A unified dynamic account of auxiliary placement in Rangi

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Abstract

The Tanzanian Bantu language Rangi exhibits a comparatively and typologically unusual word order alternation in the future tense. Whilst declarative main clauses exhibit post-verbal auxiliary placement, the auxiliary appears pre-verbally in wh-questions, sentential negation, relative clauses, cleft constructions and subordinate clauses. This paper examines this alternation from the perspective of Dynamic Syntax (Cann et al., 2005; Kempson et al., 2001). Dynamic Syntax (DS) is a parsing-oriented framework which aims to capture the way in which meaning is established incrementally as a result of lexical input encountered in context. The paper presents a unified analysis of this construction found in Rangi, locating it within the wider workings of the language. It shows that this seemingly idiosyncratic constituent order is in fact predictable on the basis of a general constraint operative in the DS framework which prohibits the co-occurrence of more than one unfixed node, thereby also confirming the claim of Dynamic Syntax to constitute a grammar framework rather than merely a parsing device.

Keywords: Dynamic Syntax, syntax, Bantu languages, morphology, word order

1. Introduction

Bantu languages are known for their agglutinative morphology, noun classes and complex systems of agreement which are particularly apparent in the verbal domain. Tense-aspect-mood information is commonly conveyed through affixes which appear as part of the verbal complex and a combination of independent auxiliary forms. In auxiliary constructions, one or more auxiliary form carries temporal information and is followed by an inflected main verb which typically hosts aspectual information (Henderson, 2006:2; Nurse, 2008).

The Tanzanian Bantu language Rangi makes use of both of these strategies. A simple verb form comprises of a single verb which is inflected for tense (and optionally aspect), as can be seen in (1) below where the marker íyó- encodes the present progressive. A compound construction comprising of an auxiliary and a lexical main verb can be seen in (2) where the auxiliary -íja is used in conjunction with a main verb which hosts the habitual suffix -áa. [1, 2]

(1) Suusu t-íyó-terek-a chá-kʉrya.
1st pl.PP SM1st pl-PRES.PROG-cook-FV 7-food
'We are cooking food.'

(2) Ana a-íja á-súk-áa ndihi.
Anna SM1-AUX.PAST2 SM1.PAST2-plait-PAST.HAB 10.rope
'Anna used to plait rope.'

Despite exhibiting the otherwise head-initial syntax associated with SVO Bantu languages, Rangi also has constructions in which the auxiliary appears after the main verb. Post-verbal auxiliary placement is restricted to the immediate and general future tense forms. This can be seen in example (3) below where the auxiliary -íise appears after the main verb kánya 'fell'. An attempt at pre-verbal auxiliary placement

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1 Rangi is a seven-vowel language with the vowels [a], [e], [i], [ɪ], [o], [u] and [ʊ] found. Following orthographic convention, the vowels [ɪ] and [ʊ] are represented by the barred vowels ɨ and ʉ respectively. Rangi also has a two-way tonal distinction. In this paper, high tones are marked through the presence of the acute accent, whilst low tones are unmarked.

2 The following abbreviations are used throughout the paper: APPL = applicative, AUX = auxiliary, CAUS = causative, CONN = conjunction, COP = copula, DEM = demonstrative, DT = disjoint, Fo = formula, FV = final vowel, INF = infinitive, LOC = locative, NEG = negative, OM = object marker, sg = singular, S = subject, SBV = subjunctive, SIT = situative, SM = subject marker, PASS = passive, PAST1 = recent past, PAST2 = distant past, pl = plural, PP = personal pronoun, PRES = present, PROG = progressive, PERF = perfective, PREP = preposition, Q = interrogative, REL = relative pronoun, Tn = tree node, Ty = type.

in future tense main clauses results in ungrammaticality, as can be seen in example (4). [3]

(3) Kán-y-a n-íise ʉ-hʉ mʉ-ti.
fell-CAUS-FV SM1stsg-AUX DEM-3 3-tree
'I will fell this tree.'

(4) *Mama a-rɨ jot-a maaji mpolɨ.
1.mother SM1- AUX get.water-FV 6.water later
Intd.: 'Mother will collect water later.'

Not only is the post-verbal auxiliary placement found in Rangi unusual in the context of East African Bantu languages where auxiliary-verb order predominates, it also appears to contradict Greenberg's (1963) proposed linguistic universal that Verb-Object languages exhibit auxiliary-verb order. This unusual word order found in Rangi is subject to a further syntactically-determined alternation in which the auxiliary appears pre-verbally in negation, subordinate and relative clauses and wh-questions (5).

(5) Ani á-rɨ rɨ́n-a ɨ-hɨ mɨ-rɨ́ɨnga.
who SM1-AUX open-FV DEM-4 4-beehive
'Who will open this beehive?'

This paper presents an account of the word order alternation found in Rangi from the perspective of Dynamic Syntax (DS, Cann et al. 2005; Kempson et al. 2001; 2010). DS is a parsing-based grammar formalism that aims to articulate and substantiate the claim that human linguistic knowledge is essentially the ability to process language in context. Under the DS view, lexical and pragmatic information combines with general constraints to define the step-by-step growth of semantic representation associated with a string of natural language (Kempson et al., 2010).

[3] Unless otherwise stated, all examples come from the author's own corpus. Data were collected in the Kondoa region of Tanzania October 2009–May 2010 and October 2011–December 2012.

The account of auxiliary constructions provided in this paper hinges on the concepts of underspecification and update which lie at the heart of the DS framework. It is proposed that, rather than requiring the positing of specific features or conditions, the DS account predicts this word order alternation found in Rangi on the basis of the standard tools made available by the formalism.

The paper adds to the growing body of work examining Bantu morphosyntax, providing new data from an under-described language which are of typological and comparative interest. The paper constitutes the first formal account of Rangi auxiliary constructions from a theoretical perspective and contributes to theoretical linguistics, as well as the development of Dynamic Syntax by extending the empirical coverage of the framework.

Section 2 provides an overview of Dynamic Syntax, outlining the tools and the mechanisms employed by the framework and the steps taken in the account developed in the current paper. Section 3 presents data exemplifying Rangi auxiliary constructions, highlighting the word order alternation found in the future tense. Section 4 provides a formal account of post-verbal auxiliary placement, whilst Section 5 models the alternation contexts – the environments in which pre-verbal auxiliary placement is found. Section 6 constitutes a conclusion.

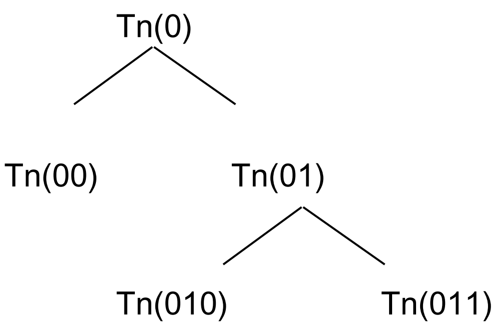
2. Dynamic Syntax

2.1. An overview

Dynamic Syntax is a formal model of utterance description that aims to articulate and substantiate the claim that linguistic knowledge is essentially the ability to parse spoken language in context and to build semantic representations from underspecified input. Rather than representing static structures and constituent relations as they are defined over words in strings, DS aims to reflect the process of parsing in real time. The tools of the framework are laid out to capture the way in which the meaning(s) associated with an utterance is built up in a step-by-step, time-linear manner. The parsing process is highly context-dependent, with options being made available – or reduced – relative to the context.

Dynamic Syntax presumes a single level of representation which is modelled using binary trees. These trees represent semantic rather than syntactic relations and are decorated with type and content information. A complete tree is one in which every node carries a full formula value and a type value. DS makes use of a number of types. The types employed in the current paper include t ‘truth, proposition’, e ‘entity’, and $e \rightarrow t$ ‘predicate’. The subtypes of the entity type – e_s ‘event term’ and $e_s \rightarrow t$ ‘event predicate’ (which combines an event term to yield a proposition) are also used. Tree nodes have addresses, enabling the identification of the exact location of a tree node with respect to the root node (or with respect to another node). Tree node addresses can be used to describe how to move from one tree node to another, as well as identifying particular locations within a tree. The relationships between tree nodes can be captured through the language of LOFT (Logic of Finite Trees; (Blackburn and Meyer-Viol, 1994)). The root node is the only node which is not dominated by any other node. Since the tree node address of the root node is Tn(0), the addresses of its two immediate daughter nodes are Tn(00) which indicated a daughter argument node, and Tn(01) which indicates a daughter functor node. This and other tree node addresses can be seen in (6) below.

(6) Tree node addresses



There are two basic LOFT modalities: ↓ and ↑ which correspond to the daughter and mother relation respectively. The system also allows for the expression of underspecified dominance relations using the kleene star (*). Thus, $\langle\downarrow_*\rangle$ indicates a node either at or below the current node, whilst $\langle\downarrow^*{}_1\rangle$ indicates a functor daughter at or below the current node. Since DS trees are used to represent growth, the pointer (◊) is used to indicate the node under development at any given time.

