

## Quantification in possessives

Possessive NPs (possNPs) can involve quantification, as in (1).

- (1) **Most mice's eyes (are red).**

In Barker (1994), possNPs are analyzed as descriptions (type  $\langle e, t \rangle$ ), quantification in them is viewed as unselective, and quantified possessors (e.g. **most mice's** in (1-a)) are therefore not represented as constituents in logical form, as can be seen from the logical form assigned by Barker's theory to (1), given in (2).

- (2)  $\text{most}([\text{mouse}(x) \ \& \ \text{eyes}(y) \ \& \ \pi(x, y)])([\text{red}(y)])$

This paper proposes an analysis of possNPs (building partly on Peters and Westerståhl 2007) in which semantic constituency reflects syntactic constituency. It is argued that this analysis has broader coverage than an unselective binding analysis, and that it also illuminates the relation between adnominal and sentential possession.

**The analysis:** A parallel is drawn between possessors and modifiers like **in every basket** in (3-a). Motivation for this can be intuited from the informal representations in (3a,b). Further motivation comes from paraphrasability exemplified in (3-c).

- (3) **Some apple in every basket is rotten.**
- a. Most mice  $x$ , the (eyes of  $x$ )(red).
  - b. Every basket  $y$ , some (apple in  $y$ )(rotten)
  - c. Most mice's eyes are red = The eyes [of *most mice*] are red.

Formally, possessive determiners as NP modifiers, i.e. as functions from GQs to GQs. A possessor takes a quantifier and returns another quantifier which is restricted in some way determined by the possessor phrase. The denotation for possessive determiners is given in (5). Arriving at these denotations compositionally from standard GQ denotations together with an appropriate denotation for 's' is relatively straightforward and omitted here. The following definitions and notations are used:

- (4) a. For any determiner  $D_{\langle\langle\tau,t\rangle,\langle\langle\tau,t\rangle,t\rangle\rangle}$  and any set  $A$ ,  $D^A(X, Y) =_{def} D(A \cap X, Y)$  (Westerståhl 1984).
- b. If  $\mathcal{P}$  is a generalized quantifier of the form  $D(X)$  and  $A$  is a set, then  $\mathcal{P}^A =_{def} \{Y : D^A(X, Y)\}$ .
- c. For any individual  $a$  and binary relation  $R$ ,  $R_a$  (the ' $R$ -domain' of  $a$ ) is used for the set  $\{x : R(a, x)\}$ .

Following Barker, I use  $\pi$  for the possessive relation (a semantically underspecified binary relation). (5-c) shows the meaning assigned to the modifier **in every basket**.

- (5) a.  $\llbracket \text{John's} \rrbracket = \lambda\mathcal{P}_{\langle\langle e,t\rangle,t\rangle} \lambda P_{\langle e,t\rangle} \cdot \mathcal{P}^{\pi_j}(P)$
- b.  $\llbracket \text{some man's} \rrbracket = \lambda\mathcal{P}_{\langle\langle e,t\rangle,t\rangle} \lambda P_{\langle e,t\rangle} \cdot \text{some}(\text{man}, \{y : \mathcal{P}^{\pi_y}(P)\})$
- c.  $\llbracket \text{in every basket} \rrbracket = \lambda\mathcal{P}_{\langle\langle e,t\rangle,t\rangle} \lambda P_{\langle e,t\rangle} \cdot \text{every}(\text{basket}, \{y : \mathcal{P}^{\text{in}_y}(P)\})$

Following Peters and Westerståhl (2008), I assume an implicit determiner in the interpreta-

tion of possessives. Thus, in an NP like *John's mice*, the possessee phrase *mice* is interpreted as denoting a generalized quantifier headed by a determiner **D** the force of which oscillates between existential and universal readings. The nature of this oscillation is discussed in the full paper, where it is argued to be similar to the problem of determining the force of quantification associated with donkey pronouns (e.g. Kanazawa 1994). As an example of the theory, the derivation of (1) is given in (6).

