A semantic model of switch reference in Koasati*

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1 Introduction

- Switch reference (SR), a morphological phenomenon found in several languages in the world, is traditionally characterized as a way of indicating whether the subjects of two conjoined clauses are the same or different (Jacobsen 1993).
- Examples of SR in Koasati, a Muskogean language spoken in Louisiana and Texas, can be seen in (1).[1]

(1) Joekak roomkã itcokhalihkok
Joe-k room-˜ itcokhali:ka-**k**
Joe-SBJ room-OBJ enter-**SS**
'Joe came into the room,' (Rising 1992: 4)

a. Edkã hihcok cokko:lit
Ed-˜ hi:ca-**k** cokko:lit
Ed-OBJ see-**SS** sat_down
'saw Ed, and sat down.'

b. Edkã hihcan cokko:lit
Ed-˜ hi:ca-**n** cokko:lit
Ed-OBJ see-**DS** sat_down
'saw Ed, and he [Ed] sat down.'

- Consider the English equivalent of (1) in (2).

(2) Joe^j came into the room. He$_j$ saw Ed^k. He$_{j/k}$ sat down.

- *He* in the third sentence could refer to either Joe or Ed.
- The English is ambiguous where the Koasati is not.

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[1] All data examples are copied unchanged from their sources except the third line of the gloss has been changed to use Leipzig glossing conventions.
Gloss abbreviations: SS = SAME SUBJECT; DS = DIFFERENT SUBJECT; SBJ = SUBJECT; OBJ = OBJECT; FOC = FOCUS; NOTHING:BUT = NOTHING BUT; DIM = DIMINUTIVE; HABIT = HABITUAL; DISTR = DISTRIBUTIVE; REALIS = REALIS; DAT = DATIVE; 3 = THIRD PERSON

- Aside form accounting for the difference between English anaphora and Koasati SR, this account aims to explain the non-canonical use of SR in Koasati and other languages.
- In (3), the SS marker on *pasá:kascok* ('she seemed dirty') should mean that the following sentence has *she* again as the subject, but this is not the case.

(3) Ho:tinannáhcok, pasá:kascok,
ho:ti-nanna-V́hco-**k** pasá:ka-:si-V́hco-**k**
sores-NOTHING:BUT-HABIT-**SS** be:dirty-DIM-HABIT-**SS**
"She was covered with sores, and she seemed dirty,"

ohimpalátka:sin. Á:yatohok,
oh-im-palátka-:si-**n** á:ya-toho-**k**
DISTR-3DAT-be:cross-DIM-**DS** go:about-REALIS-**SS**

"and people were quite cross with her. She went about," (Kimball 2010: 271; 68)

- Previous semantic analyses of SR include work by Stirling (1993) and McKenzie (2007, 2011, in review). They analyze SR as tracking events or situations, respectively.
- There seems to be an important connection between the morphology in the nominal domain and switch reference. Thus, I pursue a nominal reference tracking analysis for Koasati SR.
- I model this data on switch reference using Predicate Logic with Anaphora (PLA; Dekker 1994), a system that maintains an ordered list of individuals in a discourse.

Roadmap

§2 Koasati switch reference
§3 Introduction to PLA
§4 Initial PLA analysis: one-list system
§5 A problem & the two-list system
§6 Conclusion
§A PLA analysis of more data
§B Two list fragment

2 Koasati switch reference

- Koasati word order is typically SOV.
- SR marking appears on the verb at the end of the clause.
- The verbal SS and DS morphemes are homophonous with the nominal SBJ and OBJ markings.

Morpheme	Attached to Noun	Attached to Verb
-k	subject (SBJ)	same subject (SS)
-n	object (OBJ)	different subject (DS)

Table 1: Subject, object, and switch reference morphemes

- The overlap in the form of the nominal subject and object marker with the SR markers suggests that there is an important connection between nominal reference and SR.

Notation for tables: Bold items in the table indicate overt arguments

(1a) Joekak roomkã itcokhalihkok Edkã hihcok cokko:lit
Joe-k room-˜ itcokhali:ka-**k** Ed-˜ hi:ca-**k** cokko:lit
Joe-SBJ room-OBJ enter-**SS** Ed-OBJ see-**SS** sat_down
'Joe came into the room, saw Ed, and sat down.' (Rising 1992: 4)

Clause	Verb Gloss	Subject	Object	SR Marker
1.	enter	**Joe**	**room**	SS
2.	see	Joe	**Ed**	SS
3.	sat_down	Joe	-	-

Table 2: Breakdown of (1a)

(1b) Joekak roomkã itcokhalihkok Edkã hihcan cokko:lit
Joe-k room-˜ itcokhali:ka-**k** Ed-˜ hi:ca-**n** cokko:lit
Joe-SBJ room-OBJ enter-**SS** Ed-OBJ see-**DS** sat_down
'Joe came into the room, saw Ed, and he [Ed] sat down.' (Rising 1992: 4)

Clause	Verb Gloss	Subject	Object	SR Marker
1.	enter	**Joe**	**room**	SS
2.	see	Joe	**Ed**	DS
3.	sat_down	Ed	-	-

Table 3: Breakdown of (1b)

- From these examples, it seems that there is a pattern to how individuals are introduced and referred back to.
- Further, this pattern can be manipulated by the switch reference markers.
  - The SS marker makes the subject and object of the SS marked clause the available subject and object, respectively, for the next clause.
  - The DS marker makes the subject and object of the DS marked clause the available object and subject, respectively, for the next clause.
- A system like PLA that can order individuals can be used to model this data.

