DYNAMICS OF REFLEXIVITY AND RECIPROCITY

SARAH MURRAY

Department of Linguistics
Rutgers, The State University of New Jersey
semurray@rutgers.edu

Plural reflexives and reciprocals are anaphoric not only to antecedent pluralities but also to relations between the members of those pluralities. In this paper, I utilize Dynamic Plural Logic (van den Berg 1996) to analyze reflexives and reciprocals as anaphors that elaborate on relations introduced by the verb, which can be collective, cumulative, or distributive. This analysis generalizes to languages like Cheyenne (Algonquian) where reflexivity and reciprocity are expressed by a single proform that I argue is underspecified, not ambiguous.

1. Introduction

While syntactic theories generally treat English reflexive and reciprocal anaphors as a natural class (Lees and Klima 1963; Pollard and Sag 1992, a.o.), their semantic connection has received little attention in formal semantics, with most studies focusing on reciprocals (Heim et al. 1991; Schwarzschild 1996; Dalrymple et al. 1998, a.o.). However, many languages express reflexivity and reciprocity with a single proform (Maslova *to appear*, a.o.). In this paper I propose an analysis in Dynamic Plural Logic (van den Berg 1996, henceforth DPlL) that makes the semantic parallel within and across languages explicit.

In the next section, I analyze transitive verbs in DPlL. Collective, cumulative, and distributive relations as well as the various scope options for the object are analyzed in terms of the DPlL distinction between the *global value* and the *dependent value* assigned to a variable by a *plural information state* (set of assignment functions).

In Section Three I analyze reflexives and reciprocals as anaphors that elaborate on the relations introduced by the verb. The same distinction between global and dependent values used to analyze transitive verbs also makes it possible to draw a semantic parallel between reflexives and reciprocals: they share a requirement on global values but have differing requirements on dependent values.

In Section Four, I extend this parallel to languages which express reflexivity and reciprocity with a single proform. Using data from Cheyenne, I show that treating such proforms as underspecified accounts for their reflexive, reciprocal, and mixed construals. This proposal also accounts for the possibility of *mixed elaboration* – a mixed construal made explicit by specification in subsequent discourse of different relations for different subgroups of the antecedent. Section Five is the conclusion.

2. Collectivity, Cumulativity, and Distributivity

According to Scha 1981, sentences with plural subjects and objects can be read collectively, cumulatively, or distributively. In addition, on a distributive reading the distributive operator can take either wide or narrow scope with respect to the object. Thus, (1) allows four readings, which can be disambiguated as in (2).

(1)   Sandy and Kathy lifted four boxes.

(2)   Sandy and Kathy . . .

a.	. . . *together* lifted (a stack of) four boxes.	(collective)
b.	. . . *between* them lifted (a total of) four boxes.	(cumulative)
c.	. . . *each* lifted *the same* (stack of) four boxes.	(narrow dist.)
d.	. . . *each* lifted a *possibly different* (stack of) four boxes.	(wide dist.)

These four readings can be accounted for in DPlL if we assume that a transitive verb may optionally include an operator that distributes over the subject (δ_x) and that the scope of this operator may vary, as in (3).[1]

(3)   Four translations of *lift*[2,3]

a.	$lift_x^y$	$\rightsquigarrow$	$\epsilon_y \wedge Lxy$	(collective)
b.	$lift_{\delta_x}^y$	$\rightsquigarrow$	$\delta_x(\epsilon_y) \wedge Lxy$	(cumulative)
c.	$_{\delta_x}(lift)^y$	$\rightsquigarrow$	$\epsilon_y \wedge \delta_x(Lxy)$	(narrow distributive)
d.	$_{\delta_x}(lift^y)$	$\rightsquigarrow$	$\delta_x(\epsilon_y \wedge Lxy)$	(wide distributive)

I assume the input to semantic composition to be an indexed string of morphemes interpreted left to right, where the translations are combined by dynamic conjunction (adapting Bittner 2007). In the indexed form, superscripts introduce new values for variables, subscripts indicate anaphora to the input values, and the indices x and y stand for the subject set and the object set, respectively.

