Semantic Representation of Verbal Information –
A Case from Mandarin Verbs of Judging

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Abstract

This paper aims to introduce a recently-developed framework for lexical semantic representation of Mandarin verbal information, using verbs of judging as an illustration. The framework (MARVS) takes each verbal sense as conveying one unique eventive structure and seeks to represent all syntactically relevant information with modular and attributive characterization. By exploring the semantic-syntactic interdependencies pertaining to verbs of judging, the study is able to identify the meaning components that are crucial for syntactic distinction and ultimately represents the semantic information in a systematic and principled way with MARVS.

1. Introduction

Semantic representation has always been a central issue in Natural Language Processing (NLP). At the core of our semantic knowledge is the complex information encoded by verbs. The question as to how to fine-tune and distinguish the meaning lexicalized in each individual verb remains to be solved and presents a challenging task for semantic representation of Mandarin.

1.1 Semantic Representation and Verb Meanings

In order to represent verbal information, efforts of research have been made to identify the semantic factors that are syntactically crucial and to work out some general principles governing the mapping between lexical semantics and syntax. Traditionally, the main concern on verbal information is limited to their subcategorization frames and semantic restrictions. Most formal theories of linguistics assume that verbs are the structural head of the sentence and hence the concern is how many and what kind of argument(s) each verb can take. Clear distinctions of verb meanings are treated only as general tendencies in selectional preferences, and the semantic details of individual verbs are largely neglected. However, as pointed out in Liu, Huang and Chang (1999), recent development in lexical research has shifted the focus to investigating the grammatically-relevant semantic properties of verbs. Researchers believe that the full range of syntactic realization of a verb depends largely on the meaning of the verb, and attempts have been made to define and establish patterns of interdependencies between verb meanings and syntactic behavior (cf., Levin 1997, Pustejovsky 1995, Levin 1993, Atkins and Levin 1991, Atkins et al. 1988, etc.). In particular, Levin (1993) presents a comprehensive attempt and categorizes English verbs into semantically distinct classes on the basis of their argument alternation patterns. Pustejovsky (1995) proposed a generative framework of lexical information with a multi-layered representational scheme that includes Argument Structure, Event Structure, Qualia Structure, and Inheritance Structure. His goal is to fully represent the interaction of word meaning and compositional constraint.

In practice, Levin et al (1997) has suggested that careful consideration of the range of argument expression options exhibited by members of *various classes of verbs* may help reveal the syntactically-relevant meaning components. Based on corpus patterns of verb behavior, their case study on English verbs of sound (Levin et al 1997) has successfully factored out the grammatically crucial elements of verb meaning,

1.2 Lexical Semantic Studies of Mandarin Verbs to Date

Lexical studies on Mandarin verbal semantics have just started in recent years. Collaboration between Academia Sinica and National Chiao-Tung University has rendered some preliminary results based on a series of corpus-based studies (e.g. Chang et al 1999; Liu et al 1999; Liu, Huang, and Chang 1999; Liu et al 1998, Huang et al 1998, Tsai et al 1996, etc.). These studies can all be characterized as exploring the meaning contrast among verbs of the same semantic field by way of comparing their syntactic behavior observed in the Sinica Corpus. The earlier works focused mainly on differentiating near-synonym sets, with the goal to fine-tune the interaction between semantic features and syntactic realization. The scope was then expanded to a whole class of verbs. For example, Chang et al (1999) investigated all subgroups of 'emotion' verbs and pointed to the morphological make-up (VV vs. non-VV compounds) as the key to their syntactic variation. Liu, Huang and Chang (1999) explored verbs of surface contact and found that this group of verbs may take either the location or the substance to be the object (termed Locus-Locatum Alternation) and can be further divided into three sub-groups in terms of directional/ locational change of the substance. Taking the effect of *construction* (association of structural pattern and meaning) into consideration, Liu, Huang and Lee (1999) spelled out the importance of constructional inferences beyond lexical specification, using verb of rushing (趕) as an example.

As Liu , Huang and Lee (1999) pointed out, Mandarin lexical semantic studies are advancing but remain still in a pioneering and primitive stage. More comprehensive investigation is needed to identify the set of crucial semantic attributes as well as compositional principles that have syntactic consequences. This present study can then be viewed as one more effort in building a sound and solid foundation for further exploration of the wonder and wealth of lexical semantics of Mandarin verbs.

2. A Framework for Representing Mandarin Verb Semantics (MARVS)

The studies mentioned above all lead to one important question: What would be

a principled way of representing verbal distinctions in Mandarin?   In Huang and Ahrens (1999), a lexically based model called Module-Attribute Representation of Verbal Semantics (MARVS) was proposed as a first step toward developing a comprehensive framework for detecting and representing Mandarin verb meanings.