The growth of information during the interpretation process is represented through the step-by-step growth of binary trees. Tree growth takes place in three ways: via computational rules, lexical actions and pragmatic enrichment. The computational rules enable the development of one partial tree description into another partial tree description. The computational rules are available at any stage during the parsing process provided that specific conditions (or triggers) are present in the tree or at the node under development. Lexical actions result from lexical input which is supplied by words and morphemes which contribute distinct information about how the tree under construction can progress. Lexical content is powerful since it can build and annotate the tree(s), as well as introducing or satisfying requirements which drive forward tree growth. Whilst computational rules are considered to be universally available across-languages, lexical input is language-specific, being contained within the lexicon of a given language. Pragmatic enrichment can also serve to provide an update for otherwise underspecified terms. This can stem from the wider context of the discourse i.e. the identification of a metavariable provided by a pronoun with a referent.

Tree growth takes place incrementally. As the string is processed, information is accumulated on a step-by-step basis. The DS parsing process is goal-driven, with requirements (represented by the query '?') to derive some specific type formula from the string serving to drive the parse forward. New words encountered are assessed against the context of information which has already been introduced into the tree. Take for example, an utterance such as John likes Sally, a simplified account of the process involved in building the associated structure is outlined below.

The starting point for all structure building processes is the initial minimal tree which is annotated with the requirement for some propositional structure. This is indicated by the requirement for a type-t expression (7).

(7) THE AXIOM

Tn(0), ?t, $\Diamond$

The first element encountered in the string is the word John. Underspecification is a central concept in the DS framework which is based on the notion that natural language is to a large extent underspecified for both content and structure. The framework allows for the introduction of nodes into the tree which have an underspecified tree node address – known as unfixed nodes. Whilst the tree node address of unfixed node is unknown at the point at which they are introduced, they must receive a fixed address before the parse is complete. Unfixed nodes are introduced through a set of computational rules. The rule of *ADJUNCTION introduces an unfixed node which is decorated with the requirement for a type-e formula value. One option for parsing a potential subject expression such as John is that it is projected onto an unfixed node introduced by the rule of *ADJUNCTION. The resulting tree is shown in (8) below where the only information that is available regarding the address of the node is its relation to the root node. This is reflected in the modality $\langle\uparrow^{*}\rangle$ Tn(0) which indicates that the root node is above or at the current node.

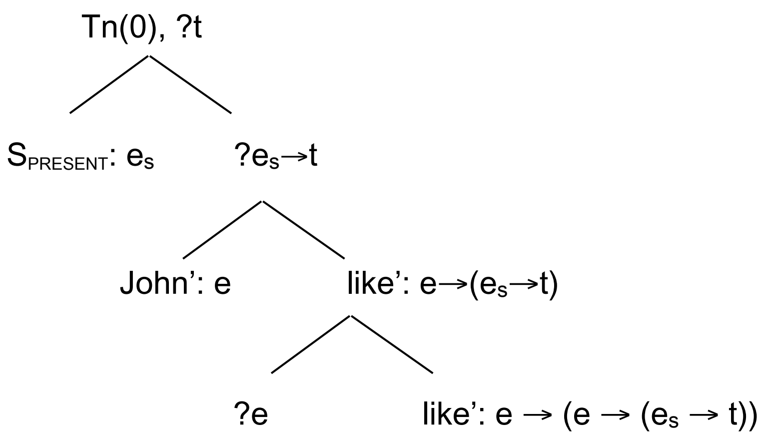
(8) Parsing: John…

Tn(0), ?t

$\langle\uparrow^{*}\rangle$ Tn(0), John': e, $\Diamond$

The second word encountered is likes. Parsing the verb likes introduces a fixed subject-predicate template and a situation argument node.[4] The situation argument node is the locus of tense and aspect information and can be decorated with the information for present tense (in this instance, the temporal reading is recoverable from the verb form likes although this is not always the case with verbs in English). The introduction of this fixed structure into the tree means that the previously unfixed node annotated with John can receive a fixed tree node address as the content is identified as the logical subject (9).

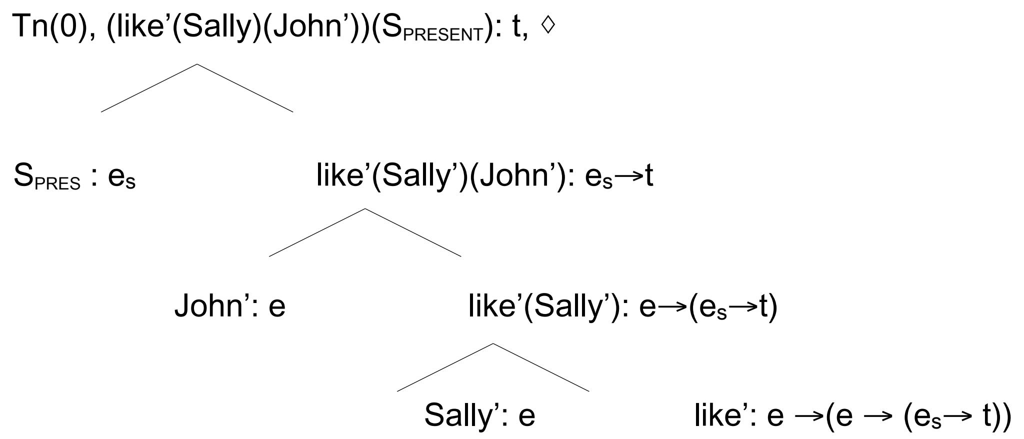
(9) Parsing: John likes…



Parsing the argument Sally enables the interpretation of the object node. With all the requirements fulfilled the information is compiled up the tree. A snapshot of the final tree is shown in (10) below. As can be seen on examination of this tree, all nodes are fully decorated with a formula value and a type specification and the parsing process is complete.

(10) John likes Sally.

[4] In the interests of space, tense and aspect information are represented throughout the paper using a variable (S) on the situation argument node. This variable hosts an attribute which determines how the information is to be interpreted, i.e. S_{PAST} for past tense or S_{FUTURE} for future. A more detailed characterisation of tense and aspect information, which is not adopted in the current paper, would involve an epsilon event term in which the feature would be a predicate restrictor on the event variable.



Whilst this tree shows a snapshot of the final tree, DS aims to represent the dynamics of structure building in real time. As such, trees showing the intermediate stages of the parsing process are as important as the final tree. It is also important to note that there may be more than one option available for parsing a given string. Certain parsing strategies may be made available or may be eliminated as information is provided and further restrictions on the parse are introduced. As can be seen in the trees above, DS trees do not model linear word order but rather the way in which semantic information is combined. By convention, nodes on the left are argument nodes whilst nodes on the right host predicates. However, word order can be established through an examination of the stages involved in the unfolding of the trees.

In addition to the rule of *ADJUNCTION which introduces an unfixed node, the rule of LOCAL *ADJUNCTION is also available. The role of LOCAL *ADJUNCTION introduces a locally unfixed node. Generally unfixed nodes have the modality $\langle\uparrow^*\rangle$ Tn(0) which indicates that the root node is either at or above the current node. The potential fixing site of a locally unfixed node is further restricted to the local domain. This is captured in the modality $\langle\uparrow_0\rangle\langle\uparrow_1{}^*\rangle$ Tn(0) which means that this node must ultimately be fixed as an argument node along a (possibly empty) functor chain. The result of LOCAL *ADJUNCTION is shown in (11).[5]

(11)The effect of LOCAL *ADJUNCTION

$$Tn(0),\ ?t$$

$$\langle\uparrow_0\rangle \quad \langle\uparrow_1^*\rangle Tn(0),\ \diamond$$

One result of unfixed tree nodes being defined in these terms is that two unfixed nodes of the same modality cannot co-exist at any point in the parsing process – they will necessarily collapse onto each other. A powerful feature of the DS framework is that the same node can be built over and over again. However, this re-building of structure will not result in a distinct node, but rather the same node will be re-built. This is due to the underlying formalism of the tree descriptions which mean that any descriptions with the same modalities necessarily define the same node. In certain instances, this rebuilding and collapse of the nodes on top of each other is necessary to ensure that they refer to the same entity – i.e. the identification of subject information on an auxiliary form and on a main verb with the same referent. However, if the annotations on the two nodes are inconsistent, this structure building will not produce a well-formed result. Two unfixed nodes annotated with different information cannot be kept distinct and will also result in just one node since their tree node addresses – albeit temporary – will be identical.

This restriction on the co-occurrence of more than one unfixed node at any point in the parse will be seen to be crucial to the account provided for the Rangi auxiliary alternation outlined in Section 4 and Section 5.

[5] Here, the argument relation is not indicated in the tree structure. However, in this and subsequent trees containing an unfixed node, it can be assumed that the tree diagram represents a modal operator which is to be interpreted as a mother relation which is followed by an unspecified path of functors nodes, i.e. the locally unfixed node will be an argument node.

2.2. Modelling Rangi clause structure in DS

Having presented the tools of the Dynamic Syntax framework, this sub-section shows these mechanisms at work through a sample derivation of a Rangi sentence. The assumptions that are adopted for modelling Rangi clause structure throughout this paper are highlighted through a discussion of the steps involved in parsing the sentence shown in (12) below.

(12) Va-singa v-íyó-terek-a chá-kʉrya.
2-children SM2-PROG-cook-FV 7-food
'The children are cooking food.'

Three strategies are made available for parsing subject expressions in DS: a locally unfixed node, an unfixed node and a Link structure. Since Bantu languages do not have constructive case which can fix the tree node address (as is proposed for Japanese and Korean for example (Kempson and Kiaer, 2009; Seraku, 2013)) the locally unfixed node account is not available. This leaves the unfixed node and Link structure strategy available for Bantu languages. These strategies have both been employed in previous accounts of Bantu subject expressions (see, for example (Kempson et al., 2011; Marten, 2011; Marten and Gibson, To appear; Marten and Kula, 2011; Seraku and Gibson, 2015)).

