

Verbal Polysemy and Event Structure

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1. Introduction

In English, there often exist various syntactic frames for each verb as follows.

- (1) a. Mary began reading the novel.
- b. Mary began to read the novel.
- c. Mary began the novel.

(Pustejovsky 1995:32)

Such a verb with multiple frames conveys slightly different meanings depending on what kind of complement it takes, and thus has been considered as an example of polysemy (cf. Ravin and Leacock, 2000).

So-called verbal alternations as shown in (2)-(3) can be also said to exemplify verbal polysemy.

(2) inchoative/causative alternation

- a. The bottle broke.
- b. John broke the bottle.

(Pustejovsky 1995:33)

(3) spray/load alternation

- a. Mary sprayed paint on the wall.
- b. Mary sprayed the wall with paint.

c . Mary loaded hay onto the truck.

d . Mary loaded the truck with hay

(Dowty 2000: 112)

In the earliest studies of traditional grammar, these verbal polysemies are seen to be simply described in the lexicon, which makes the lexicon a black box with too much information to be put in.

As the recent progress of lexical semantics has developed an idea that syntactic argument realization of a verb is determined by its conceptual meaning, however, much effort has been made to analyze such verbal polysemy in a lexical semantic approach. While most lexical semantic researches adopt Lexical Conceptual Structure (LCS) to illustrate the mechanism of argument realization(See Rappaport Hovav and Levin (1998) and Jackendoff (1990).), an approach to utilize Event Structure (ES), i.e., a level of structural representations of verbal aspectual features, seems to function better to illustrate polysemy. The notion of events has brought the field of lexical semantics a new idea that a verb has a structural event representation which interacts with its syntactic structures. A verb's event structure determines how its arguments are mapped to syntax. That is, the difference in event representations results in the different verbal syntactic frames.

Such an idea of mapping between event structure and syntax enables us to study the behavior of verbal polysemy in English from a new point of view. Various syntactic frames of a verb can be taken as the reflection of a change in its event structure.

In this paper, I argue that event structure plays a significant role to analyze verbal polysemy, basically following the framework of

Pustejovsky(1995). First, I will present how events have been treated and adopted in the preceding studies. Giving an outline of representative theories about events and event structure, I will claim that event structure is better to illustrate verbal polysemy than typical lexical semantic devices such as LCS, which need additional rules to describe lexicon-syntax mapping.

2. Event Classification of Verbs

Events have been first brought into the literature as terms to define verbal aspectual meaning in semantic theory. Each verb has a situation to denote, which is formally defined by internal temporal features. Such composition of the verbal aspectual properties is referred to as event of a verb. Most of the preceding studies on events have made much effort to propose appropriate classification of events and clarify legitimate representation for a semantic account of syntactic structures. The following illustrates main ideas represented in such semantic analyses of verbal events.

One of the earliest studies of events is proposed by Dowty(1979), which is motivated by so-called Vendler's classification of verbs. According to Vendler's classification, verbs are aspectually categorized into four types: states, activities, achievements, and accomplishments. States represent a static undifferentiated condition while activities refer to a dynamic ongoing situation. Achievements and accomplishments differ from the others in that they logically entail an outcome. Accomplishments are events composed of a process with a change of state and achievements denote that a change of state

occurs instantaneously. Dowty(1979) presents examples of verbs sorted by Vendler's classification as follows.

- (4) a. States: know believe have love
 b. Activities: run walk swim drive a car
 c. Accomplishments: paint a picture make a chair
 d. Achievements: recognize find reach die

(Dowty 1979: 54)

Based on Vendler's classification of verbs represented in (4), Dowty(1979) proposes a logical structural representation for each verbal event. Utilizing an abstract operator such as BECOME or CAUSE, he lexically decomposes events into sets of semantic primitives organized formally as logical semantic structures.

