

GOAL-OF-MOTION READINGS IN THAI DIRECTIONAL SERIAL VERBS

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ABSTRACT

In this paper we investigate the types of Thai Directional Serial Verb constructions (DSVs) compatible with GOAL-OF-MOTION readings. We find that particular types of verbs are required within the DSV construction in order to allow a goal-of-motion interpretation. We propose that the availability of goal-of-motion readings correlates with the presence of a path argument in the VP and that Thai, unlike English, does not allow PPs to introduce path arguments. The analysis is framed using Rothstein 2004's sum-operation semantics for secondary predication and Ramchand 2008's First Phase Syntax.

Key words: Thai Directional Serial Verb Construction, Goal-of-Motion Readings, Path Arguments, Sum Operation, First Phase Syntax

1. INTRODUCTION

Thepkanjana (1986) classifies Thai serial verb constructions by dividing them into seven distinct types. The serial verb construction of interest for our research is what she calls “Directional Serial Verbs” (henceforth DSVs) – i.e., serial verb constructions where the main verb is a verb of motion, and the additional verbs specify the path and direction of the motion. Sudmuk (2005) provides the following examples with a string of six verbs, from Thepkanjana (1986) and Muansuwan (2002).

(1)

- | | | | | | | | |
|----|--|------------------------|-------------------------|-------------------------|-------------------------|-------------------------|------------------------|
| | | V1 | V2 | V3 | V4a | V4b | V5 |
| a. | <i>khaw^R</i> | <i>wiŋ^F</i> | <i>troŋ^M</i> | <i>jɔɔn^R</i> | <i>klap^L</i> | <i>khaw^F</i> | <i>pay^M</i> |
| | 3.pro | run | go.str | reverse | return | enter | Go |
| | “He ran straight back in (away from the speaker’s centre of attention).” | | | | | | |
-
- | | | | | | | | | |
|----|---|------------------------|-------------------------|-------------------------|--------------------------|--------------------------|------------------------|------------------------|
| | | V1 | V2 | V3 | V4a | | V4b | V5 |
| b. | <i>maa</i> | <i>wiŋ^F</i> | <i>troŋ^M</i> | <i>jɔɔn^R</i> | <i>khaam^M</i> | <i>sa^L-</i> | <i>ɔɔk^M</i> | <i>pay^M</i> |
| | <i>lii</i> | | | | | <i>phaan^M</i> | | |
| | Maa | run | go.str | re- | cross | bridge | exit | go |
| | lee | | | verse | | | | |
| | “Maalee ran straight back, crossing the bridge, out (away from the speaker).” | | | | | | | |

The goal of our paper is to investigate the availability of GOAL-OF-MOTION interpretations for Thai DSV constructions. We observe that (i) the availability of GOAL-OF-MOTION interpretations rely relies on the presence/absence of V3-type (path-direction) and V5-type (deictic) verbs, and (ii) DSVs differ in terms of whether a bare NP or *[thii^FNP]_{PP}* is acceptable for denoting the goal-of-motion (see section 2).

We propose that our observations can be analyzed in terms of (i) whether the verbs in the DSV constructions have a specific PATH ARGUMENT (cf. Zwarts 2005), and (ii) what semantic components (e.g., SOURCE, ENDPOINT, VIA, cf. Denis et al 2003; Wechsler 2003) are encoded in this path, and how these differences are syntactically encoded

(see section 4, formalized using Ramchand (2008)). We further propose that the difference in syntax between Thai DSV and English goal-of-motion constructions follows from a difference in terms of the available compositional processes. More specifically, we propose that in Thai, path arguments can only be introduced via a Rothstein's (2008) style sum operation, and that this compositional process is type-restricted to verbs. Thus, unlike English, PPs in Thai cannot introduce a path argument, and hence cannot alone license a goal-of-motion interpretation.

This paper is organized as follows: In what remains of section 1, we discuss previous approaches to Thai DSVs and lay out the guiding questions for our research. In section 2, we present our data and generalizations. Section 3 provides the framework and analysis for the observation that GOAL- OF- MOTION interpretations rely on the presence/absence of V3 and V5-type (deictic) verbs. Section 4 presents the framework and analysis for the observation that DSVs differ in terms of whether a bare NP or $[thit^F NP]_{PP}$ is acceptable for denoting the goal-of-motion. We address unresolved issues and conclude in section 5.

1.1 Previous Approaches to Thai Directional Serial Verbs

1.1.1 Thepkanjana's (1986) linear order and co-heads

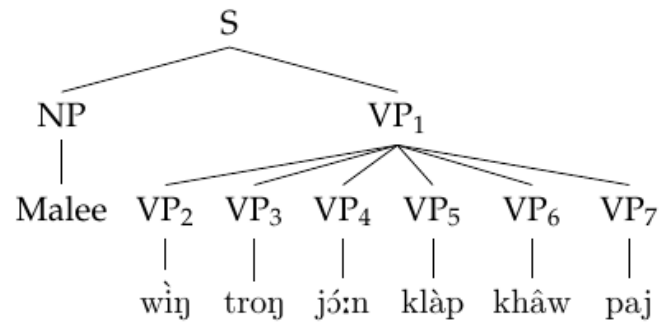
Thepkanjana (1986) proposes that the linear order of verbs in a DSV construction is restricted by the semantic properties laid out in (2):

(2) Thepkanjana's Linear Order Constraint on DSVs

- V1: motion verb
- V2: geometric shape of path
- V3: direction of movement along path
- V4a: a path orientation with respect to ground in the outside world
- V4b: direction of movement with respect to ground in the outside world
- V5: direction of movement with respect to SAPs (deictic verb)

Thepkanjana proposes a flat recursive VP structure for DSVs, using the phrase-structure rule $VP \rightarrow VP \ VP^*$.

(3) Thepkanjana's Flat Recursive Structure for Thai DSVs

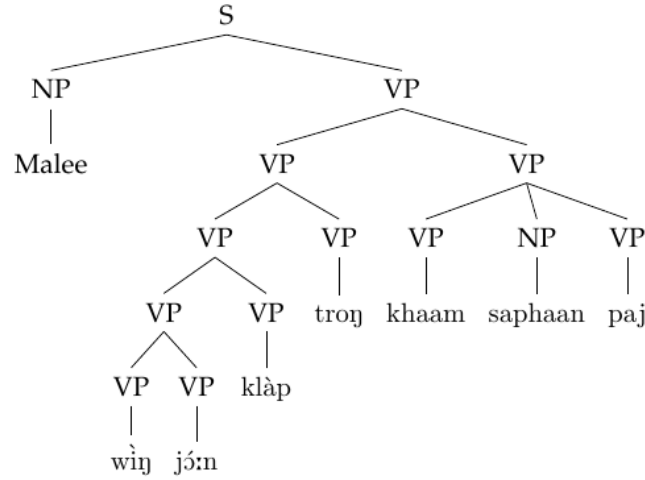


Muansuwan (2002), however, argues that a Thai DSV construction is more complex than Thepkanjana's analysis suggests.

1.1.2 Muansuwan (2002)'s co-head and complementation structure

Muansuwan (2002), using constituency tests, argues that Thai DSV constructions involve a basic recursive co-head structure for the verbs V1-V3, and a complementation structure for V4 and V5.

(4) Muansuwan's Co-Head and Complementation Structure for Thai DSVs



Thus, while Thepkanjana proposes that all verbs within a Thai DSV construction are syntactically equal, as VP modifiers, Muansuwan proposes that V4 and V5 are syntactically distinct from V1-V3, as the former involve a complementation structure. Although we found no reproduction of the data judgements of Muansuwan's consultants when we looked at those of our consultants), our analysis accords with Muansuwan in that at least V3 and V5 are syntactically distinct, framing our analysis within Ramchand's (2008) First Phase Syntax (see section 4).

1.2 Theoretical Background and Aims of the Research

The goal of our research, recall, is to investigate the availability of GOAL-OF-MOTION interpretations for Thai DSV constructions. In this subsection, we clarify the notion of GOAL-OF-MOTION, present our initial observations regarding the availability of these readings in Thai DSVs, and then lay out the guiding questions for the research.

1.2.1 Goal-of-Motion interpretations and PATH arguments

The contrast between goal-of-motion and location interpretations relates to the semantic distinction that Jackendoff (1983) makes between PATH (trajectory) and PLACE (location) PPs. Where PLACE merely encodes a spatial relationship between a figure and a ground (i.e., a place indicates a stative location), PATH is associated with a directed motion and encodes the trajectory of the figure. In the case of a PATH PP, a place does not indicate a stative location, but rather the goal of the motion.

Zwarts (2005) elaborates on this notion of PATH by breaking a path/trajectory down into three components: (i) the starting point, (ii) the endpoint, and (iii) ordered points between (i) and (ii). He then formalizes a path as a function, p , from the mathematical interval $[0,1]$ to positions in space, where $p(0)$ correlates to the starting point of the trajectory, and $p(1)$ correlates to the ending point.

(5) Zwarts (2005): A path, p , is a function from $[0,1]$ to positions in space, where

1. $p(0)$ = starting point
2. $p(1)$ = end point
3. $\forall i \in [0,1]$, $p(i)$ is the corresponding point on the path

Thus, in Zwarts's system, a path PP like $\llbracket \text{into the house} \rrbracket$ denotes a set of paths (those where the endpoint, $p(1)$, is located inside the house). The following are examples of path PP denotations:

(6) Zwarts's (2005) Style Path PP Denotations

- | | | |
|--|---|---|
| $\llbracket \text{into the house} \rrbracket$ | = | $\{p: p(1) \subseteq \text{LOC}(\text{the-house})\}$ |
| $\llbracket \text{towards the house} \rrbracket$ | = | $\{p: p(1) \text{ is closer to } \text{LOC}(\text{the-house}) \text{ than } p(0)\}$ |
| $\llbracket \text{through the house} \rrbracket$ | = | $\{p: \exists i [i \neq 0,1] \wedge p(i) \subseteq \text{LOC}(\text{the-house})\}$ |

We can thus think of GOAL-OF-MOTION readings as describing a motion event where the motion takes place along a path, and a place (denoted by an NP or PP) is interpreted as indicating the endpoint, $p(1)$, of this motion. This contrasts with a LOCATION interpretation, where the

NP or PP is interpreted as the containing the entire path of the motion – i.e., all of the points along the path, $\forall i \in [0,1], p(i)$, are contained in the spatial trace of the NP/PP. These different interpretations can be illustrated by the English minimal pair in (7):

- (7) English GOAL-OF-MOTION VS LOCATION interpretations
 a. The little girl danced [into the house]_{PP} GOAL-OF-MOTION
 b. The little girl danced [in the house]_{PP} LOCATION

The PP “into the house” in (7a) is interpreted as marking a GOAL-OF-MOTION, as shown by the fact that this sentence is false in Context 1, where the entire path of motion is contained within “the house.” In contrast, the sentence is true in Context 2, where only the endpoint of the path of motion is contained within “the house.” The PP “in the house” in (7b), on the other hand, is interpreted as containing the entire path of motion, indicated by its falseness in Context 1, and truth in Context 2.

