Switch Reference in Yudja and Update Logic with Centering*

Suzi Lima
University of Toronto/UFRJ

G. Thomas
University of Toronto

Abstract: We describe sentence internal and inter-sentential Switch-Reference markers in Yudja, a Tupi language spoken in the Xingu Indigenous territory in Brazil, and we propose a unified analysis of these two types of Switch-Reference in a logic of Update with Centering (Bittner 2014).

Keywords: Yudja, Tupi, Switch-Reference, Update with Centering

1 Introduction

In this paper we explore Switch Reference (SR) in Yudja using a logic of Update with Centering (Bittner 2001, 2014). Yudja is a Tupi language from the Juruna family that is spoken by approximately 900 people in the Xingu Indigenous Territory.[1] Unless indicated, Yudja examples are from fieldwork by the authors with two adult Yudja speakers in the Tuba Tuba village, in July 2016. We will also make use of a Yudja narrative from Fargetti's (2001) dissertation.

We focus on two positions in which SR markers are attested in Yudja: at the end of adverbial subordinated clauses, and sentence initially. Inside adverbial clauses, SR markers indicate whether the subject of the adverbial clause (the pivot) is identical to that of the main clause (the anti-pivot). Sentence initial SR markers indicate whether the subject of the marked sentence (the pivot) is identical to that of the preceding sentence (the anti-pivot).

We propose that the pivot and anti-pivot in sentence internal SR are accessed through situations that the subordinated and superordinate clause comment upon. In this respect, we depart only partially from Stirling's (1993) account, according to which they are accessed through eventualities. In sentence initial SR marking, we argue that they are accessed through the topic situation of each sentence (McKenzie 2012). The main innovation of our analysis is the claim that SR markers select their situation arguments through a process of anaphora to top-ranked entities in a dynamic logic with centering (Bittner 2014). This allows us to capture the uniformity of sentence internal and cross-sentential SR in a compositional fashion.

*We are granteful to Tawaiku Juruna and Chadawa Juruna for sharing their knowledge of Yudja with us. Many thanks to Michela Ippolito and Klaus von Heusinger, as well as the audiences of WSCLA 22 and the TOMILLA workshop for comments on this work. All errors are ours.
Contact info: suzi.lima@utoronto.ca, guillaume.thomas@utoronto.ca
[1] https://pib.socioambiental.org/pt/povo/yudja

2 Background on Yudja

Yudja is a SOV language with flexible word order. Objects and unaccusative subjects are cross-referenced on the verb. Temporality is expressed through mood: non-future tense is expressed by the realis suffix *-u* or is unmarked, while future tense is expressed by the irrealis morpheme *-a* (Fargetti 2001; Lima 2008):

(1) a. Una Pedro i-djidak-u.
1.SG Pedro 3-hit-REAL
'I hit/was hitting/am hitting Pedro.'

b. Una Pedro i-djidak-a.
1.SG Pedro 3-hit-IRR
'I will hit/will be hitting Pedro.'

Aspect marking is optional. Perfective aspect is unmarked, while imperfective aspect is optionally marked by one of three particles.

3 Sentence internal Switch Reference

SR markers are used to track subject identity in temporal adverbial clauses:

(2) *Context: Anana and the speaker are staying at a house in the village:*
a. Anana txa'-a tade, una aka pïtxik-a.
Anana go-IRR DS 1.SG house clean-IRR
'When Anana leaves, I will clean the house.'

b. Txa'-a dade, udi aka pïtxik-a.
go-IRR SS 1.PL house clean-IRR
'When we leave, we will clean the house.'

The SR marker *kade* is used to indicate identity of subjects in the first person singular (*pace* Fargetti 2001):

(3) Una txa-'a kade, una aka pïtxika.
1.SG go-IRR SS.1.SG 1.SG house clean
'When I leave, I will clean the house.'

SR markers are also used in conditionals, both indicative and subjunctive:

(4) a. *Context: I don't know whether Chadawa is at home but:*
D-aka he au dade, au iy-u anu.
3.POSS-house in be SS be sleep-REAL ASP
'If he is at home, he is sleeping.'

b. *Context: I don't know whether Chadawa is at home but:*
Suzi kuperi au tade Chadawa d-aka he au anu.
Suzi work be DS Chadawa 3.POSS-house in be ASP
'If Suzi is working, Chadawa must be at home.'

c. *Context: I know that Tuba Tuba is a Yudja village, not a Kayabi village:*
Tuba Tuba Kaxabi iyamã-ha tade si kuradada ix-a hide.
Tuba Tuba Kayabi village-PRED DS 1.PL toad eat-IRR ASP
'If Tuba Tuba were a Kayabi village, we would eat toad.'

