

Type Construction of Event Nouns in Mandarin Chinese

Shan Wang^{1,2}

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 Corpus*¹, accessed through *Chinese*

*Word Sketch Engine*², (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	unambiguous in their modification of the nominal head	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. 這是地震。

Zhè shì dìzhèn.

this is earthquake

‘This is an earthquake.’

b. ! 這是地震和海嘯。

! Zhè shì dìzhèn hé hǎixiào.

this is earthquake and tsunami

! ‘This is an earthquake and a tsunami.’

c. 這是地震，所以是自然災害。

Zhè shì dìzhèn, suǒ yǐ shì zìrán zīhài.

this is earthquake, therefore is natural disaster

‘This is an earthquake, and therefore a natural disaster.’

(1) show cases of nominal predication of natural-kind event nouns. They permit singular predication as shown in (1a). Same with entity nouns in Pustejovsky (2006), natural event noun requires predicative uniqueness, so the nominal co-predication in (1b) is an anomaly. The predication in (1b) is contradictory. In (1c), the construction 所以是 *suǒ yǐ shì* ‘therefore (it) is’ is valid with the first noun as a subtype of the second. Since 地震 *dìzhèn* ‘earthquake’ is a subtype of 自然災害 *zìrán zīhài* ‘natural disaster’, the construction in (1c) is acceptable.

(2) a. 這是婚禮。

Zhè shì hūnlǐ.

this is wedding

‘This is a wedding.’

b. 這是婚禮和宴會。

Zhè shì hūnlǐ hé yànhuì.

this is wedding and banquet

‘This is a weddings and a banquet.’

c. 這是婚禮，所以是社會活動。

Zhè shì hūnlǐ, suǒ yǐ 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 所以是 *su y shì* ‘therefore (it) is’ links the two event nouns.

(3) a. 猛烈的地震

m nglìède dìzhèn
violent earthquake
‘a violent earthquake’

b. 很長的早餐

h n ch ng de z oc n
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 *m nglìède* ‘violent’ modifies the intensity of the earthquake and is unambiguous. In (3b), the modifier 很長的 *h n ch ng 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。

! *T men k ish le f ng.*
they begin ASP wind
! ‘They began the wind.’

b. 他們開始了體操比賽。

T men k ish le t c o b sài.
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 *f ng* ‘wind’ has no prior information to get coerced, so this sentence is odd. In (4b), however, the non-natural event noun 體操 *t c o* ‘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 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) ! 這是鋼筆和桌子。

! *Zhè shì g ngb hé zhu zi.*
this is pen and table
!this is a 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) ! 這是戰爭和海水浴。

! *Zhè shì zhànzh ng hé h ishū yù.*
this is 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

dà y
heavy rain
‘heavy rain’

In (7), the adjective 大 *dà* ‘heavy’ can modify the raining event and the raindrops. This is because 雨 *y* ‘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

báisède qiáng
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 *dìzhèn* ‘earthquake’ occurs due to seismic waves caused by a sudden release of the crust’s energy. The corpus data of 地震 *dìzhèn*

‘earthquake’ shows that linguistically only the ‘event’ aspect of 地震 *dìzhèn* ‘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 *dìzhèn* ‘earthquake’.

classifier	<i>pinyin</i>	Translation	Frequency	Saliency
次	<i>cì</i>	once (re. frequency of event)	<u>59</u>	39.04
級	<i>jí</i>	magnitude	<u>5</u>	16.16
場	<i>chǎng</i>	a (scheduled) event (with beginning and ending)	<u>3</u>	9.15
起	<i>qǐ</i>	event (especially a happening, an accident)	<u>1</u>	4.44

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

Table 2 shows all the classifiers of 地震 *dìzhèn* ‘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 *dìzhèn* ‘earthquake’ as their subject in Sinica Corpus (frequency 2) are illustrated in Table 3.