(8) **Context 1: LOCATION READING**

$\forall i \in [0,1], p(i) \subseteq \text{LOC}(\text{the-house})$

The little girl is in the house. She starts dancing. After a couple minutes, she is tired and stops. She is still inside the house.

- | | |
|--------------|---|
| → (7a) False | The little girl danced [into the house] _{PP} |
| → (7b) True | The little girl danced [in the house] _{PP} |

Context 2: GOAL OF MOTION READING

$p(1) \subseteq \text{LOC}(\text{the-house})$

The little girl is in the garden beside the house. She starts dancing. She dances right through the open door of the house. Once inside the house, she stops dancing.

- | | |
|--------------|---|
| → (7a) True | The little girl danced [into the house] _{PP} |
| → (7b) False | The little girl danced [in the house] _{PP} |

Given this definition of the difference between goal-of-motion and location readings, we now turn to our initial observations regarding the distribution of these readings in Thai DSVs.

1.2.2 Goal-of-Motion readings in Thai DSVs – initial observations

The basic observation we make for Thai motion constructions is that a deictic verb (*pay* “go,” *maa* “come”) is usually required in order to have a goal-of-motion interpretation for a location-indicating NP. This is shown in (9), where the context specifies that *ta^Llaad^L* “the market” is the endpoint of the motion. While the sentence in (a), with the deictic verb *pay* “go” is acceptable, the sentence in (b), lacking the deictic verb *pay* “go” is unacceptable in the context.

- (9) **Context:** Phaa is halfway between my office and the market. Her friend wants to meet her for lunch, so she texts her friend to let her know where she is:

- a. ฉัน เดิน ไป (ที่) ตลาด
chan^R *dəən* *pay* (*thii^F*) *ta^Llaad^L*
 I walk go (PREP) market
 “I’m walking to the market.”
- b. ฉัน เดิน (ที่) ตลาด
#chan^R *dəən* (*thii^F*) *ta^Llaad^L*
 I walk PREP market
 “I’m walking (all around, at) the market.”

The data in (10) show that the other verb in the deictic class, *maa* “come,” can fulfil the same role. Again, the context provided is one that specifies that at the *ta^Llaad^L* “the market” is the endpoint of the motion. While the sentence in (a), with the deictic verb *maa* “come” is acceptable, the sentence in (b), lacking the deictic verb *maa* “come” is unacceptable in the context.

- (10) **Context:** Phaa is at the market, looking for lunch. Her friend wants to meet up with her, so she texts her friend to tell her to come find her at the market:

- a. เดิน มา ตลาด
dəən maa ta^Llaad^L
 walk come Market
 “(Come) walk to the market.”
- b. เดิน ตลาด
#dəən ta^Llaad^L
 walk Market
 “(Come) walk to the market.”

The data in (9) and (10) show cases where the location in question is indicated by what looks like a bare NP, *ta^Llaad^L*- the data in (11) show that the same generalization holds for cases where the location is marked by what looks like a PP, *taay^Fsa^Lphaan* “under the bridge.” While the sentence in (11a), with the deictic verb *pay* “go” is acceptable in a goal-of-motion context, the sentence without *pay* “go” in (11b) is not.

- (11) **Context 1:** The boat is floating along the river. It reaches the point where the bridge lies across the river.

- (11a) Acceptable
 (11b) Unacceptable

Context 2: The boat is at anchor, floating under the bridge.

- (11a) Unacceptable
 (11b) Acceptable

- a. เรือ ลอย ไป (ที่) ใต้ สะพาน
rua looy pay (t^{hi}i^F) taay^F sa^Lphaan
 boat floated go (PREP) under the bridge
 “The boat floated under the bridge.” GOAL-OF-MOTION

- b. เรือ ลอย (ที่) ใต้ สะพาน
 rua looy (thii^F) taay^F sa^Lphaan
 boat floated (PREP) under bridge
 “The boat floated under the bridge.” LOCATION

This basic observation – i.e., that deictic verbs are usually required for goal-of-motion readings – is not universal, however. In some cases, deictic verbs are not required for a goal-of-motion reading, as shown by the data in (12a), where a goal-of-motion reading is allowed, in the absence of either the deictic verb *pay* “go” or *maa* “come.” While the presence of a deictic verb is allowed, as shown in (12b), it is not required.

(12) V_{init} = Vertical Path of Motion Verb – Descend

- a. ลิฟท์ ลง (*ที่) ชั้น สอง
 lift loŋ (*thii^F) chan^H soŋ^R
 lift descend (*PREP) floor two
 “The elevator is going down to the second floor.”
- b. ลิฟท์ ลง ไป (ที่) ชั้น สอง
 lift loŋ Pay (thii^F) chan^H soŋ^R
 lift descend (go) (PREP) floor two
 “The elevator is going down to the second floor.”

An interesting observation about (12a) and (12b) is that these two sentences differ in terms of whether the presence of the preposition *thii^F* is grammatical. While the *pay*-construction allows the presence of *thii^F*, the *pay*-less construction does not. This contrasts with the previous data in (9), (10) and (11), where in both constructions (i.e., constructions with and without a deictic verb), the presence of *thii^F* is allowed (although optional).

Given these observations, we posed the following questions to guide our research:

- Q1. When are deictic verbs (*pay*, *maa*) required for a goal-of-motion reading? (and why?)
 Q2. When is the preposition *thii^F* “at” unacceptable? (e.g., (12a).)

2. DATA AND GENERALIZATIONS

Recall the six-verb examples of a DSV from Sudmuk (2005), reproduced below:

- (13)
- | | | | | | | |
|----|--|------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| | V1 | V2 | V3 | V4a | V4b | V5 |
| a. | <i>khaw^R</i> | <i>wiŋ^F</i> | <i>troŋ^M</i> | <i>jɔɔn^R</i> | <i>klap^L</i> | <i>khaw^F</i> |
| | 3.pro | run | go.str | reverse | return | enter |
| | “He ran straight back in (away from the speaker’s centre of attention).” | | | | | |
-
- | | | | | | | | |
|----|---|------------------------|-------------------------|-------------------------|--------------------------|--------------------------|------------------------|
| | V1 | V2 | V3 | V4a | | V4b | V5 |
| b. | <i>maa</i> | <i>wiŋ^F</i> | <i>troŋ^M</i> | <i>jɔɔn^R</i> | <i>khaam^M</i> | <i>sa^L-</i> | <i>ɔɔk^M</i> |
| | <i>lii</i> | | | | | <i>phaan^M</i> | <i>pay^M</i> |
| | Maa | run | go.str | re- | cross | bridge | exit |
| | lee | | | verse | | | go |
| | “Maalee ran straight back, crossing the bridge, out (away from the speaker).” | | | | | | |

Unfortunately, when collecting data judgments from our consultants, we found no strong judgements with six-verb DSVs or even with four-verb DSVs. We thus restricted our research to structures with a maximum of three verbs, as follows:

(14) Empirical Scope of the Research – V1 + V3 + V5 Structures

V1	V3	V5
motionverb	path-direction verb	deictic verb
e.g.,	e.g.,	e.g.,
dəən “walk”	loŋ “descend”	pay “go”
bin “fly”	khun ^F “ascend”	maa “come”
wiŋ ^L “run”		
khap ^L “drive”		

We further only looked at the following frame structures:

(15) Empirical Scope of the Research - Frame Sentences

- (i) V + NP_{location}
- (ii) V + [*thii*^F NP_{location}]_{PP}
- (iii) V + pay/maa+ NP_{location}
- (iv) V + pay/maa+ [*thii*^F NP_{location}]_{PP}

Where V is a variable over a (often trivial) sequence of verbs, replacable with V = V1, V3, or V1 + V3.

In other words, we only looked at cases where the location was denoted by a bare NP, or a [*thii*^F NP_{location}]_{PP}, leaving structures with possibly multiple-headed PPs like (11) as an extra level of complexity to investigate in further research. In the course of our data collection, we made the following observations:

Observation 1a: Directional path verbs like *khun*^F “ascend”, and *lon* “descend” do not require additional verbs to be compatible with a GOAL-OF-MOTION interpretation, but

Observation 1b: Manner-motion verbs like *dəən* “walk”, *bin* “fly”, *wiŋ*^L “run”, and *khap*^L “drive” do require an additional path verb like the deictic *pay/maa*, or vertical path verb *khun*^F/*lon* in order to have a GOAL-OF-MOTION interpretation.

Observation 2: In GOAL-OF-MOTION cases where the path-verb is instantiated by the vertical path verb *khun*^F/*lon* “ascend/descend”, a [*thii*^F NP_{location}]_{PP} is unacceptable, unless a deictic verb like *pay/maa* “go/come” is also present.

In the following subsections, we present the data underlying these generalizations.

2.1 VERB COMPLEX 1: V_{init} = Vertical Path of Motion Verb (V=V3)

In this section, we look at the data underlying observation 1a – i.e., that directional path verbs like *khun^F* “ascend”, and *loy* “descend” do not require additional verbs to be compatible with a GOAL-OF-MOTION interpretation. We thus constructed sentences where the V in the frame sentences from (i) – (iv) was replaced by a vertical path verb like *khun^F* “ascend”, or *loy^M* “descend” and determined whether the resulting sentence was compatible in a goal-of-motion context. Table 1 summarizes our results.