3 Background on PLA

- Predicate Logic with Anaphora (PLA; Dekker 1994) extends standard Predicate Logic in order to keep track of individuals in a discourse.
- It has regular truth conditions, but a formula is interpreted as an update of an information state.

(4) **A sample PLA information state**

$$s = \{\langle \underset{\substack{\uparrow \\ \mathsf{p}_2}}{a}, \underset{\substack{\uparrow \\ \mathsf{p}_1}}{b}, \underset{\substack{\uparrow \\ \mathsf{p}_0}}{c} \rangle\}$$

- p_i: i indexes the position of the pronoun
- $\exists$: introduces individuals to information state

(2) Joe$_j$ came into the room. He$_j$ saw Ed$_k$. He$_{j/k}$ sat down.

Table 4: Analysis of one translation (2):
…He$_k$ sat down.

	English	PLA	Pro. Interpr.	Output State
a.				$s_0 = \{\langle\rangle\}$
b.	Joe$_j$ came into the room.	$\exists \mathsf{x}(\mathsf{x} = \mathsf{j} \wedge \exists \mathsf{y}(\mathsf{y} = \mathsf{r} \wedge \mathsf{Ixy}))$		$s_1 = \{\langle r, j\rangle\}$
c.	He$_j$ saw Ed$_k$.	$\exists \mathsf{y}(\mathsf{y} = \mathsf{e} \wedge \mathsf{Hp_0y})$	$[\mathsf{p}_0]_{s_1} = j$	$s_2 = \{\langle r, j, e\rangle\}$
d.	He$_k$ sat down.	$\mathsf{Cp_0}$	$[\mathsf{p}_0]_{s_2} = e$	$s_3 = \{\langle r, j, e\rangle\}$

- In (b), the narrow scope quantifier adds r to the information state first,
- Then the broad scope quantifier adds j to the information state.

Table 5: Analysis of other translation of (2):
…He$_j$ sat down.

	English	PLA	Pro. Interpr.	Output State
a.				$s_0 = \{\langle\rangle\}$
b.	Joe$_j$ came into the room.	$\exists \mathsf{x}(\mathsf{x} = \mathsf{j} \wedge \exists \mathsf{y}(\mathsf{y} = \mathsf{r} \wedge \mathsf{Ixy}))$		$s_1 = \{\langle r, j\rangle\}$
c.	He$_j$ saw Ed$_k$.	$\exists \mathsf{y}(\mathsf{y} = \mathsf{e} \wedge \mathsf{Hp_0y})$	$[\mathsf{p}_0]_{s_1} = j$	$s_2 = \{\langle r, j, e\rangle\}$
d.	He$_j$ sat down.	$\mathsf{Cp_1}$	$[\mathsf{p}_1]_{s_2} = j$	$s_3 = \{\langle r, j, e\rangle\}$

4 PLA analysis

- In English the ambiguity of *he* is represented in PLA by different pronoun terms: p_0 and p_1.
- The lack of ambiguity in the Koasati data can be captured by translating the subject agreement marker as p_0 and object agreement marker as p_1.
- The switch reference markers can be translated so that the DS marker swaps the order of the individuals in the p_0 and p_1 positions and the SS marker maintains the order.

- a-SBJ: $\exists \mathsf{z}(\mathsf{z} = \mathsf{a})$
- b-OBJ: $\exists \mathsf{x}(\mathsf{x} = \mathsf{p}_0 \wedge \exists \mathsf{z}(\mathsf{z} = \mathsf{b}))$
- intransitive verb: $\mathsf{Vp_0}$
- transitive verb: $\mathsf{Vp_0p_1}$
- SS: $\exists \mathsf{x}(\mathsf{x} = \mathsf{p}_0 \wedge \exists \mathsf{y}(\mathsf{y} = \mathsf{p}_1))$
- DS: $\exists \mathsf{y}(\mathsf{y} = \mathsf{p}_1 \wedge \exists \mathsf{x}(\mathsf{x} = \mathsf{p}_0))$

(5) **SS marker**

$$s_n = \{\langle\ a,\ b,\ c\ \rangle\} \xrightarrow{\text{SS}} s_{n+1} = \{\langle\ \langle a,\ b,\ c,\ b,\ c\ \rangle\}$$