In addition to building a single tree structure at a time, it is also possible for two trees to be constructed in tandem. Link structures constitute a formal pairing of one tree to another through the presence of a shared term which is present in each tree. The rule of LINK ADJUNCTION introduces a requirement that a copy of the information encoded in the Linked tree will be present somewhere in the parallel tree before the tree update is complete. It is proposed that subject expressions in Rangi can be projected onto either a Link structure or onto an unfixed node. For the purposes of the current discussion – and to illustrate the Link mechanism at work – the stages involved in parsing the subject expression vasinga ‘children’ on a Link structure are outlined below.[6]

As always, the parsing process starts with the axiom. At this point, the rule of LINK ADJUNCTION can launch a new type-e node from the existing type-t root node and the content vasinga ‘children’ can be projected onto this node. In building the Link relation (here indicated by a bold line), the rule of LINK ADJUNCTION also introduces a requirement that the concept vasinga ‘children’ is found somewhere in the eventual tree before the parse is complete (represented by the requirement ⟨?↓* ⟩ (vasinga’) on the root node of the main tree). The resulting tree is shown in (13) below.

(13) $\langle L^{-1}\rangle$Tn(0), vasinga’: e

Tn(0), ?t, ⟨?↓*⟩(vasinga’):e, ◊

It is proposed that subject markers in Rangi are responsible for the introduction and the decoration of a locally unfixed node. The locally unfixed node account of Rangi subject markers is consistent with previous analyses presented for subject markers across Bantu languages (see for example Kempson et al. (2011) for siSwati, Marten and Kula (2011) for Bemba, Marten (2011) for Herero, Marten (2011) and Gibson and Marten (2016) for Swahili). The use of an unfixed node to model Bantu subject markers is related to the clitic-like status of the subject markers and reflects the observed parallels between Bantu subject markers and clitics in Romance (Bouzouita, 2008; Cann et al., 2005) and dialects of Modern Greek (Chatzikyriakidis, 2010) which are modelled in similar terms. It is also motivated in part by the observed behaviour of these subject markers in locative and subject-object reversal constructions (see Marten and Gibson, To appear). Such an account

[6] The Link structure analysis also fits in with the view that overt subject NPs in Bantu languages more broadly are topical in nature (see, amongst others, Demuth and Johnson 1989, Bresnan and Mchombo 1987).

also assumes that Rangi subject markers are pronominal in nature rather than incorporated pronouns (cf. (Bresnan and Mchombo, 1987)).

Rangi subject markers are also considered to introduce a metavariable. Metavariables are employed in the DS framework to represent underspecification of content (in contrast to unfixed nodes, for example, which are representative of structural underspecification). Metavariables are accompanied by type specifications but their content values are still in need of update. Metavariables have been used to model pronouns – in which case they are of type-e – as well as auxiliary verbs such as be (see, e.g. Cann (2011)). Here it is proposed that subject markers in Bantu introduce a metavariable that carries with it a restriction pertaining to the noun class or person/number information encoded by the subject marker. The construal of this metavariable is therefore restricted in line with the properties encoded by the subject marker in question. In the case of the class 2 subject marker va- for example, the metavariable can only receive interpretation from a nominal referent which is compatible with class 2 semantics (i.e. plural human) as indicated by U_{CLASS2}. In the current example, the metavariable can be interpreted against the context provided by expression vasinga 'children' which decorates the Linked tree. The resulting structure can be seen in (14) below.

(14)Parsing: Vasinga va-…

$\langle L^{-1}\rangle$ Tn(0) vasinga': e

Tn(0), ?t, $\langle ?\downarrow_* \rangle$ (vasinga'): e, $\Diamond$

$\langle\uparrow_0\rangle\langle\uparrow_1^*\rangle$ Tn(0),
U_{CLASS2} : e, ?∃x.Fo(x), ◊

If no overt subject expression is present, the pronominal metavariable persists until the information is made available at a later stage of the utterance (at the right periphery for example, in the case of an 'after-thought' construction) or until it can be interpreted against the context of the discourse. However, in the current example, since an overt subject expression is present, the metavariable can be updated to the formula value vasinga 'children' (15).

(15) Parsing: Vasinga va-

$\langle L^{-1}\rangle$ Tn(0) vasinga': e

Tn(0),?t, $\langle ?\downarrow_*\rangle$(vasinga'): e

$\langle\uparrow_0\rangle\langle\uparrow_1^*\rangle$Tn(0),
vasinga': e, ◊

In simple verbal constructions, tense and aspect are encoded through morphological markers that appear in either the pre-stem position or the post-stem position within the verbal template. These tense-aspect markers in Rangi are responsible for the introduction of fixed minimal predicate-argument structure, as well as contributing the associated temporal and/or aspectual information. The introduction of predicate-argument structure into the derivation by these tense-aspect markers reflects the probable historical origin of the tense-aspect markers as bleached auxiliaries (Botne, 1989; Nurse, 2008), which are also analysed as projecting a fixed predicate-argument template. This process of grammaticalisation has been noted across Bantu. For example, Sacleux (1909) claims that all Swahili tense-aspect markers have their origins in grammaticalised auxiliaries. The Swahili future tense marker -ta- for example is argued to be derived from the verb -taka 'want' (Botne, 1989; Heine et al., 1991:172). The same has been suggested for Rangi, where it is has been proposed that the marker -too- is derived from the verb kuita 'to go' and that the iterative marker -ndo- for example, is derived from the verb keenda 'to go' (Stegen, 2006).

Parsing the pre-stem present progressive marker íyó- is therefore analysed as resulting in the projection of a fixed subject node and a fixed predicate node – the first fixed structure introduced into the tree in the current example. The introduction of this structure enables the fixing of the previously unfixed tree node address of the subject expression vasinga 'children'. Tense-aspect markers also introduce a situation argument which is the locus of the tense-aspect information conveyed by the morphological form. In the current example, the situation argument node is decorated with the information reflecting the present tense ($S_{PRESENT}:e_S$).[7] The resulting tree is shown in (16) below.

(16)Parsing: Vasinga va-íyó-…

$\langle L^{-1}\rangle Tn(0)$ vasinga': e

Tn(0), ?t,

$S_{PROG}: e_S$ $\quad$ $?e_S \rightarrow t$

vasinga': e $\quad$ $?e \rightarrow (e_S \rightarrow t)$, ◊

[7] This approach is also similar to that proposed by Cann (2011) to account for the annotation of the event argument node with both temporal and aspectual information. Cann et al. (2005) and Cann (2006) propose a formula resolution rule that allows two fomulae of the same type to be combined via a form of generalised conjunction that ultimately allows these two values (which would usually yield inconsistency) to annotate the same node.

The verb stem is the next element to be parsed. The verb stem also builds a fixed predicate-argument template. However, the extent of the predicate-argument structure introduced by the verb is dependent on the valency of the verb (cf. (Marten, 2002)): an intransitive verb, for example, will build a subject and a predicate node, whilst a transitive verb will build subject, predicate and object nodes. In the current example, the verb terek ‘cook’ is transitive so builds subject, predicate and object nodes. Since a fixed subject and a fixed predicate node have already been introduced into the tree by the tense marker, the nodes introduced by the verb stem represent the re-building of this predicate-argument structure. However, as long as the decorations on these nodes are compatible, the newly-introduced nodes can harmlessly collapse with those already present in the tree. The end result however is that building the same node twice will ultimately result in a single (and the very same) node. Since these nodes have the same tree node address they cannot be distinguished from each other. In the current example such a collapse results in the tense-aspect information conveyed by the pre-stem marker and the lexical information conveyed by the main verb decorating a single tree and thereby encoding a single event. The resulting structure following the parsing of the subject information, the pre-stem tense-aspect marker and the main verb terek ‘cook’ is as shown in (17) below.

(17)Parsing: Vasinga va-íyó-terek…

⟨L^{-1}⟩ Tn(0) vasinga’: e

Tn(0), ?t,

S_{PROG}: e_s $?e_s \rightarrow t$

vasinga’:e $?e \rightarrow (e_s \rightarrow t)$

? e   terek’: $e \rightarrow (e \rightarrow (e_s \rightarrow t))$, ◊

Rangi verbs end in an obligatory suffix. This is either the ‘default’ final vowel -a or a dedicated tense-aspect suffix, such as the perfective -ire. In processing terms, parsing this suffix indicates that the end of the verb has been reached and that no further predicate-argument structure can be introduced. Formally, this is achieved by the final vowel inducing pointer movement from the predicate node to the argument node.

Parsing the object argument chákʉrya ‘food’ enables the update of this node with a fully-specified formula value. With all the requirements fulfilled, the information is compiled up the tree (18).

(18)Parsing: Vasinga víyótereka chákʉrya ‘The children are cooking food.’

Tn(0), ((terek’(chákʉrya’))(vasinga’)(S_{PROG}): t, ◊

S_{PROG}: e_s terek’(chákʉrya’)(vasinga’): $e_s \rightarrow t$

vasinga’: e,   terek’(chákʉrya’): $e \rightarrow (e_s \rightarrow t)$

chákʉrya’: e   terek’: $e \rightarrow (e \rightarrow (e_s \rightarrow t))$

As can be seen on examination of the tree above, all the nodes are type-complete and host a formula value and a type value. Having presented the stages of a sample Rangi parse, the next section presents the data pertaining to the focus of the present paper – the auxiliary alternation found in the future tense.