Such structural representations of events are refined by Parsons(1990) from a logical semantic view. By conjoining the logical propositions, Parsons(1990) describes events as shown in (5).¹

- (5) a. Mary flew the kite. ('Mary fly the kite.')

b. $(\exists e)[\text{Agent}(e, \text{Mary}) \& \text{Cul}(e) \&$

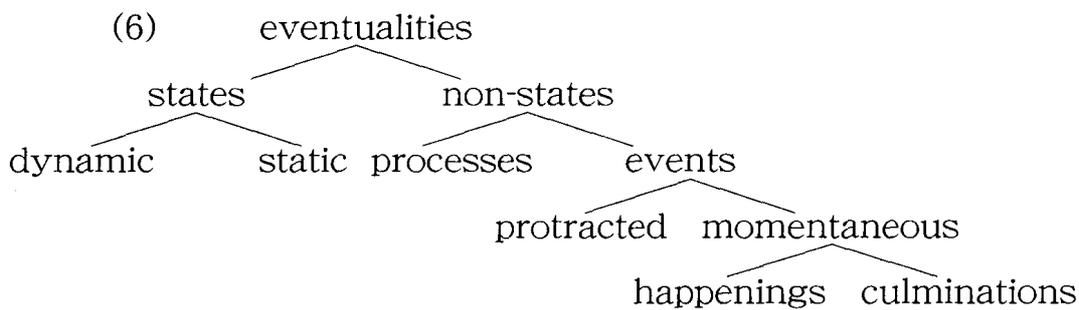
$(\exists e')][\text{Flying}(e') \& \text{Theme}(e', \text{kite}) \& \text{CAUSE}(e, e')]]$

(Parsons 1990: 109)

Besides lexical semantic labels like thematic roles and a CAUSE operator, Parsons(1990) employs the symbol *Cul* to represent a culminated event. Thus the logical structure of (5b) denotes an accomplishment reading that a culminated event *e* causes a subevent *e'*.

While such an attempt to give proper representation of events has contributed much to theorizing the nature of meaning, there arose research to suggest that events must be classified in a more detailed way than Vendler's classification. A typical example of such researches is the one proposed by Bach(1986).

Examining internal aspectual meaning of verbs, Bach(1986) classifies events into six aspectual classes as follows.



(Bach 1986: 6)

Bach(1986) assumes that such detailed types of events are necessary to give an adequate account of relation between syntax and semantics.

Similar detailed classification of events is also presented by Smith(1997). Smith(1997) distinguishes event types by examining three temporal features, i.e., stasis, telicity, and duration. Based on these features with plus and minus values, we can categorize events of verbs into five aspectual types as represented in (7).

(7)	Static	Durative	Telic
States	[+]	[+]	[-]
Activity	[-]	[+]	[-]
Accomplishment	[-]	[+]	[+]
Semelfactive	[-]	[-]	[-]
Achievement	[-]	[-]	[+]

(Smith 1997: 20)

With such valuation by features, verbs are categorized into events rather plainly. For instance, *knock at the door* denotes a single dynamic event with no outcome and thus represents a semelfactive (Smith 1997: 29).

Though such creation of numerous event types enables detailed illustration of verbal internal aspectual meaning, Verkuyl(1989) suggests that such detailed event types are unnecessary in the theory of semantics. He claims that aspectual meaning is not just determined lexically but composed with other constituents on a sentential level. Assuming that such composition of aspect does not require much detailed classification of verbal internal meaning, Verkuyl(1989) proposes that events are categorized into State, Process, i.e., an ongoing event, and Event, which includes accomplishments and achievements. Such a tripartition of events is widely accepted as necessary temporal entities in semantic theory.

As illustrated above, most traditional studies have treated events as primitive entities in semantic theory. However, a new approach that sets distinct level of events in the lexicon-syntax interface is proposed by such research as Pustejovsky(1991, 1995), Tenny(1994),² Alsina(1993),³ and Grimshaw(1990). Such a level of events is generally referred to as Event Structure (ES) and it leads to a new perspective with respect to how lexical information is mapped to syntax. That is, aspectual representation on ES is projected to syntactic structures. After a survey of the preceding studies of the lexicon-syntax mapping, I will discuss the basic idea of ES and how it can serve as an alternative theory to govern the mapping from the lexicon

to syntax.