(6) **DS marker**

$$s_n = \{\langle\ a,\ b,\ c\ \rangle\} \xrightarrow{\text{DS}} s_{n+1} = \{\langle\ \langle a,\ b,\ c,\ c,\ b\ \rangle\}$$

(1) Joekak roomkã itcokhalihkok
Joe-k room-˜ itcokhali:ka-**k**
Joe-SBJ room-OBJ enter-**SS**
'Joe came into the room,' (Rising 1992: 4)

Table 6: Analysis of (1)

	Gloss	PLA	Pronoun Interp.	Output State
a.	Joe-SBJ	$\exists z(z = j)$		$s_1 = \{\langle j\rangle\}$
b.	room-OBJ	$\exists x(x = p_0 \wedge \exists z(z = r))$	$[p_0]_{s_1} = j$	$s_2 = \{\langle j,r,j\rangle\}$
c.	enter	Ip_0p_1	$[p_1]_{s_2} = r, [p_0]_{s_2} = j$	$s_3 = \{\langle j,r,j\rangle\}$
d.	-**SS**	$\exists x(x = p_0 \wedge \exists y(y = p_1))$	$[p_1]_{s_3} = r, [p_0]_{s_3} = j$	$s_4 = \{\langle j,r,j,r,j\rangle\}$

(1a) Edkã hihcok cokko:lit
Ed-˜ hi:ca-**k** cokko:lit
Ed-OBJ see-**SS** sat_down
'saw Ed, and sat down.' (Rising 1992: 4)

Table 7: Analysis of (1a)

	Gloss	PLA	Pronoun Interp.	Output State
e.	Ed-OBJ	$\exists x(x = p_0 \wedge \exists z(z = e))$	$[p_0]_{s_4} = j$	$s_5 = \{\langle j,r,j,r,j,e,j\rangle\}$
f.	see	Hp_0p_1	$[p_1]_{s_5} = e, [p_0]_{s_5} = j$	$s_6 = \{\langle j,r,j,r,j,e,j\rangle\}$
g.	-**SS**	$\exists x(x = p_0 \wedge \exists y(y = p_1))$	$[p_1]_{s_6} = e, [p_0]_{s_6} = j$	$s_7 = \{\langle j,r,j,r,j,e,j,e,j\rangle\}$
h.	sat_down	Cp_0	$[p_0]_{s_7} = j$	$s_8 = \{\langle j,r,j,r,j,e,j,e,j\rangle\}$

(1b) Edkã hihcan cokko:lit
Ed-˜ hi:ca-**n** cokko:lit
Ed-OBJ see-**DS** sat_down
'saw Ed, and he [Ed] sat down.' (Rising 1992: 4)

Table 8: Analysis of (1b)

	Gloss	PLA	Pronoun Interp.	Output State
e.	Ed-OBJ	$\exists x(x = p_0 \wedge \exists z(z = e))$	$[p_0]_{s_4} = j$	$s_5 = \{\langle j,r,j,r,j,e,j\rangle\}$
f.	see	Hp_0p_1	$[p_1]_{s_5} = e, [p_0]_{s_5} = j$	$s_6 = \{\langle j,r,j,r,j,e,j\rangle\}$
g.	-**DS**	$\exists y(y = p_1 \wedge \exists x(x = p_0))$	$[p_1]_{s_6} = e, [p_0]_{s_6} = j$	$s_7 = \{\langle j,r,j,r,j,e,j,j,e\rangle\}$
h.	sat_down	Cp_0	$[p_0]_{s_7} = e$	$s_8 = \{\langle j,r,j,r,j,e,j,j,e\rangle\}$

- The different SR morpheme translations in (g) for **Tables 7-8** generate distinct unambiguous interpretations.

5 A problem and a proposed solution: The two list analysis

- The data in (7) cannot be accounted for using the one list system.

(7) Joekak roomkã itcokhali:kon
Joe-k room-˜ itcokhali:ka-**n**
Joe-SBJ room-OBJ enter-**DS**
'Joe came into the room,' (Rising 1992: 4)

a. Edkak hihcan cokko:lit
Ed-k hi:ca-**n** cokko:lit
Ed-SBJ see-**DS** sat_down
'Ed saw him, and Joe sat down.'

Clause	Verb Gloss	Subject	Object	SR Marker
1.	enter	**Joe**	**room**	DS
2.	see	**Ed**	Joe	DS
3.	sat_down	Joe	-	-

Table 9: Breakdown of (7)

Table 10: Analysis of (7)

	Gloss	PLA	Pronoun Interp.	Output State
a.	Joe-SBJ	$\exists z(z = j)$		$s_1 = \{\langle j\rangle\}$
b.	room-OBJ	$\exists x(x = p_0 \wedge \exists z(z = r))$	$[p_0]_{s_1} = j$	$s_2 = \{\langle j,r,j\rangle\}$
c.	enter	Ip_0p_1	$[p_1]_{s_2} = r, [p_0]_{s_2} = j$	$s_3 = \{\langle j,r,j\rangle\}$
d.	-**DS**	$\exists y(y = p_1 \wedge \exists x(x = p_0))$	$[p_1]_{s_3} = r, [p_0]_{s_3} = j$	$s_4 = \{\langle j,r,j,j,r\rangle\}$