4 Cross-sentential Switch Reference

SR reference markers are also attested sentence initially, in which case they may take the form *sutade* and *sudade*, although *tade* and *dade* are also attested. In this use, SR markers indicate whether the subject of the marked sentence is identical to that of the preceding sentence. Consider the following example from a narrative presented in Fargetti (2001). In this story, an anaconda forces a group of hunters into the river and attacks them. Note that we have reglossed the text, since Fargetti did not analyze *(su)tade* and *(su)dade* as switch reference markers.[2] We have also translated the original Portuguese translation into English:

(5) Ah... epïa daraku, daraku hi epïa be.
Ah earth throw throw REP earth DAT
'Ah…[the anaconda] was throwing earth, throwing earth.'
I=dju=se pïrïpïrï txa, i=dju=se pïrïpïrï txa, iya be
3=with=all turn.around go 3=with=all turn.around go river DAT
i=dju=se txa.
3=with=all go
'It was turning around with them, turning around with them, and took them to the river.'
Iya he dï ixiixi tese txa ta. Ixiixi tese txa.
river LOC DUB eat.RED 3.PL go also eat.RED 3.PL go
'In the river I think that it ate them too. It ate them.'
Sutade hi meme akï hi txa pinu. Meme akï hi txa pinu adïu
DS REP one only REP go flee one only REP go flee far
mahi karayã-hã.
a.bit pass-NMLZ
'Only one person fled. The one who fled alone kept walking quite a lot.
Sudade hi txa dade d-awaï be abï he.
SS REP go SS 3.POSS-people DAT tell 3.SG
'When he arrived (in the village), he told his people what happened. '
(Fargetti 2001: 270, 271)

[2] In the original glosses, both are glossed as *então* ('then') in Portuguese.

An examination of Yudja texts in Fargetti suggests that *(su)tade* and *(su)dade* are not used as non-canonical switch reference markers, i.e. to indicate changes other than that of the subject of adjacent sentences (such as changes in or identity of place or event type, see McKenzie (2012)). This being said, more fieldwork is required to confirm this observation, which is only based on positive evidence. The analysis that we propose in this paper accounts for canonical uses of SR markers, but it could easily be extended to account for non-canonical SR, should the need arise.

5 Analysis

5.1 Desiderata and previous analyses of switch reference

Our goal is to provide a unified and compositional analysis of the two aforementioned uses of SR markers. The analysis that we propose borrows elements from the work of Stirling (1993) and McKenzie (2012), but it also departs from these analyses in important respects.

Stirling (1993) proposes an analysis of Switch Reference in DRT, in which SR markers manipulate 'structured eventuality indexes' (SEI). An SEI is a tuple composed of an individual (some participant in the event), a location and a modal parameter indicating whether the event is actual. Each clause related by SR provide its SEI. Same Subject marking (SS) indicates that the two SEIs agree at least on their individual parameter, while Different Subject marking (DS) indicate that they disagree on some parameter. Which parameters are relevant varies across languages. A limitation of Sirling's analysis is that it is not immediately clear how it could be extended to deal with inter-sentential SR marking compositionally. Working within DRT, Stirling assumes that SR markers relate DRSs that are constructed from two clauses that stand in a subordination or coordination relation. She also assumes that the universe of each DRS contains the event discourse referent (dref) introduced by the main verb of the corresponding clause, along with its SEI. With sentence initial SR marking however, the SR marker would have to relate the DRS constructed from a new sentence to the DRS constructed from the discourse so far. If this discourse contains more than one sentence, the universe of the resulting DRS will contain more than one event dref, and the problem for Stirling would be to specify which is the one that the SR marker should relate to the event dref introduced in the new sentence. This problem could certainly be addressed by embedding Stirling's account in a version of DRT that incorporates a richer representation of discourse structure, such as SDRT (Asher and Lascarides 2003). In this paper, we explore an alternative solution, which uses the concept of centering to constrain which entities are related by SR markers, both sentence internally and across sentences.

McKenzie (2012) defends an analysis of canonical and non-canonical SR using Kratzer's (1989) notion of situation. McKenzie argues for an identification of canonical SR with subordinating SR marking, and non-canonical SR with coordinating SR marking. Furthermore, non-canonical SR is argued to relate the

topic situations of the two clauses, while canonical SR relates their subjects. Due to space limitation, we cannot discuss McKenzie's analysis of non-canonical SR marking, but we do see an issue with an extension of his analysis of canonical SR marking to Yudja. McKenzie argues that subordinating SR markers are introduced in the left periphery of the subordinated clause, and relate the pivot DP to a variable that is bound by the anti-pivot in the superordinate clause. It seems to us that this analysis predicts that SS marking with an R-expression (e.g. a proper name) in the subordinated clause should lead to a condition C violation, since the anti-pivot is predicted to c-command the pivot and may be co-referential to it. Yet, this prediction is not borne out in Yudja, as shown by the following example:

(6) Suzi Yudja aĩbida ha dade i-wïre iyakuha xa hide.
Suzi Yudja woman SS PRED 3-know porridge thing ASP
'If Suzi were Yudja, she would know how to make porridge.'

This problem does not arise in our analysis, which does not rely on semantic or syntactic binding.

5.2 Update with Centering

We analyze switch reference in a logic of Update with Centering (UC Bittner 2014). We refer the reader to Bittner (2011, 2014) for a detailed presentation of the underlying logic. In this paper, we will restrict ourselves to an informal discussion of UC, which we present in its DRT-style notation for convenience.