3. Syntactic Structures as the Reflections of Semantic Structures

It is widely accepted in various theories of language that a verb lexically specifies the ways it appears in syntactic configurations. A large variety of models for lexicon-syntax mapping have been proposed and it is not yet settled how the lexical information of a verb is mapped to syntax.

In a GB framework, a verb has a list representing information about the number and the type of arguments it takes in the lexicon. Chomsky(1986) assumes that such a lexical representation is a list of thematic roles, which can be indicated as follows.

- (8) a. break (Agent, Theme)
- b. put (Agent, Theme, Goal)

Such a proposal, which posits a list without information about syntactic categories or positions, is based on the assumption that the syntactic configuration for a verb is determined by its semantic properties. Chomsky(1986) states that the syntactic category of a verbal argument is specified by its thematic roles, proposing the notion called Canonical Structural Realization (CSR) as follows.

- (9) ... if a verb (or other head) s-selects a semantic category C, then it selects a syntactic category that is the "canonical structural realization of C" (CSR(C)).

Ex). CSR(Agent) = NP CSR(Theme) = NP
 CSR(Goal) = PP

(Chomsky 1986: 87)

Thus, the CSR determines that *break* in (8a) c-selects two NPs while *put* in (8c) c-selects two NPs and one PP.

As for the realization of the syntactic position for the verbal arguments, Baker(1988) proposes the Uniformity of Theta Assignment Hypothesis (UTAH) suggesting that the arguments of verbs are realized identically in D-structure if their thematic roles are the same. According to UTAH, *the window* in (10b) then originates in the same object position as the one in (10a) on the level of D-structure because they are both Theme arguments.

- (10) a. He broke the window.
 b. The window broke.

With CSR and UTAH, a lexical representation as a list of thematic roles is thus sufficient to account for how lexical information is mapped to syntax.

However, recent studies which give a close examination of verbal internal meaning associated with the syntactic realization has led to a suggestion that such a list of thematic roles is unnecessary. Various lexical semantic studies propose that the number and the type of verbal arguments are determined by the meaning of verbs itself. What is necessary to be listed is the semantic representation of verbs and the theories to govern mapping from such lexical semantic representation to syntax. Such an idea of relating the semantic

properties of verbs to their syntactic configurations is well illustrated in the analyses by Rappaport Hovav and Levin(1998), and Jackendoff(1990).⁴

Based on Dowty(1979)'s verbal semantic structures and event classification, Rappaport Hovav and Levin(1998) assume that lexical information of verbs is represented as Lexical Conceptual Structure (LCS), which consists of the primitive predicates (such as ACT, CAUSE, and STATE) and lexically assigned constants as well as variables that denote argument positions. They suggest that all verbs are classified into four aspectual types as Vendler's classification and each aspectually different verb has a distinct LCS template as its lexical representation in the lexicon. The following represent such LCS templates proposed by Rappaport Hovav and Levin(1998).

- (11)
- a. [x ACT <MANNER>] (activity)
 - b. [x <STATE>] (state)
 - c. [BECOME[x <STATE>]] (achievement)
 - d. [x/[x ACT <MANNER>]CAUSE[BECOME[y<STATE>]]] (accomplishment)

(Rappaport Hovav and Levin 1998: 108)

Thus, verbs of the same aspectual class have the same LCS templates except that their constants are different. For example, the LCS of *break* is [[x ACT]CAUSE[BECOME[y<BROKEN>]]] and that of *open* is [[x ACT]CAUSE[BECOME[y<OPEN>]]].