Table 11: Analysis of (7a)

	Gloss	PLA	Pronoun Interp.	Output State
e.	Ed-SBJ	$\exists x(x = e)$		$s_5 = \{\langle j,r,j,j,\mathbf{r},e\rangle\}$
f.	see	Hp_0p_1	$[p_1]_{s_5} = \mathbf{r}, [p_0]_{s_5} = e$	$s_6 = \{\langle j,r,j,j,\mathbf{r},e,r\rangle\}$
g.	-**DS**	$\exists y(y = p_1 \wedge \exists x(x = p_0))$	$[p_1]_{s_6} = e, [p_0]_{s_6} = \mathbf{r}$	$s_7 = \{\langle j,r,j,j,r,e,e,\mathbf{r}\rangle\}$
h.	sat_down	Cp_0	$[p_0]_{s_7} = \mathbf{r}$	$s_8 = \{\langle j,r,j,j,r,e,e,\mathbf{r}\rangle\}$

5.1 Two list analysis

- I adapt PLA to be a two list system building on Bittner (2001) who proposes a two list system for anaphora and also applies it in an analysis of the obviative system in Kalallisut (West Greenlandic) (Bittner 2011).
- In other work, Little and Moroney (2016) use a two list system related to the one presented here in an analysis of obviation in Mi'gmaq.

(8) **A sample two list information state**

$$\begin{array}{lccccl} s = \{\langle & \langle a, & b\rangle, & \langle c & d\rangle & \rangle\} \\ & \uparrow & \uparrow & \uparrow & \uparrow & \\ & p_1^{\top} & p_0^{\top} & p_1^{\perp} & p_0^{\perp} & \end{array}$$

- a-SBJ: $\exists^{\top}z(z=a)$
- b-OBJ: $\exists^{\perp}z(z=b)$
- intrans. verb: $Vp_0^{\top}$
- trans. verb: $Vp_0^{\top}p_0^{\perp}$
- SS: $\exists_{\perp}x(x=p_0^{\perp}\wedge\exists_{\perp}y(y=p_0^{\top})$
- DS: $\exists^{\top}y(y=p_0^{\perp})\wedge\exists_{\perp}x(x=p_0^{\top})$

(9) **SS marker**

$$s_n=\{\langle\ \langle a,\ b\rangle,\ \langle c,\ d\rangle\ \rangle\}\xrightarrow{SS}s_{n+1}=\{\langle\ \langle a,\ b\rangle,\ \langle c,\ d,\ b,\ d\rangle\ \rangle\}$$

(10) **DS marker**

$$s_n=\{\langle\ \langle a,\ b\rangle,\ \langle c,\ d\rangle\ \rangle\}\xrightarrow{DS}s_{n+1}=\{\langle\ \langle a,\ b,\ d\rangle,\ \langle c,\ d,\ b\rangle\ \rangle\}$$

5.2 Accounting for problematic data in (7)

- This system can account for the problematic data by keeping the available subject and object individuals separate:

Table 12: Analysis of (7)

	Gloss	PLA	Pronoun Interp.	Output State
a.	Joe-SBJ	$\exists z(z=j)$		$s_1=\{\langle\langle j\rangle,\langle\rangle\rangle\}$
b.	room-OBJ	$\exists^{\perp}z(z=r)$		$s_2=\{\langle\langle j\rangle,\langle r\rangle\rangle\}$
c.	enter	$Ip_0^{\top}p_0^{\perp}$	$[p_0^{\top}]_{s_2}=j,[p_0^{\perp}]_{s_2}=r$	$s_3=\{\langle\langle j\rangle,\langle r\rangle\rangle\}$
d.	**-DS**	$\exists y(y=p_0^{\perp})\wedge\exists^{\perp}x(x=p_0^{\top})$	$[p_0^{\perp}]_{s_3}=r,[p_0^{\top}]_{s_3}=j$	$s_4=\{\langle\langle j,r\rangle,\langle r,j\rangle\rangle\}$

Table 13: Analysis of (7a)

	Gloss	PLA	Pronoun Interp.	Output State
e.	Ed-SBJ	$\exists z(z=e)$		$s_5=\{\langle\langle j,r,e\rangle,\langle r,j\rangle\rangle\}$
f.	see	$Hp_0^{\top}p_0^{\perp}$	$[p_0^{\top}]_{s_5}=e,[p_0^{\perp}]_{s_5}=j$	$s_6=\{\langle\langle j,r,e\rangle,\langle r,j\rangle\rangle\}$
g.	**-DS**	$\exists y(y=p_0^{\perp})\wedge\exists^{\perp}x(x=p_0^{\top})$	$[p_0^{\top}]_{s_6}=e,[p_0^{\perp}]_{s_6}=j$	$s_7=\{\langle\langle j,r,e,j\rangle,\langle r,j,e\rangle\rangle\}$
h.	sat_down	$Cp_0^{\top}$	$[p_0^{\top}]_{s_7}=j$	$s_8=\{\langle\langle j,r,e,j\rangle,\langle r,j,e\rangle\rangle\}$

5.3 Examples from texts

- (12-13) show that both the one and two list system can account for non-canonical switch reference.
- (13) and (14) show that in addition to overt nouns, verbal morphology and incorporated nouns must be able to add individuals to the lists.
- (16) shows that it may also be necessary for verbal morphology to be able to pick out pronouns farther back than $p_0^{\top}$ on the list.