Subject of	<i>pinyin</i>	Translation	Frequency	Saliency
發生	<i>fāshēng</i>	occur	<u>18</u>	22.29
造成	<i>zàochéng</i>	cause	<u>19</u>	21.71
模擬	<i>mófn</i>	simulate	<u>5</u>	17.06
繼續	<i>jìxù</i>	continue	<u>9</u>	15.48
引致	<i>yǐnzhi</i>	lead to	<u>2</u>	12.47
破壞	<i>pòhuài</i>	damage	<u>4</u>	11.87
釋放	<i>shìfàng</i>	release	<u>2</u>	9.4

停止	tíngzhǐ	stop	<u>2</u>	7.54
導致	dǎozhì	result in	<u>2</u>	6.5
影響	yǐngxiǎng	affect	<u>2</u>	4.1
來	lái	come	<u>2</u>	2.3

Table 3: Verbs that have 地震 *dìzhèn* ‘earthquake’ as their subject in Sinica Corpus (frequency 2)

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

Subject	<i>pinyin</i>	Translation	Frequency	Saliency
事件	<i>shìjiàn</i>	event	<u>52</u>	27.38
地震	<i>dìzhèn</i>	earthquake	<u>18</u>	21.78
事故	<i>shìgù</i>	accident	<u>13</u>	20.53
事情	<i>shìqíng</i>	affair	<u>27</u>	20.36
悲劇	<i>bēijù</i>	tragedy	<u>11</u>	19.24
情形	<i>qíngxíng</i>	situation	<u>23</u>	18.39
事	<i>shì</i>	affair	<u>29</u>	16.42
車禍	<i>chēhuò</i>	car accident	<u>6</u>	14.18
意外	<i>yìwài</i>	accident	<u>7</u>	12.12
現象	<i>xiànxàng</i>	phenomenon	<u>11</u>	11.81
情況	<i>qíngkuàng</i>	situation	<u>11</u>	10.49
案	<i>àn</i>	case	<u>5</u>	8.83
狀況	<i>zhuàngkuàng</i>	status	<u>6</u>	7.81
問題	<i>wèntí</i>	problem	<u>12</u>	6.36
行為	<i>xíngwéi</i>	behavior	<u>5</u>	5.96

Table 4: Subjects of 發生 *fāshēng* ‘occur’ in Sinica Corpus (frequency 5)

Similar with 發生 *fāshēng* ‘occur’, in Table 3, verbs 造成 *zàochéng* ‘cause’, 繼續 *jìxù* ‘continue’, 引致 *yǐnzhi* ‘lead to’, 破壞 *pòhuài* ‘damage’, 停止 *tíngzhǐ* ‘stop’, 導致 *dǎozhì* ‘result in’, 來 *lái* ‘come’ also only selects the event aspect of 地震 *dìzhèn* ‘earthquake’ rather than the wave aspect. Verbs 模擬 *mófnǐ* ‘simulate’, 釋放 *shìfàng* ‘release’ and 影響 *yǐngxiǎng* ‘affect’ could have either the earthquake event or seismic waves as their subjects, so their selectional status is undecided.

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

Object	<i>pinyin</i>	Translation	Frequency	Saliency
發生	<i>fāshēng</i>	occur	<u>10</u>	19.07
觸發	<i>chùfā</i>	trigger	<u>2</u>	13.58
觀看	<i>guānkàn</i>	watch	<u>2</u>	10.58
引發	<i>yǐnyǎo</i>	cause	<u>2</u>	8.47
等	<i>děng</i>	wait for	<u>2</u>	8.09
經過	<i>jīngguò</i>	go through	<u>2</u>	6.93
造成	<i>zàochéng</i>	cause	<u>2</u>	5.75

Table 5: Verbs that have 地震 *dìzhèn* ‘earthquake’ as their object in Sinica Corpus (frequency 2)

In Table 5, 地震 *dìzhèn* ‘earthquake’ is the object of these verbs (frequency 2) in Sinica Corpus. Most of the verbs are event-selecting words, such as 發生 *fāshēng* ‘occur’, 觸發 *chùfā* ‘trigger’, 引發 *yǐnyǎo* ‘cause’, 經過 *jīngguò* ‘go through’, 造成 *zàochéng* ‘cause’. Thus they predict that the object 地震 *dìzhèn* ‘earthquake’ is an event. Seismic waves are invisible, so it is impossible that the verb 觀看 *guānkàn* ‘watch’ selects them; this verb can only select the event aspect of 地震 *dìzhèn* ‘earthquake’. The verb 等 *děng* ‘wait for’

could select either the event aspect of 地震 *dìzhèn* ‘earthquake’ or waves, so its selectional status is undecided.