Rank-based anaphora UC is a dynamic logic in which discourse referents (drefs) are organized in two stacks: a stack of foregrounded drefs, which are in the center of attention, and a stack of backgrounded drefs, which are in the periphery of attention. Note that in UC, drefs are not variables but entities of different types (individuals, events, etc). A pair of foreground and background stacks is called a list. An information state is a set of lists:

(7) a. Example list: $\langle\langle \mathbf{d}_1, \rangle, \langle \mathbf{e}_1, \mathbf{d}_2 \rangle\rangle$

b. Example information state:
$\{\langle\langle \mathbf{d}_1, \rangle, \langle \mathbf{e}_1, \mathbf{d}_2 \rangle\rangle, \langle\langle \mathbf{d}_1, \rangle, \langle \mathbf{e}_2, \mathbf{d}_3 \rangle\rangle, \langle\langle \mathbf{d}_1, \rangle, \langle \mathbf{e}_3, \mathbf{d}_4 \rangle\rangle\}$

Anaphors can pick up drefs at different positions in this stack. In addition, they may pick drefs by type. For instance, a pronoun may be anaphoric to the most salient (i.e. topmost in the stack) entity of type δ (individuals) in the foreground stack, or maybe the second most salient entity of type ε (events) in the background stack. In this paper, we will use seven types of drefs:

(8) Types of discourse referents:

type:	δ	ε	σ	τ
dref entity:	individuals	events	states	times
UC variable:	*x*	*e*	*s*	*t*

type:	ζ	ω	Ω
dref entity:	situations	worlds	propositions
UC variable:	*z*	*w*	*p*

Drefs are retrieved with the operators $\top$, $\top'$, $\bot$, $\bot'$, defined as follows:

(9) Anaphoric operators:

- $\top a$ Most salient (i.e. highest ranked) dref of type *a* in the foreground
- $\bot a$ Most salient dref of type *a* in the background
- $\top' a$ Just demoted (i.e. next to highest) dref of type *a* in the foreground
- $\bot' a$ Just demoted dref of type *a* in the background

UC being a dynamic logic, sentences are interpreted as instructions to update an information state. Updates are represented using DRT-style boxes. In particular, we will use the following conventions:

(10) Types of updates:

- [x | C] update the input-info state by adding some individual x to the top of the background stacks and remove lists that do not satisfy condition C.
- $^{\top}$[x | C] update the input-info state by adding some individual x to the top of the foreground stacks and remove lists that do not satisfy condition C.
- [C] remove lists that do not satisfy condition C

Updates are added to the discourse by sequencing operators. Aside from the basic sequencing operator, two special operators are used to require comments on a recently introduced topic or backgrounded entity:

- K ; K$'$
  update the input info-state with K, and then update the resulting info-state with K$'$
- K $^{\top}$; K$'$
  defined only if K updates the foreground with some entity of type *a*, and for all type *a* such that K updates the foreground with some entity of this type, K$'$ does not update the foreground with any entity of type *a*. If defined, reduces to K ; K$'$

- K $^{\perp}$; K′
  defined only if K updates the background with some entity of type a, and for all type a such that K updates the background with some entity of this type, K′ does not update the background with any entity of type a. If defined, reduces to K ; K′

Propositions and the common ground The background information that discourse participants take for granted is the Common Ground (CG, Stalnaker 1978). In the initial state of discourse, each world that is compatible with the CG is the highest ranked dref of type ω in the foreground of some list. The initial context set (i.e. the intersection of the CG) is the highest ranked dref of type Ω (a proposition) in the foreground of all lists in this default information state. It is represented as p_0. If the initial context set is $p_0 = \{w_1, w_2\}$, the default information state as we have just defined it is $\{\langle\langle w_1, p_0\rangle, \langle\rangle\rangle, \langle\langle w_2, p_0\rangle, \langle\rangle\rangle\}$.

Note that the context set can be referred to with the anaphor $\top\omega\,||$. For any type a, $\top a\,||$ is the set of all drefs of type a that are highest ranked on the foreground of any list in the information state (i.e. the set of all $\top a$ in any list of the information state). In the default information state defined above, $\top\omega\,||$ refers to $\{w_1, w_2\}$.

Eventualities and centering We will assume that an eventuality or situation v may be centered on an individual $\uparrow(v)$, which we call the individual center of the eventuality/situation (Bittner 2014). Likewise, they may be associated with a backgrounded individual $\downarrow(v)$. An eventuality or situation u is a central part of eventuality or situation v iff u is a part of v and both entities are centered on the same individual. This is written as $u \sqsubseteq_{\uparrow} v$.

Speaking up puts the speech event at the center of attention. This is captured by assuming that the most salient dref of type ε is, by default, the speech event $\top\varepsilon$, whose central individual is the speaker $\uparrow(\top\varepsilon)$, and whose background individual is the addressee $\downarrow(\top\varepsilon)$.

We will assume that Yudja verbs always center their event argument on their subject. For example, in the next example, the subordinated event of leaving is centered on Anana and the matrix event of cleaning is centered on the speaker:

(11) Anana txa-'a tade, una aka pïtixk-a
Anana go-IRR DS 1SG house clean-IRR
'When Anana leaves, I will clean the house.'