2.1 Basic Constructs

The model takes each verbal sense as one *event structure* conveying distinct *eventive information* which consists of two modules: Event Module with event compositional information and Role Module with salient participant role information. Within each module, detailed specifications are represented as attributes: Inherent Attributes are features concerning the semantics of the event itself and Role-internal Attributes are features further specifying a participant role. The model can be schematized as follows:

(1) Module-Attribute Representation of Verbal Semantics (MARVS):

Verb – Sense$_i$ – Eventive Information

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┌─────────────────────────────────────────────────┐
│   Event Module    ---------    Role Module        │
│        |                           |               │
│   Inherent Attribute      Role-Internal Attribute  │
│                                                    │
└─────────────────────────────────────────────────┘
```
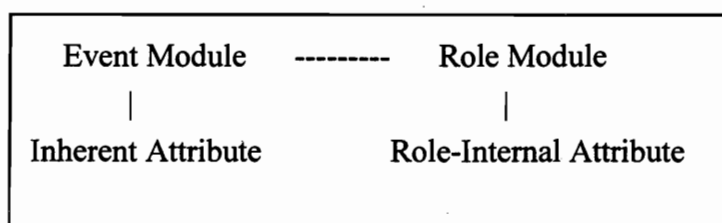
The model is built upon three theoretical premises.   First, all grammatical information is encoded in the lexicon.   Grammar is information-based and lexicon-driven.   Second, verbs express eventive information.   The identification of verbal senses is then dependent on the identification of event types and event structures. Third, the classification of information is twofold: structural vs. attributive.   There are therefore two ways to break down verbal semantic information to atomic units. Structural components are viewed as modules while attributive information are treated as features.

More specifically, Event Modules are the basic building blocks of the event contour.   There are five event modules:
- Boundary : an event module that can be identified with a temporal point and must be regarded as a whole (including Complete Event);
- Punctuality: an event module that represents an single occurrence of an activity that cannot be measured by duration.

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- Process: an event module that represents an activity that has a time course; i.e. it can be measured in terms of temporal duration.
- State: a homogeneous event module in which the concept of temporal duration is irrelevant; i.e. it is neither punctural nor has a time course.
- Stage: an event module consisting of iterative sub-events.

The five modules can be symbolized as follows:

(2) Symbol Representaion of Event Modules
a. Boundary •
b. Punctuality /
c. Process /////
d. State ____
e. Stage ^^^^

The five basic building blocks may be combined to render three event composition types attensted in Mandarin: Nucleus Event, Simplex Events, and Composite Events (for details of the these event types, please see Huang and Ahrens 1999). The next section provides a simple illustration of the framework.

2.2 An Illustration with Verbs of Construction

There are three verbs in Mandarin which can all be translated as 'build' – 建、蓋、造, but their meanings are actually distinct if we observe carefully the typical object they take:

(3) Objects for Verbs of Building:
a. 地主在河川地 蓋／建／*造 房子。
b. 政府在山上造／建／*蓋 水庫
c. 計劃與波音合作造／*建／*蓋 飛機。

It is clear that 蓋 only occurs with objects denoting 'building', 建 takes an architecture as its object, while 造 requires the object to have some kind of internal design. Their difference in the semantic requirement of the object (or the incremental theme) also explains why only 造 can be used in the following sentence:

(4) 工程師造／*建／*蓋 不出房子。

Since 工程師 'engineers' are not designers, they are not able to create any houses.

Besides, the three verbs also differ in aspectual composition. Only 建 can be used in the sentence below, pointing to the fact that 建 may allow a focus on the endpoint or completion of the activity:

(5) 房子建／*蓋／*造 了三年了還沒人住。

In sum, although the three verbs share the same Role Module (all taking an incremental theme), they can be differentiated in terms of Event Module and Role-internal Attribute, as specified below:

(6) MARVS Representation of 建、蓋、造

建　　• ///// • (Bounded Porcess)　　<Agent, Incremental Theme>

　　　　　　　　　　　　　　　　　　　　　　|

　　　　　　　　　　　　　　　　　　　　[architecture]

蓋　　• ///// (Inchoative Process)　　<Agent, Incremental Theme>

　　　　　　　　　　　　　　　　　　　　　　|

　　　　　　　　　　　　　　　　　　　　[building]

造　　• ///// (Inchoative Process)　　<Agent, Incremental Theme>

　　　　　　　　　　　　　　　　　　　　　　|

　　　　　　　　　　　　　　　　　　　　[design]

To show in more details how this framework can be used for differentiating as well as representing Mandarin verbal semantics, we investigate another group of verbs – verbs of judging – in the following sections.