In sum, three evidences have been explored to discover whether 地震 *dìzhèn* ‘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 *món* ‘simulate’ and 釋放 *shìfàng* ‘release’ and 影響 *yǐngxiǎng* ‘affect’ have a undecided status; 3) when it is an object, the majority of the predicates select an event, except that 等 *děng* ‘wait for’ has a undecided status. These evidences indicate that no verbs exclusively select the wave aspect of 地震 *dìzhèn* ‘earthquake’. We know the existence of the ‘wave’ aspect due to our world knowledge. Linguistically 地震 *dìzhèn* ‘earthquake’ only has an event reading. For natural-kind nouns like 地震 *dìzhèn* ‘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 *dìzhèn* ‘earthquake’, 雪 *xu* ‘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 *xu* ‘snow’ in Sinica Corpus are illustrated in Table 6.

Classifier	<i>p ny n</i>	Translation	Frequency	Salience	雪 <i>xu</i> ‘Snow’
場	<i>ch ng</i>	a (scheduled) event (with beginning and ending)	<u>5</u>	16.84	event
堆	<i>du</i>	pile	<u>2</u>	11.36	physobj
次	<i>cì</i>	once (re. frequency of event)	<u>2</u>	7.37	event

捧	<i>p ng</i>	handful	<u>1</u>	7.17	physobj
團	<i>tuán</i>	lump	<u>1</u>	6.64	physobj
把	<i>b</i>	handful	<u>1</u>	6.43	physobj
重	<i>chóng</i>	layer	<u>1</u>	6.17	physobj
層	<i>céng</i>	layer	<u>1</u>	5.86	physobj
片	<i>piàn</i>	chunk	<u>1</u>	5.36	physobj

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

場 *ch ng* ‘a (scheduled) event (with beginning and ending)’ and 次 *cì* ‘once (re. frequency of event)’ are event classifiers which indicate that 雪 *xu* ‘snow’ is an event. Differently, 堆 *du* ‘pile’, 捧 *p ng* ‘handful’, 團 *tuán* ‘lump’, 把 *b* ‘handful’, 重 *chóng* ‘layer’, 層 *céng* ‘layer’, and 片 *piàn* ‘chunk’ are individual classifiers, which selects entities. Hence 雪 *xu* ‘snow’ is a physical object when selected by them.

Secondly, the verbs that have 雪 *xu* ‘snow’ as their subject in Sinica Corpus (frequency 2) are depicted in Table 7.

Subject of	<i>p ny n</i>	Translation	Frequency	Salience	雪 <i>xu</i> ‘Snow’
紛飛	<i>fēnfēi</i>	fall in flakes	<u>4</u>	20.95	physobj
落下	<i>luòxià</i>	fall	<u>3</u>	15.8	physobj
停	<i>tíng</i>	stop	<u>3</u>	13.13	event
下	<i>xià</i>	fall	<u>4</u>	12	event
停止	<i>tíngzhǐ</i>	stop	<u>3</u>	11.43	event
覆蓋	<i>fùgài</i>	cover	<u>2</u>	10.81	physobj
埋	<i>mái</i>	bury	<u>2</u>	10.36	physobj
來臨	<i>láilín</i>	advent	<u>2</u>	10.17	event
封	<i>fēng</i>	close	<u>2</u>	9.03	physobj
來	<i>lái</i>	come	<u>3</u>	4.83	event

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

紛飛 *fēnfēi* ‘fall in flakes’, 落下 *luòxià* ‘fall’, 覆蓋 *fùgài* ‘cover’, 埋 *mái* ‘bury’, and 封 *fēng* ‘close’

describes 雪 *xu* ‘snow’ as physical objects: snowflakes. By contrast, 停 *tíng* ‘stop’, 停止 *tíngzhǐ* ‘stop’, 下 *xià* ‘fall’, 來臨 *láilín* ‘advent’, and 來 *lái* ‘come’ and depicts the snowing event.