Table 1. $V = V_{vertical-path}$ eg., *khun^F* “ascend”, *loy^M* “descend”

Goal-Of-Motion Interpretation	Allowed? (Allowed or Not)
(i) $V + NP_{location}$	✓ (a)
(ii) $V + [thii^F NP_{location}]_{PP}$	✗ (b)
(iii) $V + pay/maa + NP_{location}$	✓ (c)
(iv) $V + pay/maa + [thii^F NP_{location}]_{PP}$	✓ (c)
→ <i>pay/maa</i> OPTIONAL	
→ <i>thii^F</i> ACCEPTABLE WITH PAY	

The data previously presented as (12), with the verb *loy* “descend”, is reproduced below in (16). The same pattern is shown in (17) for the verb *khun^F* “ascend”. These data show that directional path verbs like *khun^F* “ascend”, and *loy* “descend” by themselves, are compatible with a goal-of-motion interpretation for a following NP (16/17a), but not for a following $[thii^F NP_{location}]_{PP}$, which is just not only semantically unacceptable, but can also be judged to be ungrammatical (16/17b), unless a deictic verb like *pay/maa* is also present (16/17c).

(16) V_{init} = Vertical Path of Motion Verb – Descend

- a. ลิฟท์ ลง ชั้น สอง
 lift *loy* *chan^H* *sɔɔŋ^R* (i)
 lift descend floor two
 “The elevator is going down to the second floor.”

- b. *ลิฟท์ ลง ที่ ชั้น สอง
 lift *loŋ* *thii^F* *chan^H* *sɔɔŋ^R* (ii)
 lift descend PREP floor two
 “The elevator is going down to the second floor.”

- c. ลิฟท์ ลง ไป (ที่) ชั้น สอง
 lift *loŋ* *Pay* (*thii^F*) *chan^H* *sɔɔŋ^R* (iii/iv)
 lift descend (go) (PREP) floor two
 “The elevator is going down to the second floor.”

(17) V_{init} = Vertical Path of Motion Verb – Ascend

- a. ลิฟท์ ขึ้น ชั้น สอง
 lift *khun^F* *chan^H* *sɔɔŋ^R* (i)
 lift ascend floor two
 (go)
 “The elevator is going up to the second floor.”

- b. *ลิฟท์ ขึ้น ที่ ชั้น สอง
 lift *khun^F* *thii^F* *chan^H* *sɔɔŋ^R* (ii)
 lift ascend PREP floor two
 (go)
 “The elevator is going up to the second floor.”

- c. ลิฟท์ ขึ้น ไป (ที่) ชั้น สอง
 lift *khun^F* *Pay* (*thii^F*) *chan^H* *sɔɔŋ^R* (iii/iv)
 lift ascend (go) (PREP) floor two
 “The elevator is going up to the second floor.”

2.2 VERB COMPLEX 2: V_{init} = Manner Motion Verb (V=V1)

In this section we present the data underlying observation 1b – i.e., that manner-motion verbs like *dəən* “walk”, *bin* “fly”, *wiŋ^L* “run”, and *khap^L* “drive” require an additional path-type verb like the deictic *pay/maa*, or directional *khun^F/loŋ* in order to have a GOAL-OF-MOTION interpretation. The results are summarized in Table 2.

Table 2. V=V_{manner} e.g., *dəən* “walk”, *bin* “fly”, *wiŋ^L* “run”, *khap^L* “drive”

V_{manner} alone (describing horizontal movement)

Goal-Of-Motion Interpretation	Allowed? (Allowed or Not)
(i) V + NP _{location}	✗ (a)
(ii) V + [<i>thii^F</i> NP _{location}] _{PP}	✗ (a)
(iii) V + <i>pay/maa</i> + NP _{location}	✓ (b)
(iv) V + <i>pay/maa</i> + [<i>thii^F</i> NP _{location}] _{PP}	✓ (b)

→ *pay/maa* REQUIRED
→ *thii^F* OPTIONAL

Recall that the data in (9) showed this pattern for the manner motion verb *dəən* “walk.” The data in (18) and (19) show the same pattern for the manner motion verbs *khap^L* “drive”, and *bin* “fly”, respectively. The data in (18/19a) show that these verbs, by themselves, are incompatible with a goal-of-motion context. Note that in this case, the sentences are not ungrammatical; rather they express a LOCATION reading. In a location context (e.g., where Suda is driving all around Suratthaani Province), the sentence in (18a) is acceptable, although the addition of the aspectual marker *yuu^L* following the verb is preferred. The data in (18/19b) show that the addition of the deictic verb *pay* “go” shifts the meaning of the sentences so that they are compatible with a goal-of-motion context.

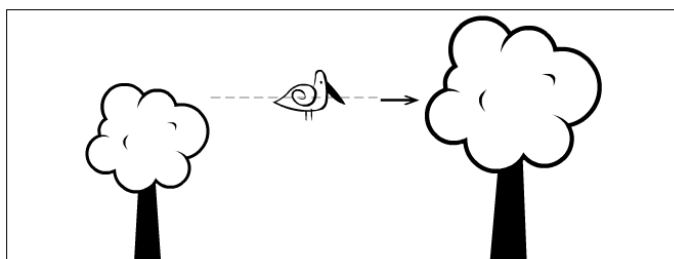
(18) V_{manner} (Horizontal Movement Component Only)

Context: Suda is on his way to Suraatthani Province, driving.

- a. #เขา ขับ (ที่) สุราษฎร์ธานี
khaw^R khap^L (thii^F) suraat^F (i/ii)
 he drive (PREP) Suraatthani.Province
 (Location reading – preferred to have *yuu^L*)
- b. เขา ขับ ไป (ที่) สุราษฎร์ธานี
khaw^R khap^L pay (thii^F) suraat^F (iii/iv)
 he drive go (PREP) Suraatthani.Province
 “He is driving to Suraatthani Province.”

(19) V_{manner} (Horizontal Movement Component Only)

Context a: A bird is flying from one tree to another (larger) tree



- a. #นก บิน (ที่) ต้นไม้ใหญ่
 nok^L bin (thii^F) ton^Fmaay^H yay^L (i/ii)
 bird fly (PREP) tree big
 “The bird is flying at/around the big tree”
 (Location reading – preferred to have yuu^L)

- b. นก บิน ไป (ที่) ต้นไม้ใหญ่
 nok^L bin pay (thii^F) ton^Fmaay^H yay^L (iii/iv)
 bird fly go (PREP) tree big
 “The bird is flying to the big tree.”

Notice that for both of the (18) and (19) examples (a) and (b), the presence of the prepositional *thii^F* is optional.

2.3 VERB COMPLEX 3: V= V1_{manner} + V3 vertical “path of motion”

In the previous cases, the path of motion presented in the context was purely horizontal. In this section we look at cases where the path has both a horizontal and vertical component. In the cases we investigated, the addition of a vertical path verb (e.g., *khun^F* “ascend”) is additionally allowed in these cases. The data in (20) with *dəən* “walk” shows that a vertical path verb is not necessary in this sort of context; the presence of a deictic verb like *pay* “go” is sufficient to license a vertical goal-of-motion reading.¹ Without the addition of a verb like *khun^F* “ascend”, this case

¹ Although see section 5.2.2 where we discuss an additional data where the presence of a

patterns exactly like the previous data in section 2.2. The data in (21) shows the same pattern with the manner motion verb *bin* “fly”.

(20) V^{MANNER} (HORIZONTAL + VERTICAL COMPONENT)

Context: Suda is walking up the stairs to floor three

- a. #เขา เดิน (ที่) ชั้น สาม (i/ii)
 khaw^R dɔɔn (thii^F) chan^H saam^F
 he walk (PREP) floor three
 “He is walking around the third floor.”
 (*Location reading – preferred to have yuu^L*)
- b. เขา เดิน ไป (ที่) ชั้น สาม (iii/iv)
 khaw^R dɔɔn pay (thii^F) chan^H saam^F
 he walk go (PREP) floor three
 “He is walking up to the third floor.”

(21) V^{MANNER} (HORIZONTAL + VERTICAL COMPONENT)²

Context: A bird in the atrium of a mall is flying up to the third floor

- a. #นก บิน (ที่) ชั้น สาม (i/ii)
 nok^L bin (thii^F) chan^H saam^F
 bird fly (PREP) floor three
 “The bird is flying to the third floor.”
 (*Location reading – preferred to have yuu^L*)

vertical path verb is necessary to facilitate a goal-of-motion reading where the path has a vertical component.

² We found that the verb *bin* “fly” doesn’t always behave as shown in this section; see section 5 for more details.

- b. นก บิน ไป (ที่) ชั้น สาม
 nok^L bin pay (thii^F) chan^H saam^F (iii/iv)
 bird fly go (PREP) floor three
 “The bird is flying to the third floor.”

When a vertical path verb (e.g., (a) V3-type verb like *khun^F* “ascend”) is present, however, the pattern is different from the data we just saw in section 2.2 (but similar to the pattern in 2.1). This pattern is summarized in Table 3.

Table 3. V = V_{manner} + V_{vertical-path}

Goal-Of-Motion Interpretation	Allowed? (Allowed or Not)
(i) V + NP _{location}	✓ (a)
(ii) V + [thii ^F NP _{location}] _{PP}	✗ (b)
(iii) V + pay/maa + NP _{location}	✓ (c)
(iv) V + pay/maa + [thii ^F NP _{location}] _{PP}	✓ (c)
→ pay/maa	OPTIONAL
→ thii ^F	UNGRAMMATICAL WITHOUT PAY

The data in (22) and (23) show this for the verbs *dəən* “walk” and *bin* “fly”, respectively. (22/23a) show that with the presence of the vertical path verb *khun^F* “ascend”, no deictic verb *pay/maa* is required to license a goal-of-motion reading for a following NP. (22/23b) show, however, that this is not the case for a following [thii^F NP_{location}]_{PP}, which results in ungrammaticality, unless a deictic verb like *pay/maa* is also present, as shown in (22/23c).Context

- (22) V^{MANNER} + V_{V-PATH} (HORIZONTAL + VERTICAL COMPONENT)

Context: Suda is walking up the stairs to floor three

- a. เขา เดิน ขึ้น ขึ้น สาม
 khaw^R dəən khun^F chan^H saam^F (i)
 he walk ascend floor three
 “He is walking up to the third floor.”