A simple example Before we can discuss Switch Reference, let us illustrate how simple Yudja sentences may be interpreted in this framework. Consider the following sentence and its interpretation:

(12) a. Pedro Maria i-zak-u
Pedro Maria 3-see-REAL
'Pedro saw Maria.'

i. $^{\top}[z \mid z \sqsubseteq \top\omega]^{\top}$;

ii. $(^{\top}[x \mid x = \textbf{pedro}]^{\top}$;

iii. $(^{\perp}[x \mid x = \textbf{maria}]^{\perp}$;

iv. $(^{\top}[t \mid t \leq \theta_{\top\omega}(\top\varepsilon)]; [\top\omega \in \top\omega \mid\mid]^{\top}$;

v. $([e \mid \textbf{see}_{\top\omega}\langle e, \top\delta, \perp\delta\rangle, \uparrow(e) = \top\delta]; [\theta_{\top\omega}(\perp\varepsilon) \subseteq \top\tau]; [\perp\varepsilon \sqsubseteq_{\uparrow} \top\zeta];)))$;

vi. $^{\top}[p \mid p = \top\omega \mid\mid]$;

(12i) adds a new situation on top of the foreground stacks. Then in (ii), Pedro is introduced on top of these stacks, along with a request to comment on this new topic. Maria is added on top of the background stacks in (iii), along with a request to comment on this new backgrounded individual. In (iv), a new topic time is introduced, and is required to be no later than the run time $\theta_{\top\omega}(\top\varepsilon)$ of the speech event $\top\varepsilon$. In addition, the topic world $\top\omega$ is required to be part of the context set $\top\omega \mid\mid$. In (v), a new event of Pedro ($\top\delta$) seeing Maria ($\perp\delta$) is introduced in the background, which satisfies the request for comments on these individuals introduced in (ii) and (iii). This event of seeing is centered on Pedro ($\uparrow(e) = \top\delta$). The run time of this event is required to be included in the topic time ($\theta_{\top\omega}(\perp\varepsilon) \subseteq \top\tau$), and to be a central part of the topic situation ($\perp\varepsilon \sqsubseteq_{\uparrow} \top\zeta$). This entails that both the event of seeing and the topic situation that the sentence comments on are centered on Pedro. Finally, (vii) updates the context set by introducing a new topic proposition that consists of the topic worlds in every list that has survived the preceding updates.

We will now show how to derive this interpretation compositionally in a simple categorial grammar. We start by giving lexical entries for the verb and verbal morphology:

(13)

i-zak	$\vdash$ v:	$\lambda w.[e \mid \textbf{see}_w < e, \top\delta, \perp\delta >, \uparrow(e) = \top\delta]$
$(.)_{\text{PFV}}$	$\vdash$ v\v:	$\lambda V.\lambda w.V(w)^{\perp}; [\theta_w(\perp\varepsilon) \subseteq \top\tau]$
$(.)_{\top\zeta}$	$\vdash$ v\v:	$\lambda V.\lambda w.V(w)^{\perp}; [\perp\varepsilon \sqsubseteq_{\uparrow} \top\zeta]$
-u	$\vdash$ v\v:	$\lambda V.\lambda w.[\top\tau \leq \theta_w(\top\varepsilon)]; [w \in \top\omega \mid\mid]; V(w)$
$(.)^{\top\tau}$	$\vdash$ v\v:	$\lambda V.\lambda w.^{\top}[t]^{\top}; V(w)$

The verb stem is interpreted as a function from a world to an update that introduces an event of seeing in the background, with $\top\delta$ as an agent and $\perp\delta$ as a patient. Perfective aspect is contributed by a covert operator $(.)_{\text{PFV}}$, which adds a further update after the one contributed by the verb. The operator $(.)_{\top\zeta}$ then conveys that the event introduced by the verb is centrally included in the topic situation. Realis mood introduces a update that precedes the one contributed by $((\text{i-zak})_{\text{PFV}})_{\top\zeta}$. It conveys that the topic time does not follow the speech time, and that the topic world belongs to the context set. Finally, the covert operator $(.)^{\top\tau}$ introduces the topic time as a first update:

(14) $(((\text{i-zak})_{\text{PFV}})_{\top\zeta}\text{-u})^{\top\tau} \vdash \text{v}$:
$\lambda w.\ ^{\top}[t]^{\top};\ ([\top\tau \leq \theta_w(\top\varepsilon)];[\top\omega \in \top\omega\ ||];$
$([e \mid \mathbf{see}_w < e, \top\delta, \bot\delta >, \uparrow(e) = \top\delta]^{\bot};$
$([\theta_w(\bot\varepsilon) \subseteq \top\tau];[\bot\varepsilon \sqsubseteq \uparrow(\top\zeta)])))$

We then discuss the interpretation of noun phrases. Proper names like 'Pedro' and 'Maria' are interpreted as functions from individuals and worlds to updates that introduce a dref of type δ. Whether noun phrases update the foreground or the background stacks is specified by functions $(.)^{\top}$ and $(.)^{\bot}$. Subject noun phrases are updates to the foreground stacks, while object noun phrases are updates to the background stacks:

(15)