Thirdly, the verbs that have 雪 *xu* ‘snow’ as their object in Sinica Corpus (frequency 2) are illustrated in Table 8.

Object of	<i>pinyin</i>	translation	Frequency	Salience	雪 <i>xu</i> ‘Snow’
賞	<i>shǎng</i>	appreciate	12	27.33	event-physobj, or physobj
下	<i>xià</i>	fall	9	19.27	event
玩	<i>wán</i>	play	6	15.74	physobj
看	<i>kàn</i>	look at	9	12.42	event-physobj, or physobj
躲避	<i>dùbì</i>	avoid	2	11.43	event
夾	<i>jiā</i>	mix	2	9.89	physobj
冒	<i>mào</i>	brave	2	9.87	event
降	<i>jiàng</i>	drop	2	9.86	event
避	<i>bì</i>	avoid	2	9.82	event
落	<i>luò</i>	drop	2	9.68	event-physobj
像	<i>xiàng</i>	resemble	2	5.15	physobj
無	<i>wú</i>	not have	2	4.94	event-physobj, or physobj

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

玩 *wán* ‘play’, 夾 *jiā* ‘mix’, and 像 *xiàng* ‘resemble’ treats 雪 *xu* ‘snow’ as snowflakes. 下 *xià* ‘fall’, 躲避 *dùbì* ‘avoid’, 冒 *mào* ‘brave’, 降 *jiàng* ‘drop’, 避 *bì* ‘avoid’ depict 雪 *xu* ‘snow’ as an event. 落 *luò* ‘drop’ describes 雪 *xu* ‘snow’ as a dot object event-physobj. 賞 *shǎng* ‘appreciate’, 看 *kàn* ‘look at’, and 無 *wú* ‘not have’ can either refer to event-physobj or simply snowflakes. Moreover, the event reading and physical object reading of 雪 *xu* ‘snow’ can be represented in one sentence as shown in (9).

(9) 這場下了三天三夜的大雪覆蓋了整片森林。

Zhè chǎng xià le sān tiān sān yè de
this CL fall ASP three day three night DE
dàxué fùgài le zhèng piàn sēnlín.
heavy snow cover ASP entire CL forest
‘The snow that lasted three days and three nights covered the entire forest.’

In (9), 場 *chǎng* ‘a (scheduled) event (with beginning and ending)’ is an event classifier which indicates that 雪 *xu* ‘snow’ is an event. 覆蓋 *fùgài* ‘cover’ selects a physical object as its subject as shown in (10).

(10) 豆苗被雜草覆蓋。

Dòumiáo bèi záocǎo fùgài.
bean seedling BEI(passive marker) weed cover
‘Bean seedlings are covered by weeds.’

In (10), 雜草 *záocǎo* ‘weed’ is an entity rather than an event. Hence, 覆蓋 *fùgài* ‘cover’ selects the snowflakes reading of 雪 *xu* ‘snow’.

In sum, three evidences have indicated that linguistically 雪 *xu* ‘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 *xu* ‘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. 地震 *dìzhèn* ‘earthquake’ only refers to an event and thus it is a natural type, while 雪 *xu* ‘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 戰爭 *zhànzhēng* ‘war’ and 比賽 *bǐsài* ‘game’ are only

artifactual types.

(11) 這場曠日持久的戰爭不僅造成嚴重的人員傷亡和財產損失，而且成為影響俄社會穩定與安寧的重要因素。

Zhè chǎng kuàng rì chí jiǔ de zhànzhēng bù jǐn
this CL protracted war not only
zào chéng yánzhòng de rényuán shāng wáng hé
cause serious casualties and
cái chéng wéi yǐng xiǎng wú shè huì
property loss, but also become affect Russia
shè huì wǎn dìng yǎn níng de zhòng yào
society stability and tranquility DE important
yīn sù.
factor.

‘This protracted war not only caused serious casualties and property losses, but has also become an important factor that affects the stability and tranquility of the Russian society.’