(11) Tayyí sihnóhcok á:yatoho:limpatš
tayyí sihno-V́hco-**k** á:ya-toho-:li-mpa-t-š
woman old-HABIT-**SS** go:about-REALIS-DEDUC-HEARSAY-PAST-PH:TR

"It is said that an elderly woman was going about." (Kimball 2010: 271; 68)

One list: $\langle\rangle\xrightarrow{\text{WOMAN}}\langle w\rangle\xrightarrow{SS}\langle w,w\rangle$

Two list: $\langle\langle\rangle,\langle\rangle\rangle\xrightarrow{\text{WOMAN}}\langle\langle w\rangle,\langle\rangle\rangle\xrightarrow{SS}\langle\langle w\rangle,\langle w\rangle\rangle$

(12) Ho:tinannáhcok, pasá:kascok,
ho:ti-nanna-V́hco-**k** pasá:ka-:si-V́hco-**k**
sores-NOTHING:BUT-HABIT-**SS** be:dirty-DIM-HABIT-**SS**

"She was covered with sores, and she seemed dirty," (Kimball 2010: 271; 68)

One list: $\langle w,w\rangle\xrightarrow{SS}\langle w,w,w\rangle\xrightarrow{SS}\langle w,w,w,w\rangle$

Two list: $\langle\langle w\rangle,\langle w\rangle\rangle\xrightarrow{SS}\langle\langle w\rangle,\langle w,w\rangle\rangle\xrightarrow{SS}\langle\langle w\rangle,\langle w,w,w\rangle\rangle$

(13) ohimpalátka:sin. Á:yatohok,
oh-im-palátka-:si-**n** á:ya-toho-**k**
DISTR-3DAT-be:cross-DIM-**DS** go:about-REALIS-**SS**

"and people were quite cross with her. She went about," (Kimball 2010: 271; 68)

One list: $\langle\ldots,w\rangle\xrightarrow{\text{DISTR}}\langle\ldots,w,p\rangle\xrightarrow{DS}\langle\ldots,w,p,w\rangle$
$\xrightarrow{SS}\langle\ldots,w,p,w,p,w\rangle$

Two list: $\langle\langle w\rangle,\langle w,w,w\rangle\rangle\xrightarrow{\text{DISTR}}\langle\langle w,p\rangle,\langle w,w,w\rangle\rangle\xrightarrow{DS}\langle\langle w,p,w\rangle,\langle w,w,w,p\rangle\rangle$
$\xrightarrow{SS}\langle\langle w,p,w\rangle,\langle w,w,w,p,w,p\rangle\rangle$

(14) atlawístanannáhcok,
at-lawísta-nanna-V́hco-**k**
person-small(pl)-NOTHING:BUT-HABIT-**SS**

"and there were nothing but children; " (Kimball 2010: 271; 68)

One list: $\langle\ldots,w,p,w\rangle\xrightarrow{\text{PERSON-SMALL(PL)}}\langle\ldots,w,p,w,c\rangle\xrightarrow{SS}$
$\langle\ldots,w,p,w,c,w,c\rangle$

Two list: $\langle\langle w,p,w\rangle,\langle w,w,w,p\rangle\rangle\xrightarrow{\text{PERSON-SMALL(PL)}}\langle\langle w,p,w,c\rangle,\langle\ldots,p\rangle\rangle\xrightarrow{SS}$
$\langle\langle w,p,w,c\rangle,\langle\ldots,p,c,p\rangle\rangle$

(15) loá:caskok í:satohon.
loká:ca-si-k-o**k** í:sa-toho-**n**
orphan-DIM-ART-**SS**:FOC dwell(pl)-REALIS-**DS**

"there were orphans dwelling there. " (Kimball 2010: 271-272; 68)

One list: $\langle\ldots,c,w,c\rangle\xrightarrow{SS}\langle\ldots,c,w,c,w,c\rangle\xrightarrow{DS}$
$\langle\ldots,c,w,c,c,w\rangle$

Two list: $\langle\langle w,p,w,c\rangle,\langle\ldots,p,c,p\rangle\rangle\xrightarrow{SS}\langle\langle w,p,w,c\rangle,\langle\ldots c,p,c,p\rangle\rangle\xrightarrow{DS}$
$\langle\langle w,p,w,c,p\rangle,\langle\ldots c,p,c,p,c\rangle\rangle$

