THE CHINESE ASPECTUAL SYSTEM

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The Chinese Aspectual System

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CERTIFICATE OF ORIGINALITY

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_____(Signed)

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Abstract

Chinese aspect is studied from two different perspectives. The first focuses on the functionalities of the aspectual markers 着 *zhe0* 'ZHE', 了 *le0* 'LE' and 过 *guo4* 'GUO'. The other focuses on the aspectual classification of verbs (situation aspect). However, very few studies concern about the relationship between aspectual markers and situation aspect. Situation classification in Chinese, itself, is also problematic, e.g. whether the classification should be performed in word, phrase or sentence level. This question is actually related to the philosophical question how human perceive events and treat them differently, which is addressed in ontological descripitions of different event types. In this sense, previous studies have been trying to classify linguistic units into ontological categories, encountering the problems being discussed for decades. The intrinsic reason is that each linguistic unit in various granularities including word, phrase and sentences can be used to describe different ontological event types.

This thesis describes a study on aspectual classification in Chinese. Different from previous studies that have tried to classify linguistic units into different situation types directly, this study will first describe ontological event types that are potentially shared by all human beings. After that, the study will focus on how these events are described in language, which then involves the concept of viewpoint aspects, which can be defined as the viewpoint we choose in order to describe this event, e.g. the starting point, ending point etc. There are researchers who argue that viewpoint aspect is still shared universally and thus in ontological level however in linguistic domain. Such ontological events with viewpoint aspects can be called ontological linguistic events, or just linguistic event. Then, the study will focus on how such ontological events with certain viewpoint aspects are described in Chinese, which will be language dependent. Finally, linguistic units in Chinese can be classified according to how they are usually used to realize linguistic events.

The Chinese aspectual system thus includes two different levels: linguistic units that denote ontological situation types, and lingusitic units that denote viewpoint aspect. Situation types are mainly expressed by verbs and their arguments. This motivates most of the research works on classifying verbs, phrases or sentences into situation types. The aspectual markers 着 *zhe0* 'ZHE', 了 *le0* 'LE' and 过 *guo4* 'GUO' in addition to some aspectual verbs/adverbs, such as 在 *zai4* 'progressive', 开始 *kai1shi3* 'start', 结束 *jie2shu4* 'end', 继续 *ji4xu4* 'continue', 停止 *ting2zhi3* 'stop', 完成 *wan2cheng2* 'finish' etc., are linguistic devices that are used to express certain viewpoints, so as to form linguistic events.

On the other hands, linguistic units may not be associated with unique situation types or viewpoint aspects. This also raised the difficulties encountered in previous studies that would not be resolved unless we can have an overall view of the whole Chinese aspectual system in different levels. The study described in this thesis thus starts from the ontological perspective to examine how human perceives events in the world and then go through all different levels to linguistic units in Chinese to examine how these units are used to describe linguistic events. In detail, the following issues will be discussed.

1) How many situation types are there? Vendler (1957) presented four situation types, namely state, activity, accomplishment and achievement, which were suggested to be ontological categories later. Simith (1991) adopted another category, namely semelfactive, in his framework. By analyzing the primitives of events, I give a theorectical analysis how many situation types are there and propose eight basic categories.

2) How many viewpoints are there? Theorectically, there are unlimited number of viewpoints from which we can observe and describe an event. Linguistically, we only choose meaningful viewpoints in order to express the right and necessary information with pragmatic factors. Previously, different viewpoint aspects have been discussed, including inchoative, progressive, terminative and completive etc.

3) What is the relation between viewpoints and situation types? As have been shown that progressive is not compatible with instantaneous events. I will discuss this issue in a systematic way in the ontological level with the consideration that such compatibilities should be shared all over the world.

4) What are the consequences by proposing the different linguistic event types? I first give formal representation, mostly in first order logic. Finally, it seems clear that a linguistic event is associated with a reference time or duration based on which a background situation is described. The study of aspect turns out to be the study of the relation between the reference time or duration and different situation types.

