Enriching valency lexicons with constructional analyses:

between verbal semantics and argument structure constructions

Pavlina Kalm and William Croft
University of New Mexico

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Introduction

To define event structure, most valency lexicons focus on defining **thematic roles** that describe **entities core to the event description**.

Some valency lexicons, such as PropBank or PDT-Vallex, also **link these roles to syntactic arguments** and include text annotations.

PropBank

Verb sense:

touch.01 - be or come into contact with

Roles:

ARG0-PAG: *toucher*
ARG1-GOL: *thing touched*
ARG2-MNR: *touched with (if separate from agent)*

Example:

ARG0 and ARG1 and ARG2

But if you will come and touch her with your hand, she will live again .

Event structure representation

The **lexically-oriented analysis** in valency lexicons generates a predicate argument structure for each verb sense. The meaning of an utterance is inferred by **pairing thematic roles to syntactic arguments**.

However, **some uses of verbs don't evoke the prototypical roles** defined in the predicate argument structure, such as when *kick* is used to describe an event of transfer:

1. (a) *He kicked him the ball.*

An event structure representation of such examples must include additional analyses beyond the verbal semantics (Kalm et al. 2019).

Our presentation focuses on the **contribution of constructional meaning** to event structure as independent of verb meaning. We discuss possible ways **to incorporate** constructional analyses into existing lexicons and highlight some of the **benefits** associated with linking verbal and constructional semantics.

Same verb sense, different construals

Verbs can occur in **various semantically different argument structure constructions** (or "constructions") which may evoke additional or fewer participants than the verbal profile.

For example, *kick* can describe events of **contact by impact** (2a), **directed motion** (2b), **transfer** (2c), or a **change of state** (2d) (Goldberg 1995:11; Croft et al. 2016).

(2)	a. *He kicked the wall.*	[contact by impact]
	b. *He kicked the baseball into the crowd.*	[directed motion]
	c. *She kicked him the ball.*	[transfer]
	d. *He kicked him black and blue.*	[change of state]

Analyses that solely rely on verb meaning are challenged by construals that do not 'align' with the predicate argument structure, such as the use of *kick* in (2b-d) in which additional participants are evoked.

To account for such uses, **verbal and constructional semantics must be treated as independent** of each other.

Syntactic alternations

The same event can be construed differently depending on which **participant's change** is in focus:

3. (a) *He loaded **the truck** (e.g., with hay).*
   (b) *He loaded **hay** (e.g., in the truck).*

Both examples describe events of *loading*; however, the use of different constructions signals that **the event is construed differently**. In 3a, the theme undergoing change is *the truck*. In 3b, the theme is what's being loaded, i.e. *the hay*.

The **predicate argument structure for *load* is the same** irrespective of the construction. The verb evokes the following roles:

ARG0-PAG: *loader, agent*
ARG1-GOL: *beast of burden*
ARG2-PPT: cargo
ARG3-MNR: instrument

However, the **constructional analysis for these two examples is different**. In (3a), the construction describes an event of *change of state* in which the truck's property changes from not loaded to loaded, while in (3b), the construction describes an event of *placing* in which the theme is put in a different location.

Argument structure constructions

Argument structure constructions carry meanings that are independent of particular verbs: “semantic structures together with their formal expression must be recognized as constructions independent of the lexical items which instantiate them” (Goldberg 1995:1).

TRANSFER CONSTRUCTION	“X CAUSES Y TO RECEIVE Z”
Syntactic frame:	[SBJ V OBJ OBJ_2]
Transfer verb:	*give*
Example:	*She gave him a letter.*

CAUSED MOTION CONSTRUCTION	“X CAUSES Y TO MOVE Z”
Syntactic frame:	[SBJ V OBJ OBL]
Caused motion verb:	*put*
Example:	*He put a box in his car.*