In DPlL, *plural information states* (sets of assignment functions) encode the values for variables as well as the relations (*dependencies*) between these values. Thus, dependencies as well as values are transferred from state to state. The *global value* – i.e. the set of values assigned to a variable by a plural info state – is distinguished from a *dependent value* – i.e. a subset of the global value, restricted to a particular

---

[1] For definitions, see van den Berg 1996, except for distributivity, where I assume the modified definition of Nouwen 2003.

[2] C.f. van den Berg 1996 (§5.4.2), who analyzes these using a 'pseudo-distributivity' operator which, for both the distributive and cumulative readings, scopes over both the variable introduction and the verb.

[3] The verb may also distribute over the object (δ_y), e.g. $_{\delta_y}(lift_x)^y \rightsquigarrow \epsilon_y \wedge \delta_y(Lxy)$ yields a reading where Sandy and Kathy together lifted four boxes *one at a time*. (Including optional object-distributivity, there are eight translations for *lift*.)

value for another variable. This allows for a straightforward account of the four readings disambiguated in (2).

When the object variable is introduced (ϵ_y) in the scope of the distributive operator (as in (3b,d)), different y values can be introduced for each x value. Thus Sandy and Kathy can pick up different boxes on the cumulative and wide distributive readings (2b,d). If the object variable is introduced outside the scope of the distributive operator (as in (3a,c)), the y values must be the same for all x values. Thus, on the collective and narrow distributive readings (2a,c), both Sandy and Kathy pick up the same four boxes.

When the verbal relation is outside the scope of distributivity (as in (3a,b)), then the relation holds between the global value of x and the global value of y. Thus, on the collective and cumulative readings (2a,b), the plurality of Sandy and Kathy picks up the plurality of the boxes. When the verbal relation is in the scope of distributivity (as in (3c,d)), then for each x value the relation holds between that value and its dependent y values. Thus, on distributive readings (2c,d), Sandy picks up her four boxes and Kathy picks up hers.

The translations of these four readings are given in (4). The NP (4i) and the VP (4ii) are combined by dynamic conjunction ($\wedge$).

(4)　　 i. $Sandy\ and\ Kathy\dots\quad\rightsquigarrow$
　　　　　　$+[v = s]\ \wedge\ \epsilon_x\ \wedge\ x = v \oplus w\ \wedge\ +[w = k]$

　　　　 ii. $\dots lifted\ four\ boxes\quad\rightsquigarrow$

$\epsilon_y\ \wedge\ Lxy\ \wedge\ 4y\ \wedge\ \delta_y(By)$	(collective)
$\delta_x(\epsilon_y)\ \wedge\ Lxy\ \wedge\ 4y\ \wedge\ \delta_y(By)$	(cumulative)
$\epsilon_y\ \wedge\ \delta_x(Lxy)\ \wedge\ 4y\ \wedge\ \delta_y(By)$	(narrow distributive)
$\delta_x(\epsilon_y\ \wedge\ Lxy\ \wedge\ 4y\ \wedge\ \delta_y(By))$	(wide distributive)

As noted by van den Berg 1996, plural anaphora respects the relations introduced in antecedent discourse. For example, in the context of the wide distributive reading of (1), the sentence *They brought them upstairs* is read analogously, i.e. *Sandy and Kathy each brought her stack of four boxes upstairs*.

3.　Reflexive and Reciprocal Anaphors

In some languages, reflexivity and reciprocity are expressed by means of distinct proforms. For example, English *themselves* expresses reflexivity while *each other* expresses reciprocity. I analyze such anaphors as elaborating on the dependencies introduced by the verb. I propose that they share an identity requirement on global values (*global identity*) but differ in their requirements on dependent values (*distributive overlap* vs. *distributive non-overlap*). These requirements also determine which readings of the verb are compatible with which proform.

The proposed translations of the English plural reflexive and reciprocal are given in (5) and (6) respectively. The translation of the singular reflexive pronoun (e.g. *himself*) would differ from (5) only in number.