Pedro	$\vdash$ np:	$\lambda x.\lambda w.[x = \mathbf{pedro}]$
Maria	$\vdash$ np:	$\lambda x.\lambda w.[x = \mathbf{maria}]$
$(.)^{\top}$	$\vdash$ (v/v)\np:	$\lambda P.\lambda V.\lambda w.(^{\top}[u]^{\top};\ P(\top\delta)(w))^{\top};\ V(w)$
$(.)^{\bot}$	$\vdash$ (v/v)\np:	$\lambda P.\lambda V.\lambda w.([u]^{\bot};\ P(\bot\delta)(w))^{\bot};\ V(w)$

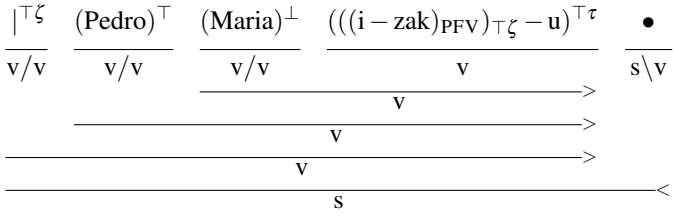
Finally, the covert sentence initial operator $|^{\top\zeta}$ introduces a new topic situation (cf. Bittner 2017), while the sentence final operator $\bullet$ updates the context set:

(16)

$\|^{\top\zeta}$	$\vdash$ v/v:	$\lambda V.\lambda w.^{\top}[z \mid z \sqsubseteq w]^{\top};\ V(w)$
$\bullet$	$\vdash$ s\v:	$\lambda V.V(\top\omega);\ ^{\top}[p \mid p = \top\omega\ ||]$

The syntactic derivation of example (12) is given in (17). The parallel semantic derivation is left to the reader:

(17)



5.3 Sentence initial switch reference

The analysis of sentence initial SR marker is now straightforward: these expression modify the covert operator $|^{\top\zeta}$, and indicate whether the new topic situation is centered on the same individual as the just demoted topic situation:

(18)

sudade	$\vdash$ (v/v)\(v/v):	$\lambda Q.\lambda V.\lambda w.Q(\lambda w.[\uparrow(\top\zeta) = \uparrow(\top'\zeta)]^{\top};\ V(w))(w)$
sutade	$\vdash$ (v/v)\(v/v):	$\lambda Q.\lambda V.\lambda w.Q(\lambda w.[\uparrow(\top\zeta) \neq \uparrow(\top'\zeta)]^{\top};\ V(w))(w)$

To illustrate, (19) is interpreted as in (20), which is identical to (12) save for the addition of the SR update:

(19) Sudade, Pedro Maria i-zak-u
SS Pedro Maria 3-see-REAL
'Pedro saw Maria.'

(20) $^{\top}[z \mid z \sqsubseteq \top\omega][\uparrow(\top\zeta) = \uparrow(\top'\zeta)]$
$(^{\top}[x \mid x = \textbf{pedro}]\ ^{\top}; (^{\perp}[x \mid x = \textbf{maria}]\ ^{\perp};$
$(^{\top}[t \mid t \leq \theta_{\top\omega}(\top\varepsilon)]; [\top\omega \in \top\omega \mid\mid]$
$([e \mid \textbf{see}_{\top\omega}\langle e, \top\delta, \perp\delta\rangle, \uparrow(e) = \top\delta]; [\theta_{\top\omega}(\perp\varepsilon) \subseteq \top\tau]; [\perp\varepsilon \sqsubseteq_{\uparrow} \top\zeta];))));$
$^{\top}[p \mid p = \top\omega \mid\mid];$

The present analysis assumes that sentence initial SR markers always relate the subject of the marked sentence to that of the preceding sentence. It is still an open question whether Yudja sentence initial SR markers allow clause skipping. If they do, we will need to loosen our definition of sentence initial SR to allow anaphora to topic situations other than the top ranked ones, which might in turn lead us to incorporate discourse relations in our analysis of sentence initial SR, to constrain these anaphoric relations using resources other than centering.

5.4 Adverbial clauses

We propose that subordinated clauses introduce a backgrounded situation, which is centered on the same individual as the event introduced by their verb. Sentence internal SR indicates whether this backgrounded situation is centered on the same individual as the topic situation of the main clause.

5.4.1 Temporal adverbial clauses

Temporal adverbial clauses introduce a topic time upon which their superordinate clause must comment. In the following example, this is a time that follows the leaving event, and that is picked up as the interval inside which the cleaning event is located:

(21) Anana txa'-a tade, una aka pïtxik-a.
Anana go-IRR DS 1.SG house clean-IRR
'When Anana leaves, I will clean the house.'

We implement this intuition by adding an update after the adverbial clause has been processed, which retrieves the event $\perp\varepsilon$ introduced in the adverbial clause, introduces a new topic time in the consequent state $\triangleright\perp\varepsilon$ of the event, and requires that the next update comment on this time. Since the subordinator is also a DS marker, the same update requires that the background situation (of the subordinated clause) and the topic situation (of the matrix clause) are centered on different individuals. Consider the interpretation of (21) in (22):