(16) Óhłan, atlawístak ayyihó:cihónkan
ó,h,**ła-n** at-lawísta-k ayyihó:ci-hónka-**n**
be:there(sg),H:GRADE,-**DS** person-small(pl)-NOM have:pity-ADV-**DS**
cokkó:toho:limpatš.
cokkó:li-toho:-li-mpa-t-š
sit(sg)-REALIS-DEDUC-HEARSAY-PAST-PH:TR

"Having arrived over there, and the children felt great pity for her, and she sat down, so it is said." (Kimball 2010: 272; 68)

One list: $\langle\ldots,c,w,c,c,w\rangle\xrightarrow{DS}$
$\langle\ldots,c,w,c,c,w,w,c\rangle\xrightarrow{DS}\langle\ldots,c,w,c,c,w,w,c,c,w\rangle$

Two list: $\langle\langle\ldots,w,c,p\rangle,\langle\ldots\ldots,p,c\rangle\rangle\xrightarrow{(SG)=P_1^{\top}}\langle\langle\ldots,w,c,p,\mathbf{w}\rangle,\langle\ldots\ldots,p,c\rangle\rangle\xrightarrow{DS}$
$\langle\langle\ldots,p,\mathbf{w},c\rangle,\langle\ldots\ldots,p,c,w\rangle\rangle\xrightarrow{DS}\langle\langle\ldots,p,\mathbf{w},c,w\rangle,\langle\ldots\ldots,p,c,w,c\rangle\rangle$

Example-Clause	Verb Gloss	Subject	Object	SR Marker
(11)-1	old	**woman**		SS
(11)-2	go_about	woman		PH:TERM
(12)-1	sores-NOTHING:BUT	woman	-	SS
(12)-2	be:dirty	woman	-	SS
(13)-1	**DISTR**-3DAT-be:cross	**DISTR**:people	woman	DS
(13)-2	go:about	woman	-	SS
(14)-1	**person-small(pl)**	**PL**:children	-	SS
(15)-1	orphan	children	-	SS
(15)-2	dwell(pl)	children	-	DS
(16)-1	be:there**(sg)**	woman	-	DS
(16)-2	have:pity	**person-small(pl)**	woman	DS
(16)-3	sit(sg)	woman		PH:TERM

Table 14: Breakdown of (11-16)

6 Conclusion

- I have presented basic data of switch reference in Koasati.
- I have discussed two PLA analyses for how to account for this data:
  - One account uses Dekker's (1994) one-list system.
  - The other account modifies his system to two lists to separate subjects and objects.
- Both accounts can make the correct predictions for non-canonical cases of SR.
- For this analysis, it seems to be necessary for verbal morphology to be able to add individuals to the information state.
- If verbal morphology can also be used to identify the correct previously introduced individual in an information state, then the two list system works best for Koasati switch reference.
- If we do not want to allow the verbal morphology to do this, we would need to use animacy features—not overtly expressed in Koasati —to rule out unwanted predictions of the one list system.
- While these details still need to be worked out, it seems that a reference tracking analysis in the nominal domain can do a lot of work in accounting for Koasati switch reference, which is nice given the connection between verbal switch reference marking and nominal subject object marking.

References

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A PLA analyses of extra data

- The two list system can still account for the initial data:

Table 15: Analysis of (1)

	Gloss	PLA	Pronoun Interp.	Output State
a.	Joe-SBJ	$\exists^{\top} z(z = j)$		$s_1 = \{\langle\langle j\rangle, \langle\rangle\rangle\}$
b.	room-OBJ	$\exists^{\perp} z(z = r)$		$s_2 = \{\langle\langle j\rangle, \langle r\rangle\rangle\}$
c.	enter	$I p_0^{\top} p_0^{\perp}$	$[p_0^{\top}]_{s_2} = j, [p_0^{\perp}]_{s_2} = r$	$s_3 = \{\langle\langle j\rangle, \langle r\rangle\rangle\}$
d.	-**SS**	$\exists^{\perp} x(x = p_0^{\perp} \wedge \exists^{\perp} y(y = p_0^{\top}))$	$[p_0^{\perp}]_{s_3} = r, [p_0^{\top}]_{s_3} = j$	$s_4 = \{\langle\langle j\rangle, \langle r, j, r\rangle\rangle\}$

Table 16: Analysis of (1a)