3. The Rangi auxiliary alternation

The use of simple and complex verb forms to encode tense-aspect distinctions is widespread throughout Bantu. Languages vary as to the subject-marking properties and the specifics of the encoding of tense-aspect information in these complex constructions. Bantu languages also vary in relation to the number of auxiliary forms which can occur in an auxiliary construction (Nurse, 2008), as well as the form of these auxiliaries. Rangi employs compound constructions in the formation of five tense-aspect combinations: the recent past perfective, the distant past perfective, the distant past habitual, the general future and the immediate future.

The formation of Rangi auxiliary constructions can be seen in the examples below. In example (19), the auxiliary -íja combines with a main verb inflected for habitual aspect. In example (20), the auxiliary -rɨ carries the recent past tense marker áá- and combines with a perfective suffix to encode a distant past perfective reading.

(19)Mama a-íja a-dóm-ire
1a.mother SM1-AUX.PAST2 SM1.PAST2-go-PTV
'Mother has gone.'

(20)U-ra mu-gonjwa áá-rɨ a-a-kwíy-ire
1-DEM 1-ill.person SM1.PAST1-AUX SM1-PAST1-die-PTV
'That ill person has died.'

In contrast to the examples above, in the immediate and general future tense, compound constructions exhibit verb-auxiliary order. The immediate future tense is formed using an infinitival verb form and the auxiliary -íise which is inflected for subject information (21). The general future tense is formed using an infinitival verb and the auxiliary -rɨ (22). In both the immediate future tense and the general future tense, the auxiliary appears post-verbally, and an attempt at pre-verbal placement of the auxiliary results in ungrammaticality (23).

(21)Nɨɨnɨ dóm-a n-íise na Dodoma haha
1stsg.PP go-FV SM1stsg-AUX PREP Dodoma now
'I will go to Dodoma now.'

(22) Mama jót-a á-rɨ maaji mpolɨ.
1.mother get.water-FV SM1-AUX 6.water later
'Mother will get water later.'

(23) *Mama á-rɨ jót-a maaji mpolɨ.
1.mother SM1-AUX get.water-FV 6.water later
Intd. 'Mother will get water later.'

Whilst declarative main clauses in both the immediate and general future tenses exhibit post-verbal auxiliary placement, the auxiliary appears pre-verbally when the future construction is:

a) preceded by a wh-element
b) part of sí…tʉkʉ sentential negation
c) part of a relative clause
d) part of a subordinate clause
e) part of a cleft construction

The pre-verbal placement of the auxiliary in the contexts outlined above is noteworthy since none of the alternation contexts outlined in (a)-(e) above are associated with word order changes in other tenses in the language.[8] The contexts which trigger auxiliary-verb order in the future tense are discussed in turn below.

3.3.1. Wh-questions

Clauses introduced by wh-phrases result in pre-verbal auxiliary placement. This can be seen in the general future tense example (24) where ani 'who' is associated

[8] This is a generalisation which appears to apply across Bantu more broadly where none of the contexts which exhibit this alternation in Rangi are associated with a word order change in complex auxiliary constructions. The exception to this might be the small subset of other Bantu languages which exhibit this unusual verb-auxiliary order. Five other languages which exhibit post-verbal auxiliary placement have been found (see Gibson, 2015). However, a more detailed description of all of these languages is required in order to ascertain whether they also exhibit the inverted order in some or all of the contexts outlined for Rangi above.

with placement of the auxiliary árɨ before the main verb wúla 'buy'. Similarly in example (25), the phrase na nadi 'when' results in pre-verbal placement of the auxiliary form túrɨ. An attempt at post-verbal auxiliary placement in wh-questions results in ungrammaticality (26).

(24)Ani á-rɨ wúl-a ma-papai?
who SM1-AUX buy-FV 6-papaya
'Who will buy papayas?'

(25)Na nadi tú-rɨ pát-a my-eekenye?
When SM1stpl-AUX get-FV 4-sugar.cane
'When is it that we will get sugarcane?'

(26)*Na nadi chw-a tú-rɨ vi-ryo?
when harvest-FV SM1stpl-AUX 8-millet
'When will we harvest millet?'

3.3.2. Sentential negation

Sentential negation also results in pre-verbal auxiliary placement. Negation in Rangi is achieved through the use of a bipartite construction in which the negative marker sɨ́ appears before the verb and the negative marker tʉkʉ which appears either after the verb or clause-finally (Gibson, 2012; Stegen, 2011:29). In negative future tense constructions the negative marker sɨ́ appears before the auxiliary form whilst tʉkʉ appears after the main verb. As can be seen in examples (27) and (28) below, the negative future tense is associated with pre-verbal auxiliary placement.

(27)Nɨɨ́nɨ sɨ́ ndɨ́-rɨ dóm-a na Kondoa tʉkʉ.
1stsg.PP NEG SM1stsg-AUX go-FV PREP Kondoa NEG

'I will not go to Kondoa.'

(28)Ng'oombe sɨ́ jí-rɨ kʉ-nyw-a maaji y-óósi voo tʉkʉ.
10.cows NEG 10-AUX INF-drink-FV 6.water 6-all all NEG
'The cows will not drink all of the water.'

3.3.3. Relative clauses

Relative clauses also result in pre-verbal auxiliary placement. There are two strategies for the formation of relative clauses in Rangi: either through the use of the relative pronoun -eene which shows agreement with the relative head (29) or without the presence of the relative pronoun in which case the auxiliary carries a high tone (30). In both instances however, the auxiliary appears pre-verbally in future tense constructions.

(29) Kʉ-ʉntʉ kw-eene ndɨ́-rɨ dóm-a…
16-place 16-REL SM1stsg-AUX go-FV
'The place where I will go...' (Oliver Stegen p.c.)

(30) Mʉ-lay-ɨr-a ha-antʉ á-rɨ rɨ́m-a isikʉ.
OM1-show-CAUS-APPL-FV 16-place SM1-AUX farm-FV 9.today
'Show him/her the place where s/he will farm today.'

Subordinate clauses also exhibit pre-verbal auxiliary placement as can be seen in the example below where a future tense construction follows the subordinator koóni 'if' (31).

(31) Kʉ-ʉ́j-a á-rɨ koóni á-rɨ reet-a chá-kurya.
INF-come-FV SM1-AUX if SM1-AUX bring-FV 7-food
'S/he will come if s/he brings food.

3.3.4. Cleft constructions

A constituent in a Rangi sentence can be focused by way of a cleft construction. Clefts are formed through the use of the copula nɨ́ which is positioned before the verbal complex and the fronting of a nominal expression which receives a contrastive focus interpretation. Future tense cleft constructions are also associated with pre-verbal auxiliary placement, as can be seen in example (32).

(32)Nɨ́ na lʉ-ʉl-wíi ndɨ́-rɨ dóm-a.
COP CONN 11-mountain-LOC SM1st sg-AUX go-FV
'It is to the mountain that I will go.'

To summarise, Rangi uses a combination of simple and complex verb forms to encode tense-aspect. In complex constructions, an auxiliary combines with a lexical main verb. Whilst three of these auxiliary-based constructions exhibit the more canonical auxiliary-verb order, the immediate and general future tense constructions in Rangi exhibit post-verbal auxiliary placement. A further alternation between pre- and post-verbal auxiliary placement is also associated with the future tense construction. Whilst this post-verbal placement is obligatory in declarative, main clauses, this order is reversed in wh-questions, sentential negative, cleft constructions and relative and subordinate clauses.

4. Modelling post-verbal auxiliary placement

This section develops a step-by-step account of the stages involved in parsing post-verbal auxiliary placement in Rangi future tense constructions from the perspective of the DS framework. An analysis is adopted which hinges on the concept underspecification and which highlights the context-dependent nature of the parsing process. The main verb in future tense constructions is proposed to be projected onto an unfixed node and can only receive update to a fixed tree node address once the auxiliary is parsed. The stages involved in parsing a future such as that shown in (33) are outlined below.

(33)Lʉ́ʉ́s-a n-íise.
speak-FV SM1st sg-AUX
'I will speak [soon].'

It is proposed that when the infinitive is the first element to be parsed in a clause it is projected onto an unfixed node.[9] This proposal reflects the underspecified nature of clause-initial infinitives in Rangi and is motivated by the observation that Bantu infinitives, including the infinitive in Rangi, exhibit both nominal and verbal properties (Creissels, 2009; Doke, 1955; Du Plessis, 1982; Meeussen, 1967; Meinhof and Van Warmelo, 1932; Visser, 1989). On the one hand, the infinitive exhibits properties which are typical of nominal elements; it appears in subject and object NP positions, is associated with concord agreement, and is available for nominal modification. However, in many Bantu languages the infinitive can also be inflected for aspect and mood, can be negated, can take a valency-changing verbal suffix, may take an object or objectival concord and can be modified by adverbs and locatives, all of which are properties commonly associated with verbs. The Rangi infinitive also exhibits these nomino-verbal properties with the infinitive appearing, for example, as a nominal subject (34) or as a verbal element which can be modified and host an object marker (35).