(22) a. $|^{\top\zeta}$
$^{\top}[z \mid z \sqsubseteq \top\omega]$

b. $^{\top}$(Anana) (((txa')$_{\text{PFV}})_{\top\zeta}$-a)$^{\top\tau}$ tade,
$([z|z \in \top\omega]^{\perp}; (^{\top}[x \mid x = \textbf{anana}]^{\top}; (^{\top}[t \mid t > \theta_{\top\omega}(\top\varepsilon)]; [\top\omega \in \top\omega \mid\mid]$
$([e \mid \textbf{leave}_{\top\omega}\langle e, \top\delta\rangle, \uparrow(e) = \top\delta]; [\theta_{\top\omega}(\perp\varepsilon) \subseteq \top\tau]; [\perp\varepsilon \sqsubseteq_{\uparrow} \perp\zeta])))));$
$[\uparrow(\perp\zeta) \neq \uparrow(\top\zeta)];^{\top}[t|t \subseteq \theta_{\top\omega}(\triangleright\perp\varepsilon)]^{\top};$

c. $^{\top}$(una) $^{\perp}$(aka) (((pïtxik)$_{\text{PFV}})_{\top\zeta}$-a)$_{\top\tau}$.
$(^{\top}[x \mid x = \uparrow(\top\varepsilon)]^{\top}; (^{\perp}[x \mid \textbf{house}\langle x\rangle]^{\perp}; ([\top\tau > \theta_{\top\omega}(\top\varepsilon)]; [\top\omega \in \top\omega \mid\mid]$
$([e \mid \textbf{clean}_{\top\omega}\langle e, \top\delta, \perp\delta\rangle, \uparrow(e) = \top\delta]; [\theta_{\top\omega}(\perp\varepsilon) \subseteq \top\tau]; [\perp\varepsilon \sqsubseteq_{\uparrow} \top\zeta])))));$
$^{\top}[p \mid p = \top\omega \mid\mid];$

(22a) introduces the topic situation of the matrix sentence. (22b) starts with an update that introduces a new situation in the background, and introduces an event of Anana leaving in the future of the speech event, which is centrally included in the background situation. The last two updates of (22b) require that the topic situation and the background situation be centered on different individuals, locate a new topic time in the consequent state of the event of leaving $\perp\varepsilon$, and require that the next update comment on the new topic time.

Along with the lexical entry for sentence internal *tade* and *dade*, we define the covert operators $|^{\perp\zeta}$, which introduces a background situation, and $|^{\top\tau,\triangleright}$, which introduces a new topic time in the consequent state $\triangleright\perp\varepsilon$ of the most salient backgrounded event $\perp\varepsilon$:

(23)

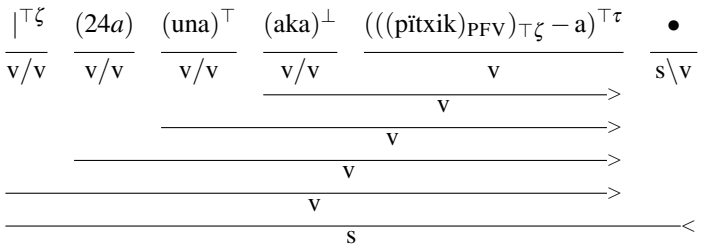
$\mid^{\perp\zeta}$	$\vdash$ v/v:	$\lambda V.\lambda w.[z \mid z \sqsubseteq w]^{\perp}; V(w)$
$\mid^{\top\tau,\triangleright}$	$\vdash$ v\v:	$\lambda V.\lambda U.\lambda w.V(w);^{\top}[t \mid t \subseteq \theta_w(\triangleright\perp\varepsilon)]^{\top}; U(w)$
tade	$\vdash$ ((v/v)\v)\(v\v):	$\lambda Q.\lambda V.Q(\lambda w.V(w); [\uparrow(\top\zeta) \neq \uparrow(\perp\zeta)])(w)$
dade	$\vdash$ ((v/v)\v)\(v\v):	$\lambda Q.\lambda V.Q(\lambda w.V(w); [\uparrow(\top\zeta) = \uparrow(\perp\zeta)])(w)$

The syntactic derivation of (21) proceeds as follows:

(24) a.

$\mid^{\perp\zeta}$	$^{\top}$(Anana)	$(((\text{txa'})_{\text{PFV}})_{\top\zeta} - a)^{\top\tau}$	$\mid^{\top\tau,\triangleright}$	tade
v/v	v/v	v	v\v	((v/v)\v)\(v\v)
	v (>)			
v (>)				
			(v/v)\v (>)	
v/v (>)				

b.



The SR marker *kade*, which is used to mark identity of first person singular subjects, can be analyzed as *dade* with an additional presupposition that the background situation is centered on the subject.

Note that this analysis easily accounts for stacked temporal adverbial clauses. In the following example, each SR marker requires that the background situation of its subordinated clause be centered on the same individual as the matrix topic situation:

(25) Ebe abahu tade mãdïka abï ne tade, udi l-ãlũ
2.SG get.sick DS moon this.many similar DS 1.PL 2.SG-remove
e-be.
2.SG-DAT
'When you get sick, when this many [4 fingers] moons [have passed], we will remove you.' (Fargetti 2001)

The syntactic and semantic derivation of this example is a trivial extension of the simpler case with only one subordinated clause.