	Gloss	PLA	Pronoun Interp.	Output State
e.	Ed-OBJ	$\exists^{\perp} z(z = e)$		$s_5 = \{\langle\langle j\rangle, \langle r, j, r, e\rangle\rangle\}$
f.	see	$H p_0^{\top} p_0^{\perp}$	$[p_0^{\top}]_{s_5} = j, [p_0^{\perp}]_{s_5} = e$	$s_6 = \{\langle\langle j\rangle, \langle r, j, r, e\rangle\rangle\}$
g.	-**SS**	$\exists^{\perp} x(x = p_0^{\perp} \wedge \exists^{\perp} y(y = p_0^{\top}))$	$[p_0^{\top}]_{s_6} = j, [p_0^{\perp}]_{s_6} = e$	$s_7 = \{\langle\langle j\rangle, \langle r, j, r, e, j, e\rangle\rangle\}$
h.	sat_down	$C p_0^{\top}$	$[p_0^{\top}]_{s_7} = j$	$s_8 = \{\langle\langle j\rangle, \langle r, j, r, e, j, e\rangle\rangle\}$

Table 17: Analysis of (1b)

	Gloss	PLA	Pronoun Interp.	Output State
e.	Ed-OBJ	$\exists^{\perp} z(z = e)$		$s_5 = \{\langle\langle j\rangle, \langle r, j, r, e\rangle\rangle\}$
f.	see	$H p_0^{\top} p_0^{\perp}$	$[p_0^{\top}]_{s_5} = j, [p_0^{\perp}]_{s_5} = e$	$s_6 = \{\langle\langle j\rangle, \langle r, j, r, e\rangle\rangle\}$
g.	-**DS**	$\exists y(y = p_0^{\perp}) \wedge \exists^{\perp} x(x = p_0^{\top})$	$[p_0^{\top}]_{s_6} = j, [p_0^{\perp}]_{s_6} = e$	$s_7 = \{\langle\langle j, e\rangle, \langle r, j, r, e, j\rangle\rangle\}$
h.	sat_down	$C p_0^{\top}$	$[p_0^{\top}]_{s_7} = e$	$s_8 = \{\langle\langle j, e\rangle, \langle r, j, r, e, j\rangle\rangle\}$

B Two list fragment

- Additions to PLA are indicated with a $*$

DEFINITION 1.1 (Basic Expressions of PLA)

1. $C = \{\mathsf{a}, \mathsf{b}, \ldots \mathsf{n}\}$ (entity) constants
2. $V = \{\mathsf{x}, \mathsf{y}, \mathsf{z}, \mathsf{x}', \mathsf{y}', \mathsf{z}', \ldots\}$ (entity) variables

$*$3. $A = \{\mathsf{p}_\mathsf{i}^\top \mid \mathsf{i} \in \mathscr{N}\}$ (entity) pronouns of list $\top$

$*$4. $B = \{\mathsf{p}_\mathsf{i}^\perp \mid \mathsf{i} \in \mathscr{N}\}$ (entity) pronouns of list $\perp$

$*$5. $T = C \cup V \cup A \cup B$ (entity) terms

6. $R^n = \{\mathsf{A}^1, \ldots, \mathsf{A}^n, \mathsf{B}^1, \ldots, \mathsf{Z}^n\}$ n-ary predicates

DEFINITION 1.2 (Syntax of PLA) The set L of PLA formulas is the smallest set such that:

1. if $\mathsf{t}_1, \ldots, \mathsf{t}_\mathsf{n} \in T$ and $\mathsf{R} \in R^n$, then $\mathsf{R}\mathsf{t}_1 \ldots \mathsf{t}_\mathsf{n} \in L$
2. if $\mathsf{t}_1, \mathsf{t}_2 \in T$, then $\mathsf{t}_1 = \mathsf{t}_2 \in L$
3. if $\phi \in L$, then $\neg\phi \in L$

$*$4. if $\phi \in L$ and $x \in V$, then $\exists^\top \mathsf{x}\phi \in L$

$*$5. if $\phi \in L$ and $x \in V$, then $\exists^\perp \mathsf{x}\phi \in L$

6. if $\phi, \psi \in L$, then $(\phi \wedge \psi) \in L$

DEFINITION 2.1 (Information States)

$*$1. $S^n = \mathscr{P}(D^a \times D^b)$ the set of information states about n subjects, where a is the number of subject in the $\top$ list and b is the number of subjects in the $\perp$ list and $a + b = n$

2. $S = \cup_{n \in \mathscr{N}} S^n$ the set of information states

$*$3. For a state $s \in S^n$, where $a + b = n$ and $0 < j \leq a$, and for any case $e = \langle\langle d_1^\top, \ldots, d_a^\top\rangle, \langle d_1^\perp, \ldots, d_b^\perp\rangle\rangle \in s$, $d_j^\top$ is a possible value for the j-th subject of s, also indicated as $e_j^\top$.

$*$4. For a state $s \in S^n$, where $a + b = n$ and $0 < k \leq b$, and for any case $e = \langle\langle d_1^\top, \ldots, d_a^\top\rangle, \langle d_1^\perp, \ldots, d_b^\perp\rangle\rangle \in s$, $d_k^\perp$ is a possible value for the k-th subject of s, also indicated as $e_k^\perp$.