(34) Kʉ-ter-er-a ma-sare y-á u-loongo sɨ́ vy-aboh-a tʉkʉ.
INF-listen-APPL-FV 6-words 6-of 14-lies NEG 8-be.good-FV NEG
'To listen to lies is not good.' (lit.: 'The listening to of lies is not good.')

(35) Na-sáák-í-ire kʉ-í-ón-a.
SM1stsg.PRES-want-APPL-PFV INF-OM9-see-FV
'I have looked for it.' (lit.: 'I have searched for seeing it.') (Stegen, 2002:21)

Thus, it is proposed that when the infinitive is parsed in this clause-initial position, its ultimate location in the tree is not yet known. Drawing on the notion of structural underspecification, it is proposed that this infinitive is projected onto an unfixed predicate node. Whilst the framework has previously made available unfixed type-e

[9] Subject pro-drop is widespread in Rangi. However, in instances in which an overt subject expression is present, this expression is projected onto a Link structure as outlined in Section 2. The subsequent stages of the parse proceed in line with the account provided in the current section and the Link structure has no bearing on the availability of this strategy.

nodes, it is proposed that the behaviour of the infinitive in Rangi (and in Bantu more broadly) necessitates the introduction of an unfixed predicate node – i.e. an unfixed node hosting a requirement for a predicate expression. It is further proposed that this is a natural extension of the theory, combining both the notions of structural underspecification as represented by unfixed nodes and the availability of different types in the DS system (Cann et al., 2005; Kempson et al., 2010; Kempson et al., 2001). The proposal is therefore that a transitional rule of PREDICATE ADJUNCTION results in the introduction of an unfixed predicate node from a type-t node.

Parsing the infinitive results in the annotation of this unfixed predicate node with the semantic information encoded in the verb form (36).[10]

(36)Parsing: Lʉʉsa…

Tn(0), ?t

⟨$\uparrow^*$⟩Tn(0),
lʉʉs’: $e \rightarrow e_s \rightarrow t$

The next element to be parsed is the inflected auxiliary form níise. As was seen in the preceding sections, parsing the subject marker on the auxiliary projects a locally unfixed node annotated with a restricted metavariable. In this case the subject marker n- encodes first person singular and can be updated to the term speaker’. The partial tree that results at this stage therefore comprises of an unfixed node annotated with information from the predicate lʉʉs ‘speak’ and a locally unfixed node annotated with information about the potential subject marker expression (in this case speaker’). These two nodes can co-exist since they are defined distinctly – the unfixed predicate node is defined by a relation of general dominance by the root

[10] The final vowel indicates that the end of the verbal template has been reached and no further predicate-argument structure can be introduced. The annotation on the tree nodes however appears as lʉʉs’ since the final vowel does not make any lexico-semantic contribution to the tree, rather it serves simply to induce pointer movement.

node ($\langle\uparrow^*\rangle Tn(0)$), whilst the locally unfixed node must be interpreted locally and is necessarily an argument node (defined as $\langle\uparrow_0\rangle\langle\uparrow_1^*\rangle Tn(0)$).

The auxiliary introduces a fixed subject node and a fixed predicate node. This follows the analysis of the English copula be provided by Cann (2011) in which be is assumed to project fixed predicate-argument structure. This account also reflects the historical origin of auxiliary forms in main verbs (Botne, 1989; Nurse, 2008:59) which are also modelled as introducing fixed predicate-argument structure (see Section 2). The introduction of this fixed structure into the tree enables the fixing of the previously unfixed node hosting the infinitive as the rule of UNIFICATION which merges the tree node description of an unfixed node with that of a fixed node. The auxiliary also builds a situation argument node and introduces the immediate future tense annotation (37).

(37)Parsing: Lʉ́ʉ́sa n-íise…

Tn(0), ?t

$\langle\uparrow^*\rangle$Tn(0), $S_{IMM\ FUTURE}$: e_s ?$e_s \rightarrow t$

lʉ́ʉ́s': $e \rightarrow e_s \rightarrow t$

speaker': e ?$e \rightarrow (e_s \rightarrow t)$, ◊

With all the tree node addresses fully specified and all requirements fulfilled, the information is compiled up the tree. The resulting structure is shown in (38) below.

(38) Parsing: Lʉ́ʉ́sa níise 'I will speak.'

(lʉʉs'(speaker'))($S_{IMM\ FUTURE}$): t, ◊

$S_{\text{IMM FUTURE:}}\ e_s$ lʉʉs'(speaker'):$e_s \rightarrow t$

speaker': e lʉʉs': $e \rightarrow (e_s \rightarrow t)$

A similar account can be extended to general future tense clauses with the general future tense interpretation resulting from parsing -rɨ in the presence of the unfixed node annotated with the information from the infinitival verb. Whilst the details of such an account are not developed in detail here, it is assumed that the same processes of structure building would be employed.

The account provided here highlights the way in which lexical information combines with the generalised computational rules to result in the establishment of the proposition expressed. Underspecified values are introduced at an early stage in the parse – i.e. an unfixed tree node address or a metavariable place holder – and are enriched as additional information is made available via context and lexically-supplied input.

5. Modelling pre-verbal auxiliary placement

The contexts in which pre-verbal auxiliary placement in the future tense occur involve a range of different elements – fronted constituents, subordinating conjunctions and wh-words. The challenge is to be able to account for the pre-verbal auxiliary placement that is found across all of these seemingly disparate contexts. If we consider post-verbal auxiliary placement to be the unmarked order in the future tense, then the task is to identify what triggers the pre-verbal auxiliary placement in the alternation contexts. In the account developed in the current section, it is proposed that wh-questions, sentential negation, relative and subordinate clauses and cleft constructions all involve an unfixed node as part of their processing strategy. The presence of this unfixed node is considered to be the condition which enables the auxiliary to be parsed, thereby triggering auxiliary-verb order. The alternation between pre- and post-verbal auxiliary placement is therefore predictable on the basis that two unfixed nodes of the same modality cannot co-exist (i.e. cannot remain distinct from each other) at any given time in the parsing process. The stages involved in parsing these structures and the associated triggering contexts are outlined in turn below.

5.1. Wh-questions

Wh-elements and fronted constituents are modelled in DS using an unfixed node (Bouzouita, 2008; Cann et al., 2005; Chatzikyriakidis, 2010; Kempson et al., 2001). In the current work, this approach is extended to Rangi, with wh-elements modelled as projecting an unfixed node labelled with a WH metavariable. Following Kempson et al. (2001), Rangi wh-elements are also modelled as introducing a question feature (Q) at the root node which marks the utterance as interrogative.[11] The use of an unfixed node as part of the processing strategy is therefore considered responsible for the auxiliary-verb order associated with wh-questions. The stages involved in parsing a wh-question such as that shown in (39) are outlined below.

(39) Ani á-ri wúl-a ma-papai?
who SM1-AUX buy-FV 6-papaya
'Who will buy papayas?'

Parsing the question word ani 'who' results in the projection of an unfixed node. The question word ani 'who' can only be used to ask about class 1 (i.e. singular human) nouns. The WH metavariable introduced by ani 'who' is therefore considered to carry

[11] Unlike other metavariables, update to a full formula value is not obligatory for the specialised WH metavariable. Formally, this is captured by the fact that it is not accompanied by the requirement for update which would be specified as ?∃x.Fo(x). Conceptually, this reflects the fact that a question is by nature underspecified with regards to the element which is being questioned, in the case of ani 'who' this is the subject.

a restriction limiting its possible interpretation to class 1 nouns (represented by WH_{CLASS1} in the tree below).[12] The partial tree is shown in (40) below.

(40)Parsing: Ani…

$Tn(0), ?t, Cat(Q), \Diamond$

$\langle\uparrow^{*}\rangle Tn(0),$
$WH_{CLASS1}: e$

Following the annotation of the unfixed node with the information made available by the wh-expression, the tree can be further developed with content provided by the rest of the clause. Parsing the subject marker on the auxiliary results in the projection of a locally unfixed node (41).

(41)Parsing: Ani a- …

$Tn(0), ?t, Cat(Q), \Diamond$

$\langle\uparrow^{*}\rangle$ $Tn(0),$ $\langle\uparrow_0\rangle\langle\uparrow_1^{*}\rangle Tn(0),$
$WH_{CLASS1}: e$ $U_{CLASS1}: e$

These two unfixed nodes can co-exist since they have distinct modalities: one is an unfixed node and one is a locally unfixed node. However, the metavariable annotation introduced by the subject marker a- can be interpreted against the background of the information introduced by the wh-element ani 'who' since they are both restricted for interpretation by a class 1 expression. With the metavariable receiving update from the wh-question, the two nodes can be updated to that shown

[12] In the case of plural human referents, the question word valani 'who (plural)' is used and possible substituents for valani would subsequently be restricted to class 2 – and be represented by the restricted metavariable WH_{CLASS2}. The restriction of terms with which the metavariable can be identified is found only in the three agreeing wh-elements ani 'who', valani 'who (pl)' and -irikwi 'which'.

in (42) whereby a more tightly restricted interpretation of the WH metavariable (as an argument node along a functor spine) obtains.

(42)Parsing: Ani a- ...

