



Language and Technology: Motion Predicates in Akan

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1. Goals

- Discuss the structural representation of motion in language
- Gain a better understanding of cognition and the structural properties of language
- Connect this structure to computational linguistics



2. Introduction

- Human-Robot Interaction
 - Algorithm to compute appropriate motion trajectories
- Literal Motion in Text (LiMiT) dataset (Manotas et al., 2020)
 - Most recent dataset related to motion
 - Cites some of the same papers we will discuss
- Motion Entity Tagging model (Vo et al., COLING 2020)
 - BERT-NER model trained with the LiMiT dataset
 - Improves performance of named entity recognition

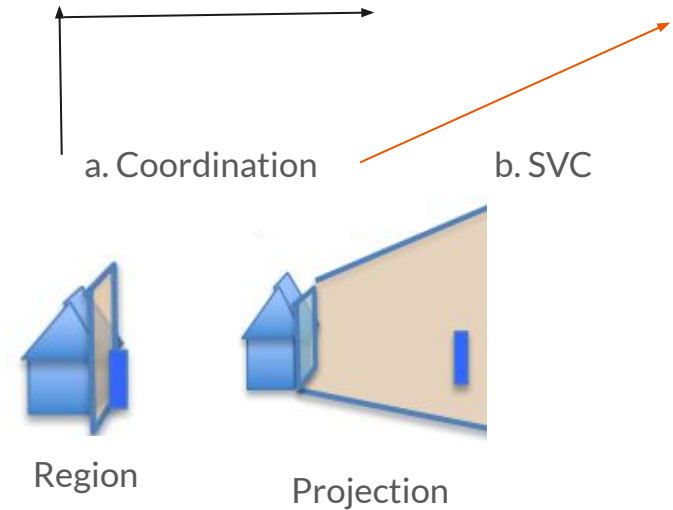


a. i. Motion and Language Technology

2. Introduction

- Movement can be represented via the Cartesian Coordinate System
 - Horizontal, vertical, deictic planes
 - Mental representation of motion
 - Path of motion is conceptualized as a vector
- Telicity is a property of predicates that indicates an action having a specific endpoint
 - Endpoint can be conceptualized in motion predicates as the tail of a vector
 - Endpoint is conveyed by a locative constituent
 - Endpoint locatives can only be a region in terms of Svenonius (2008)

a. ii. The Concept of Motion



(Benedicto, 2016)



2. Introduction

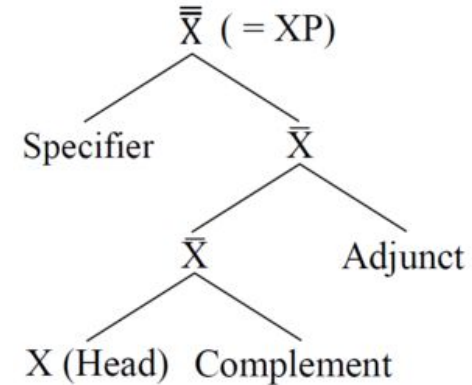
a. iii. The Linguistics of Motion

- This study provides a structural analysis of how telic predicates are expressed in Akan.
- **Previous studies on Motion predicate:**
 - Typology of motion predicates - (Talmy, 2000, 2007).
 - Theoretical issues about the subeventive complexity of predicates - (Borer, 2005; Harley, 2013; Kratzer, 1996; Pylkkänen, 2008; Ramchand, 2008)
- **Expressing Motion with Serial Verb Constructions**
 - SVC in Motion Predicates - (Benedicto & Salomon, 2014 on Mayangna and Zheng, 2012 on SwaTawWe, Osei-Tutu 2019 on GSP, Taherkhani 2019 on Tati, Chen 2021 on Mandarin, Zúñiga 2023 on Limonese Creole).
 - Among the very few studies on SVCs in motion there is none that focuses on the Akan language, specifically, in the context of language technology.
 - This is rather unfortunate because, by virtue of how they are formed, Akan presents a relatively well-studied system of Serial Verb Constructions (SVCs) that are used in expressing Motion event.

2. Introduction

- Linguistics is the scientific study of language and its structure
- Morpheme is the smallest meaningful unit in a language
- Syntax
 - Head is the core of a phrase
 - Determines the form and characteristics of the phrase
 - Head can move systematically
 - Complement is sister of the head
 - Grants special privileges

b. i. Linguistics Refresher





2. Introduction

b. ii. Why Akan?