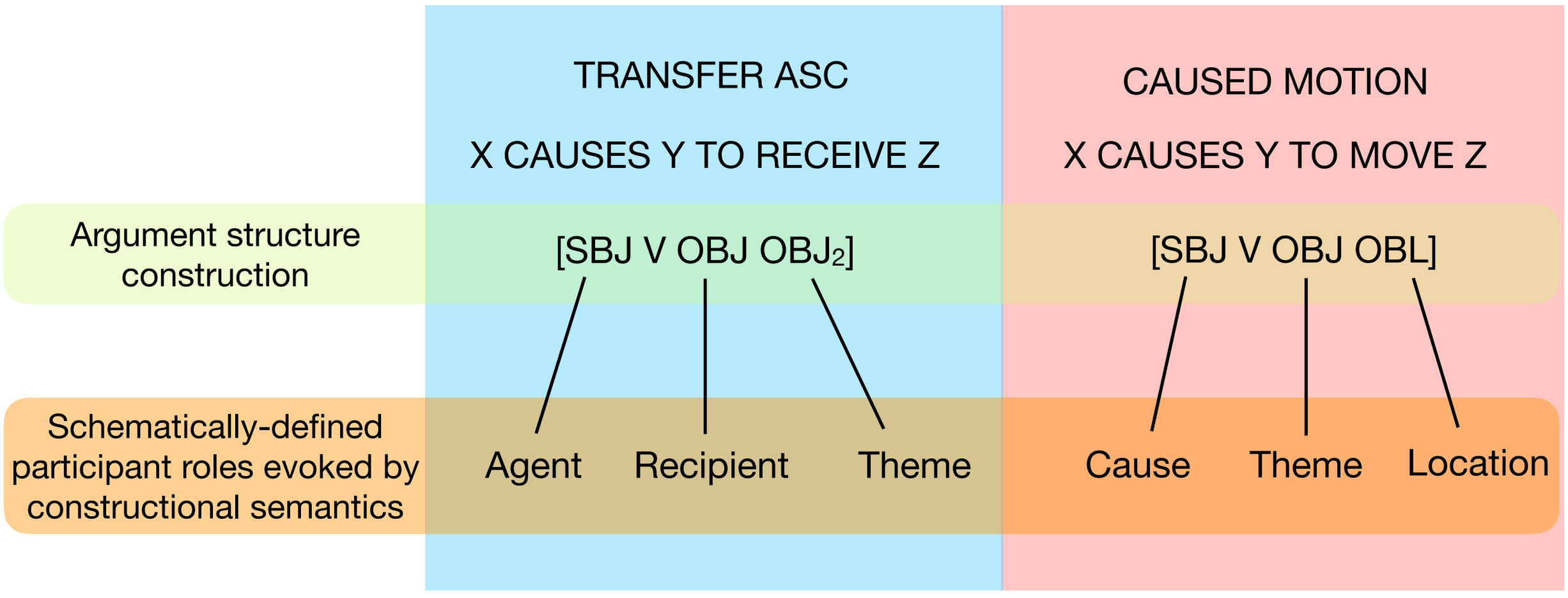
Since the meaning of constructions is independent of the verbs that prototypically occur in them, other semantically different verbs can express the event evoked by the construction, e.g., *kick* in the transfer or caused motion construction.

Constructional analyses

Similarly to predicate argument structures defined for verbal semantics, **constructions can be analyzed as schematic structures that evoke event participants**.

Each syntactic argument that is core to the event evoked by the construction can be identified by **a general label that describes its role** in the event.

The analysis of constructional meaning is thus analogous to the semantic analysis of verbs.



When verbal and constructional analyses don't 'align'