5) How are the aspectual markers and some constructions such as RVCs related with different linguistic event types and indirectly with different situation types? I will discuss different aspectual markerss, 着 *zhe0* 'ZHE', 了 *le0* 'LE' and 过 *guo4* 'GUO' in addition to some verbs and adverbs, including 在 *zai4* 'progressive', 开始 *kai1shi3* 'start', 结束 *jie2shu4* 'end', 继续 *ji4xu4* 'continue', 停止 *ting2zhi3* 'stop', 完成 *wan2cheng2* 'finish'. These words across different word classes are discussed together with the consideration that they all function in the domain of aspects.

6) Does the aspect framework covers all possible cases in real data? I will present an annotated corpus containing more than about 5000 sentences. The annotation framework will incorporate different modalities as their presence can affect the acceptability of certain linguistic events.

7) Is it possible to identify the aspectual information automatically by computer? I will conduct experiments with machine learning approaches on the annotated corpus, using general syntactic features, e.g. tokens, dependency relations etc. The results show a promising result, proving that the aspectual system I proposed is effective and potentially useful for computational applications.

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The study of Chines aspectual system is important but difficult. The completion of this thesis is largely dependent on the help of my supervisor and the other team members and friends. Here, I would give my thanks to all those people who have offered their help on my study.

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Chapter 1

Introduction

Studies on aspect in Chinese are conducted by two groups of people. The first group focuses on the functionalities of the aspectual markers 着 *zhe0* 'ZHE', 了 *le0* 'LE' and 过 *guo4* 'GUO'. The other group focuses on the aspectual classification of verbs. However, very few studies concern about the detailed relationship between the aspectual markers and the situation aspect. In the limited studies on situation aspect of Chinese, there are still flaws. Many issues remain unsolved. This thesis describes a study on aspectual classification in Chinese. Meanwhile, discussions on the ways how different situation types are described in Chinese language with a special viewpoint are also provided. For example, some aspectual operators, such as 开始 *kai1shi3* 'start', 结束 *jie2shu4* 'end, 继续 *ji4xu4* 'continue', 停止 *ting2zhi3* 'stop', 完成 *wan2cheng2* 'finish' and so on, are such linguistic devices that could be used to shift one situation to a part of it. I will show that the aspectual markers 着 *zhe0* 'ZHE', 了 *le0* 'LE' and 过 *guo4* 'GUO' are the aspectual markers that can also affect the situation shift. This chapter describes the scope, goals, methodology and other related issues of the study. It also describes the organization of the whole thesis.

1.1. What is Aspect

1.1.1. Definition of Aspect

Things happen in our world. One important function of human language is to describe the happenings that we perceive. Generally, aspect is the way in which human describes what happens in the world. Comrie defines aspect as *different ways of viewing the internal temporal constituency of a situation.*

Aspect should be discriminated from tense which is another important component to describe an event. Tense is about how one event is located in the time axis with reference to the speech time, including past, present and future. Aspect concerns the internal structure of an event regardless the temporal location of the events.

An event in our mind is a meaningful unit of information that reflects the real situations in the world. The event described by a speaker is then a linguistic event with unnecessary information omitted according to some certain pragmatic concerns. Thus, the first thing I need to clarify is that

the study in this thesis only focuses on linguistic events rather than real events in the world (Physics) nor events in human's mind (Ontology).

1.1.2. Studies on Chinese Aspectual Markers

The study of aspect in Chinese is mostly focused on the aspectual markers 着 *zhe0* 'ZHE', 了 *le0* 'LE' and 过 *guo4* 'GUO', in consideration of the relation between them and the progressive and perfect aspects. Some studies also focused on defining the meaning carried by them in order to predict their syntactic behaviors, e.g. their combinational property with different types of verbs. For example, LE is associated with perfect aspect which indicates the completion of an event. ZHE is a progressive marker, which is only compatible with part of verbs, e.g. 病 *bing4* 'ill', 饿 *e4* 'hungry' etc.; it is typically not compatible with individual state, e.g. 漂亮 *piao4liang4* 'beautiful', 聪明 *cong1ming2* 'clever' etc. GUO is previous treated as experiential marker, e.g. (1.a). Recent studies show that it could also be perfective, e.g. (1.b). There are discussions on whether experiential GUO and perfective GUO are the same.