(5) *themselves*$_{y,x}$ $\rightsquigarrow$ $+[PLy] \wedge +[y = x] \wedge +[\delta_y(y \bigcirc x)]$

(6) *each other*$_{y,x}$ $\rightsquigarrow$ $+[y = x] \wedge +[\delta_y(y \oslash x)]$

According to (5), the plural reflexive presupposes (+) plurality, like non-reflexive plural pronouns, as well as global identity and distributive overlap. The reciprocal (6) has two presuppositions: global identity, like reflexives, and distributive non-overlap (the plurality requirement follows). The shared presupposition of global identity requires that two arguments of the verb (here, the subject x and the object y) denote the same set.[4] The distributive conditions impose further constraints on the dependencies between x and y that were introduced by the verb.[5]

The relations introduced by the verb may be elaborated on not only sentence-internally but also by subsequent discourse. For example, in discourse (7) the interpretation of sentences (7ii) and (7iii) depends on the relations introduced in (7i) by the verb and elaborated on by the reciprocal object. That is, each girl borrowed an outfit from the girl she dressed up as and returned that outfit to that girl.

(7) i. Some girls dressed up like each other (for Halloween).

ii. They borrowed outfits from each other.

iii. (The next day,) they returned them.

Crucially, both the plurality of girls and the relations between them are passed on from (7i) to the subsequent discourse. If only the values were passed on, then the relations between the individual girls could be different in subsequent sentences.

These observations can be captured by the following analysis of discourse (7) (where $D = dress.up.like$, $B = borrow.from$, and $R = return$):

(8) i. $\epsilon_x \wedge \delta_x(Gx) \wedge PLx \wedge \delta_x(\epsilon_y \wedge Dxy) \wedge +[y = x] \wedge +[\delta_y(y \oslash x)]$

ii. $+[PLx] \wedge \delta_x(\epsilon_z \wedge Bxzy) \wedge \delta_z(Oz) \wedge PLz \wedge +[y = x] \wedge +[\delta_y(y \oslash x)]$

iii. $+[PLx] \wedge \delta_x(Rxzy) \wedge +[PLz]$

4. Reflexive/Reciprocal Underspecification

In contrast to English, many languages express reflexivity and reciprocity with a single proform. One such language is Cheyenne, which expresses both with the verbal affix *-ahte*. For example, Cheyenne (9) can be translated into English with a reflexive object, as in (10), or or a reciprocal object, as in (11).

---

[4]Translations of the English reflexive and reciprocal without global identity, i.e. *themselves*$_{y,x}$ $\rightsquigarrow$ $+[PLy] \wedge +[\delta_y(y \bigcirc x)]$ and *each other*$_{y,x}$ $\rightsquigarrow$ $+[\delta_y(y \oslash x)]$, would incorrectly allow for different members in the argument (x and y) sets.

[5]For the reflexive, a translation with distributive identity as opposed to distributive overlap, i.e. *themselves*$_{y,x}$ $\rightsquigarrow$ $+[PLy] \wedge +[y = x] \wedge +[\delta_y(y = x)]$, would incorrectly preclude a collective interpretation of the verb (e.g., *the students praised themselves*). For the reciprocal, a translation with distributive non-identity as opposed to distributive non-overlap, i.e. *each other*$_{y,x}$ $\rightsquigarrow$ $+[y = x] \wedge +[\delta_y(y \neq x)]$, would incorrectly allow a (subject-)collective interpretation of the verb.

(9)   *ka'éskone-ho   é-axeen-**ȧhtse**-o'o*
        child-PL.AN   3-scratch.AN-*ahte*-3PL.AN

(10)   The children scratched *themselves*

(11)   The children scratched *each other*

In addition to allowing both a reflexive and a reciprocal construal, Cheyenne (9) allows a mixed construal, which is partially reflexive and partially reciprocal. On a mixed construal, (9) can refer to a group of children, some of whom scratched each other while others scratched themselves.

   I propose that such proforms have only the global identity presupposition of the English anaphors. Thus, Cheyenne *-ahte* has the following translation:

(12)   *-ahte* $\rightsquigarrow$ $+[y = x]$

The translation (12) correctly allows the antecedent to be a singleton. For plural sets, the relations between the members are not specified, allowing for various construals. In particular, (13i) (= (9)) admits a mixed construal, compatible with (13ii).