- Akan [AKN] - a Kwa language widely spoken in Ghana and other parts of West Africa.
- Akan presents a relatively well-studied system of Serial Verb Constructions (SVCs) that are used in expressing Motion event.
- Each SVC expresses a single event. Therefore we are interested in investigating how motion is encoded in the structure of Akan.
- We are also interested in describing the syntactic structure and the type of event expressed by each subcomponent of the entire motion event.

1. Background

- Akan is one of the Kwa languages spoken in Ghana which belongs to the Niger-Congo language family. According to Dolphyne (1988:xi), other varieties of Akan are also spoken in Ivory Coast.
- Akan is spoken in eight out of the sixteen regions in Ghana. That is Bono, Bono East, Ahafo, Ashanti, Eastern, Central, Western and Western North region of Ghana.
- Out of the 68 languages spoken in Ghana, Akan is the most widely spoken language

b. iii. Where is Akan?





2. Introduction

b. iv. Structural Properties of Motion in Akan

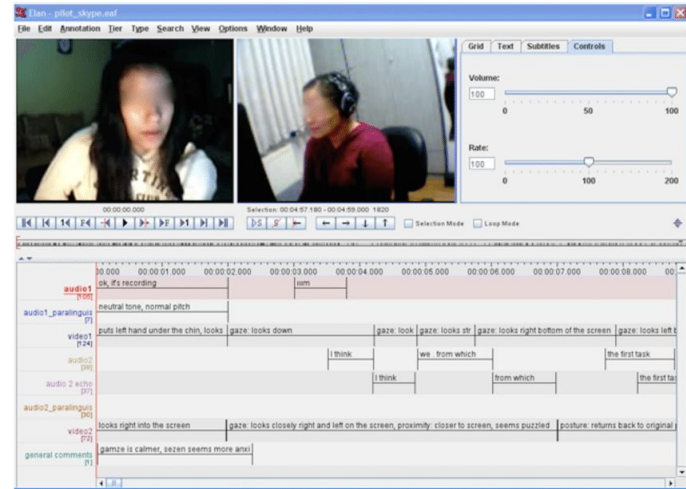
- Serial verb constructions generally constitute unrelated verbs acting together as a single predicate.
- This means that, in such constructions, verbs have no marker of coordination or subordination. In addition, an SVC is conceptualized as a single event and also described as monoclausal because its intonational properties are not different from that of a monoverbal clause (Aikhenvald 2006:1).

Fosu	sóré	kó-ó	fié
Fosu	stand	go-PST	home

‘Fosu stood up to go home’

3. Methodology

- 175 animated video clips designed to elicit and contrast path, telicity, result, and agentivity (Benedicto, 2019)
- 4 native speakers of Akan were asked to describe the video clips
- Video data was recorded over Zoom
- Utterances transcribed, coded, and glossed in ELAN
- Export glosses to Excel



Satar, Müge. (2016)

4. Preliminary Findings

- A telic reading is obtained
 - only by the presence of a resultative verbal morpheme, e.g., *si* 'stand', *wura* 'enter'
 - *Si* selects a locative constituent which denotes an endpoint; represented by an element such as *so* 'top'.
 - The locative constituents denote a region in terms of Svenonius (2008) [a]

[a]

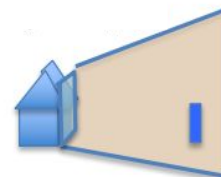


Region

1. Anomaa no a-tu a-firi fence no so a-ka-**si** dua no **so**
 Bird DEF PRF-fly 3SG-leave fence DEF top PRF-go-stand tree DEF top
 'The bird flew from the fence on to the tree.'

- The absence of a resultative verbal morpheme indicates atelicity
 - A potential locative can be introduced by a post-position, e.g., *nkyen*, *ho* 'side'
 - This locative has the interpretation of projection in terms of Svenonius (2008) [b]

[b]



Projection

(Benedicto, 2016)

- Anomaa no a-tu a-firi fence no so re-ka dua no **ho**
 Bird DEF PRF-fly PRF-leave fence DEF top PROG-go tree DEF side
 'The bird from the fence is flying towards a tree'.