(1) a. 他去过北京。

ta1	qu4	guo4	bei3jing1
he	go	GUO	Beijing

He has been to Beijing.

b.吃过饭再去上课。

chi1	guo4	fan4	zai4	qu4	shang4ke4
eat	GUO	meal	then	go	attend_class

Go to class after the meal.

Nonetheless, the studies on the aspectual markers rely on the verbs they can coordinate with. On the other hand, the classification of Chinese verbs is not clear, which makes the study of the aspectual markers meet the bottleneck.

1.1.3. Studies on Aspectual Classification

Another group of researchers that have dedicated study of aspect on classifying verbs into categories based on their event structures. This kind of study is also termed as classification of situation types or aspectual classification. Most of studies have followed Vendler's framework, within which there are mainly four different situation types: state, activity, accomplishment and achievement, regarding dynamicity, telicity and duration. State is usually treated as static, atelic and durative, such as (2.a). Activity is treated as dynamic, atelic and durative, such as (2.b). Accomplishment is dynamic telic and durative, such as (2.c). Achievement is dynamic, telic and punctual, such as (2.d). Besides the four situations, semelfactive has also been discussed as another

situation, which is dynamic, atelic and punctual, such as (2.e). Other examples mainly refer to the actions such as 敲 *qiao1* 'knock', 咳嗽 *ke2sou0* 'cough' etc.

(2) a. 张三喜欢看书。

zhang1san1	xi3huan1	kan4	shu1
Zhangsan	like	read	book

ZhangSan likes reading.

b. 张三在跑步。

zhang1san1	zai4	pao3bu4
Zhangsan	ZAI	run

ZhangSan is running.

c. 张三写了一封信。

zhang1san1	xie3	le0	yi1	feng1	xin4
Zhangsan	write	LE	one	CL	letter

ZhangSan wrote a letter.

d. 张三病了。

zhang1san1	bing4	le0
Zhangsan	ill	LE

ZhangSan got ill.

e. 张三咳嗽了一下。

zhang1san1	ke2sou0	le0	yi1	xia4
Zhangsan	cough	LE	one	CL

Zhangsan coughed once.

The study of aspectual classification is then to discriminate whether a situation is dynamic or static, durative or punctual, telic or atelic. In English, the telicity could be tested according to in-adverbial. Telic situations allow in-adverbial, while atelic situations don't. For example, *he wrote a letter in half an hour*, *he arrived in five minutes*, while *he liked swimming in half an hour*, *he ran in half an hour* is not acceptable. Durative and dynamic situations are compatible with progressive form and for-adverbial. For example, he is running. He ran for ten minutes. He is writing a letter. *he wrote a letter for ten minutes. However, the progressive form is not good for durative dynamic situations, such as *he is being foolish*, *he is arriving*. Meanwhile, the following examples are also not possible to be progressive form as they only refer to a result of a dynamic process.

Degree achievements also show variable telicity as follows.

(3) He lengthened the rope for half an hour. (Atelic)
He lengthened the rope in half an hour. (Telic)

Degree achievements have raised a problem for aspectual studies. Scalar structure is proposed for dealing with degree achievements. However, there are some other predicates that could also show variable telicity. This problem remains unsolved.

(4) 他洗了十分钟澡。

ta1	xi3	le0	shi2	fen1zhong1	zao3
he	wash	LE	ten	minute	bath

He showered for ten minutes.

他十分钟洗了（一个）澡。

ta1	shi2	fen1zhong1	xi3	le0	yi1	ge4	zao3
he	ten	minute	wash	LE	one	CL	bath

He showered in ten minutes.

(5) He wiped the table for one minute.
He wiped the table in one minute.

Even for the verbs that have been commonly treated as atelic could possibly obtain telicity in a context. For example, the second sentence could be interpreted as he started running in half an hour. It seems that telicity not only comes from lexical semantics, but also context. This has made the aspectual classification on verbs or phrases more difficult as it seems.

(6) He ran for half an hour.
He ran in half an hour. (Comrie 1976)

1.1.4. Situation Aspect vs. Viewpoint Aspect

Based on the discussion above, we may find that the situation types, namely state, activity, accomplishment and achievement, are not actually related to any linguistic notions at all, but more likely to be cognitive events in human's mind. Verkuyl also suggests that what Vendler proposed are actually ontological categories. Previous studies have tried to classify verbs or predicates into ontological categories. For example, the difference of *she is eating an apple* and *he ate an apple* is thus out of the discussion of situation aspect, since they are both instances of accomplishment. As we have shown, the assumption that one verb of a specific sense or a predicate is corresponding to only one ontological category is problematic.