Tn(0), ?t, Cat(Q), ◊

$\langle\uparrow_0\rangle\langle\uparrow_1^*\rangle$ Tn(0),

WH_{CLASS1}: e

In projecting a whole propositional template, the auxiliary results in the introduction of the first fixed structure into the derivation. This takes the form of a fixed subject, a fixed predicate node and the situation argument note. The introduction of this fixed structure enables the tree node address of the previously unfixed node annotated with the WH metavariable to be fixed as the subject node. The resulting tree is shown in (43) below.

(43)Parsing: Ani arɨ…

Tn(0), ?t, Cat(Q)

S_{FUTURE}: e_S $?e_S \rightarrow t$

WH_{CLASS}': e $?e \rightarrow (e_S \rightarrow t)$, ◊

The next element to be parsed is the infinitive. In Section 4 the clause-initial infinitive was projected onto an unfixed predicate node. However, with a fixed predicate-requiring node already present in the tree, the infinitive can provide immediate update to a full predicate value for this node. In addition to the subject and predicate nodes which have already been introduced by the auxiliary, the verb wula ‘buy’ projects a full template, i.e. subject, object, predicate and situation argument nodes. Since the infinitive projects an entire propositional template, the partial tree can be duly updated and expanded with this new information. The infinitive re-builds the situation argument node and the subject-predicate node. As a non-finite verb the infinitive does not introduce any new information onto the situation argument so this newly introduced node collapses with the node already present in the tree. The newly introduced additional predicate node and object node lead to further growth of the tree. The parsing of the object expression mapapai 'papayas' provides the interpretation for the type-e object node. With all the requirements fulfilled, the information can be compiled up the tree. The resulting structure is shown in (44).

(44)Parsing: Ani arɨ wúla mapapai? 'Who will buy papayas?'

Tn(0), ((wul'(WH_{class1})(mapapai'))(S_{FUTURE}): t, Cat(Q), ◊

S_{FUTURE}: e_s wul' (WH_{class1})(mapapai'): $e_s \rightarrow t$

WH_{CLASS1}: e wul'(mapapai'): e→ ($e_s \rightarrow t$)

mapapai': e wul' e→ (e→ ($e_s \rightarrow t$))

The proposal is therefore that the interrogative sentence above exhibits auxiliary-verb order due to the parsing of the clause-initial wh-question ani 'who' on an unfixed node. This claim is further supported by the observation that future tense polarity interrogatives formed using the clause-final question particle ʉ́ʉ do not trigger pre-verbal auxiliary placement ((45) – (47)).

(45)Dóm-a mw-íise ʉ́ʉ?
go-FV SM2ndpl-AUX Q
'Will you (pl) go?'

(46)Haánd-a w-íise vi-ryo ʉ-hʉ mw-ááka ʉ́ʉ?
plant-FV SM2nd sg-AUX 8-millet DEM-3 3-year Q
'Will you plant millet this year?'

(47)*Mw-íise dóm-a ʉ́ʉ?
SM2nd pl-AUX go-FV Q
'Will you (pl) go?

The examples show that it is not the interrogative (or affirmative) status of the clause which triggers the auxiliary-verb constituent order in wh-questions. Rather it is the unfixed node processing strategy used to model wh-words which appear at the left periphery. In interrogative utterances which do not have sentence-initial wh-words (as in examples (45)–(47) above), the parse proceeds in the same manner as for a standard declarative utterance: the infinitive is projected onto an unfixed node and the auxiliary introduces fixed structure before the interrogative marker ʉ́ʉ comes into parse. The interrogative nature of the utterance is only indicated at the end of the clause by the presence of the polar interrogative marker ʉ́ʉ which results in the introduction of the question feature at the root node. The difference between a wh-question with a clause-initial wh-word and a polar interrogative can therefore be viewed purely in terms of the processing strategy involved. Parsing a wh-word in a clause-initial position involves an unfixed node. The presence of this unfixed node enables the auxiliary to be parsed, thereby triggering pre-verbal auxiliary placement. In polar interrogatives in which the interrogative term is only encountered clause-finally, the verb-auxiliary order is maintained.

5.2. Sentential negation

Sentential negation in Rangi involves the negative marker sɨ́ which appears before the verbal complex and the negative marker tʉkʉ which appears either post-verbally or clause-finally. Sentential negation is another context in which auxiliary-verb order is found in the future tense. The proposal here is that processing sentential negation involves the projection of an unfixed situation argument-requiring node ($?e_s$). This proposal is in part motivated by the observation that the negative marker sɨ́ participates in two types of negative construction. On the one hand, it functions as negative marker alongside a main verb in instances of sentential negation (48). On the other hand, it also functions as a copula in clauses where it is the predicative base (49).

(48) Sɨ́ ndɨ́-rɨ dóm-a na Kondoa tʉkʉ.
NEG SM1st sg-AUX go-FV PREP Kondoa NEG
'I will not go to Kondoa.'

(49) Ɨki kɨ-kombe sɨ́ chaanɨ tʉkʉ
7.DEM 7-cup NEG 7-my NEG
'This cup is not mine.'

Modelling sɨ́ as projecting a situation argument also stems from the observation that although the negative marker does not encode a specific tense-aspect distinction, it interacts with temporal and aspectual information contained in the verb form.[13] In addition to projecting an unfixed situation argument node, the negative marker sɨ́ decorates the root node with the negative diacritic Cat(Neg), indicating the negative polarity of the utterance (50).[14]

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[13] A similar proposal involving the projection of a situation argument is put forward for negation in Cypriot Greek. For Cypriot Greek it is observed that indicative negative constructions behave differently from subjunctive and imperative negative environments and as such, interact with tense-aspect information in different ways (Chatzikyriakidis, 2010).

[14] The annotation Cat(Neg) (following Cann et al., 2005) is not a formal representation of negation but merely an indication of the negative polarity of the utterance, in the absence of a formal account of negation in the DS system. To this end, it should not be considered as an argument but merely a decoration at the root node.

(50)Parsing: Sɨ́...

Tn(0), ?t, Cat(Neg)

? e_s

Once the negative marker has been parsed, the remainder of the verbal complex is processed following the steps that have been outlined so far. The auxiliary introduces the higher structure of a propositional template – a structure which the main verb overlays. The infinitive contributes the lexico-semantic information and parsing the main verb in the presence of the situation argument results in the future tense interpretation. Following Marten (2002), it is assumed that the prepositional phrase na Kondoa 'to Kondoa' is of type-e and can provide fulfilment for the requirement on the object node. A snapshot of the final stage of the derivation is shown in (51) below.

(51)Sɨ́ ndírɨ doma na Kondoa 'I will not go to Kondoa.'

Tn(0), ((dom'(Kondoa')(speaker'))(S_{FUTURE}): t, Cat(Neg), ◊

S_{FUTURE}: e_s dom'(Kondoa')(speaker'): $e_s \rightarrow t$

speaker': e dom'(Kondoa') : $e \rightarrow (e_s \rightarrow t)$

Kondoa': e

dom': $e \rightarrow e \rightarrow (e_s \rightarrow t)$

The unfixed node analysis is further supported by the presence of examples in which negation is achieved solely through the use of the negative polarity item tʉkʉ. The post-verbal negative marker tʉkʉ can therefore be analysed as making no structural contribution to the parse but as being responsible for introducing the negative feature into the clause. In the example above, the annotation Cat(Neg) has already been introduced at the root node by the pre-verbal negative marker sɨ́. However, there also exist negative constructions in which the negative marker tʉkʉ can appear without sɨ́. This is the case in the negative prohibitive for example, instances of non-verbal predication and example (52) below. In such instances, tʉkʉ can be considered responsible for decorating the root node with the negative diacritic.

(52) Sínj-a tú-rɨ mbúri tʉkʉ.

slaughter-FV SM1stpl-AUX 9.goat NEG
'We will not slaughter the goat.'

Examples such as (52) above provide further support for the unfixed node analysis of sentential negation in Rangi since they show that it is not the negative polarity of the utterance but rather the specific construction and the associated processing strategy which result in the pre-verbal auxiliary placement (as was also seen in polar interrogatives in 5.1). With no negative word at the left periphery, the verb-auxiliary order is maintained and the clause is parsed in the same way as for an affirmative future tense construction. When the clause-final negative word tʉkʉ is encountered this provides an annotation for the root node but does not make any structural contribution to the clause. As such, pre-verbal auxiliary placement – which takes place only in the presence of an element projected onto an unfixed node at the left periphery – is not triggered.

5.3. Relative clauses

Relative clauses are modelled in DS as a conjunction of two trees connected by the presence of a shared term (Cann et al., 2005; Kempson et al., 2001). A Link structure is built from a type-e node to a new type-t node based on the rule of LINK ADJUNCTION (FOR RELATIVES) (Cann et al., 2005:88). This is also the analysis adopted in previous DS accounts of relative clauses in Bantu (see Marten and Kula (2011) on Bemba, for example), and is the basis of the analysis developed here for Rangi. Under the DS approach, a relativiser is considered to be responsible for the transition which licenses the closure of one (albeit as yet incomplete) structure and the opening up of another (Kempson and Wei, 2011). It is proposed that parsing the Rangi relativiser -eene licenses the launch of a Link transition from the type-e node which is already present in the tree (the head noun) to a new type-t-requiring node in a parallel emergent tree. The relativiser is also assumed to be responsible for the provision of the copy of this head noun. Since there is no fixed structure present in the tree at this initial stage of structure-building, the copy of the head noun is projected onto an unfixed node. In the future tense construction, the presence of this unfixed node is therefore considered to be responsible for pre-verbal auxiliary placement. The stages involved in parsing a relative clause construction such as that shown in example (53) are outlined below.

