Type Construction of Event Nouns in Mandarin Chinese

Shan Wang¹,² Chu-Ren Huang¹

¹Dept. of Chinese and Bilingual Studies, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong
²Department of Computer Science, Volen Center for Complex Systems, Brandeis University
{wangshanstar, churenhuang} @gmail.com

Abstract

Natural and non-natural kinds have significant differences. This paper explores the subclasses of each kind and establishes the type system for event nouns. These nouns are divided into natural types, artifactual types, complex types (including natural complex types and artifactual complex types). This new classification not only enriches the Generative Lexicon theory, but also helps us to capture the properties of different types of event nouns.

1 Introduction

A considerable amount of research has been conducted into event nouns in Mandarin Chinese (Chu 2000; Han 2010a; Ma 1995; Wang & Zhu 2000; Wang & Huang 2011a, 2011b, 2011c, 2012a, 2012b, 2012c, 2012d). Previous research on the classification of these nouns is based on their semantic categories (Han 2004, 2010b; Liu 2004; Wang 2010; Zhong 2010). However, such classification conceals the shared characteristics of different categories of event nouns. Because natural and non-natural kinds have significant differences (Pustejovsky 2001, 2006; Pustejovsky & Jezek 2008), this paper explores the subclasses of each kind and establishes the type system for event nouns.

The Data in this research are collected from three sources: (a) a balanced Modern Chinese corpus Sinica Corpus¹, accessed through Chinese Word Sketch Engine², (b) Gigaword Corpus, also accessed through Chinese Word Sketch Engine, and (c) web data collected through the search engines google and baidu.

2 Related Work

Pustejovsky (2001, 2006) and Pustejovsky & Jezek (2008) establish a type system for the three upper concepts (entity, event and quality). Each concept is divided into three subtypes (natural, artifactual and complex) by using qualia structure as a typing specification. Entities are distinguished into three types: (a) Natural Types: Predication from the domain of substance, e.g., the qualia formal or constitutive. (b) Functional Types: Predication includes reference to either agentive or telic qualia. (c) Complex Types: Cartesian type formed by Dot Object Construction. Similarly, the domains of relations and properties are also partitioned into three ranks: (a) Natural Events: Arguments in the predicate or relation are only from the domain of substance, e.g., the qualia formal or constitutive. (b) Functional Events: At least one argument in the predicate or relation is a functional type, f, e.g., makes reference to either agentive or telic qualia. (c) Complex Events: At least one argument in the predicate or relation is a complex type, e.g., a type formed by Dot Object Construction.

Pustejovsky (2006) further discusses three linguistic diagnostics which motivate a fundamental distinction between natural and

¹ http://db1x.sinica.edu.tw/kiwi/mkiwi/
² http://wordsketch.ling.sinica.edu.tw/
unnatural kinds. These diagnostics are: (a) Nominal Predication: How the common noun behaves predicatively; (b) Adjectival Predication: How adjectives modifying the common noun can be interpreted; (c) Interpretation in Coercive Contexts: How NPs with the common noun are interpreted in coercive environments. The analysis in Pustejovsky (2006) is summarized in Table 1.

| Diagnostics          | Natural Kind | Non-Natural Kinds |
|----------------------|--------------|-------------------|
| Nominal Predication  |              |                   |
| singular predication | yes          | yes               |
| nominal co-predication | no         | yes               |
| and-therefore - construction | yes | yes |
| Adjectival Predication |            |                   |
| adjectival modification | unambiguou     | modify aspects of the nominal head other than the physical object; ambiguous |
| Interpretation in Coercive Contexts |                       |                   |
| selection of NPs in type coercive contexts | NPs carry no prior information to undergo type coercion | NPs carry their own default interpretation in coercive contexts |

Table 1: Diagnostics between Natural and Non-Natural Kinds

Pustejovsky (2006) has used the three diagnostics to test entity nouns. In the following, we will use them to test event nouns, as depicted in (1)-(4).

(1) a. Zhè shì dìzhèn.
   this is earthquake
   ‘This is an earthquake.’

b. ! Zhè shì dìzhèn hé hǎixiào.
   ‘This is earthquake and a tsunami.’

c. Zhè shì dìzhèn, su yì shì zìrán zāihài.
   this is earthquake, therefore is natural disaster
   ‘This is an earthquake, and therefore a natural disaster.’

(2) a. Zhè shì hūnl.
   this is wedding
   ‘This is a wedding.’

b. Zhè shì hūnl hé yānhuì.
   this is wedding and banquet
   ‘This is a weddings and a banquet.’

c. Zhè shì hūnl, su yì shì shèhuì
   this is wedding, therefore is social huódòng.
   activity
   ‘This is a wedding, and therefore a social activity.’