- b. *เขา เดิน ขึ้น ที่ ชั้น สาม
khaw^R dɔɔn khun^F thii^F chan^H saam^F (ii)
 he walk ascend PREP floor three
 “He is walking up to the third floor.”
- c. เขา เดิน ขึ้น ไป ที่ ชั้น สาม
khaw^R dɔɔn khun^F pay thii^F chan^H saam^F (iii/iv)
 he walk ascend go PREP floor three
 “He is walking up to the third floor.”

(23) $V^{\text{MANNER}} + V_{\text{V-PATH}}$ (HORIZONTAL + VERTICAL COMPONENT)

Context: A bird in the atrium of a mall is flying up to the third floor

- a. นก บิน ขึ้น ขึ้น สาม
nok^L bin khun^F chan^H saam^F (i)
 bird fly ascend floor three
 “The bird is flying to the third floor.”
- b. *นก บิน ขึ้น ที่ ชั้น สาม
nok^L bin khun^F thii^F chan^H saam^F (ii)
 bird fly ascend PREP floor three
 “The bird is flying to the third floor.”
- c. นก บิน ขึ้น ไป (ที่) ชั้น สาม
nok^L bin khun^F pay (thii^F) chan^H saam^F (iii)
 bird fly ascend go (PREP) floor three
 “The bird is flying to the third floor.”

Thus, we observe that cases where $V = V1_{\text{nanner}} + V3_{\text{v-direction}}$ are exactly parallel to the cases presented in section 2.1, where $V = V3_{\text{v-direction}}$.

2.5 Summary of the Data Generalizations

The data can be summarized as in table IV, where the ✓ indicates that the construction is grammatical and compatible with a goal-of-motion

interpretation. The infelicity sign # indicates that the construction is grammatical, but not compatible with a goal-of-motion interpretation – rather the NP/PP is interpreted as a location. The unattested symbol * indicates that the construction is ungrammatical (and hence untestable for felicity within the goal-of-motion context).

Table 4. Summary of Data Patterns

Goal-Of-Motion Interpretation	V = V1	V = V3	V = V1 + V3
(i) V + NP _{location}	#	✓	✓
(ii) V + [<i>thii</i> ^F NP _{location}] _{PP}	#	*	*
(iii) V + <i>pay/maa</i> + NP _{location}	✓	✓	✓
(iv) V + <i>pay/maa</i> + [<i>thii</i> ^F NP _{location}] _{PP}	✓	✓	✓

The overall generalizations can be summarized in terms of two observations:

Observation 1: GOAL-OF-MOTION interpretations for a following NP/PP require a path verb in the DSV construction – either a vertical directional path verb like *khun*^F/*loŋ* “ascend/descend”, or deictic path verb like *pay/maa* “go/come”; manner motion verbs alone are insufficient.

Observation 2: In GOAL- OF- MOTION cases where the path- verb is instantiated by the vertical path verb *khun*^F/*loŋ* “ascend/descend”, a [*thii*^F NP_{location}]_{PP} is unacceptable, unless a deictic verb like *pay/maa* “go/come” is also present.

In section 3 we will argue that goal-of-motion interpretations are only licensed when the verbal predicate has a semantic path argument, and that Observation 1 follows from an analysis where manner motion verbs in Thai lack a path argument, and that Thai lacks a compositional process where PPs can introduce path arguments. The infelicity of the # cases thus follows from a lack of a semantic path argument. We will also argue that path-motion verbs differ in terms of whether they lexically encode information about an internal path structure (where vertical direction path verbs *khun*^F/*loŋ* verbs “ascend/descend” encode this structure, but deictic path verbs like *pay/maa* “go/come” do not). This semantic difference in

subpath structure maps onto a difference in syntactic structure, which we formalize using Ramchand's (2008) First Phase Syntax. These two distinct structures are associated with different semantic type-driven selectional restrictions. The ungrammaticality of the * cases follows from a semantic incompatibility between the path structure of verbs like *khun^F/loŋ* "ascend/descend" and *[thi^F NP_{location}]_{PP}*.

3. THEORETICAL FRAMEWORK AND ANALYSIS FOR GENERALIZATION 1

Because the data generalizations are primarily semantic as opposed to distributional – i.e., our goal is to predict the presence/absence of goal-of-motion interpretations – we propose an analysis using compositional semantics. We assume a basic type-driven semantic system where the lexical entries of words (formalized as typed lambda expressions) combine via type-sensitive compositional rules to eventually produce the meaning of the sentence in the form of truth-conditions (cf. Heim and Kratzer 1998). In this sort of system, readings/interpretations can be ruled out if the truth-conditions required are either (i) not contained in the lexical entries of the words making up the sentence, or (ii) if the type-driven system of compositional rules does not allow the lexical entries to combine in such a way so as to create those truth-conditions. Crosslinguistic differences in the availability of interpretations must follow from (i) differences in the lexical entries of the languages, or from (ii) differences in the compositional rules available to the language. In this section, we present the theoretical machinery required to formalize our lexical entries for Thai motion verbs and our system of compositional rules. In particular, in section 3.1 we discuss compositional approaches to incorporating semantic path arguments into VPs (i.e., Gawron's 2005 path-operator). In section 3.2 we discuss Rothstein's (2004) approach to secondary predication, and adapt her subject individual-introducing compositional rule, SSUM, into a path-introducing compositional rule, PSUM_B.

3.1 Incorporating Path Arguments into the Lexical Entry of Motion Verbs

In section 1.2.1 we introduced the notion of semantic path arguments in PPs, discussing Jackendoff (1983) and Zwarts (2005). Recall that Zwarts (2005) decomposes paths into three components: (i) the starting point, (ii) the endpoint, and (iii) ordered points between (i) and (ii). His formalization is repeated below in (24).

(24) Zwarts (2005): A path, \mathbf{p} , is a function from $[0,1]$ to positions in space, where

1. $\mathbf{p}(0)$ = starting point
2. $\mathbf{p}(1)$ = end point
3. $\forall i \in [0,1], \mathbf{p}(i)$ is the corresponding point on the path

Zwarts's formalization of paths, however, applies to PPs, which is interested in the paths encoded in verbs. Gawron (2005), looking at motion verbs, formally incorporates paths into the verbal domain by proposing a path operator, paths , which applies to events, and yields a path function.

(25) $\text{paths}(e) = \pi$

Gawron's path function, π , is a function that maps X from a spatiotemporal index, (for our purposes, a temporal index), to the location of the verbal event's theme/figure. This contrasts with Zwarts's prepositional path functions, which are functions that map X from the mathematical interval $[0,1]$ to locations. In order to relate this compositionally to Zwarts's prepositional paths, we can use a function to map the temporal indices within the runtime of the event, $\tau(e)$, to points in the mathematical interval $[1,0]$ – i.e., a function to map a temporal interval onto the mathematical interval.³ Such a function, \mathbf{F} , is provided in (26).

³ The reader may wonder why we do not just use the system that Gawron (2005) provides for PP paths and VP paths, as that would not require us to propose a mapping from π to \mathbf{p} . Gawron's semantics for paths, however, is more complex than Zwarts's, involving spatiotemporal slices via a function, SLICE . As our data do not require the extra complexity, we choose to map to Zwarts's simpler system.

(26) Function from Instants in $\tau(e)$ to the mathematical interval $[0,1]$

Let **F** be the function that maps from instants in $\{t: t \in \tau(e)\}$ to indices in $[0,1]$

F: $\{t: t \in \tau(e)\} \rightarrow [0,1]$
 such that $\forall t, t' \in \tau(e) [t < t'] \rightarrow [F(t) < F(t')]$
 (i.e., if t precedes t' , then $F(t)$ is less than $F(t')$)

This function is a linear mapping where precedence relations are preserved – i.e., a function where for all mathematical indices, i and j , where i numerically precedes j , then i and j map onto temporal indices t_i and t_j so that t_i temporally precedes t_j . A diagrammatic representation of the function is provided in (27).

(27) Diagrammatic Representation of **F**: $\{t: t \in \tau(e)\} \rightarrow [0,1]$

RUNTIME OF EVENT:	t_{init}	t_1	t_2	t_3	t_4	t_{97}	t_{98}	t_{99}	t_{fin}
	↓	↓	↓	↓	↓		↓	↓	↓	↓
MATHEMATICAL INTERVAL:	0,	0.1,	0.2,	0.3,	0.4	0.97,	0.98,	0.99,	1.0

Now that we have a way to map from paths to events, we need to introduce paths into the semantics of verbs. Gawron introduces paths into the semantics of motion verbs by encoding them in the definedness conditions of the verb – an example is given in (28):

(28) $\llbracket \text{zigzag} \rrbracket(e)$ iff $\text{zigzag-shape} \circ \text{paths}(e)$
 (defined iff the path of e overlaps with zigzag-shape)

Definedness conditions, however, are not available for modification by the compositional semantics. Therefore, as we want to be able to introduce paths and modify paths (via the addition of serial verbs within the DSV construction), we cannot adopt Gawron's formalization. We will instead introduce paths as a semantic argument into the lexical entry of path- motion verbs (cf. Krifka 1998; Beavers 2003). The theoretical motivation to incorporate a path argument into the lexical entry of motion

verbs is thus parallel to Davidson's motivation to incorporate an event argument into the lexical entry of verbs – we want lexical elements to be able to compositionally introduce, modify and refer to paths. We will also follow the standard Davidsonian approach to satisfying event arguments via existential closure – i.e., we assume that if no overt syntactic path argument is provided to satisfy the path argument, the argument will be satisfied via existential closure at the sentence-level. A sample template (and example) of the denotation of our proposed path-motion verbs is provided in (29a), as a lambda expression (29b) represents the same information as a simplified theta-grid.