6. Analysis

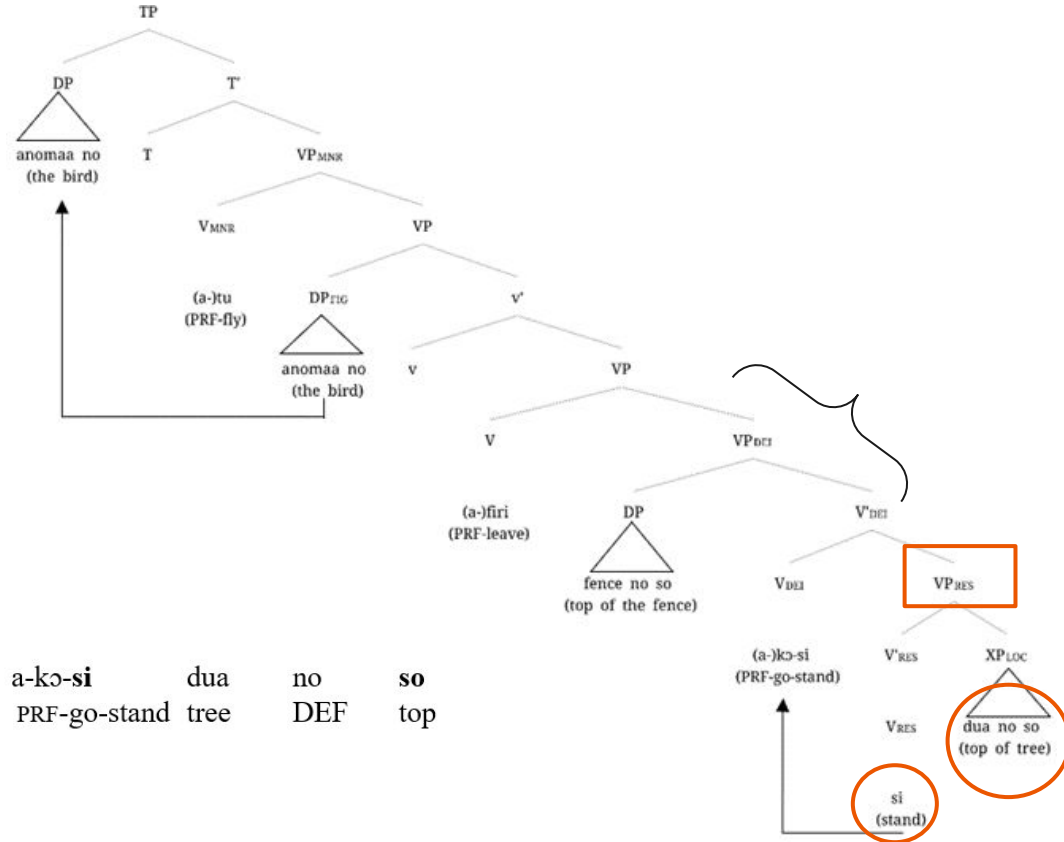
- We claim that:

si is the morphological head of the result subcomponent, VP_{RES} , in the sub-eventive motion structure

si moves head-to-head to the path denoting head *kɔ* ‘go’.

- | | | | | | | | | | | |
|--------|-----|---------|-----------|-------|-----|-----|--------------|------|-----|-----|
| Anomaa | no | a-tu | a-firi | fence | no | so | a-kɔ-si | dua | no | so |
| Bird | DEF | PRF-fly | 3SG-leave | fence | DEF | top | PRF-go-stand | tree | DEF | top |

‘The bird flew from the fence on to the tree.’





6. Analysis

- Notice that *si* is an independent verb

Anomaa	no	si	dua	no	so
Bird	DEF	stand	tree	DEF	top

‘The bird is on top of the tree’

- Helps identify serial verb construction

1. Anomaa no a-tu a-firi fence no so a-ko-**si** dua no **so**
Bird DEF PRF-fly 3SG-leave fence DEF top PRF-go-stand tree DEF top

‘The bird flew from the fence on to the tree.’



6. Analysis

- Wh- extraction to prove that VP_{RES} is a complement
 - Proves that the head movement is allowed
 - Test that linguists uses to detect complements
 - Complements can do things that other things cannot do

1. a. John drank a coke

b. What did John drink ____?