3　Mandarin Verbs of Judging

Verbs of judging, as a semantic group, can be defined as verbs that describe a person's judgmental attitude towards another person (or institute) on a certain, presumably factual ground.　These verbs may be purely mental (eg. 滿意、不滿) or accompanied with speaking act (eg. 稱讚、責罵).　To narrow the scope of our study, we first look at verbs of negative judgement.　Its class members include: 不滿、埋怨、批評、指責、斥責、責備、責難、責罵、責怪、駁斥、痛斥、怒斥、罵、咒罵、叫罵、破口大罵, etc.

At first sight, we noticed that these verbs are quite heterogeneous in terms of

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verbal kinetics, or the Stative vs. Active distinction:

> (7) Distinction in Verbal Kinetics
> Highly stative: 不滿
> Highly active: 斥責、罵

It is also observable that the active verbs in this group can also be characterized as verbs of speaking in that they denote a verbal act outwardly reflecting the negative judgement. One immediate question follows: does the distinction in kinetics bear any significant consequences in their syntactic behavior? To answer the question, we looked carefully at their uses in the corpus and found that they have quite different distributions in the following aspects.

3.2 Grammatical Roles

These verbs differ in terms of the major grammatical functions they may be used for. Although they all occur as verbs, their distributions among other grammatical functions vary. Among all the verbs, 不滿 displays the widest range of grammatical roles: it may be used as adjectival modifier, as in (8a); adverbial modifier, as in (8b), nominal object or complement, as in (8c), and verbal predicate, as in (8d):

> (8) Grammoatical Roles:
> a. Adjectival modifer: 人民的不滿情緒
> b. Adverbial Modifier: 陳水扁強烈不滿地指出…
> c. Nominal Complement: 大陸漁民仍表示不滿
> d. Verbal Predicate: 部份黨員不滿提名作業不符黨內民主

In the table below, we listed the distributional differences for six of the verbs in this group:

(9) Distribution among Major Grammatical Roles:

	不滿	批評	指責	斥責	責怪	罵
Total #	178	833	200	93	86	272
Adjectival	4%(8)	3%(24)	0	0	0	<1%(2)
Adverbial	2%(4)	0	0	0	0	0
Nominal	52%(92)	25%(208)	18%(34)	13%(12)	2% (2)	<1%(2)
Verbal	42%(80)	72%(601)	88%(166)	85%(81)	98%(86)	99%(268)

It is clear from the table that the mental verb-不滿, as the most stative verb in the group, is most flexible in its grammatical realization, while verbs with speech act, such as 指責, do not function as modifiers at all and their use as nominal complement is also significantly lower[1].   This syntactic difference can in part be attributed to their inherent properties in event denoting: Although they all involve some kind of judgmental evaluation, verbs like 不滿 are Attitude-denoting, focusing more on internal state change and thus more 'attributive', while speech act verbs like 指責、責罵 are Action-denoting, focusing more on the verbal act being performed as a result of the negative judgement.   Verbs such as 批評、埋怨 are, on the other hand, either Attitude-denoting or Action-denoting since they may allow non-actional, attributive use:

(10) Attitude-Denoting Use with 批評、埋怨:
　　a. Adjectival: 面對自己的 批評／埋怨 心態
　　b. Adverbial: 埋怨地看著他

3.3　Argument Expression

When used as verbal predicates, most of the verbs display a similar range of argument expression.   They can take a single NP-Goal, as in (11a), or a clausal complement denoting Goal with Cause, as in (11b):

(11) a. Goal: 埋怨／批評／指責　政府（or 政府的無能）
　　 b. Goal-Cause: 埋怨／批評／指責　政府 毫無行政效率（or 執法不力）

Aside from this similarity, a clear difference is found with some Action-denoting verbs as they can also be used as quotation verbs with or without '說', where the content of speaking is taken as a salient argument:

(12) a. 以台語斥責說：車子是怎麼開的。
　　　 遭中共人員斥責：這裡是大陸，不是香港。

Among the Action-denoting verbs, 罵 (and related members as 叫罵、謾罵) singles itself out as it does not allow any *inanimate* Goal, as shown in (13a), and its

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[1] The adjectival and nominal uses with 罵 are highly idiomatic and restricted, as show in the examples:

Ajectival: 罵話語彙

Nominal: 挨了一頓罵 (derived from 挨罵, which itself should be treated as a verb entry.)

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occurrence with direct quotation is much higher than other speech verbs, as exemplified in (13b):

(13) a. 一再罵 政府／*政府的無能

b. 上船就罵：他媽的，要給你死

大聲叫罵：國民黨走狗。

It is obvious that 罵 differs from other Action-denoting verbs in its specification of the Goal-argument (if there is one) and its tendency of taking the content of speaking as its sole argument.　Here, as in English, a Manner of Speaking verb (i.e. 罵) can be used as a Content of Speaking verb (e.g. 說) to introduce direct quotations.