(13)   i. *ka'éskone-ho   é-axeen-**ȧhtse**-o'o*   = (9)
              child-PL.AN   3-scratch.AN-*ahte*-3PL.AN

          ii. *hetané-ka'éskone   é-axeen-**ahtse**   naa*
              man-child   3-scratch.AN-*ahte*   CNJ
              *he'é-ka'ėškóne-ho   noná-mé'tó'e   é-axeen-**ȧhtse**-o'o*
              woman-child-PL.AN   *noná*-NON.ID   3-scratch.AN-*ahte*-3PL.AN

The conjunction (13ii) is a *mixed elaboration* of (13i), specifying a reflexive relation for the subgroup of the boy and a reciprocal relation for the subgroup of the girls. It is difficult to translate the Cheyenne discourse (13) into English. The least awkward translation is (14), where Cheyenne (13i) is rendered as (14i), without any object:

(14)   i. The children *were scratching*.

          ii. The boy scratched *himself* and the girls scratched *each other*.

(15)   i. The children scratched {*themselves*, *each other*}

        # ii. The boy scratched *himself* and the girls scratched *each other*.

If there is a reflexive or reciprocal object, as in (15i), then mixed elaboration is infelicitous (#).[6] However, discourses parallel to Cheyenne (13) are acceptable in other languages which express reflexivity and reciprocity with a single proform. This holds regardless of the morphological category of the proform: it can be an affix, like Cheyenne *-ahte*, a clitic, such as Polish *się* (Bittner, p.c.), Romanian *se* (Brasoveanu, p.c.), and French *se* (Déprez, p.c.), or an independent word, like German *sich* (Tonhauser, p.c.). The present proposal is a step toward understanding this cross-linguistic pattern.

---

[6] A discourse like (15) may be acceptable with 'themselves' on a collective interpretation. The proposed analysis of reflexives is compatible with collective translation of the verb: see Sections 2 and 3.

Sarah Murray

5. Conclusion

The DPlL distinction between global and dependent values allows a semantic parallel to be drawn between reflexive and reciprocal anaphors. Such anaphors are sentence-internal elaborations of the relations introduced by the transitive verb. These relations, which can be collective, cumulative, or distributive, can also be elaborated on in subsequent discourse. This analysis generalizes to languages that express reflexivity and reciprocity with a single proform. Such proforms are not ambiguous, but underspecified. They presuppose only global identity with the antecedent set, allowing singular antecedents as well as mixed construals.

Bibliography

van den Berg, M.: 1996, *Some Aspects of the Internal Structure of Discourse*, Ph.D. thesis, ILLC, University of Amsterdam, Amsterdam

Bittner, M.: 2007, Online update: Temporal, modal and de se anaphora in polysynthetic discourse, in C. Barker and P. Jacobson (eds.), *Direct Compositionality*, Chapt. 11, pp 363 – 404, Oxford University Press, New York

Dalrymple, M., Kanazawa, M., Kim, Y., Mchombo, S., and Peters, S.: 1998, Reciprocal expressions and the concept of reciprocity, *Linguistics and Philosophy* 21(2), 159–210

Heim, I., Lasnik, H., and May, R.: 1991, Reciprocity and plurality, *Linguistic Inquiry* 22(1), 63–101

Lees, R. B. and Klima, E. S.: 1963, Rules for English pronominalization, *Language* 39, 17–28

Maslova, E.: *to appear*, Reflexive encoding of reciprocity, in E. König and V. Gast (eds.), *Reciprocals and Reflexives*, Mouton de Gruyter

Nouwen, R.: 2003, *Plural Pronominal Anaphora in Context*, University of Utrecht, Graduate School of Linguistics Dissertations, LOT, Utrecht, The Netherlands

Pollard, C. and Sag, I. A.: 1992, Anaphors in english and the scope of binding theory, *Linguistic Inquiry* 23, 261–303

Scha, R.: 1981, Distributive, collective and cumulative quantification, in M. Stokhof and T. Janssen (eds.), *Formal Methods in the Study of Language*, pp 483–512, Mathematisch Centrum, Amsterdam

Schwarzschild, R.: 1996, *Pluralities*, Kluwer Academic Publishers, Dordrecht