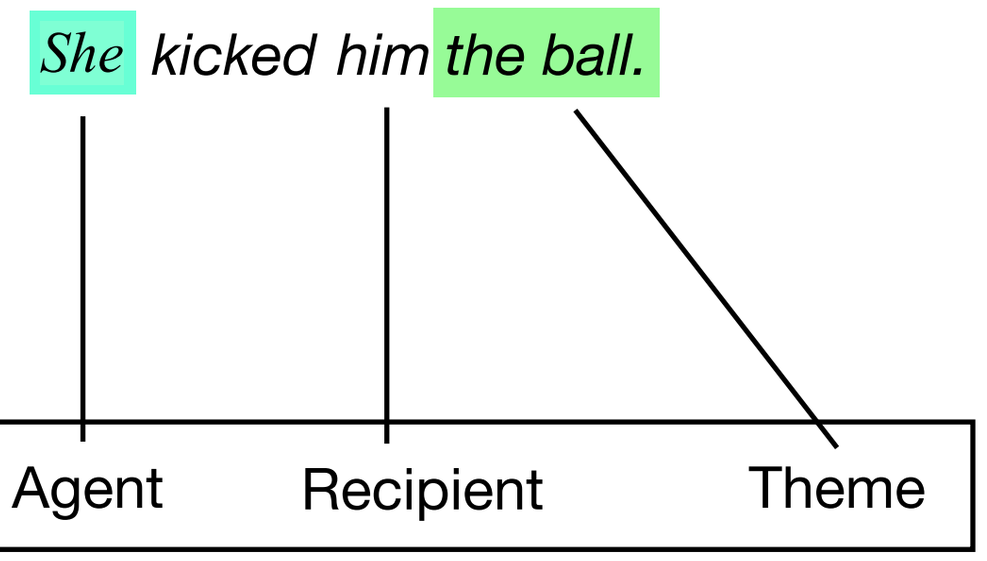
The primary reason for adding constructional analyses is to represent event structure in cases when the constructional analysis doesn't 'align' with verb meaning, as shown in the transfer example with *kick* below:

Predicate argument structure for *kick:*

ARG0-PAG: *kicker*

ARG1-GOL: thing kicked

ARG2-MNR: *instrument (defaults to foot)*



Adding a constructional analysis reveals that:

1) the **verb meaning does not align** with the constructional semantics; and
2) the construction evokes an **additional participant** in the event structure.

Two-tier event structure representation

A two-tier event structure representation in which constructional and verbal semantics are analyzed separately has been **the focus of research at UNM** in the past years (Kalm et al. 2019, Croft et al. 2021, Kalm 2023).

Our representation is anchored in the theory of "**force-dynamics**" (Talmy 1988, Croft 2012) and was applied to data in VerbNet:

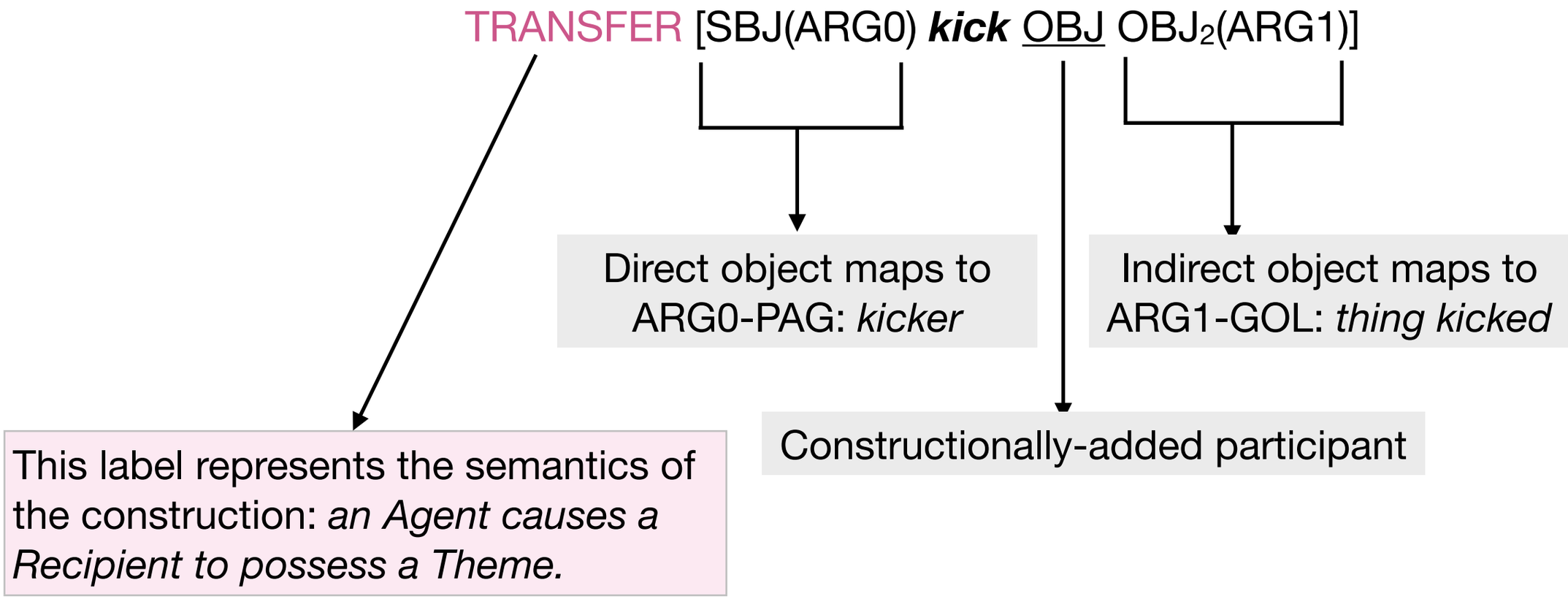
- Using VerbNet classes, we **grouped verbs into "types"** and defined their event structures based on their shared force-dynamic properties; i.e., the same event participants and force-dynamic relations between them.