The mapping of arguments from such lexical semantic representations above is executed by linking of the variables to

Predicate Argument Structure (PAS), i.e., a lexical syntactic structure that represents the type and the number of verbal arguments. Rappaport Hovav and Levin(1998) propose that such linking of the variables within LCS is constrained by the linking rules. The linking rules, which are orderly applied to the LCS by their own ranking of precedence, determine the realization of variables according to their structural positions in the LCS. The following are some examples of such linking rules represented in Levin and Rappaport Hovav(1995).

(12) a. Immediate Cause Linking Rule

The argument of a verb that denotes the immediate cause of the eventuality described by that verb is its external argument.

(Levin and Rappaport Hovav 1995: 135)

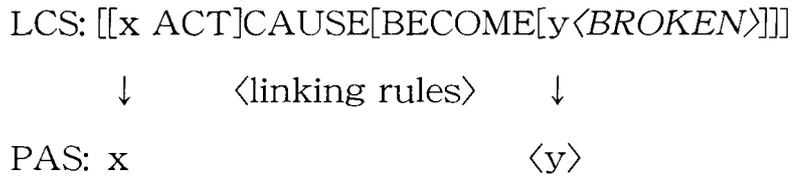
b. Directed Change Linking Rule

The argument of a verb that corresponds to the entity undergoing the directed change described by that verb is its direct internal argument.

(Levin and Rappaport Hovav 1995: 146)

A model of mapping from the lexicon to syntax by Rappaport Hovav and Levin(1998) is therefore schematized as follows.

(13) break



As the schema in (13) illustrates, the verb *break* is an accomplishment verb and thus has the LCS with two variables *x* and *y*. Such linking rules as (12) apply to this LCS and the variable *x*, which is the semantic argument of the causing event, is linked to the external argument, while *y* is linked to the direct internal argument because it undergoes the change of state.

Though he makes the same assumption as Rappaport Hovav and Levin(1998) that LCS is a lexical basis of verbal syntactic configuration, Jackendoff(1990) proposes a slightly different approach to LCS representation and its linking properties. Though Rappaport Hovav and Levin(1998) proposes a list of LCS templates which are fixed by verbal event types, Jackendoff(1990) attempts to define the structural representation of lexical concepts in a more generative way.

Postulating the distinct autonomous level of conceptual structures, Jackendoff(1990) suggests that a finite set of conceptual primitives is organized by the principles of combination on the conceptual structure level. As for the principles governing the conceptual formation, the formation rules shown in (14) are represented by Jackendoff(1990).

(14)

- a. [PLACE] → [_{Place}PLACE-FUNCTION([THING])]
- b. [PATH] → [_{Path}TO/FROM/TOWARD/AWAY-FROM/

VIA([THING/PLACE])

- c. [EVENT] → [EventGO([THING],[PATH])] or
[EventSTAY([THING],[PLACE])]
- d. [STATE] → [StateBE([THING],[PLACE])]
[StateORIENT([THING],[PATH])]
[StateEXT([THING],[PATH])]
- e. [EVENT] → [EventCAUSE([THING/EVENT],[EVENT])]

(Jackendoff 1990: 43)

The entity Thing shown above is either empty for an argument position or filled with the semantic constant lexically assigned by the verbs. The following examples illustrate how such a difference in the Thing constituents is reflected in the syntactic configuration of verbs.

- (15) a. open: _____ NP
[CAUSE([Thing],[GO([Thing],[TO[OPEN]])])]
- b. put: _____ NP PP
[CAUSE([Thing],[GO([Thing],[TO[Place]])])]

(Jackendoff 1990: 80, 250)

As the examples in (15) suggest, the verb *open* and *put* have the same LCS representations except that the Thing argument in the terminal event of *put* is empty while it is filled with the conceptual predicate OPEN in the case of *open*. When Thing is an empty entity, it is indexed to a syntactic argument to be realized in syntax and thus the verb *put* is a verb with three possible arguments while *open* is syntactically realized with two possible arguments. Such linking with coindexing is

governed by a hierarchical principle.