5.4.2 Conditional clauses

Bittner (2001) argues that the antecedent of conditionals describe a set of worlds to which the modal base of the superordinate modal operator is anaphoric. This analysis of conditionals takes its roots in Stalnaker's (1968) analysis of indicative conditionals, which was further developed notably by Schlenker (2004). In this paper, we will restrict our attention to 'indicative' readings of Yudja conditionals. To illustrate, let us repeat example (4b):

(26) Suzi kuperi au tade Chadawa d-aka he au anu.
Suzi work be DS Chadawa 3.POSS-house in be ASP
'If Suzi is working, Chadawa must be at home.'

In the present analysis, the antecedent describes the set of worlds in which Suzi is working, and the consequent conveys that Chadawa is at home in the subset of these worlds that best satisfy our expectations regarding the normal course of events. Crucially, the modal base is anaphoric to the set of worlds described in the consequent. SR marking again conveys that the background situation of the

adverbial clause is centered on a different individual from the one that the matrix topic situation is centered on.

In order to illustrate the analysis of indicative conditionals in UC independently of SR, let us first discuss a simple example from English, abstracting away from situation semantics:

(27) If John sings, Mary will be happy.

a. If John sings,
$[w]^{\perp}$;
$((^{\top}[t \mid t \geq \theta_{\perp\omega}(\top\varepsilon)]; [\perp\omega \in \top\omega \mid\mid]^{\top}$;
$(^{\top}[x \mid x = \textbf{john}]^{\top}; ([e \mid \textbf{sing}_{\perp\omega}\langle e, \top\delta\rangle, \uparrow(e) = \top\delta, \top\tau \subseteq \theta_{\perp\omega}(e)])))$;
$^{\top}[p \mid p = \perp\omega \mid\mid]^{\top}$;

b. Mary will be happy.
$(^{\top}[x \mid x = \textbf{mary}]^{\top}; ([\top\tau \geq \theta_{\perp\omega}(\top\varepsilon)]; [\perp\omega \in \top\omega \mid\mid]$
$[s \mid \textbf{happy}\langle s, \top\delta\rangle, \uparrow(s) = \top\delta, \top\tau \subseteq \theta_{\perp\omega}(s)])))$;
$[\text{MAX}\langle\top\Omega, \exp_{\top\omega}(\top\varepsilon)\rangle \subseteq \perp\omega \mid\mid]$;
$^{\top}[p \mid p = \top\omega \mid\mid]$

The antecedent first introduces a world in the background. The second to fourth updates in (27a) introduce an event of John singing, which takes place in this world. In addition, since the conditional is indicative, this information is required to be compatible with the common ground by the third update, which requires that the background world be included in the context set: $[\perp\omega \in \top\omega \mid\mid]$. The last update then forms the set of all such background worlds in the just updated information state, and adds it to the top stack of each list as a new topic proposition. The consequent introduces a state of Mary being happy that is required to hold in the background world of each list. The updated set of background worlds $\perp\omega \mid\mid$ is then required to include $\text{MAX}\langle\top\Omega, \exp_{\top\omega}(\top\varepsilon)\rangle$, i.e. the subset of the topic proposition $\top\Omega$ that is optimal with respect to the expectations of the speaker in $\top\omega$. Finally, the context set is updated to the set $\top\omega \mid\mid$ of all topic worlds that survived the update with the condition $\text{MAX}\langle\top\Omega, \exp_{\top\omega}(\top\varepsilon)\rangle \subseteq \perp\omega \mid\mid$.

Yudja 'indicative' conditionals are interpreted in the same fashion, save for the additional update contributed by the SR marker. Consider the following example:

(28) Suzi kuperi au tade, Chadawa daka he au anu.

a. $|^{\top\zeta}$
$^{\top}[z \mid z \sqsubseteq \top\omega]$;

b. Suzi kuperi au tade
$([w]^{\perp}; ([z \mid z \sqsubseteq \perp\omega]^{\perp}$;
$(^{\top}[t \mid t \leq \theta_{\perp\omega}(\top\varepsilon)]; [\perp\omega \in \top\omega \mid\mid]^{\top}; (^{\top}[x \mid x = \textbf{suzi}]^{\top}$;
$([e \mid \textbf{work}_{\perp\omega}\langle e, \top\delta\rangle, \uparrow(e) = \top\delta, \top\tau \subseteq \theta_{\perp\omega}(e)]; [\perp\varepsilon \sqsubseteq_{\uparrow} \perp\zeta])))))$;
$[\uparrow(\top\zeta) \neq \uparrow(\perp\zeta)]; ^{\top}[p \mid p = \perp\omega \mid\mid]^{\top}$;

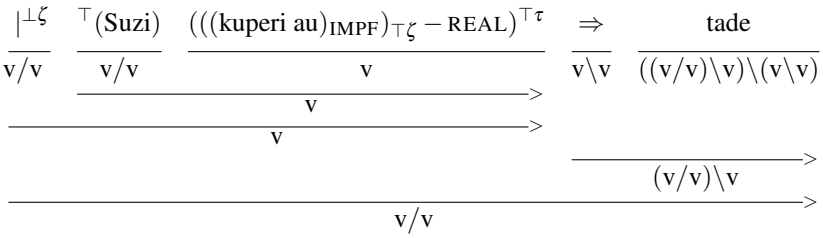
c. Chadawa daka he au anu.
$(^{\top}[x \mid x = \textbf{chadawa}]^{\top}; ([\top\tau \leq \theta_{\perp\omega}(\top\varepsilon)]; [\perp\omega \in \top\omega \mid\mid]$
$[s \mid \textbf{at.home}\langle s, \top\delta\rangle, \uparrow(s) = \top\delta, \top\tau \subseteq \theta_{\perp\omega}(s)]; [\perp\varepsilon \sqsubseteq_{\uparrow} \top\zeta])));$
$[\text{MAX}\langle \top\Omega, \exp_{\top\omega}(\top\varepsilon)\rangle \subseteq \perp\omega \mid\mid];$
$^{\top}[p \mid p = \top\omega \mid\mid]$