(53) Mwaarimʉ	mweene	a-rɨ	loka	a-boh-a
1-teacher	17-REL	SM1-AUX	go-FV	SM1-be_good-FV

'The teacher who will leave is good.'

The subject expression mwaarimʉ 'teacher' is projected onto a Link structure introduced by the rule of LINK ADJUNCTION. Parsing the relativiser mweene however, results in the rule of LINK ADJUNCTION firing again and the launch of a second Link structure from the node annotated with the subject expression to a new type-t node. The presence of these two Link relations reflects the status of the potential subject expression mwaarimu 'teacher' against which the subject marker is interpreted, as well as the flow of information between the two parts of the relative clause. The potential subject nominal expression is projected onto a Link structure as has been assumed throughout this paper. The rule of LINK ADJUNCTION also introduces a requirement that the concept mwaarimu 'teacher' is found somewhere in the eventual tree (54).

(54) Parsing: Mwaarimʉ …

⟨L^{-1}⟩ Tn(0) mwaarimu': e

Tn(0), ?t, ⟨?↓$_*$⟩ mwaarimʉ: e

The rule of Link adjunction then applies again, introducing a new type-t node. It is from this new type-t node that an unfixed node annotated with the copy of the subject term is projected. In this way, the contribution of the relativiser to the clause is purely procedural – it does not make any semantic contribution to the parse, but licenses the unfolding of the tree structure. The resulting tree structure is shown in (55) below.

(55) Parsing: Mwaarimʉ mweene…

⟨L^{-1}⟩ ⟨L^{-1}⟩ Tn(0)?t

⟨L^{-1}⟩ Tn(0) mwaarimu': e

mwaarimʉ': e, ◊

Tn(0), ?t, ⟨?↓$_*$⟩ mwaarimʉ: e

The derivation proceeds with the information provided by the relative clause. The Linked tree is built through a combination of computational rules and lexical input. The auxiliary is the next element to be parsed. Parsing the auxiliary results in the introduction of the first fixed structure into the tree and enables the fixing of the copy of the head noun as the logical subject of the clause. This also satisfies the requirement that the copy of the head noun is found somewhere in the tree before the parse is complete. Parsing the verb provides update for the lexico-semantics of the predicate node and builds an additional predicate-argument structure. Parsing the infinitival verb in the presence of the situation argument node encodes the general future tense interpretation, as has been seen throughout the alternation contexts presented in this section. The information is compiled up the tree (56).

(56) Parsing: Mwaarimʉ mweene arɨ loka… 'The teacher who will leave…'

$\langle L^{-1}\rangle \langle L^{-1}\rangle$ Tn(0) (lok'(mwaarimʉ'))(S_{FUTURE}): t

S_{FUTURE}: e_s lok'(mwaarimʉ'): $e_s \rightarrow t$ $\langle L^{-1}\rangle$ Tn(0) mwaarimʉ': e

Tn(0), t, ◊

mwaarimʉ': e lok': $e \rightarrow (e_s \rightarrow t)$

The remaining information provided by the matrix clause can provide update for the main tree. The Link relation ensures the flow of information between the matrix clause on the main tree and the information from the relative clause on the Linked tree. A snapshot of the resulting tree is shown in (57) below.

(57) Parsing: Mwaarimʉ mweene arɨ loka aboha 'The teacher who will leave is good.'

$\langle L^{-1}\rangle \langle L^{-1}\rangle$ Tn(0) (lok'(mwaarimʉ'))(S_{FUTURE}): t

S_{FUTURE}: e_s lok'(mwaarimʉ'): $e_s \rightarrow t$ $\langle L^{-1}\rangle$ Tn(0) mwaarimʉ': e

mwaarimʉ': e lok': $e \rightarrow (e_s \rightarrow t)$

Tn(0), (boh'(mwaarimʉ'))($S_{PRESENT}$): t, ∧ (lok'(mwaarimʉ'))(S_{FUTURE}): t ◊

$S_{PRESENT}$:e_s boh'(mwaarimʉ') : $e_s \rightarrow t$

mwaarimʉ': e boha': $e \rightarrow (e_s \rightarrow t)$

Section 3 showed that there are two strategies for the formation of relative clauses in Rangi: one employs the relativiser -eene, as has been discussed in the current sub-section. The other strategy involves the presence of a high tone on the subject marker of the auxiliary. The proposal here is that the account provided for relative clauses formed using the relativiser -eene can be straightforwardly extended to those which employ a tonal strategy. Under this account, the distinctive high tone on the subject marker results in the same stages of the process as was outlined for the relative pronoun: the launch of a Link relation and the provision of a copy of the head noun. Such an account is possible since relative clauses are the only context in which this high tone is found on the subject marker on the auxiliary. Such an analysis also mirrors parallels with the account put forward for the pronominal and tonal strategies for modelling relative clauses in Bemba (Marten and Kula, 2011).

The flow of information between the matrix clause and the relative clause is ensured by the presence of a shared term in the two trees and the Link structure. Parsing the relative pronoun or the high tone on the subject marker results in the launch of this Link relation, the introduction of a requirement for a copy of the head noun to be present in the eventual tree, as well as introducing this copy. Parsing a Rangi future tense relative clause also involves the projection of an unfixed node onto which the copy of the head noun is projected. The unfixed node as the condition enabling the auxiliary to be parsed and triggering auxiliary-verb order can therefore be extended to relative clauses.

5.4. Subordinate clauses

Subordinate clauses are another context in which pre-verbal auxiliary placement is found in Rangi future tense constructions. In her Dynamic Syntax analysis of conditionals, Gregoromichelaki (2006) proposes that subordination includes a pair of Linked trees in which the term shared by both trees is a situation argument. In conditional structures, the IF clause is therefore assumed to be linked to the THEN clause via this Link relation. For English conditionals, the proposal is that lexical actions encoded in the conditional conjunction if are responsible for the projection of this Link relation. A similar analysis for subordinating conjunctions is adopted here for Rangi, with the subordinator joolɨ ‘how’ for example, considered responsible for the launch of this Link relation and the projection of an unfixed situation argument node. The projection of this situation argument requiring node reflects the need for a new situation/event in the matrix clause of the subordinate clause. The unfixed tree node address of this situation argument is motivated by the observed parallels between the subordinator and other clause-initial elements such as wh-words which also appear at the left periphery.

Consider the subordinate clause formed using joolɨ ‘how’ shown in (58). The first part of the utterance is parsed following the standard assumptions that have been outlined for Rangi so far in the current paper. Parsing the subordinating conjunction joolɨ ‘how’ results in the launch of an unfixed node from the type t-requiring node. The resulting tree is shown in (59) below.

(58)N-íyó-wás-a	joolɨ	ndɨ́-rɨ	pát-a	chá-kʉrya.
SM1st sg-PROG-think-FV	how	SM1st sg-AUX	get-FV	7-food

‘I am thinking about how I will get food.’

(59)Parsing: Níyówása joolɨ… ‘I am wondering how…’

Tn(0), ?t, ◊

$S_{PRESENT}$:e_S ?e_S→t

speaker’: e ?: e→ (e_S→t)

?t was’: t→ e→ (e_S→t)

? e_S

Since the verb was ‘wonder, think’ categorises for a type-e argument and a type-t argument, the remainder of the clause is parsed following the steps outlined previously with the subsequent structure built from this new type-t node. The subject marker on the auxiliary is projected onto a locally unfixed node. Parsing the auxiliary introduces fixed predicate-argument structure and a situation argument – although in this case, the situation argument collapses with the one already present in the tree. Parsing the auxiliary -rɨ in the presence of the term-requiring situation argument node results in the provision of the temporal information for the clause (general future) as has been seen across the alternation contexts. With all the requirements fulfilled, the information is compiled up the tree. The resulting tree is shown in (60) below.

(60)Parsing: Níyówása joolɨ ndírɨ páta chákʉrya ‘I am wondering how I will get food.’

Tn(0), (was’(speaker’)($S_{PRESENT}$): t, ◊

$S_{PRESENT}$: e_s was'(speaker')

speaker': e was': e→ (e_s→t)

(pat'(chakurya')(speaker')) (S_{FUTURE}): t: was': t→e→ (e_s→t)

S_{FUTURE}: e_s pat'(chákʉrya')(speaker'): e_s→t

speaker': e pat'(chákʉrya'): e→ (e_s→t)

chákʉrya: e pat': e→ e→ (e_s→t)

On the basis of the account provided above, the auxiliary-verb order found in subordinate clauses can also be accounted for by the presence of the unfixed node as part of the parsing strategy, albeit in this instance it is an unfixed situation argument node.

5.5. Cleft constructions

Cleft constructions in Rangi also result in auxiliary-verbal order. Dynamic Syntax makes available two possibilities for parsing cleft constructions. As focus constructions, the fronted elements in clefts can be modelled, like wh-expressions, as decorating an unfixed node (Cann et al., 2005:153-154; Kempson et al., 2001:150-189). The observation that certain types of cleft structures involve a presentational or backgrounding effect however, means that they can also be represented through the construction of a pair of Linked trees. Under this analysis, the clefted element decorates a type-e node connected to the main tree by a Link relation. This strategy also reflects the observed cross-linguistic parallels between cleft constructions and relative clauses which are also modelled in DS using Link structures.