(29) Sample Template for PATH-MOTION verbs:

- a. $\lambda p. \lambda x. \lambda e. \text{AG-TH}(e)=x \wedge \text{paths}(e)=\pi \wedge p(F(t))=\pi(t)$
 eg., $\llbracket \text{rise}_v \rrbracket = \lambda p. \lambda x. \lambda e. \text{AG-TH}(e)=x \wedge \text{paths}(e)=\pi \wedge p(F(t))=\pi(t)$
 $\wedge p(1) >_y p(0)$
- b. Thematic Grid for Path-Motion Verbs
 - (1. Path)
 Where
 2. Agent-Theme
 - (3. Event)

A path-motion verb thus takes three arguments – a path, p , an individual, x , and an event, e . The individual argument, x , is identified as the agent and theme of the event, e . The range of the path argument, p , is identified as mapping directly onto the range of π , the path of the event, via the function F . Any additional information about the properties of the path, p , can be lexically encoded by additional conjuncts within the semantic formula, as shown in the example denotation for the English verb, *rise*, where the path, p , is additionally restricted so that the final point of the path, $p(1)$ is vertically higher than the initial point of the path $p(0)$.

3.2 Rothstein (2004)’s Secondary Predication and Sum-Operation Rules

Having set up a template for the lexical entry of motion-path verbs, we now need semantic mechanisms to compositionally combine different types of motion verbs – i.e., compositional rules. In addition to the standard compositional rules of functional application (FA), predicate modification (PM) and predicate abstraction (PA) (Heim and Kratzer 1998), we will use a modification of Rothstein’s (2004) secondary predication approach in order to provide a formulation of the semantics involved in the introduction and modification of path arguments in Thai directional serial verb constructions.

Rothstein (2004) identifies two types of secondary predication – depictive predication and resultative predication. These types of secondary predication can also be categorized according to whether the secondary predicate is predicated of the subject or object. This four-way distinction is illustrated by the examples in (30) and (31).

(30) Depictive Predication

- | | | |
|----|---|------------------|
| a. | John _i drove the car drunk _i | subject-oriented |
| b. | Mary drank the coffee _i hot _i | object-oriented |

(31) Resultative Predication

- | | | |
|----|--|-----------------|
| a. | John _j painted the house _i red _{i/*j} | object-oriented |
| b. | John laughed *(himself _i) sick _i | object-oriented |

Rothstein argues that secondary predication, semantically, must involve a SUM operation and not set intersection. This is because the two predicates involved in secondary predication can have distinct thematic structures and distinct aspectual structures. Two predicates with incompatible thematic and aspectual structures should have a zero-intersection, and thus would be unable to yield a non-zero set of events if they combine via set intersection. She thus proposes a basic sum-operation for formalizing secondary predicate formation, given in (32). This operation takes two predicates of events, P_1 and P_2 , and creates a new

predicate of events, where the event argument, e , is the singular sum of two events, a P_1 event, e_1 , and a P_2 event, e_2 . These two subevents, e_1 and e_2 , further must satisfy **TPCONNECT**, which requires that these two events have the same runtime, and share a participant, y .⁴

$$\begin{aligned}
 (32) \text{ SUM } [P_1(e_1), P_2(e_2)] = \\
 \lambda e. \exists e_1 \exists e_2 [e =^s (e_1 \oplus e_2) \wedge P_1(e_1) \wedge P_2(e_2) \wedge \text{TPCONNECT}(e_1, e_2, y)] \\
 \text{Where } \text{TPCONNECT}(\Delta(e_1), e_2, y) = 1 \text{ iff} \\
 \begin{aligned}
 & (i) \tau(e_1) = \tau(e_2) \\
 & (ii) e_1 \text{ and } e_2 \text{ share a participant, } y
 \end{aligned}
 \end{aligned}$$

In Rothstein's (description of the) interface between the syntax and the semantics, subject-oriented secondary predication differs from object-oriented predication in that subject-oriented secondary predication involves the introduction of an individual argument. That is, while both predicates in object-oriented secondary predication are of type $\langle e, \langle l, t \rangle \rangle$, where the individual argument of both predicates are related under identity, such arrangement does not hold in the case of subject-oriented secondary predication. In her system, subject-oriented secondary predication involves a main predicate of type $\langle l, t \rangle$, and a secondary predicate of type $\langle e, \langle l, t \rangle \rangle$ - i.e., the secondary predicate effectively introduces a new individual argument to the overall VP predicate. She thus differentiates between **SSUM** (the composition rule required for subject-oriented secondary predication), where an individual argument is introduced, and **OSUM** (the composition rule required for object-oriented secondary predication), where the individual argument is already present in the original predicate. These compositional rules are provided in (33).

⁴ Rothstein's **SUM** operation actually allows for two different formalizations of **TPCONNECT**— one to account for depictive predication (where the runtimes of both events map onto the same intervals, and the other to account for resultative predication (where the runtime of one event maps onto the runtime of the culmination of the other event). As Thai DSV constructions require serial verb events to have the same runtime, we have abstracted away from the mechanism that allows for resultative predication.

$$(33) \text{ OSUM } [P_1(e_1), P_2(e_2)] = \\ \lambda y. \lambda e. \exists e_1 \exists e_2 [e =^s(e_1 \oplus e_2) \wedge P_1(e_1, y) \wedge P_2(e_2, y) \wedge \text{TPCONNECT}(e_1, e_2, y)]$$

$$\text{SSUM } [P_1(e_1), P_2(e_2)] = \\ \lambda e. \exists e_1 \exists e_2 [e =^s(e_1 \oplus e_2) \wedge P_1(e_1) \wedge P_2(e_2) \wedge \text{TPCONNECT}(e_1, e_2, y)]$$

We propose that Thai DSVs involve secondary predication in the spirit of Rothstein's compositional approach – in particular, we propose a PSUM operation (cf. Rothstein's 2004 OSUM, SSUM, RSUM)⁵ This PSUM operation, like Rothstein's other SUM operations, sums two events into a singular event, and further requires that these two events must share a runtime and an individual argument. However, crucially, for our purposes, PSUM will also require that these two events share a path argument, *p*. Following Rothstein, we will also make a distinction between a secondary predication that combines two path-motion verbs VS a secondary predication that combines a non-path motion verb (i.e., a manner-motion verb) with a path-motion verb. These two types of PSUM operations are defined in (34) - PSUMA requires that two path predicates share the same path argument, while PSUMB takes a non-path predicate and a path predicate, and makes *e*₂'s path part of *e*₁.

(34) Path-Oriented Secondary Predication⁶

Type A: Sums two predicates of type $\langle p, \langle e, \langle l, t \rangle \rangle \rangle$

e.g., $V_{v\text{-path}}$ with V_{deictic}

$$\text{PSUMA } [P_{1\langle p, \langle l, t \rangle \rangle}, P_{2\langle p, \langle l, t \rangle \rangle}] = \\ \lambda p. \lambda x. \lambda e. \exists e_1 \exists e_2 [e =^s(e_1 \oplus e_2) \wedge P_1(e_1, p) \wedge P_2(e_2, p) \wedge \text{TPCONNECT}(e_1, e_2, x, p)]$$

⁵ Object-Oriented Secondary Predication; Subject-Oriented Secondary Predication; which are both depictives; and Resultative Secondary Predication.

⁶ This follows a Rothstein-style framework where the subject is introduced VP-externally (cf. Kratzer 1996, among others).

Type B: Sums a predicate of type $\langle e, \langle l, t \rangle \rangle$ with a predicate of type $\langle p, \langle e, \langle l, t \rangle \rangle \rangle$

e.g., V_{manner} with $V_{\text{v-path}} / V_{\text{deictic}}$

$\text{PSUMB} [P_{1\langle l, t \rangle}, P_{2\langle p, \langle l, t \rangle \rangle}(p_2)] =$

$\lambda p. \lambda x. \lambda e. \exists e_1 \exists e_2 [e =^s (e_1 \oplus e_2) \wedge P_1(e_1) \wedge P_2(e_2, p) \wedge \text{TPCONNECT}(e_1, e_2, x, p)]$

An important thing to note about our proposed compositional rules PSUMA and PSUMB is their type-restrictions: these compositional rules require both of the combining elements, P_1 and P_2 , to have an event argument. We will make the assumption that Thai PPs lack event arguments in their lexical entry, and therefore cannot trigger the compositional rules PSUMA or PSUMB. In other words, while motion-path verbs and PPs both have semantic path arguments, only motion path verbs are of the right semantic type to trigger PSUMB and introduce a path argument to a non-path motion verb.

3.3 Analysis for Observation 1

Recall the initial observation:

Observation 1: GOAL-OF-MOTION interpretations for a following NP/PP require a path verb in the DSV construction – either a vertical directional path verb like *khun^F/loŋ* “ascend/descend” (V3), or deictic path verb like *pay/maa* “go/come” (V5); manner motion verbs (1) alone are insufficient.

V1	V3	V5
manner motion verb	path-direction verb	deictic verb
e.g.,	e.g.,	e.g.,
<i>dəən</i> “walk”	<i>loŋ</i> “descend”	<i>pay</i> “go”
<i>bin</i> “fly”	<i>khun^F</i> “ascend”	<i>maa</i> “come”
<i>wij^L</i> “run”		
<i>khap^L</i> “drive”		

We propose that manner motion verbs crucially differ from directional path verbs and deictic verbs in terms of their semantic type. More specifically, we propose that in Thai, V1 manner motion verbs lack

a semantic path argument, while V3 and V5 directional path and deictic verbs have a semantic path argument. This difference is illustrated by the example verb templates in (35) - while manner motion verbs have a template as in (A), and are of type $\langle e, \langle l, t \rangle \rangle$, selecting only for individual and event arguments, the directional path and deictic verb share a template as in (B) and additionally select for a path argument, having the semantic type $\langle p, \langle e, \langle l, t \rangle \rangle \rangle$.