3.3 Passive Construction

It is widely known that Mandarin passive construction is semantically negative, i.e., associated with negative evaluation.　Therefore, we looked at the co-occurrence of these negative judgement verbs with the passive marker 被 or 遭.　What we found was that 不滿, as a highly stative and attitude-denoting verb, is incompatible with passive construction.　In the corpus, 不滿 never occurs with passive markers such as 被 or 遭, as shown below:

(14) Occurrence with Passive Markers

	不滿	批評	斥責	責怪	責備
Total #	178	833	93	86	49
被	0	6%(46)	3%(3)	2%(2)	10%(5)
遭(到/受)	0	8%(65)	13%(12)	1%(1)	8%(4)

This finding is not surprising given that stative verbs in general cannot be passivized, as an universal trend in most languages.

3.4 Degree vs. Manner Modifier

Another interesting observation related to the Attitude-denoting vs. Action-denoting distinction is that the two types of verbs display different patterns of adverbial modification.　Attitude-denoting verb 不滿 occurs only with *degree* modifier such as 強烈、十分、極度, etc., while the Action-denoting verbs occur predominantly with manner modifier, such as 大聲、嚴厲, etc., as made clear in the

table below:

(15) Different Types of Adverbial Modification

	不滿	批評	斥責	指責	責備
總筆數	178	833	93	200	49
Degree	29%(51)	3%(22)	0	<1% (1)	2%(1)
Manner	0	6%(50)	12%(11)	7%(12)	6%(3)

And again, verbs capable of either attitude-denoting or action-denoting (eg. 批評、埋怨) display more evenly between both types of modification, as exemplified below:

(16) a. Degree:　強烈批評民政局
　　　　　　　　　更加埋怨對方
　　　b. Manner:　嚴詞批評中共的對台政策
　　　　　　　　　大聲埋怨對方

4　MARVS Representation of Verbs of Judging

Adopting the representational scheme MARVS, as introduced in section 2, we can identify the meaning differences among verbs of judging in terms of the following Module-Attribute characterization, using 不滿、埋怨、指責、罵 as four representative verbs:

● With regard to Event Module, 不滿 differs from other verbs in that it denotes a state rather than a process.　More specifically, 不滿 encodes an effect state or inchoative state (schematized as　·____), which allows an event focus on either the effect or the durative state.　Other verbs behave more like inchoative process (symbolized as · /////).　The difference between 埋怨 and 指責／罵 can then be captured with a further specification on Inherent Attribute: 埋怨 allows attitude-denoting, which enables it to be used as an adjectival or adverbial modifier.

● With regard to Role Module, 不滿 and 埋怨 both take a Goal or Goal-Cause as their argument, while 指責 may in addition take the Content (direct quotation) as a salient argument.　In contrast, although 罵 may also take a Goal-NP, it differs from the others in that it does not occur with Cause-argument; instead, it takes a Content-argument, as either a direct quotation or a clausal complement.　Furthermore, 罵 enforces a Role-internal restriction on the semantics of the Goal: it has to be animate.

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(17) MARVS Representation of Four Types of Negative Judging Verbs

	不滿	埋怨	指責	罵
Event Module	·	· /////	· /////	· /////
| Inherent Attribute	Attitude-denoting	Attitude-denoting Action-denoting	Action-denoting	Action-denoting Speech Act
Role Module	[Goal – (Cause)]	[Goal – (Cause)]	[Goal – (Cause)] [Content]	[Goal-(Content)] [Content]
| Role-Internal Attribute				Goal: +Animate

These four verbs are typical of four sub-groups of judgement verbs. Among them, the 指責-group seems to be the largest. It is also tentatively noted that the four-way distinction may apply to positive judgement verbs as well, with corresponding members such as 滿意、讚許、稱讚、誇. A follow-up study is needed to confirm the speculation.

5 Conclusion

This study has shown that based on corpus observation and analysis, the group of negative judging verbs can be further divided into four sub-groups, each with distinct syntactic behavior that stems from their unique properties in lexical meaning. The representational framework based on Module-Attribute taxonomy (MARVS) was adopted for systematic sense differentiation. The model helps to delimit and identify the meaning components that are syntactically crucial and provides a principled way to represent these features as well-defined eventive information.

Given that the processing of Mandarin depends largely on semantic information, a representational framework that is semantically-constrained is indeed needed. Focusing on verbal semantics, the present work can be seen as a preliminary effort towards developing a comprehensive model for knowledge representation as well as future application.

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