2. a. John went out, ate a sandwich, and drank a coke.

b. **What did John go out, eat a sandwich, and drink ____?

6. Analysis

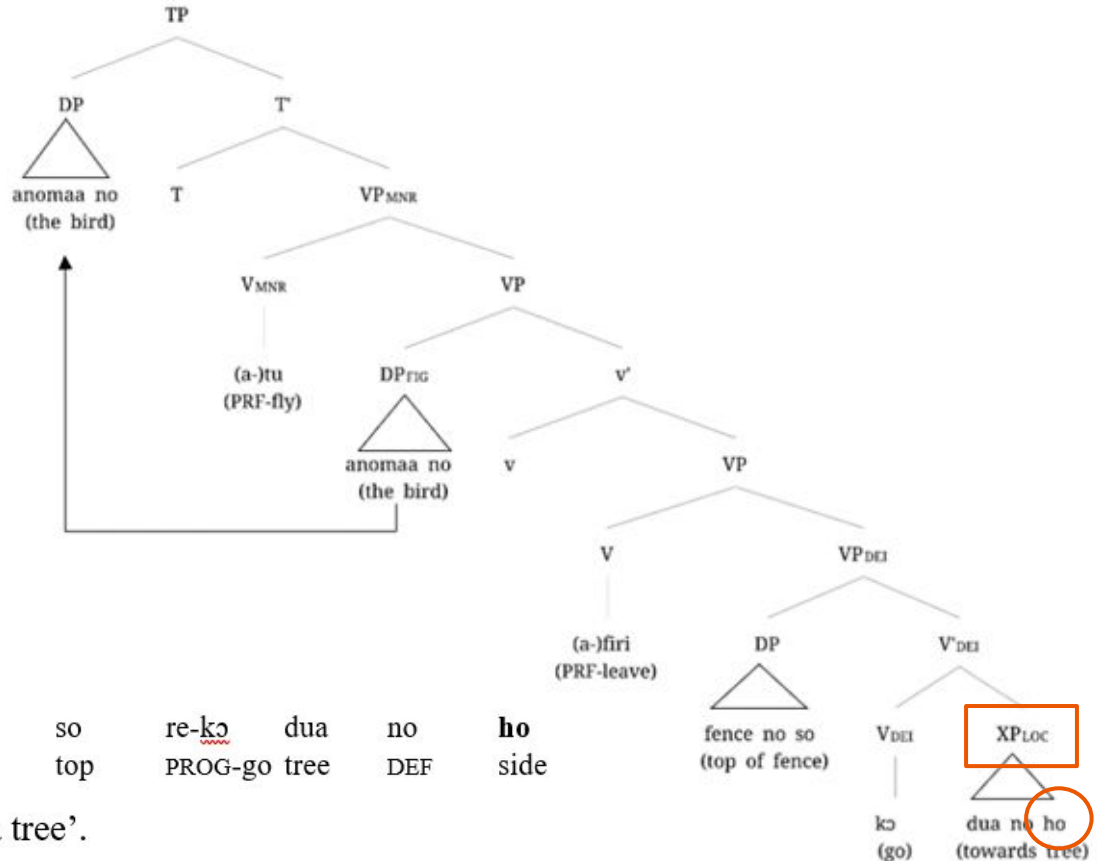
- We show that the Akan sentence is not a coordination, but rather an SVC represented by an embedded structure

Hen na anomaa no tu kɔ-e
Where DEM bird DEF fly go-PST
'Where did the bird fly to?'

1. Anomaa no a-tu a-firi fence no so a-kɔ-si dua no so
 Bird DEF PRF-fly 3SG-leave fence DEF top PRF-go-stand tree DEF top
 'The bird flew from the fence on to the tree.'

6. Analysis

- The lack of the result subcomponent indicates atelicity





6. Language Technology in Akan

- Not much work is being done with motion and language technology in Akan
- GhanaNLP project (2021)
 - Open Source
 - Focus on Ghanaian languages and expanding to other West African languages
 - Khaya - translating app
 - ABENA - A Bert Now in Akan
- SVCs are an interesting problem to language technology (Adebara & Abdul-Mageed, ACL 2022)
 - Issues with crosslingual embeddings



7. Conclusion

- Understand the systematic representation of motion in Akan
- Can provide a new perspective for language technology

Questions?

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