- (6) a.  $\llbracket \text{most mice's} \rrbracket = \lambda \mathcal{P}_{\langle \langle e,t \rangle, t \rangle} \lambda P_{\langle e,t \rangle} . \mathbf{most}(\text{mouse}, \{y : \mathcal{P}^{\pi_y}(P)\})$   
 b.  $\llbracket \text{eyes} \rrbracket = \lambda P_{\langle e,t \rangle} . \mathbf{D}(\text{eyes}, P)$   
 c.  $\llbracket \text{Most mice's eyes} \rrbracket = \llbracket \text{Most mice's} \rrbracket(\llbracket \text{eyes} \rrbracket) =$   
 $\lambda \mathcal{P}_{\langle \langle e,t \rangle, t \rangle} \lambda P_{\langle e,t \rangle} . \mathbf{most}(\text{mouse}, \{y : \mathcal{P}^{\pi_y}(P)\})(\llbracket \text{eyes} \rrbracket) =$   
 $\lambda P_{\langle e,t \rangle} . \mathbf{most}(\text{mouse}, \{y : \llbracket \text{eyes} \rrbracket^{\pi_y}(P)\})$   
 d.  $\llbracket \text{Most mice's eyes are red} \rrbracket = \llbracket \text{Most mice's eyes} \rrbracket(\llbracket \text{are red} \rrbracket) =$   
 $\lambda P_{\langle e,t \rangle} . \mathbf{most}(\text{mouse}, \{y : \llbracket \text{eyes} \rrbracket^{\pi_y}(P)\})(\text{red}) =$   
 $\mathbf{most}(\text{mouse}, \{y : \llbracket \text{eyes} \rrbracket^{\pi_y}(\text{red})\})$

On this analysis, possessive NPs receive semantic representations that reflect syntactic constituency. Another immediate advantage of this analysis over the unselective binding account is that partitive possessives such as (7) are straightforwardly accounted for.

- (7) *Two of most mice's legs are long.*

It is unclear what representation the unselective binding analysis would assign to (7). A plausible candidate might be (8). However, this representation cannot be derived in any obvious way from the assumed syntactic structure.

- (8)  $\mathbf{most}(\llbracket \text{mouse}(x) \ \& \ \text{legs}(y) \ \& \ \pi(x, y) \rrbracket, [\mathbf{two}(\{\{z : z \in y\}\}], [\text{red}(z)])])$

On the proposed analysis, the partitive phrase simply provides the value for the determiner *D*, which occurs as a free variable in the representation of a possessive NP. One way of achieving this compositionally is assuming that when a partitive phrase is present, the free variable is abstracted over, and the result is applied to the partitive determiner, as in (9).

- (9)  $\llbracket \text{of Most mice's eyes} \rrbracket = \lambda D_{\langle \langle e,t \rangle, \langle \langle e,t \rangle, t \rangle \rangle} \lambda P_{\langle e,t \rangle} . \mathbf{most}(\text{mouse}, \{y : \mathbf{D}^{\pi_y}(\text{eyes})(P)\})$   
 $\llbracket \text{two of Most mice's eyes} \rrbracket = \llbracket \text{of Most mice's eyes} \rrbracket(\llbracket \text{two} \rrbracket) =$   
 $\lambda P_{\langle e,t \rangle} . \mathbf{most}(\text{mouse}, \{y : \mathbf{two}^{\pi_y}(\text{eyes})(P)\})$

The analysis also affords important insight into the relation between adnominal possession and sentential possession with *have*. *Have*-sentences are analyzed as involving a relation between two GQs, so that the following equivalence holds:

- (10)  $\text{GQ}_1 \text{ has } \text{GQ}_2 = \text{GQ}_1(\{x : \text{GQ}_2(\pi_x)\})$   
 Every band has a singer = Every band is such that its  $\pi$ -domain (definition 4c) contains a singer.

Quantified possessors in both possNPs and *have*-sentences involve a relation between two GQs. The difference between the two is that the quantified possessor binds into the restriction of a GQ in the former, but into the scope of a GQ in the latter.