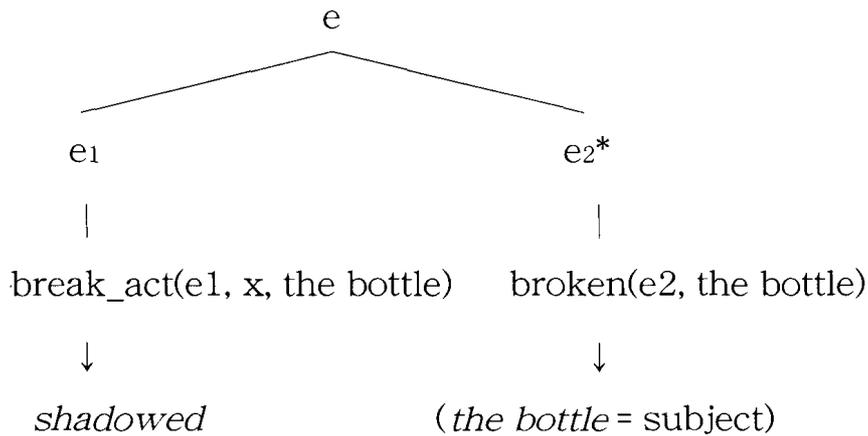
To sum up, to make it clear how the lexical semantic representation is structurally mapped to syntax in the preceding analyses, the proposed models of the lexicon-syntax interface consider that mapping is either governed by the linking rules which rely much on the detailed structural representation of verbs or a principle based on hierarchical relations. An approach to govern linking from the lexicon to syntax by the representation of events, on the other hand, enables us to account for the numerous syntactic frames of verbs structurally from the ES itself. Now that I have demonstrated the general ideas of the lexicon-syntax linking, I will briefly illustrate how ES governs mapping from the lexicon to syntax in the next section.

4. Prominence in Verbal Events and Syntactic Configurations

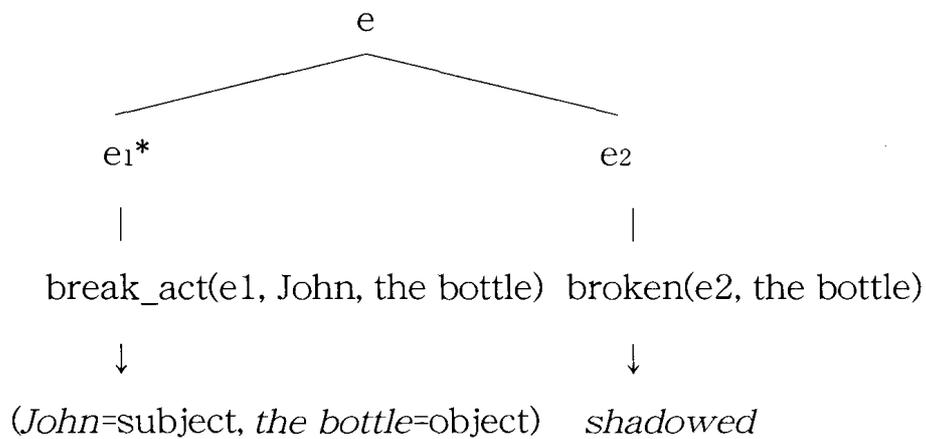
The idea of adopting ES to govern mapping from the lexicon to syntax is well demonstrated in Pustejovsky (1991, 1995). He claims that a verbal event is a composite of subevents with relative prominence between them. The most prominent subevent becomes the head event of the verb, and the arguments of the head event are realized as syntactic arguments.

According to such ES derivation, so-called inchoative/causative alternation shown in (2), which is a typical example of verbal polysemy, can be described as follows.

(16) a. The bottle broke.



b. John broke the bottle.



(e_n^* =head event)

As shown in (16), the verb *break* basically has the ES consisting of the activity *breaking* event and the result *broken* event. In (16a), the result event gets more prominence than the activity event and thus *the bottle*, the argument of the result subevent is realized as the only syntactic argument. On the other hand, the arguments of the more prominent activity event appear in syntactic configuration in (16b).