(12) 馬拉松式的比賽及火熱氣溫是球員體力和球技的大考驗。

Mǎ lā sōng shì de bǐ sài jí huǒ rè qì wēn
Marathon-style DE game and hot temperature
shì qiú yuán tǐ lì hé qiú jì de
are player physical strength and ball skills DE
dà kǎo yàn.
big challenge

‘Marathon-style game and high temperature are a big challenge to the physical strength and ball skills of the players.’

Both 戰爭 *zhànzhēng* ‘war’ and 比賽 *bǐsài* ‘game’ represent events. In (11) 戰爭 *zhànzhēng* ‘war’ is modified by 曠日持久的 and in (12) 比賽 *bǐsài* ‘game’ is modified by 馬拉松式 *mǎlāsōngshì* ‘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 Event•Information (演講 *yǎnjiǎng* ‘lecture’), Event•Music (音樂會 *yīnyuè huì* ‘concert’), Event•Physobj (早餐 *zǎocān* ‘breakfast’), and Process•Result (分析 *fēnxī* ‘analysis’) are complex types. These event nouns refer to more than one aspect.

(13) 這場演講很有意義。

Zhè chǎng yǎnjiǎng hěn yǒu yìyì.
this CL speech very has meaningful
‘This speech is meaningful.’

For example, in (13), 場 *chǎng* ‘a (scheduled) event (with beginning and ending)’ is an event classifier, which indicates that 演講 *yǎnjiǎng* ‘lecture’ is an event noun. 很有意義 *hěn yǒu yìyì* ‘of great significance’ states the information aspect of 演講 *yǎnjiǎng* ‘lecture’.

To summarize, event nouns of non-natural kinds can be divided into artifactual types and artifactual complex types. For example, 戰爭 *zhànzhēng* ‘war’ only has an event reading, so it is an artifactual type. 演講 *yǎnjiǎng* ‘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 既……又…… *jì……yòu……* ‘not only……but also……’, 不但……而且…… *bùdàn……érqiě……* ‘not only……but also……’, (雖然)……但是…… *(su rán)……dànshì……* ‘(although)……but……’, 又……又…… *yòu……yòu……* ‘(both)……and……’.

Examples (14) and (15) illustrate complex types of natural and artifactual event nouns respectively. In (14), 密 *mì* ‘dense’ is about the physical object aspect of snow; 急 *jí* ‘rapid’ is about the event aspect of snow. The conjunctions 又……又…… *yòu……yòu……* ‘(both)……and……’ connects both 密 *mì* ‘dense’ and 急 *jí* ‘rapid’, which indicates that 雪 *xuě* ‘snow’ is a complex type. In (15), 冗長 *rǒngcháng* ‘tediously long’ modifies the breakfast’s event aspect; 好吃 *hǎochī* ‘good to eat’ modifies its physical object aspect. They are connected by the conjunctions 雖然……但是…… *su rán……dànshì……* ‘although……but……’,

which proves that 早餐 *z oc n* ‘breakfast’ is a complex type.

(14) 好大的雪，又密又急。

H o dà de xu , yòu mì yòu jí 。
how heavy DE snow, and dense and rapid
‘What a heavy snow! (It is) dense and rapid.’

(15) 這次早餐雖然很冗長，但是很好吃。

Zhè cì z oc n su rán h n
this CL breakfast although very
r ngcháng, dànshì h n hào ch .
tediously long, but very good eat
‘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.

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

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

Table 9 can be re-represented in Table 10 in order to fit into the tripartite system in Pustejovsky (2001, 2006) and Pustejovsky & Jezek (2008). Event nouns are divided into natural types, artifactual types and complex types (including

natural complex types and artifactual complex types).

Event Nouns	Natural Types	
	Artifactual Types	
	Complex 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.

Acknowledgements

We would like to express our gratitude to Prof. James Pustejovsky for the discussion on this paper. The remaining errors are ours.

References

- Chu, Zexiang. 2000. *An Investigation on Nouns' Adaptation to Temporality*. Modern Chinese Grammar Studies that Face the Challenges of New Century: the International Conference on Modern Chinese Grammar, 1998, ed. by Jianming Lu. Jinan: Shandong Education Press.
- Han, Lei. 2004. An Analysis of Event Nouns in Modern Chinese. *Journal of East China Normal University (Philosophy and Social Sciences)*, 36 (5).P106-113.
- Han, Lei. 2010a. Analysing the Word Class Status of Event Nouns. *Journal of Ningxia University (Humanities & Social Sciences Edition)*, (1).P6-10.
- Han, Lei. 2010b. The Definition of Event Nouns. *Paper presented at The 16th Symposium on Modern Chinese Grammar*, City University of Hong Kong, Hong Kong.