$*$5. $s_0 = \{\langle\langle\rangle, \langle\rangle\rangle\}$ (the initial state of information: $D^0 \times D^0$)

$*$6. $\top^n = D^a \times D^b$ (the minimal state of information about n subjects, where $a + b = n$)

$*$7. $\{e\}$ for any $e = \langle\langle d_1^\top, \ldots, d_a^\top\rangle, \langle d_1^\perp, \ldots, d_b^\perp\rangle\rangle \in D^a \times D^b$ (the maximal state of information about n subjects, where $a + b = n$)

8. $\perp^n = \{\}$ (the absurd information state about n subjects, where $n > 0$)

DEFINITION 2.2 (Notational Convention)

1. If $e \in D^n$ and $e' \in D^m$, then $e \cdot e' = \langle e_1, \ldots e_n, e_1', \ldots, e_m'\rangle \in D^{n+m}$
2. e' is an extension of e, $e \leq e'$, iff $\exists e'' : e' = e \cdot e''$

$*$3. e' is an extension of e, $e \leq e'$, iff $\forall e^{\top'} \in e'\ \exists e^\top \in e : e^\top \leq e^{\top'}$ & $\forall e^{\perp'} \in e' \exists e^\perp \in e : e^\perp \leq e^{\perp'}$

$*$4. For $s \in S^n (i \in D^n)$, $N_s = n (= a + b)$, $N_\top = a$, $N_\perp = b$, the number of subjects of $s(i)$

DEFINITION 2.3 (Information Update)

1. State s' is an update of state $s, s \leq s'$, iff $N_s \leq N_{s'}$, and $\forall e' \in s' \exists e \in s : e \leq e'$

DEFINITION 3.1 (Interpretation of Terms)

1. $[\mathsf{c}]_{\mathscr{M},s,e,g} = F(\mathsf{c})$ for all constants c
2. $[\mathsf{x}]_{\mathscr{M},s,e,g} = g(\mathsf{x})$ for all variables x

$*$3. $[p_i^\top]_{\mathscr{M},s,e,g} = e^\top_{N_\top - i}$ for all pronouns $p_i^\top$ and e and $e^\top$ and s such that $e^\top \in e$ and $e \in s$ and $N_\top > i$

$*$4. $[p_i^\perp]_{\mathscr{M},s,e,g} = e^\perp_{N_\perp - i}$ for all pronouns $p_i^\perp$ and e and $e^\perp$ and s such that $e^\perp \in e$ and $e \in s$ and $N_\perp > i$

DEFINITION 3.2 (Semantics of PLA)

1. $s[\![\mathsf{R}\mathsf{t}_1 \ldots \mathsf{t}_\mathsf{n}]\!]_{\mathscr{M},g} = \{e \in s \mid \langle[\mathsf{t}_1]_{\mathscr{M},s,e,g}, \ldots, [\mathsf{t}_\mathsf{n}]_{\mathscr{M},s,e,g}\rangle \in F(\mathsf{R})\}$ (if $N_s > I_{\mathsf{t}_1,\ldots,\mathsf{t}_\mathsf{n}}$)
2. $s[\![\mathsf{t}_1 = \mathsf{t}_2]\!]_{\mathscr{M},g} = \{e \in s \mid [\mathsf{t}_1]_{\mathscr{M},s,e,g} = [\mathsf{t}_2]_{\mathscr{M},s,e,g}\}$
3. $s[\![\neg\phi]\!]_{\mathscr{M},g} = \{e \in s \mid \neg\exists e' : e \leq e'$ & $e' \in s[\![\phi]\!]_{\mathscr{M},g}\}$

$*$4. $s[\![\exists^\top x\phi]\!]_{\mathscr{M},g} = \{\langle e^\top \cdot d, e^\perp\rangle \mid d \in D$ & $\langle e^\top, e^\perp\rangle \in s[\![\phi]\!]_{\mathscr{M},g[x/d]}\}$

$*$5. $s[\![\exists^\perp x\phi]\!]_{\mathscr{M},g} = \{\langle e^\top, e^\perp \cdot d\rangle \mid d \in D$ & $\langle e^\top, e^\perp\rangle \in s[\![\phi]\!]_{\mathscr{M},g[x/d]}\}$

6. $s[\![\phi \wedge \psi]\!]_{\mathscr{M},g} = s[\![\phi]\!]_{\mathscr{M},g}[\![\psi]\!]_{\mathscr{M},g}$

DEFINITION 4.1 (Support and Entailment)

1. s supports ϕ wrt $\mathscr{M}$ and g, $s \vDash_{\mathscr{M},g} \phi$ iff $\forall e \in s : \exists e' : e \leq e'$ & $e' \in s[\![\phi]\!]_{\mathscr{M},g}$
2. $\phi_1, \ldots, \phi_n$ entail $\psi, \phi_1, \ldots, \phi_n \vDash \psi$ iff $\forall \mathscr{M}, g\ \forall s \in S : s[\![\phi_1]\!]_{\mathscr{M},g} \ldots [\![\phi_n]\!]_{\mathscr{M},g} \vDash_{\mathscr{M},g} \psi$ (if defined)