ E, D(A)(B) = D(A$\cap$B)(E). Natural language test: "Det CN VP" is true iff "Det CN which VP exist(s)" is true. A determiner D is *existential* if it is a basic existential determiner or it is built up from basic existential determiners by Boolean combinations (and, or, not).

Examples:

(i) *Three* is a basic existential determiner because it is true that: Three cats are in the tree iff three cats which are in the tree exist.

(ii) *Every* is not a basic existential determiner. If there are 5 cats, of which 3 are in the tree, "Every cat is in the tree" is false but "Every cat which is in the tree exists" is true.

Basic existential determiners = symmetric determiners.

We can prove, given that all determiners are *conservative* (Barwise and Cooper 1981), that Keenan's basic existential determiners are exactly the symmetric determiners.

Symmetry: A determiner D is *symmetric* iff for all A, B, D(A)(B) ≡ D(B)(A).

Testing:

Weak (symmetric): Three cats are in the kitchen ≡ Three things in the kitchen are cats.

More than 5 students are women ≡ More than 5 women are students.

Strong (non-symmetric): Every Zhiguli is a Russian car ≠ Every Russian car is a Zhiguli.

Neither correct answer is an even number ≠ Neither even number is a correct answer.

Many factors make it difficult to apply to Russian the test we used for English. A better, but provably equivalent, semantic test comes from symmetry:

(a) Na kuxne tri černye koški ≡
In kitchen 3 black cats
≡ Tri koški na kuxne černye.
3 cats in kitchen black

(b) Na kuxne vse černye koški ≠
In kitchen all black cats
≠ Vse koški na kuxne černye.
all cats in kitchen black (8)

It is also harder to find constructions in Russian which allow only weak determiners, for a variety of reasons. There do seem to be at least two:

(i) The context in (9) is modeled on the English weak-NP context involving *have* with relational nouns, which I've discussed in print (Partee 1999). It's important that the noun is relational.

U nego est' ____
at him.GEN is ____
sestra / sestry / sester
sister.NOM.SG / sister.GEN.SG / sister.GEN.PL
'He has ____ sister(s).' (9)

The context in (9) clearly accepts weak Dets including cardinal numbers, *nikakoj sestry* 'no sister', *ni odnoj sestry* 'not a single sister', *nikakix sester* 'no sisters' (the negative ones require replacement of *est'* 'be' by *net* 'not-be', of course), *neskol'ko* 'several', *mnogo* 'many', *nemnogo* 'few'. And it clearly rejects strong Dets *vse* 'all', *mnogie* 'most', *eti* 'those'.

(ii) Another context which allows only weak determiners, in at least English, Polish, and Russian is the following (Joanna Blaszczak, p.c.):

dom s _____ oknom/oknami
a house with _____ window/windows (10)

Caution: as noted by Milsark (1974, 1977), many English determiners seem to have both weak and strong readings, and the same is undoubtedly true of Russian.

3. Property-type NP interpretations

While some differences in the possible occurrence of 'weak' and 'strong' NPs can be accounted for by drawing semantic distinctions within the theory of

generalized quantifiers, as in the account above, it has been argued that in some cases, weak NPs are really of "property type" (an intensional variant of type e → t), rather than generalized quantifiers. Property-type analyses of various "weak NPs" are becoming increasingly common in Western formal semantics, and may have application to some problems in Russian semantics, including the Russian Genitive of Negation (section 4.)

3.1. Zimmermann 1993 on intensional verbs.

Zimmermann (1993) argues that Montague's analysis of verbs like *seek* ("intensional transitive verbs", or "opaque verbs") as taking arguments of type "intension of Generalized Quantifier", or <s,<s,<e,t>>,t> is incorrect. He argues that the NP objects of opaque verbs should be semantically interpreted as *properties* (or type <s,<e,t>>.)

3.1.1. The fundamental properties of intensional contexts.

Caroline found a unicorn.

(extensional, unambiguous) *(11)*

Caroline sought a unicorn.

(intensional, ambiguous) *(12)*

Sentences with *seek* are ambiguous between a specific and a non-specific reading (or transparent vs. opaque reading). (1) is unambiguous, (2) is ambiguous.

On the opaque reading of (2), the existence of a unicorn is not entailed.

Substitution of extensionally equivalent expressions in an intensional context (on the opaque reading) does not always preserve truth-value. E.g., the extension of *unicorn* is the same as the extension of *13-leaf clover* (both are the empty set in the actual world). Substituting *a thirteen-leaf clover* for *a unicorn* in (11) preserves truth-value. The same substitution in (12) might not.

Examples of verbs taking intentional direct objects: *seek, owe, need, lack, prevent, resemble, want, look for, request, demand.*

3.1.2. The classical analysis and its problems.

Quine (1960) argued that *seek* should be decomposed into *try to find.* He argued that intensionality is (in general) the result of embedding under an intensional operator, such as the verb *try*. Within *Caroline try [Caroline find x]* , there are then two places a quantifier phrase could take its scope: the higher clause, giving the transparent reading, and the lower clause, giving the opaque reading.