With such ES derivation, one does not have to stipulate additional linking rule to explain the argument mapping from the semantic description to the syntactic composition. The syntactic

structure can be drawn by the ES itself. Moreover, such difference in the event prominence can naturally explain the difference in the reading of the intransitive *break* and the transitive *break*. In (16a), the semantic focus is the state of *the bottle* being *broken* while the focus of the meaning is *John's* activity of *breaking* in (16b). Postulating that there is difference in the prominence between the subevents of the verbal ES and the most prominent subevent becomes the head event to choose verbal syntactic configuration, one can naturally lead such difference in the readings of (16a) and (16b). Theme is more important than agent in (16a) because it is the only argument in the most prominent subevent.

5. Conclusion

In this paper, I have argued that verbal polysemy can be structurally described on the level of ES. Various syntactic verbal frames are reflection of lexical semantic structure of the verbs.

Though much more detailed ES description is necessary to illustrate numerous examples of verbal polysemy, I believe that aspectual consideration on the lexicon-syntax interface is essential to explain argument mapping from the lexicon to syntax.

Notes

- 1 Higginbotham(2000) also employs similar logical structural representation with the predicate *Cul* and *Hold* to represent the difference between telic and atelic.
- 2 Tenny(1994) claims that a change in argument realization of verbs is due to the semantic composition within ES, proposing ES

representation as follows.

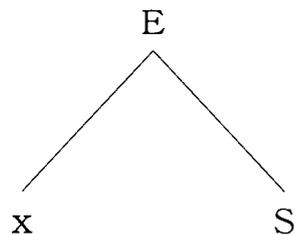
(1) a. run:[_____ []]

b. run a mile:[_____ [MEASURE]]

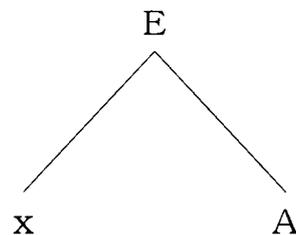
The verb *run* is originally unergative with no internal arguments. When the event nucleus MEASURE is inserted into the ES, the event of *run* becomes delimited and a direct internal argument which shows the endpoint of the verbal event is licensed as the subcategorization.

3 Alsina(1999) posits a level of ES representation which is named as semantic structure and proposes a tree event structure composed not only of the event predicator but also of the variables of arguments as follows.

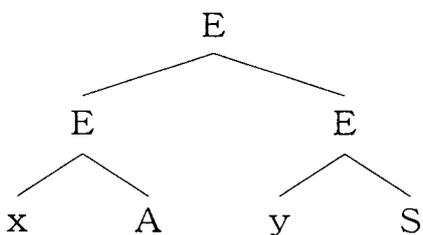
(2) <State>



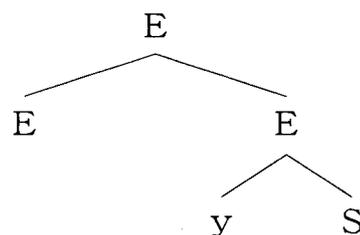
<Activity>



<Accomplishment>



<Achievement>



4 Hale and Keyser(1990) also propose a new model of approach to lexicon-syntax interface. Their approach does not employ LCS as a lexical basis of verbal syntactic configuration. It is a lexical syntactic analysis based on Lexical Relational Structure (LRS),

which represents the subcategorizations of verbs by syntactic tree diagrams. Assuming that a syntactic representation is necessary to represent argument structure of verbs adequately, they suggest that each verb has a tree diagram as VP in which the syntactic relations between the verb and its arguments are structurally defined. There are definite types of LRS and verbs have distinct LRSs according to their meanings. Such a lexical syntactic representation enables direct projection of lexical information from the lexicon to syntax and thus does not need to postulate any specific rule or theory of linking basically.

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