- VerbNet's syntactic frames and examples served as the backbone of our constructional analysis from which we **constructed mappings** between verbal and constructional representations.

Our analysis covers the vast majority of verb classes in VerbNet. We analyzed all events of physical causation and social interactions. Our analysis of mental verbs is a subject of future research.

Adding constructional information to valency lexicons

In PropBank-like lexicons which annotate text with thematic roles, the linking between roles and syntactic arguments already exists. However, **linking thematic roles evoked by verbs to participants that are evoked constructionally** adds a new layer of semantic information:



This type of analysis and notation could also be used in lexicons that do not link thematic roles to annotated text, as long as each role evoked by the verb meaning is assigned a number, so that it can be used to link that role to a constructionally-evoked participant in the event structure representation.

Analysis of syntactic alternations

Predicate argument structure for *load:*	ARG0-PAG: *loader, agent* ARG1-GOL: *beast of burden* *ARG2-PPT: cargo* *ARG3-MNR: instrument*

4a) *He* ***loaded*** *the truck.* [*change of state*]

Participants evoked by the Change of State construction:	Causer	Patient	

The construction describes an event in which an entity (“Causer”) causes a change in another entity’s (“Patient”) property.

Event structure representation: CHANGE OF STATE [SBJ(ARG0) *load* OBJ(ARG1)]

4b) *He* ***loaded*** *the hay.* [*place*]

Participants evoked by the Placing construction:	Causer	Theme	Goal

The construction describes an event in which an entity (“Causer”) causes another entity (“Theme”) to move to a different location (“Goal”).

Event structure representation: PLACE [SBJ(ARG0) *load* OBJ(ARG2) OBL(NI)]

Proposal for valency lexicons

We propose to **include constructional information in lexicons** (Croft and Sutton 2017). This can be done by making **an inventory of argument structure constructions** associated with each verb sense based on annotated text or examples that are provided.

The notation that we suggest below **combines verbal and constructional semantics** by specifying the meaning of a construction and by **pairing verb roles to syntactic arguments** within the constructional analysis.

kick.01 - drive or impel with the foot

Verb participant roles:

Roles:

ARG0-PAG: *kicker*
ARG1-GOL: *thing kicked*
ARG2-MNR: *instrument*

Argument structure constructions:

1) **CONTACT** (SBJ(ARG0) V OBJ(ARG1))

Example: He kicked the wall.

2) **DIRECTED MOTION** (SBJ(ARG0) V OBJ(ARG1) OBL))

Example: He kicked the ball across the field.

3) **TRANSFER** (SBJ(ARG0) V OBJ OBJ(ARG1))

Example: He kicked him the ball.

4) **CHANGE OF STATE** (SBJ(ARG0) V OBJ(ARG1) ResultPP)

Example: He kicked him black and blue.

Conclusion

Valency lexicons deal with constructional semantics only indirectly; argument structure constructions are not dealt with independently of verb meaning.

We argue that a representation in which verbal and constructional semantics are analyzed separately would enrich the description of event structure in lexicons.

In particular, it would help:

- differentiate construals of a verb that do not *align* with the verb meaning;
- identify participants that are evoked constructionally rather than lexically.

A two-tier representation provides a more comprehensive understanding of the semantics of the event and the correspondences between lexical and constructional semantics.