(35) A. Template for the lexical entry of V1-type verbs:⁷

$$\lambda x. \lambda e. \text{AG-TH}(e)=x \wedge \mathbf{manner}_s(e)=\mathbf{M}$$

B. Template for the lexical entry of V3 and V5 -type verbs:

$$\lambda p. \lambda x. \lambda e. \text{AG-TH}(e)=x \wedge \mathbf{paths}(e)=\pi \wedge \mathbf{p}(F(t))=\pi(t)$$

$$\text{e.g. } \llbracket \text{pay} \rrbracket = \lambda p. \lambda x. \lambda e. \text{AG-TH}(e)=x \wedge \mathbf{paths}(e)=\pi \wedge \mathbf{p}(F(t))=\pi(t) \\ \wedge p(0) >_{sp} p(1)$$

$$\llbracket khun^F \rrbracket = \lambda p. \lambda x. \lambda e. \text{AG-TH}(e)=x \wedge \mathbf{paths}(e)=\pi \wedge \mathbf{p}(F(t))=\pi(t) \\ \wedge \forall p' \in p \ [\forall i, i' \in [0,1] \ [i' > i \rightarrow p'(i) >_y p'(i')]]$$

When V3 and V5 verbs syntactically combine with each other, they trigger the semantic composition rule PSUMA because they are of the same semantic type $\langle p, \langle e, \langle l, t \rangle \rangle \rangle$. PSUMA identifies the path arguments of the separate verbs as the same path argument via TPconnect. When V3/V5 verbs syntactically combine with an V1 verb of type $\langle e, \langle l, t \rangle \rangle$, they compose via PSUMB, where the path argument of the V3/V5 verb is introduced into the V1-headed VP denotation, yielding a VP of type $\langle p, \langle e, \langle l, t \rangle \rangle \rangle$. Because goal-of-motion readings are defined in terms of $p(1)$, we assume that only VPs with path arguments, p , can be interpreted as such. (Trivial) DSVs consisting purely of manner verbs thus cannot be interpreted as goal-of-motion, as there is no path, and hence no path endpoint, $p(1)$, for an XP to specify. (Trivial) DSVs consisting of a V3 directional path verb like *khun^F/loj* “ascend/descend”, on the other hand,

⁷ We reserve for further discussion the interesting question of what, exactly, a “manner” is, and how it maps onto other elements of the semantic ontology. We have assumed the existence of a function, *manners*, which like Gawron’s *paths* function, maps from a (spatio) temporal trace of the event. Rather than mapping to the spatial location of the event’s figure/theme, though, we assume that it maps to a body-positioning or body-configuration of the event’s figure/theme.

have a path argument, and hence a following XP can specify the endpoint of the path, p(1). In cases where the DSV consists of a V1 manner verb, a V3 or V5 path verb can merge, triggering PSUMB, introducing a path argument (and hence goal-of-motion interpretation) to the VP predicate. A sample composition is provided in (36):

(36) Semantic Composition for V1 + V3 $\llbracket bin \text{ } khun^F \text{ } chan^H \text{ } saam^F \rrbracket$
fly-ascend floor three

$$\begin{array}{c}
\llbracket \text{bin khun}^F \text{ chan}^H \text{ saam}^F \rrbracket = \\
\lambda p. \lambda x. \lambda e. \exists e_1 \exists e_2 [e = {}^s(e_1 \oplus e_2) \wedge \text{AG-TH}(e_2) = x \wedge \mathbf{manner}_s(e_1) = \mathbf{fly}' \wedge \text{AG-TH}(e_2) = x \wedge \mathbf{path}_s(e_2) = \pi \wedge \\
\mathbf{p}(F(t)) = \pi(t) \wedge \forall p' \in p [\forall i, i' \in [0, 1] [i' > i \rightarrow p'(i) >_y p'(i')] \wedge \wedge \text{TPCONNECT}(e_1, e_2, x, p)] \wedge \text{LOC}(\mathbf{floor-3}) = p(1) \\
\\
\llbracket \text{bin khun}^F \rrbracket = \\
\lambda p. \lambda x. \lambda e. \exists e_1 \exists e_2 [e = {}^s(e_1 \oplus e_2) \wedge \text{AG-TH}(e_2) = x \wedge \mathbf{manner}_s(e_1) = \mathbf{fly}' \wedge \text{AG-TH}(e_2) = x \wedge \mathbf{path}_s(e_2) = \pi \wedge \\
\mathbf{p}(F(t)) = \pi(t) \wedge \forall p' \in p [\forall i, i' \in [0, 1] [i' > i \rightarrow p'(i) >_y p'(i')] \wedge \wedge \text{TPCONNECT}(e_1, e_2, x, p)] \\
\\
\llbracket \text{bin} \rrbracket = \qquad \qquad \qquad \llbracket \text{khun}^F \rrbracket = \\
\lambda x. \lambda e. \text{AG-TH}(e) = x \wedge \mathbf{manner}_s(e) = \mathbf{fly}' \qquad \qquad \lambda p. \lambda x. \lambda e. \text{AG-TH}(e) = x \wedge \mathbf{path}_s(e) = \pi \wedge \mathbf{p}(F(t)) = \pi(t) \\
\wedge \forall p' \in p [\forall i, i' \in [0, 1] [i' > i \rightarrow p'(i) >_y p'(i')]]
\end{array}$$

The addition of the directional path verb, *khun*^F, is crucial as it triggers PSUMB, introducing the path argument, **p**, which the following phrase (type <p,t>) *chan*^H *saam*^F “floor three” can modify. If the directional path verb, *khun*^F, had not merged, then the phrase *chan*^H *saam*^F “floor three” could not be interpreted as modifying a path, and hence could not be interpreted as the goal-of-motion. Rather, we propose that the phrase *chan*^H *saam*^F “floor three” must be interpreted as an event modifier, situating the spatial trace of the entire event within the spatial location of “floor three.” A sample composition of this type of construction is provided in (37).

(37) Semantic Composition for V1 $\llbracket bin\ chan^H\ saam^F \rrbracket\ fly\ floor\ three$

$$\begin{array}{c}
 \llbracket bin\ \emptyset_{Adv}\ chan^H\ saam^F \rrbracket = \\
 \lambda x. \lambda e. AG-TH(e)=x \wedge \mathbf{manner}_s(e)=\mathbf{fly}' \wedge loc(e) = floor-3 \\
 \swarrow \quad \searrow \\
 \begin{array}{cc}
 \llbracket bin \rrbracket = & \llbracket \emptyset_{Adv}\ chan^H\ saam^F \rrbracket = \\
 \lambda x. \lambda e. AG-TH(e)=x \wedge \mathbf{manner}_s(e)=\mathbf{fly}' & \lambda e. loc(e) = floor-3
 \end{array}
 \end{array}$$

Recall that PSUMB is only triggered when an element of type $\langle e, \langle l, t \rangle \rangle$ combines with an element of $\langle p, \langle e, \langle l, t \rangle \rangle \rangle$. A PP/NP like “floor three” $chan^H\ saam^F$ (type $\langle e, t \rangle$ or $\langle l, t \rangle$ ⁸) or one like “at floor three” $thii^F\ chan^H\ saam^F$ (type $\langle p, t \rangle$) lack the event argument necessary to trigger this semantic composition rule. Thus, neither of them can introduce a path-argument into the denotation of the VP, and the VP cannot be interpreted as goal-of-motion. This is why V1 + NP_{location} and V1 + [$thii^F$ NP_{location}]_{PP} constructions, while grammatical, cannot be interpreted as goal-of-motion and the NP/PP can only be interpreted as the location of the entire event.

The behaviour of Thai DSVs is crucially different from English manner-motion constructions, as in English, a (directional) PP can, by itself, be interpreted as the goal-of-motion. This contrasts with Thai, where a path-verb must first introduce a path in order to facilitate a goal-of-motion interpretation. We suggest that this difference may follow from two possible analyses: (1) English manner-motion verbs, unlike Thai manner-motion verbs, contain an (unspecified) semantic path argument that can be modified by a directional PP, or (2) English has an additional compositional rule that allows directional PPs to introduce a semantic path argument to VPs. In any case, we argue that neither of these options are available for Thai.

⁸ As a bare NP, we will assume that it has type $\langle e, t \rangle$, but the same surface string can be interpreted as being modified by a null adverbial \emptyset_{Adv} that converts it to type $\langle l, t \rangle$ as per the lambda expression in (37).

4. THEORETICAL FRAMEWORK AND ANALYSIS FOR OBSERVATION 2

In this section, we address the second data generalization, which relates to the acceptability of a following $[thii^F NP_{location}]_{PP}$. Recall:

Observation 2: In GOAL-OF-MOTION cases where the path-verb is instantiated by the vertical path verb $khun^F/loŋ$ “ascend/descend”, a $[thii^F NP_{location}]_{PP}$ is unacceptable, unless a deictic verb like pay/maa “go/come” is also present.

We will suggest that this follows from a difference in the path-structure encoded into vertical path verbs like $khun^F/loŋ$ “ascend/descend”, as compared to deictic verbs like pay/maa “go/come”. Recall Zwarts (2005)’s path decomposition, formalized as in (38).

(38) Zwarts (2005): A path, p , is a function from $[0,1]$ to positions in space, where

1. $p(0)$ = starting point
2. $p(1)$ = end point
3. $\forall i \in [0,1]$, $p(i)$ is the corresponding point on the path

This decomposition can be used to formalize an observation made regarding Denis et al. (2003) and Wechsler (2003) regarding the paths contained in motion-path verbs. They argue that verbal motion paths can differ in terms of the number of the path components that they encode including a distinction between MINIMAL PATHS and EXTENDED PATHS, which we describe below using Zwarts’s function formalization:

(39) MINIMAL paths

- encode $p(1)$ and $p(0)$; no internal structure
e.g., no information about $p(i)$, where $i \in (0,1)$

EXTENDED paths

- encode internal structure in addition to $p(1)$ and $p(0)$
e.g., information about $p(i)$, where $i \in (0,1)$
- three subpaths; SOURCE $p(0)$, VIA, and ENDPOINT $p(1)$

We will suggest that while vertical path verbs like *khun^F/lon* “ascend/descend” are extended path verbs, encoding information about intermediate points on the path, deictic verbs like *pay/maa* “go/come” are minimal path verbs, encoding no information about the internal structure of the path. Rather, they only encode information about **p**(1) and **p**(0) (i.e., for *pay* that **p**(1) is further away from the speaker than **p**(0), and the opposite is the case for *maa*. These distinct path ‘sub-structures’ correlate to a distinct syntax, with distinct semantic restrictions on their complements. While a minimal path *pay/maa* structure is compatible with either a bare NP or *[thii^F NP_{location}]_{PP}*, an extended path *khun^F/lon* construction is only semantically compatible with a bare NP. To formalize our analysis, we will use the system of syntax-semantics mapping in Ramchand (2008)’s First Phase Syntax.