The current paper adopts a Link structure analysis of Rangi cleft structures under which the clefted element is related to the main tree via a Link. Such an analysis reflects the presentational interpretation that is associated with clefting the NP expression, as well as being in line with the Link structure analysis for clefts proposed for the Southern African Bantu language siSwati (Kempson et al., 2011) and for Japanese (Seraku, 2013). However, for Rangi, it is also proposed that following the introduction of the Link structure, a copy of the term in the cleft is projected onto an unfixed node.

Consider the cleft construction in (61) below. The truth conditions of such an utterance are the same as for ‘I will fell this tree’. Under the DS approach, this means that the final tree of both the clefted and the non-clefted sentence will be identical.

(61) Nɨ́ nɨɨ́nɨ ndɨ́-rɨ kán-y-a ʉ-hʉ mʉ-ti.
COP 1stsg.PP SM1stsg-AUX fall-CAUS-FV DEM-3 3-tree
‘It is me that will fell this tree.’

Clefts are viewed as focus plus predication structures (Kempson et al., 2011), with the associated contrastiveness taken to be characteristic of clefts being brought out by the construction of a novel term within the structure. The proposal for Rangi clefts is that parsing the clause-initial nɨ́ and the clefted nominal element induces a Link structure. Parsing nɨ́ also results in the introduction of an unfixed node as part of this LINKed tree. The resulting tree is shown in (62) below.

(62) Parsing Nɨ́

⟨L^{-1}⟩ Tn(0), ?t, ↓*e? Tn(0), ?t

?e, ◊

This structure building process is the result of parsing nɨ́ in the sentence initial position where it serves to introduce a cleft construction. In this way, nɨ́ in these contexts is not assumed to be functioning as a copula and as such, is not modelled as building any propositional structure. Rather, nɨ́ can be viewed as a type of cleft marker, serving only to trigger the set of actions which are associated with cleft constructions. In other words, whilst nɨ induces a set of actions which introduce requirements into the tree, it cannot satisfy these requirements. The requirement for a type-e expression is satisfied upon parsing the obligatory nominal – in this case nɨɨ́nɨ 'I' – which annotates the unfixed node.

(63)Parsing nɨ́ nɨɨ́ni…

⟨L^{-1}⟩Tn(0) ?t,   Tn(0), ?t

speaker', ◊

With this clause-initial nominal element projected onto an unfixed node, the remainder of the clause can be parsed. The presence of an unfixed node enables the parsing of the inflected auxiliary form. The subject marker on the auxiliary can be interpreted against the content annotating the Link structure – in this instance speaker'. The information annotating the unfixed node can receive a fixed tree node address in the Linked tree and parsing the auxiliary introduces the temporal information into the tree (64).

(64)Parsing: Nɨ́ nɨ́nɨ ndí-rɨ...

Tn(0), ?t, ◊

⟨L^{-1}⟩Tn(0) speaker’: e

$S_{GEN\ FUTURE}$:e_S ? $e_S \rightarrow t$

speaker’: e ?e→ ($e_S \rightarrow t$)

Parsing the main verb kanya ‘cut’ results in the projection of a full predicate-argument template. This collapses with the fixed structure already introduced by the auxiliary, but as a transitive verb also introduces a fixed object node and a ?e→ ($e_S \rightarrow t$) predicate node. The subject argument collapses with the subject node which has previously been built by the auxiliary (and by this time already decorated with the expression speaker’). The object argument node receives interpretation when the object ʉhʉ mʉti ‘this tree’ comes into parse. The resulting structure is shown in (65) below.

(65)Parsing: Nɨ́ nɨ́nɨ ndiri kánya ʉhʉ mʉti.

((kanya’(ʉhʉ_mʉti’)(speaker’))($S_{GEN\ FUTURE}$): t,◊

⟨L^{-1}⟩Tn(0) speaker’: e

$S_{GEN\ FUTURE}$: e_S kanya’(ʉhʉ mʉti)(speaker’): $e_S \rightarrow t$

speaker’: e kanya’ (ʉhʉ mʉti’):e→ ($e_S \rightarrow t$)

ʉhʉ mʉti': e kany': e→ e→ (e_s→t)

This analysis is based on the notion that the combination of nɨ and the clefted nominal at the beginning of the clause mark this construction as a cleft. However, in these constructions nɨ́ functions merely as a cleft marker (rather than as a copula which would project structure into the tree), inducing an unfixed node decorated with a requirement for a type-e.[15] However, nɨ́ does not provide this value, which is rather only provided by the nominal element which appears immediately after nɨ. With the unfixed node present in the tree, the conditions are met for parsing the auxiliary as the next element, thus resulting in auxiliary-verb order. Cleft constructions can therefore also be seen to fit within the contexts in which auxiliary-verb order is found and the generalisation that pre-verbal auxiliary placement occurs when an unfixed node is part of the processing environment is therefore to be maintained for all the inversion contexts.

6. Conclusion

This paper has presented an analysis of Rangi auxiliary-main verb constructions with a focus on the word order alternation found in the future tense. Declarative main clauses in the future tense exhibit a typologically and comparatively unusual order in which the auxiliary appears after the verb. However, these future tense constructions exhibit a syntactically-determined alternation in which wh-questions, sentential negation, relative and subordinate clauses and cleft constructions exhibit pre-verbal placement. The paper does not discuss the possible origins of this non-canonical

[15] A reviewer suggested that an alternative account for clefts would be to see them as a combination of a true form of the copula nɨ́ followed by a relative clause, i.e. a biclausal analysis rather than a monoclausal analysis. Such an account is not developed here on the basis that the subject marker on the putative relative clause would be expected to carry a high tone. However, such an account is appealing in that it would reflect the similarities between clefts and relative clauses in a transparent way.

order (see instead Gibson (2013)). However, a formal account of this alternation from the perspective of the Dynamic Syntax framework is proposed.

Dynamic Syntax aims to model the way in which hearers build structured semantic representations from words encountered in context. This paper shows the way in which lexical input combines with the generalised computational rules to lead to the establishment of propositional structure in Rangi auxiliary constructions. The account has its origins in DS analyses of clause structure across Bantu languages, as well as observed parallels with unrelated languages. The challenge of modelling the Rangi auxiliary constructions lies in accurately capturing the word order alternation, as well as the attendant interpretation.

It is assumed that individual morphemes and words make their own distinct contribution to the parsing process via the lexical actions they encode. The account developed here is based on the notion that auxiliary forms introduce fixed predicate-argument structure, reflecting their historical origin in main verbs which are also thought of as inducing structure, as well as following the account developed in (Cann, 2011) for modelling English auxiliaries. Auxiliaries may introduce temporal information. However, since these are bleached of their lexico-semantic content, the ultimate interpretation of the clause is dependent on the main verb which contributes information about the predicate.

The impact of the building and re-building of structure has been seen throughout the paper. Regardless of the word order, the structure introduced by the auxiliary and the that introduced by the lexical verb can – and indeed must – collapse onto each other since there is no way to distinguish these as nodes within the tree. In the case of the structure built by the auxiliary and the verb, this collapse results in the encoding of just a single event – and the terms are accordingly associated with a single tree structure.

The analysis presented in this paper is also able to account for the word order alternation found in these auxiliary constructions. In future tense main clauses, the infinitive is projected onto an unfixed node. This proposal is motivated by the observation that at the point at which the infinitive is parsed, its eventual position within the tree is not yet known. This structural underspecification is conveyed by the unfixed node. In the verb-auxiliary order, the infinitive remains unfixed until the auxiliary is parsed, introducing the first fixed structure into the tree. In contrast, the alternation contexts all involve an unfixed node as part of the parsing strategy. The presence of this unfixed node at the left periphery in the alternation contexts is the condition which enables the auxiliary to be parsed as the next element, thereby triggering auxiliary-verb order.

The word order alternation found in Rangi can therefore be viewed as the result of the basic tree logic employed in DS, in which two unfixed nodes of the same modality cannot be distinguished in terms of their tree node address and therefore necessarily collapse into a single tree node. The effect of this constraint on the tree building process can be seen to have reflexes across a range of phenomena in unrelated languages. From a cross-linguistic perspective, the Rangi data exhibit parallels with clitic placement phenomena in Romance and dialects of Modern Greek. Bouzouita (2008) attributes the alternation between enclisis and proclisis in Medieval Spanish to a set of triggering contexts relating to the parsing strategies involved – one of which is the presence of an unfixed node. Similarly, Chatzikyriakidis (2010) proposes an account of clitic placement in Cypriot Greek by reference to the presence of an unfixed node or a situation argument-requiring node as triggering conditions. Seraku (2013) proposes an account of cleft constructions and multiple foci in Japanese by reference to the prohibition on the co-occurrence of more than one unfixed node at any given time. Rather than simply reflecting a language-specific word ordering idiosyncrasy, the alternation in the Rangi future tenses can therefore be seen to stem from an independent constraint operative within the DS framework. Employing the unfixed node strategy to account for Rangi auxiliary placement therefore contributes to compelling cross-linguistic support for this constraint, naturally harnessing the power of DS to account for distinct phenomena in unrelated languages by reference to the universal concepts of the left-to-right incrementality, structural underspecification and information update which lie at the heart of the framework.

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