The only significant difference between this example and the English conditional in (27) is the addition of the update $[\uparrow(\top\zeta) \neq \uparrow(\perp\zeta)]$ in (28b). In order to derive this interpretation compositionally, we add two operators to our lexicon. The conditional operator $\Rightarrow$ introduces a topic proposition consisting of the most salient background worlds after the antecedent update $V(w)$, and proceeds to the consequent update $U(w)$. The operator $\Box_{\text{exp},\top\varepsilon}$ takes scope over the antecedent and consequent, and introduces the modal update properly speaking:

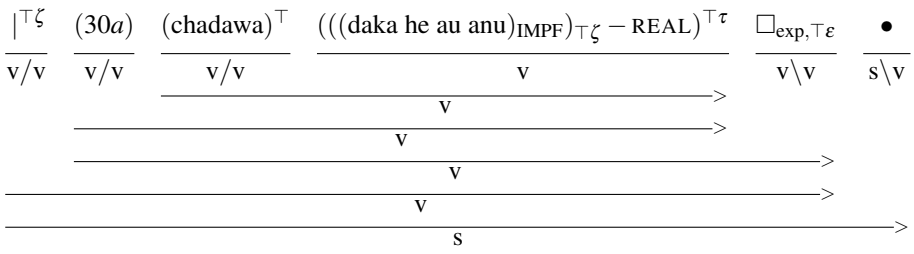
(29) $\Rightarrow$ $\quad\vdash$ v\v: $\lambda V.\lambda U.\lambda w.V(w);\ ^{\top}[p \mid p = \perp\omega \mid\mid]^{\perp}; U(w)$
$\Box_{\text{exp},\top\varepsilon}$ $\vdash$ v\v: $\lambda V.\lambda w'.[w]^{\perp}; V(\perp\omega); [\text{MAX}\langle \top\Omega, \exp_{w'}(\top\varepsilon)\rangle \subseteq \perp\omega \mid\mid]$

The syntactic derivation of (28) proceeds as follows. For the sake of conciseness, we represent *kuperi au* and *daka he au anu* as if they were simple verb forms. The semantic derivation is again left to the reader:

(30) a. Suzi kuperi au tade



b. Chadawa daka he au anu



6 Conclusion

We presented a unified analysis of sentence internal and inter-sentential SR in Yudja, using a logic of Update with Centering. We proposed that SR markers

express a relation between the individual center of the topic situation of a sentence, and that of another situation. While sentence internal SR markers relate the individual center of the superordinate topic situation to that of the subordinate backgrounded situation, inter-sentential SR markers relate it to the individual center of the just demoted topic situation. The analysis borrows elements of both Stirling's (1993) and McKenzie's (2012) analyses of switch-reference.

References

Asher, N. and Lascarides, A. (2003). *Logics of Conversation*. Cambridge: Cambridge University Press.

Bittner, M. (2001). Topical referents for individuals and possibilities. In Hasting, R., Jackson, B., and Zvolenszky, Z., editors, *Proceedings from SALT XI*, pages 36–55. CLC, Cornell University, Ithaca.

Bittner, M. (2011). Time and modality without tenses or modals. In Rathert, M. and Musan, R., editors, *Tense across Languages*, pages 147–188. Tübingen: Niemeyer.

Bittner, M. (2014). *Temporality: universals and variation*. Wiley-Blackwell.

Bittner, M. (2017). Topic states in mandarin discourse. In *Proceedings of the 25th North American Conference on Chinese Linguistics*, pages 1–20. Ohio University Press.

Fargetti, C. (2001). *Estudo Fonológico e morfossintático da língua Juruna*. PhD thesis, University of Campinas.

Kratzer, A. (1989). An investigation of the lumps of thoughts. *Linguistics and Philosophy*, pages 607–653.

Lima, S. (2008). A estrutura argumental dos verbos na língua Juruna (Yudja). Master's thesis, Universidade de São Paulo.

McKenzie, A. (2012). *The role of contextual restriction in reference tracking*. PhD thesis, University of Massachusetts - Amherst.

Schlenker, P. (2004). Conditionals as Definite Descriptions. *Research on Language and Computation*, 2:417–462.

Stalnaker, R. (1968). A theory of conditionals. In Rescher, N., editor, *Studies in Logical Theory*, American Philosophical Quaterly Monographs, pages 98–112. Oxford: Blackwell.

Stalnaker, R. (1978). Assertion. In Cole, P., editor, *Syntax and Semantics 9*, pages 315–332. New York: Academic Press.

Stirling, L. (1993). *Switch-Reference and Discourse Representation*. Cambridge University Press.