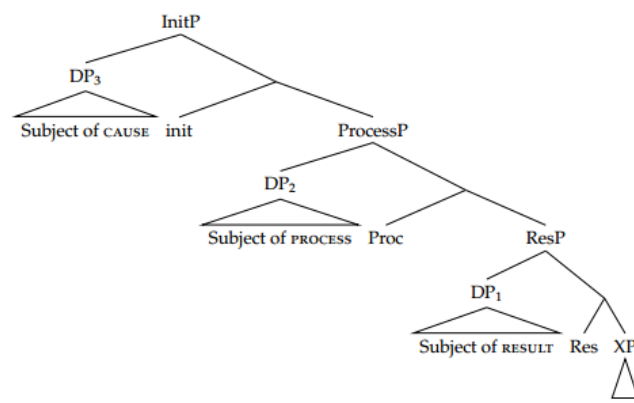
4.1 Ramchand’s (2008) First Phase Syntax

In our current system, paths are represented as semantic arguments in the denotations of PPs and path-motion VPs. These path arguments, at present, are represented as primitives in the system. In order to distinguish between path-arguments with an internal structure (extended paths), and path arguments without an internal structure (minimal paths) we need a way to represent path sub-structure. We suggest that Ramchand’s (2008) decomposition of event substructure provides the sort of path sub-structuring that we require.

Ramchand (2008) proposes a complex VP structure consisting of up to three subevent components, each subevent represented with a distinct functional projection:

- (i) InitP encodes a causing subevent
- (ii) ProcP encodes a process-denoting subevent
- (iii) ResP encodes a result-state subevent

(40)



The head of each of these functional projections is associated with a specific lexical entry so that the specifier of each functional projection is associated with a specific thematic/ semantic role. Examples of these semantic roles are **INITIATOR**, **UNDERGOER**, **RESULTEE**, **PATH** and **RHEME**. Of particular interest for our purposes is the syntactic position associated with Ramchand's PATH theta role and RHEME theta role. She proposes that dynamic ProcP heads are encoded with path structures, and that any RHEME complement to such a Proc head must homomorphically map to this path structure (cf. Krifka's 1989 'Mapping-to-Objects' and 'Mapping-to-Events', among others.). Thus, the event-structure of the verb, and the internal composition of the RHEME must be consistent – i.e., if the verb is bounded/quantized, the RHEME must be bounded/quantized, and if the verb is unbounded/ unquantized, the RHEME must be unbounded/unquantized.

(41) Ramchand's Homomorphic Requirement (cf. Krifka 1989)

The topological properties of the PP/DP Rheme must be consistent with the topological properties encoded in the event structure.

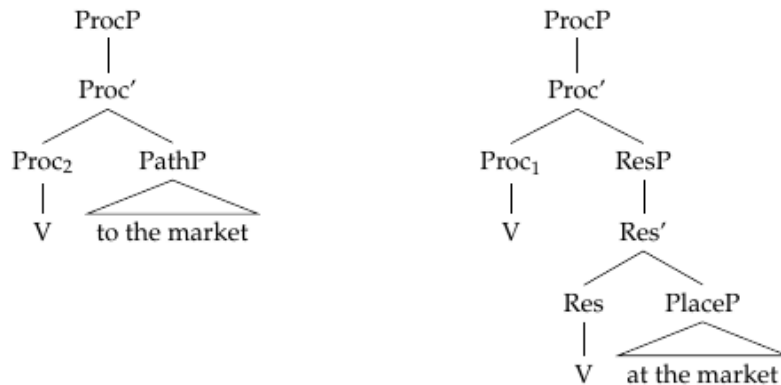
There are two different types of ProcP heads, however. Each of these different ProcP heads results in a different structure, and a different way to derive a GOAL-OF-MOTION interpretation.

(42) Ramchand's (2008) Types of ProcP

- (i) Proc_1^0 selects for a ResP
 - XP complement to Res denotes a result state
 - e.g., this approximates $p(1)$
- (ii) Proc_2^0 is encoded with a PATH STRUCTURE
 - XP complement to Proc^0 denotes a path
 - i.e., path-function, p

One type of ProcP head, proc_1^0 selects for a ResP. Any XP complement to the Res head denotes a result state (given the resultative semantics of Res). For our purposes, this means that any XP that combines with this sort of structure (proc_1^0 -ResP) will be interpreted as an approximation of the endpoint of the path. No actual information about the internal path structure is encoded in this sort of structure. The second type of ProcP head, proc_2^0 is lexically encoded with a path structure. With the homomorphic requirement, this means that any XP complement to Proc_2^0 must denote a path that is topologically consistent with the path encoded in the motion-path verb. The two goal-of-motion structures (with their distinct ProcP heads) are shown in (43).

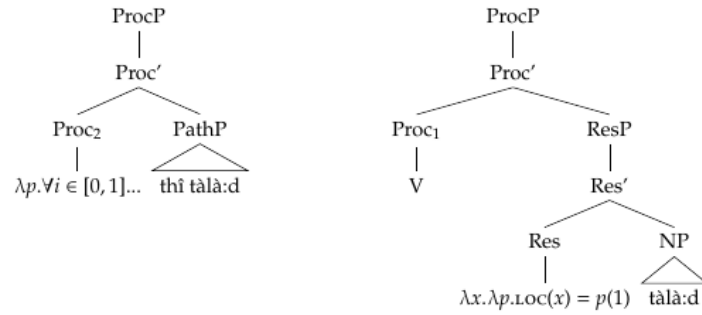
(43) Ramchand (2008)'s Types of ProcP



4.2 Proposed Analysis for Observation 2

We propose that Thai allows both structures for GOAL-OF-MOTION readings. These two structures are illustrated in (44):

(44) Thai Goal-of-Motion Structures



These two structures differ in their selectional restrictions. While a ProcP headed by Proc_2^0 selects for a PP (i.e., a PathP) of type $\langle p, t \rangle$, like $[\text{thi}^F \text{ NP}]$, a ProcP headed by Proc_1^0 , due to the semantics of the Res head, selects for a NP of type $\langle e, t \rangle$.

4.2.1 Proc_2^0 structures select for PP (PathP) Rhemes

In the Proc_2^0 structure, the internal structure of the path represented in Proc_2^0 can either

- (i) be lexically specified by the verb (e.g., with an extended path verb like *khun^F* “ascend”), or
- (ii) be underspecified (e.g., with a minimal path verb like *pay* “go”)

In the case of (ii), we suggest that the underspecified internal structure of Proc_2^0 can be further modified by the $[\text{thi}^F \text{ NP}]$ PathP, semantically formalized as in (45):

$$(45) [\text{thi}^F \text{ NP}] = \lambda p. \exists i \in [0,1] [p(i) \subseteq \text{LOC}([\text{NP}])]]$$

Thus [(V) *pay thii^F* NP] structures are semantically well-formed. The homomorphic requirement is satisfied, as the unspecified internal structure of *pay* places no effective restrictions on the $\llbracket thii^F \text{ NP} \rrbracket$ rheme.

In contrast, we suggest that this is not possible when the internal structure of the path represented in Proc_2^0 is lexically specified by a directional path verb like *khun^F* “ascend”. The reason for this is the Ramchand homomorphic requirement – i.e., the path denoted by a $\llbracket thii^F \text{ NP} \rrbracket$ lacks the internal structure necessary to be homomorphic to the path denoted by a directional path verb like *khun^F* “ascend”. It only states that some point in the path is contained within the location of the NP. Thus [(V) *khun^F thii^F* NP] structures are not semantically well-formed, and are grammatically ruled out.

4.2.2 Proc_1^0 -ResP structures select for NP Rhemes

In the Proc_1^0 -ResP structure, the internal structure of path is not lexically encoded. Rather the Res head (lexically specified as in (46)) specifies that its bare NP complement is the endpoint of the path.⁹

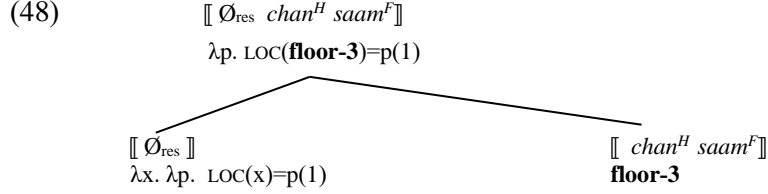
(46) $\llbracket \emptyset_{\text{res}} \rrbracket = \lambda x. \lambda p. \text{LOC}(x) = p(1)$ (selects for a bare $\llbracket \text{NP} \rrbracket$ - type e)

Recall that in section 3, we provided the following denotation for the XP *chan^H saam^F* “floor three”, where it represented a path, locating the endpoint of the path at the spatial location of “floor three”.

(47) $\llbracket \emptyset_P \text{ chan}^H \text{ saam}^F \rrbracket = \lambda p. \text{loc}(\mathbf{floor-3}) = p(1)$

We propose that XP *chan^H saam^F* “floor three” was interpreted this way because it actually merged as the NP complement of a ResP, as shown in (48):

⁹ Here we are abstracting away from the event argument of the Res head.