- Huang, Chu-Ren & Kathleen Ahrens. 2003. Individuals, Kinds and Events: Classifier Coercion of Nouns. *Language Sciences* 25 (4).P353-373.
- Liu, Shun. 2004. A Study of Temporality of Common Nouns. *Language Teaching and Linguistic Studies* (4).P25-35.
- Ma, Qingzhu. 1995. *Verbs with Denotational Meaning and Nouns with Statement Meaning*. Research and Exploration of the Grammar. Beijing: The Commercial Press.
- Pustejovsky, James. 2001. *Type Construction and the Logic of Concepts*. The Language of Word Meaning, ed. by Pierrette Bouillon & Federica Busa, P91-123: Cambridge University Press.
- Pustejovsky, James. 2005. A Survey of Dot Objects. Brandeis University. Technical report.
- Pustejovsky, James. 2006. Type Theory and Lexical Decomposition. *Journal of Cognitive Science* 7 (1).P39-76.
- Pustejovsky, James & Elisabetta Jezek. 2008. Semantic Coercion in Language: Beyond Distributional Analysis. *Distributional Models of the Lexicon in Linguistics and Cognitive Science, special issue of Italian Journal of Linguistics/Rivista di Linguistica*.
- Wang, Hui & Xuefeng Zhu. 2000. *Subcategorization and Quantitative Research on Modern Chinese Nouns*. Modern Chinese Grammar Studies that Face the Challenges of New Century:the International Conference on Modern Chinese Grammar,1998. Jinan: Shandong Education Press.
- Wang, Shan & Chu-Ren Huang. 2011a. *Compound Event Nouns of the 'Modifier-head' Type in Mandarin Chinese*. Proceedings of The 25th Pacific Asia Conference on Language, Information and Computation (PACLIC-25), ed. by Helena Hong Gao & Minghui Dong, P511-518. Nanyang Technological University, Singapore.
- Wang, Shan & Chu-Ren Huang. 2011b. Domain Relevance of Event Coercion in Compound Nouns. *Paper presented at The 6th International Conference on Contemporary Chinese Grammar (ICCCG-6)*, I-Shou University, Kaohsiung, Taiwan.
- Wang, Shan & Chu-Ren Huang. 2011c. Event Classifiers and Their Selected Nouns. *Paper presented at The 19th Annual Conference of the International Association of Chinese Linguistics (IACL-19)*, Nankai University, Tianjin, China.
- Wang, Shan & Chu-Ren Huang. 2012a. A Constraint-based Linguistic Model for Event Nouns. *Paper presented at Forum on 'Y. R. Chao and Linguistics', Workshop of The 20th Annual Conference of the International Association of Chinese Linguistics (IACL-20)*, The Hong Kong Institute of Education, Hong Kong.
- Wang, Shan & Chu-Ren Huang. 2012b. *A Preliminary Study of An Event-based Noun Classification System*. The 13th Chinese Lexical Semantics Workshop (CLSW-13), ed. by Yanxiang He & Donghong Ji, P4-9. Wuhan University, China.
- Wang, Shan & Chu-Ren Huang. 2012c. Qualia Structure of Event Nouns in Mandarin Chinese. *Paper presented at The Second International Symposium on Chinese Language and Discourse*, Nanyang Technological University, Singapore.
- Wang, Shan & Chu-Ren Huang. 2012d. Temporal Properties of Event Nouns in Mandarin Chinese. *Paper presented at The 57th Annual International Linguistic Association Conference (ILA-57)*, New York, USA
- Wang, Yanqing. 2010. *A Study on the Combination of the Time-quantity Phrase and the Event Noun*. Wuhan: Central China Normal University.
- Zhong, Ming. 2010. *A Study on Event Nouns in Chinese and English*. Nanchang: Nanchang University.