In this thesis, I would propose the notion of linguistic event. To be a linguistic event, viewpoint aspect is the other important component, based on which an ontological event is described.

Previous studies discussed situation aspect and viewpoint aspect separately. In this thesis, I will combine the two components, namely situation aspect and viewpoint aspect, to form different linguistic event types. Viewpoint aspect is also called grammatical aspect, which mainly differentiate perfective and imperfective. Smith (1997) suggests that both situation aspect and viewpoint aspect are universal. This is to say that viewpoint aspect is also semantic rather than syntactic and should be shared across different language. I agree with Smith's opinion. I would also suggest that viewpoint aspect should be extended to include different ways people adopt to describe an event, such as the start, middle and end etc.

1.2. The Goal of the Study

From the discussion, we see two gaps. The first gap is the study on the relation between situation aspect and viewpoint aspect. It will be interesting to see which viewpoints are compatible with a certain situation type. For example, we can imagine that start viewpoint will only be durative state or process. It will be also interesting to see whether different viewpoints for the same situation will be lexicalized with different words. For example, Chinese RVCs are typical class of verbs that lexicalize the end of a dynamic process, such as 写完 *xie3wan2* 'write-finish', 打碎 *da3sui4* 'hit-break', 喝醉 *he1zui4* 'drink-drank' etc. If this is true, classifying verbs into ontological categories will not be enough to differentiate and predict their syntactic behaviors.

The second gap is the study on the regulations how aspectual markers and some aspectual light verbs, or generally aspectual operators are used as linguistic devices to combine certain verbs to realize different linguistic events. For example, a state attached with LE could express an inchoative, i.e. the start of the state, such as (7). An activity attached with LE may cause ambiguity. For example, (8.a) could be the start of a class, such as (8.b). It could also be a past activity, such as (8.c).

(7) 天晴了。
tian1 qing2 le0
sky sunny LE
It becomes sunny.

(8) a. 我们上课了。
wo3men2 shang4ke4 le0
we attend_class LE
Class begins. / We attended a class.

b. 我们上课了，大家请安静。

wo3men2	shang4ke4	le0	da4jia4	qing3	an1jing4
we	attend_class	LE	every	please	quiet

Class begins. Quiet please.

c. 刚才，我们上课了。

gang1cai2	wo3men2	shang4ke4	le0
just_now	we	attend_class	LE

We attended a class just now.

The question is then where does the ambiguity come from. This framework provides another perspective to study the aspectual markers that is to observe them in different linguistic event types.

1.3. Methodology

I will propose a new theoretical framework that combines situation and viewpoint aspect for discussion rather than discuss them independently. As a result, we may expect that there are more thypes of linguistic events than situation types. For example, the start of a state, the continuous of a state, the ending of a state, the start of an activity, the ongoing of an activity, the end of an activity, the start of an accomplishment, the ongoing of an accomplishment, the termination of an accomplishment, the completion of an accomplishment. The following are some examples that show how one verb could be used to express different linguistic events.

(9) a. 他担任了局长的职位。

ta1	dan1ren4	le0	ju2zhang3	de0	zhi2wei4
he	take_the_position	LE	director	DE	position

He took the position of the director.

b. 他担任着局长的职位。

ta1	dan1ren4	zhe0	ju2zhang3	de0	zhi2wei4
he	take_the_position	ZHE	director	DE	position

He holds the position of the director.

c. 他担任过局长的职位。

ta1	dan1ren4	guo4	ju2zhang3	de0	zhi2wei4
he	take_the_position	GUO	director	DE	position

He hold the position of the director before.

d. 他担任局长的职位。

ta1	dan1ren4	ju2zhang3	de0	zhi2wei4
he	take_the_position	director	DE	position

He holds the position of the director.

e. ?他正在担任局长的职位。

ta1	zheng4zai4	dan1ren4	ju2zhang3	de0
he	ZAI	take_the_position	director	DE
zhi2wei4				
position				

?He is taking the position of the director.

f. 他开始担任局长的职位。

ta1	kai1shi3	dan1ren4	ju2zhang3	de0
he	start	take_the_position	director	DE
zhi2wei4				
position				

He started to hold the position of the director.