(2) show cases of nominal predication of non-natural kind event nouns. Non-natural kind event nouns permit both singular predication and co-predication as shown in (2a) and (2b) respectively. (2a) tells us what this activity is. (2b) shows this activity has the function of both a wedding and a banquet. In (2c), a wedding is a subtype of social
activities, so (2c) is valid when 所以 (it) is ‘therefore (it) is’ links the two event nouns.

(3) a. 猛烈的地震
    violent earthquake
    ‘a violent earthquake’

b. 很长的早餐
    very long DE breakfast
    ‘a very long breakfast’

(3) are examples of adjectival modification to both natural and non-natural event nouns. In (3a), the adjective 猛烈的 měngliède ‘violent’ modifies the intensity of the earthquake and is unambiguous. In (3b), the modifier 非常的 hěn cháng de ‘very long’ can refer to both the eating event and the food itself, so (3b) is ambiguous.

(4) a. 他們開始了風。
    they begin ASP wind
    !They began the wind.’

b. 他們開始了體操比賽。
    They begin le gymnastics competition
    ‘They began the gymnastics competition.’

(4) show the difference between natural and non-natural event nouns in coercive context. In (4a), the natural event noun 風 fēng ‘wind’ has no prior information to get coerced, so this sentence is odd. In (4b), however, the non-natural event noun 體操 tǐcāo ‘gymnastics’ is coerced to be performing gyms through agentive role exploitation.

Examples (1)-(4) indicate that event nouns display clear differences between natural and non-natural kinds. This is the similar to entity nouns. However, the discussion on nominal co-predication and adjectival predication in Pustejovsky (2006) is not sufficient. First, let’s look at cases of nominal co-predication. Though non-natural kinds permit nominal co-predication, it is impossible to co-predicate any artifacts, as shown in (5).

(5) 鋼筆和桌子。
    this is a pen and a table
    !this is pen and a table.

A pen is a long thin object that is used for writing, while a table is a piece of furniture with a flat top that is used for putting things on. It is rarely possible that an entity can have either the form or function that both a pen and a table have. The basis for nominal co-predication of artifacts is that the artifacts describe different form (the formal role) or function (the telic role) of one entity from different perspectives. This argument also holds for event nouns, as shown in (6).

(6) 战争和海水浴。
    war and seawater bath
    !This is a war and a seawater bath.’

A war is a violent fight between different parties that last long, while a seawater bath is a way that you wash yourself in seawater. The two artificial events are too divergent to be co-predicated and refer to one social event.

Second, let’s turn to adjectival modification. It is not the case that all natural kinds are unambiguous when they are modified by adjectives, as shown in (7).

(7) 大雨
    heavy rain
    ‘heavy rain’

In (7), the adjective 大 dà ‘heavy’ can modify the raining event and the raindrops. This is because 雨 yǔ ‘rain’ is a complex type and thus inherently ambiguous.

Besides, it is not true that all non-natural kinds are ambiguous when they are modified by adjectives, as shown in (8).

(8) 白色的牆
    white wall
    ‘a white wall’

In (8), the adjective 白色的 báisède ‘white’ modifies the artifact 牆 qiáng ‘wall’, which means
that the wall has a white color. It is not ambiguous at all.

Based on these analyses, we made some modifications to nominal co-predication and adjectival modification in Pustejovsky (2006). a) Nominal co-predication of non-natural kinds requires that the co-predicated nouns must share a property of the item being predicated, such as the formal role or the telic role. b) When an adjective modifies a complex-type natural noun, this construction could be ambiguous, as shown in (7). When an adjective modifies an artifactual-type non-natural noun, this construction is not necessarily ambiguous, as depicted in (8).

This section has indicated that natural kind and non-natural kind event nouns have different properties. The following section will establish a classification system for event nouns based on the natural and non-natural distinction.

3 Establish a Classification System for Event Nouns

Previous research classifies event nouns according to their semantic categories (Han 2004, 2010b; Liu 2004; Wang 2010; Zhong 2010). The main categories include natural phenomenon, wars, conferences, competitions, entertainments, ceremonies, etc. These semantic categories, however, cover the shared properties of event nouns from different categories. For example, wars, conferences, and competitions are all non-natural kinds and have more features in common compared to natural kinds. This section will investigate the subclasses of natural kinds and non-natural kinds based on GL.