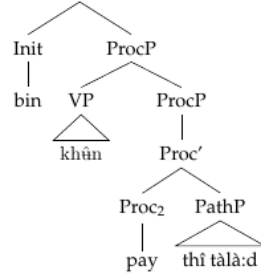


In contrast to the previous structures, $\text{Proc}_1^0\text{-ResP}$ structures are compatible with both directional path verbs like $khun^F$ “ascend” and deictic path verbs like pay “go”. This is because the XP rheme in these structures is not restricted to being homomorphic to the path-structure encoded in Proc^0 – it only needs to satisfy the selectional restrictions of the Res head. Thus both directional path verbs like $khun^F$ “ascend” and deictic path verbs like pay “go” are compatible with this sort of structure, where the goal-of-motion is denoted by a bare NP.

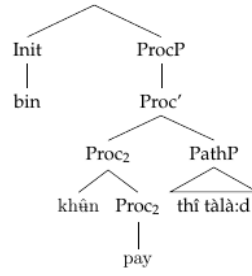
4.2.3 Constructions with V1 + V3 + V5 (*bin* “fly” - $khun^F$ “ascend” - pay “go”)

Recall that V1 constructions with both $khun^F$ “ascend” and pay “go” behave like constructions that only contain pay - i.e., they are compatible both with a bare NP, or a $[thii^F \text{ NP}]$. This suggests that when $khun^F$ and pay co-occur with a $[thii^F \text{ NP}]$, it is pay that is the main path verb, which restricts the homomorphic requirements of the V+V complex, whereas $khun^F$ is just a ProcP modifier (combining via PSUM_A), as shown in (49a). Our system would also generate the same surface-string with the structure in (49b), but the adjunction of $khun^F$ to the Proc2 head would impose path-structure restrictions on the $[thii^F \text{ NP}]$ and be ruled out for failing to satisfy Ramchand’s homomorphic requirement.

(49) a.



b.



In any case, however, the system can generate the structure in (49a) to account for the grammaticality of *bin khun^F pay [thi^F NP]* sequences. Notice that the sort of structure in (49a) is reminiscent of what Muansuwan (2002) proposed – i.e., mixed complementation and adjunction, in contrast to the flat VP-recursive structure in Thepkanjana (1986).

5. SUMMARY AND UNRESOLVED ISSUES

In this paper we proposed an analysis for the following properties of Thai DSVs:

- (i) GOAL-OF-MOTION DSVs require a path-motion verb
-i.e., unlike English, Goal-of-Motion cannot be encoded with a PP
- (ii) Path-Motion verbs differ in whether the goal can be indicated with an NP vs a *[thi^F NP]_{PP}*

To account for the first generalization, we proposed that Goal-of-Motion readings require a path argument, and that whereas vertical path verbs (V3) and deictic verbs (V5) have one, manner motion verbs (V1) lack a path argument. We further argued that the semantic mechanism used for introducing path arguments (PSUM_B) is type-restricted to elements of type $\langle p, \langle l, t \rangle \rangle$ – i.e., motion-path verbs. Because PPs are of type $\langle p, t \rangle$, they cannot introduce a path argument and their presence is thus insufficient for licensing a goal-of-motion reading. This part of our analysis relied purely on a compositional system of lexical entries and

compositional rules as the data were semantic, i.e., it relied on the presence/absence of goal-of-motion readings.

To account for the second generalization, we proposed that motion-path verbs (V3, V5) differ in terms of whether they are homomorphically compatible with the semantically underspecified nature of $[thii^F NP]_{PP}$ phrases. We further suggested that Ramchand's (2008) system of syntax-semantics mapping could be used to formalize our analysis. This part of our analysis relied on a particular syntactic structure in addition to commonly assumed semantic principles (i.e., verb-complement homomorphism). Although we assumed Ramchand's proposed verbal substructures, we acknowledge that as of yet, we have no syntactic/distributional evidence for assuming the presence of these verbal substructures in Thai. We hope further empirical research may yield syntactic diagnostics that can support or disconfirm the structures we have assumed.¹⁰

In what follows, we discuss additional empirical aspects of the research that we were unable to address in this paper.

5.1 Interaction with Aspectual Marker yuu^L

Throughout the course of our data collection process, we observed that $khun^F$ constructions with and without pay also differ in terms of compatibility with the aspectual marker yuu^L - more specifically, that constructions incompatible with $[thii^F NP]_{PP}$ phrases are also incompatible with the aspectual marker yuu^L .

(50) **Context:** A bird in the atrium of a mall is flying up to the third floor

- a. *นก บิน ขึ้น อยู่ (ที่) ชั้น สาม
 nok^L bin $khun^F$ yuu^L $(thii^F)$ $chan^H$ $saam^F$
 bird fly ascend ASP (PREP) floor three
 “The bird is flying to the third floor.”

¹⁰ We attempted to use standard constituency tests (e.g., movement tests, conjunction tests, replacement tests), but were unable to find tests that successfully targeted the verbal constituents. Similarly, as the syntax-semantic mapping properties of binding and quantifier scope phenomena have not been established in Thai, binding and quantifier scope tests were also not considered reliable indicators of structure.

- b. นก บิน ไป อยู่ (ที่) ชั้น สาม
nok^L bin pay yuu^L (thii^F) chan^H saam^F
 bird fly go ASP (PREP) floor three
 “The bird is flying to the third floor.”

- c. นก บิน ขึ้น ไป อยู่ (ที่) ชั้น สาม
nok^L bin khun^F pay yuu^L (thii^F) chan^H saam^F
 bird fly ascend go ASP (PREP) floor three
 “The bird is flying to the third floor.”

Recall that the data that were only compatible with location readings were also much preferred with the addition of the aspectual marker *yuu^L* after the verb. An example of this data is repeated below:

(51) Location Readings of V1 “bin”

- a. ?นก บิน ที่ ต้นไม้ ใหญ่
nok^L bin thii^F ton^Fmaay^H yay^L
 bird fly PREP tree big
 “The bird is flying at/around the big tree.”
- b. นก บิน อยู่ ที่ ต้นไม้ ใหญ่
nok^L bin yuu^L thii^F ton^Fmaay^H yay^L
 bird fly ASP PREP tree big
 “The bird is flying at/around the big tree.”

Our analysis, as of yet, has no way of accounting for this observation and correlation.

5.2 Different Types of Goal NPs

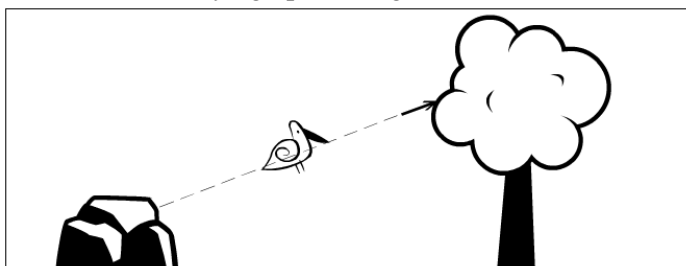
The data generalizations discussed in this paper regarding manner-motion verbs are a simplification. In all of the cases discussed, the NP, *chan^H saam^F*, “floor three” can be interpreted as either the endpoint of the goal of motion, or as a location. However, if the NP in question lacks the

internal space to be interpreted as a location, the understanding of the data appears to be more complicated.

Recall that in the previously cases, the presence of the vertical path verb *khun^F* was allowed, but not required, when the path had a vertical component. However, the following data shows that this is not the case when the initial verb is *bin* “fly”, and the goal NP is not *chan^H saam^F*, “floor three”, but *ton^Fmaay^H yay^L* “big tree”. In this context, all three elements (*khin^F + pay + thit^F*) are required. This observation is summarized in Table V.

(52) V^{manner} + V_{v-path} (Horizontal + Vertical Component)

Context: A bird is flying up to a large tree



- a. #นก บิน ไป ที่ ต้นไม้ ใหญ่
nok^L bin pay thit^F ton^Fmaay^H yay^L
 bird fly go PREP tree big
 “The bird is flying to the big tree.”
 → cannot have vertical meaning component
- b. นก บิน ขึ้น ไป ที่ ต้นไม้ ใหญ่
nok^L bin khun^F pay thit^F ton^Fmaay^H yay^L
 bird fly ascend go PREP tree big
 “The bird is flying up to the big tree.”
- c. #นก บิน ขึ้น ต้นไม้ ใหญ่
nok^L bin khun^F ton^Fmaay^H yay^L
 bird fly ascend tree big
 “The bird is flying up to the big tree.”

- d. #นก บิน ขึ้น ไป ต้นไม้ ใหญ่
nok^L bin khun^F pay ton^Fmaay^H yay^L
 bird fly ascend go tree big
 “The bird is flying up to the big tree.”
- e. #นก บิน ขึ้น ที่ ต้นไม้ ใหญ่
nok^L bin khun^F thii^F ton^Fmaay^H yay^L
 bird fly ascend PREP tree big
 “The bird is flying up to the big tree.”

We leave this empirical puzzle as an avenue for further research.

Pattern: V_{manner} + required V3 vertical “path of motion”

Table 5. V_{manner} + V_{vertical-path}

Goal-Of-Motion Interpretation	Allowed? Allowed or Not
(i) V + NP _{location}	✗ (c)
(ii) V + [<i>thii^F</i> NP _{location}] _{PP}	✗ (e)
(iii) V + <i>pay^M/maa^M</i> + NP _{location}	✗ (d)
(iv) V + <i>pay^M/maa^M</i> + [<i>thii^F</i> NP _{location}] _{PP}	✓ (b)

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泰語趨向連動式結構中表示位移終點的語義分析

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本文旨在探討泰語趨向連動式結構中表示位移終點的語義表現。研究發現，在泰語趨向連動式結構中，只有若干動詞能夠表示位移終點的語義。本文得出的結論是，泰語動詞詞組中表示位移終點的語義與趨向動詞的出現存在直接聯繫，即若要表示位移終點的語義，需要在結構中使用趨向動詞，而英語裏則不允許趨向動詞出現在介詞詞組中。本文以羅斯坦（Rothstein）（2004）提出的綜合法語義分析理論和拉姆錢德（Ramchand）（2008）提出的第一語段句法理論為研究框架。

關鍵字：泰語趨向連動式結構、表示位移終點的語義、趨向動詞、綜合法、第一語段句法理論