Montague (1973) argued that the same semantic effect can be achieved with a simpler syntax, if NPs as *a unicorn* express Generalized Quantifiers. In argument position, every category gets an intensional operator "^" applied to it (i.e. functions apply to the *intensions* of their arguments).

For Montague, the relation between *seek* and *try to find* is captured not by decomposition but by a meaning postulate.

Meaning postulate:

seek' (x, ^Q) → try' (x, ^[Q(λy find' (x,y))]). *(13)*

So Montague treats a verb like *seek* as denoting a relation between an individual and an intensional generalized quantifier. The transparent reading results from "quantifying in".

But there are problems with Quine's and Montague's classical analyses. Among other problems, (Zimmermann 1993) points out an *overgeneration* problem with Montague's (and Quine's) account, in that true quantifier phrases are normally unambiguously "transparent" after intensional transitive verbs like *compare*, *seek*, although they are ambiguous in constructions like *try to find*. Simple indefinites with *a*, on the other hand, are indeed ambiguous with intensional verbs. Compare:

(a) Arnim compares himself to a pig.

(ambiguous)

(b) Arnim compares himself to each pig.

(unambiguously transparent) *(14)*

(a) Alain is seeking a comic book.

(ambiguous)

(b) Alain is seeking each comic book.

(unambiguous; lacks ambiguity of (c))

(c) Alain is trying to find each comic book.

(ambiguous) *(15)*

3.1.3. Zimmermann's alternative account.

Zimmermann argues that we can capture the relevant generalizations once we note that definites and indefinites, which do receive opaque readings with intensional verbs, correspond, in a way he makes precise, to *properties,* type <s,<e,t>>. Zimmermann's proposal is that a verb like *seek* denotes a relation between an individual and a property. So *seek a unicorn* would be interpreted as (16):

seek'(^unicorn') (where ^ is Montague's 'intension operator') *(16)*

This would be a case of NP type-shifting by coercion: *seek* demands a property-type argument, and we know that indefinite NPs easily shift into <s,<e,t>> readings, as was shown for predicate nominals and the PRED-argument of *consider* in (Partee 1986).

For the transparent, or specific, or *de re*, reading, Zimmermann gives an analysis (details omitted here) involving "quantifying in", similar to the analysis in (Partee 1986) for Edwin Williams' example "*This house has been every color*". Zimmermann thus has a solution to the overgeneration problem.

3.2. McNally 1995. "Bare plurals in Spanish are interpreted as properties."

Bare plurals in Spanish differ from bare plurals in English in several ways; and their distribution and interpretation is not the same as that of overtly indefinite Spanish NPs. McNally (1995) proposes that Spanish bare plurals are uniformly interpreted as **properties**.

It is interesting to compare McNally's analysis of the Spanish bare plurals as properties with Zimmermann's analysis of the objects of opaque verbs as properties. In the bare plural analysis, it is the NPs that are specified as being of property type; they combine with ordinary verbs that take ordinary e-type arguments, and the verbs shift to accommodate these arguments, building in an existential quantifier to bind the e-type argument the verb was looking for: this is a case of *incorporation*. In Zimmermann's analysis of the opaque verbs, it is the verbs that are semantically special: they demand a property-type argument rather than an e-type argument; so the NPs have to shift to get a property-type meaning in order to occur there, and those that can't don't get opaque readings.

It is also interesting to compare McNally's and other similar analyses along the dimension of independence/non-independence of the NP interpretation, where maximal non-independence means some kind of incorporation. On McNally's analysis, bare plurals have obligatorily narrowest scope, since the existential quantifier is packed into the shifted meaning of the verb. And the bare plural has no "discourse referent", which accounts for much of its 'decreased referentiality' and non-independence.

4. Russian Genitive of Negation

Hypothesis: Wherever we see Nom/Gen and Acc/Gen alternation (both under negation and under intensional verbs), Nom or Acc represents an ordinary e-type argument position ('referential'; and may be quantified), whereas a Gen NP is always interpreted as property-type: <e,t>, or <s,<e,t>>.

In the case of the intensional verbs like *ždat'*, this connects to the work of (Zimmermann 1993). It also connects to the work of Helen de Hoop (1989, 1990, 1992). She argued for a distinction between "weak case" and "strong case" for direct objects in Germanic languages, with both syntactic and semantic properties. Objects with "strong case" can move to topic position, can escape the scope of various operators, and are interpreted as e-type (or as generalized quantifiers if they are quantified). Objects with "weak case" cannot move far from the verb; they have to stay inside the VP, and consequently they fall under the scope of any operators that affect the VP; and they are interpreted quasi-adverbially.

A third, similar, connection to the work of van Geenhoven (1995, 1998), who treats 'weak' object NPs in West Greenlandic as "incorporated to the verb": they are not fully independent objects, but get an existential quantifier from the verb, similarly to McNally's treatment of Spanish bare plurals.

This hypothesis is still speculative at this stage and requires further research.

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