3.1 Natural Kinds: Natural Types and Natural Complex Types

Though intuitively all natural occurring events should have physical object manifestations, not all of them are linguistically represented. For example, 地震 ‘earthquake’ occurs due to seismic waves caused by a sudden release of the crust’s energy. The corpus data of 地震 ‘earthquake’ shows that linguistically only the ‘event’ aspect of 地震 ‘earthquake’ is expressed, while the ‘wave’ aspect is not. This is shown from Table 2 to Table 4.

First, let’s look at the classifiers of 地震 ‘earthquake’.

| Classifier | Pinyin | Translation | Frequency | Salience |
|------------|--------|-------------|-----------|----------|
| [] | cì | once (re. frequency of event) | 59 | 39.04 |
| [] | jí | magnitude | 5 | 16.16 |
| [] | chǎng | a (scheduled ) event (with beginning and ending) | 3 | 9.15 |
| [] | qǐ | event (especially a happening, an accident) | 1 | 4.44 |

Table 2: Classifiers of 地震 ‘earthquake’ in Sinica Corpus (frequency ≥1)

Table 2 shows all the classifiers of 地震 ‘earthquake’ in Sinica Corpus. All of them are event classifiers (Huang & Ahrens 2003), so the noun they select must represent an event.

Second, the verbs that have 地震 ‘earthquake’ as their subject in Sinica Corpus (frequency ≥2) are illustrated in Table 3.

| Subject of | Pinyin | Translation | Frequency | Salience |
|------------|--------|-------------|-----------|----------|
| [] | fāshēng | occur | 18 | 22.29 |
| [] | zàochèng | cause | 19 | 21.71 |
| [] | mǒnǐ | simulate | 5 | 17.06 |
| [] | jìxū | continue | 9 | 15.48 |
| [] | yǐnzhì | lead to | 2 | 12.47 |
| [] | pōhuái | damage | 4 | 11.87 |
| [] | shìfàng | release | 2 | 9.4 |

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In Table 3, the subject of these verbs in Sinica Corpus is the first verb "fāshēng ‘occur’". It is an event-selecting verb as shown in Table 4. This table lists the words that are the subjects of "fāshēng ‘occur’". These words either represent events in themselves or are coerced to refer to events. For example, "shíjiàn ‘event’", "shígu ‘accident’", and "chēhuò ‘car accident’" refer to events directly. "wèntí ‘problem’" is an entity noun, but it is coerced to be an event when it is selected by "fāshēng ‘occur’". Therefore, in Table 3, the subject "dǐzhèn ‘earthquake’" selected by "fāshēng ‘occur’" has an event reading, rather than a wave reading.

In Table 4, subjects of "fāshēng ‘occur’" in Sinica Corpus (frequency ≥5)

Similar with "fāshēng ‘occur’", in Table 3, verbs "zàochéng ‘cause’", "jìxù ‘continue’", "yǐnfā ‘cause’", "sīdàng ‘cause’", "bānshuǐ ‘cause’", "jīngguó ‘go through’", and "zàochéng ‘cause’" could have either the earthquake event or seismic waves as their subjects, so their selectional status is undecided.

Thirdly, the verbs that have "dǐzhèn ‘earthquake’" as their object in Sinica Corpus (frequency ≥2) are presented in Table 5.

In Table 5, the object of these verbs (frequency ≥2) in Sinica Corpus. Most of the verbs are event-selecting words, such as "fāshēng ‘occur’", "chūfā ‘trigger’", "yǐnfā ‘cause’", "jīngguó ‘go through’", "zàochéng ‘cause’". Thus they predict that the object "dǐzhèn ‘earthquake’" is an event. Seismic waves are invisible, so it is impossible that the verb "guānkàn ‘watch’" selects them; this verb can only select the event aspect of "dǐzhèn ‘earthquake’". The verb "děng ‘wait for’" selects them in Table 3.
could select either the event aspect of 地震 ‘earthquake’ or waves, so its selectional status is undecided.

In sum, three evidences have been explored to discover whether 地震 ‘earthquake’ has an event reading or a seismic waves reading linguistically. They are: 1) all its classifiers are event classifiers; 2) when it is a subject, most of its predicates select event-reading words, except that 模擬 ‘simulate’ and 釋放 ‘release’ and 影響 ‘affect’ have a undecided status; 3) when it is an object, the majority of the predicates select an event, except that 等 ‘wait for’ has a undecided status. These evidences indicate that no verbs exclusively select the wave aspect of 地震 ‘earthquake’. We know the existence of the ‘wave’ aspect due to our world knowledge. Linguistically 地震 ‘earthquake’ only has an event reading. For natural-kind nouns like 地震 ‘earthquake’, which only have an event reading and no physical manifestation linguistically represented, we classify them into natural types.

Different from the natural phenomenon 地震 ‘earthquake’, 雪 ‘snow’ can be linguistically expressed as both an event and a physical object (physobj), as shown in Table 6 through Table 8.

First, all the classifiers of 雪 ‘snow’ in Sinica Corpus are illustrated in Table 6.

| Classifier | pinyin | Translation       | Frequency | Salience | 雪 ‘Snow’ |
|------------|--------|-------------------|-----------|----------|----------|
| 程 | chéng | a (scheduled) event (with beginning and ending) | 5         | 16.84    | event    |
| 堆 | duī | pile | 2 | 11.36 | physobj  |
| 一次 | cì | once (re. frequency of event) | 2 | 7.37 | event   |

Table 6: Classifiers of 雪 ‘snow’ in Sinica Corpus (frequency ≥1)

Table 7: Verbs that have 雪 ‘snow’ as their subject in Sinica Corpus (frequency ≥2)

| Subject of | pinyin | Translation | Frequency | Salience | 雪 ‘Snow’ |
|------------|--------|-------------|-----------|----------|----------|
| 紛飛 | fēnfēi | fall in flakes | 4 | 20.95 | physobj |
| 落下 | luòxià | fall | 3 | 15.8 | physobj |
| 停 | tíng | stop | 3 | 13.13 | event |
| 下 | xià | fall | 4 | 12 | event |
| 停止 | tíngzhǐ | stop | 3 | 11.43 | event |
| 覆蓋 | fùgài | cover | 2 | 10.81 | physobj |
| 埋 | mái | bury | 2 | 10.36 | physobj |
| 来临 | láilí | advent | 2 | 10.17 | event |
| 封 | féng | close | 2 | 9.03 | physobj |
| 来 | lái | come | 3 | 4.83 | event |

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describes 雪 xuě ‘snow’ as physical objects: snowflakes. By contrast, 停 tíng ‘stop’, 停止 tíngzhǐ ‘stop’, 下 xià ‘fall’, 來 lái ‘come’ and 来臨 láilín ‘advent’, and 来 ‘a (scheduled) event (with beginning and ending)’ is an event classifier which indicates that 雪 xuě ‘snow’ is an event. 雪 xuě ‘snow’ as their object in Sinica Corpus (frequency ≥ 2) are illustrated in Table 8.

| Object of | pin yin | translation | Frequency | Salience | xuě ‘Snow’ |
|-----------|---------|-------------|-----------|----------|-------------|
| 雪 xuě    | appr     | 12          | 27.3      | event    |
| 雪 xuě    | fall     | 9           | 7         | event    |
| 雪 xuě    | play     | 6           | 4         | physobj  |
| 雪 xuě    | look at  | 9           | 2         | event    |
| 雪 xuě    | avoid    | 2           | 3         | event    |
| 雪 xuě    | mix      | 2           | 9.89      | physobj  |
| 雪 xuě    | brave    | 2           | 9.87      | event    |
| 雪 xuě    | drop     | 2           | 9.86      | event    |
| 雪 xuě    | avoid    | 2           | 9.82      | event    |
| 雪 xuě    | drop     | 2           | 9.68      | physobj  |
| 雪 xuě    | look at  | 9           | 12.4      | event    |
| 雪 xuě    | avoid    | 2           | 11.4      | event    |
| 雪 xuě    | mix      | 2           | 2         | physobj  |
| 雪 xuě    | not have | 2           | 4.94      | physobj  |

Table 8: Verbs that have 雪 xuě ‘snow’ as their object in Sinica Corpus (frequency ≥ 2)

Zhè chéng xià le sān tiān sān yè de heavy snow cover ASP three day three night DE dà xuě fūgài le zhèng piàn sēnlín. The snow that lasted three days and three nights covered the entire forest.

In (9), zhàng ‘a (scheduled) event (with beginning and ending)’ is an event classifier which indicates that 雪 xuě ‘snow’ is an event. 雪 xuě ‘snow’ as their object in Sinica Corpus (frequency ≥ 2) are illustrated in Table 8.

In (10), zá cáo ‘weed’ is an entity rather than an event. Hence, fūgài ‘cover’ selects the snowflakes reading of 雪 xuě ‘snow’.

In sum, three evidences have indicated that linguistically 雪 xuě ‘snow’ can either direct at the snowing event or the physical objects snowflakes. They are: 1) its classifiers can be both event classifiers and individual classifiers; 2) when it is a subject, its predicates select either the event reading or the physical object reading; 3) when it is an object, its predicates select the snowing event, physical objects snowflakes or event physobj. For natural-kind nouns like 雪 xuě ‘snow’, which have both an event reading and a physical object reading encoded in one lexical item, we classify them into natural complex types.

To summarize, the corpus data prove that natural phenomenon can fall into either natural types or natural complex types. Shìzhèn ‘earthquake’ only refers to an event and thus it is a natural type, while 雪 xuě ‘snow’ can be either an event or a physical object and thus it is a complex type.

3.2 Non-Natural Kinds: Artifactual Types and Artifactual Complex Types

Social activities can be from either artifactual types or complex types. Some social activities such as zhànhèng ‘war’ and bǐsài ‘game’ are only
artifactual types.

(11) zhè chǎng kuàngrìchíjiù de zhànzhěng bùnèng zhènghòng yánzhòng dà de rényuánshěngwáng hé cause serious property loss, but also become affect Russia shèhui wěndōng yānzhǔng de zhòngyàowù shì stability and tranquility of the Russian society.

(12) M lànghuì de bā sà jí hu rè qiūwēn Marathon-style DE game and hot temperature shī qíyuán tǐ hé qíqū de are player physical strength and ball skills DE dà de kǒu yán big challenge ‘Marathon-style game and high temperature are a big challenge to the physical strength and ball skills of the players.’

Both zhànzh[text]eng ‘war’ and bǐsài ‘game’ represent events. In (11) zhànzheng ‘war’ is modified by bǐsài ‘game’ and in (12) bǐsài ‘game’ is modified by mǎlǎsōngshì ‘Marathon-style’. The two adjectives refer to the duration of the war and the game respectively, which indicates that both war and game are events. Some other social activities such as yánjìäng ‘lecture’, yǐnyuè hùi ‘concert’, zhōngyào ‘breakfast’, and fēnxí ‘analysis’ are complex types. These event nouns refer to more than one aspect.

(13) zhè chǐng yǒu nèng yuè yìyì ‘This speech very has meaningful’ this CL speech very has meaningful ‘This speech is meaningful.’

For example, in (13), zhànzheng ‘war’ only has an event reading, so it is an artifactual type. Yánjìäng ‘speech’ can direct at either the speaking event or the information, so it is an artifactual complex type.

4 Structures to Identify Complex Types

Pustejovsky & Jezek (2008) argues that co-predication is a property of complex types. Our research provides more syntactic patterns to identify complex types in Mandarin Chinese, such as ‘not only……but also……’, ‘although……but……’.

Examples (14) and (15) illustrate complex types of natural and artifactual event nouns respectively. In (14), mǐ ‘dense’ is about the physical object aspect of snow; jí ‘rapid’ is about the event aspect of snow. The conjunctions ‘not only……but also……’, ‘although…… but……’ connects both mǐ ‘dense’ ‘dense’ and jí ‘rapid’, which indicates that xuě ‘snow’ is a complex type. In (15), róngcháng ‘tediously long’ modifies the breakfast’s event aspect; hào chī ‘good to eat’ modifies its physical object aspect. They are connected by the conjunctions ‘although…… but……’,
which proves that 早餐  "breakfast" is a complex type.

(14) 好大的雪，又密又急。
      Hǎo dà de xuě, yòu mì yòu jí
      'What a heavy snow! (It is) dense and rapid.'

(15) 这次早餐虽然很冗长，但是很好吃。
      Zhè cì zǎocān suīrán hěn rǒngcháng, dànshì hěn hǎo chī.
      'The breakfast, although it is tediously long, was tasty.'

Though co-predication is important property of complex type, it is not a necessary property. Example (16) is from Pustejovsky (2005).

(16) appointment (Event•Human)
a. Your next appointment is at 3:00 pm.
b. Your next appointment is a blonde.

(16a) refers to an event, while (16b) refers to a human. The event and human aspects of appointment cannot get co-predication.

5 Conclusions

To conclude, this paper finds that natural kinds can be divided into natural types and natural complex types; non-natural kinds fall into artifactual types or artifactual complex types. This is shown in Table 9.

Table 9: Event Nouns: Natural Kinds and Non-Natural Kinds

| Event Nouns | Natural Kinds | Non-Natural Kinds |
|-------------|---------------|-------------------|
|             | Natural Types | Artifactual Types |
|             | Natural Complex Types | Artifactual Complex Types |

Table 10: A Tripartite Classification System for Event Nouns

The results indicate that event nouns of the same semantic category can be from different types. For instance, event nouns that represent natural phenomenon can either belong to natural types or natural complex types. Event nouns that represent social activities can be either from artifactual types or artifactual complex types.

This work has enriched the complex types by including both natural complex types and artifactual complex types. The new classification, which is based on types rather than semantic categories, can help to capture the characteristics of different types of event nouns.

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