(10) a. 他打了乒乓球。

ta1	da3	le0	ping1pang1qiu2
he	play	LE	table_tennis

He played table tennis.

b. 他打着乒乓球。

ta1	da3	zhe0	ping1pang1qiu2
he	play	ZHE	table_tennis

He is playing table tennis.

c. 他打过乒乓球。

ta1	da3	guo4	ping1pang1qiu2
he	play	GUO	table_tennis

He has played table tennis.

d. 他打乒乓球。

ta1	da3	ping1pang1qiu2
he	play	table_tennis

He plays table tennis.

e. 他正在打乒乓球。

ta1	zheng4zai4	da3	ping1pang1qiu2
he	ZAI	play	table_tennis

He is playing table tennis.

f. 他开始打乒乓球了。

ta1	kai1shi3	da3	ping1pang1qiu2	le0
he	start	play	table_tennis	LE

He started to play table tennis.

(11) a. 他喜欢了音乐。

ta1	xi3huan1	le0	yin1yue4
he	like	LE	music

He becomes to like music.

b. 他喜欢着音乐。

ta1	xi3huan1	zhe0	yin1yue4
he	like	ZHE	music

He is liking music.

c. 他喜欢过音乐。

ta1	xi3huan1	guo4	yin1yue4
he	like	GUO	music

He liked music before.

d. 他喜欢音乐。

ta1	xi3huan1	yin1yue4
he	like	music

He likes music.

e. ?他正在喜欢音乐。

ta1	zheng4zai4	xi3huan1	yin1yue4
he	ZAI	like	music

?He is liking music.

f. 他开始喜欢音乐。

ta1	kai1shi3	xi3huan1	yin1yue4
he	start	like	music

He started to like music.

(12) a. 他踢碎了玻璃。

ta1	ti1sui4	le0	bo1li0
he	kick-break	LE	glass

He broke the glass by kicking.

b. ?他踢碎着玻璃。

ta1	ti1sui4	zhe0	bo1li0
he	kick-break	ZHE	glass

?He is breaking the glass by kicking.

c. 他踢碎过玻璃。

ta1	ti1sui4	guo4	bo1li0
he	kick-break	GUO	glass

He broke some glass by kicking before.

d. ?他踢碎玻璃。

ta1	ti1sui4	bo1li0
he	kick-break	glass

?He breaks glass by kicking.

e. ?他正在踢碎玻璃。

ta1	zheng4zai4	ti1sui4	bo1li0
he	ZAI	kick-break	glass

He is breaking the glass by kicking.

f. ?他开始踢碎玻璃。

ta1	kai1shi3	ti1sui4	bo1li0
he	start	kick-break	glass

He started to break the glass by kicking.

(13) a. 他赢了比赛。

ta1	ying2	le0	bi3sai4
he	win	LE	game

He won the game.

b. ?他赢着比赛。

ta1	ying2	zhe0	bi3sai4
he	win	ZHE	game

He is winning the game.

c. 他赢过比赛。

ta1	ying2	guo4	bi3sai4
he	win	GUO	game

He won the game before.

d. ?他赢比赛。

ta1	ying2	bi3sai4
he	win	game

?He wins the game.

e. ?他正在赢比赛。

ta1	zheng4zai4	ying2	bi3sai4
he	ZAI	win	game

He is winning the game. (In the sense of winning process)

f. ?他开始赢比赛。

ta1	kai1shi3	ying2	bi3sai4
he	start	win	game

He started to win the game.

(14) a. 气温上升了。

qi4wen1	shang4sheng1	le0
air_temperature	rise	LE

The air temperature rose.

b. 气温上升着。

qi4wen1	shang4sheng1	zhe0
air_temperature	rise	ZHE

The air temperature is rising.

c. 气温上升过。

qi4wen1	shang4sheng1	guo4
air_temperature	rise	GUO

The air temperature once rose.

d. ?气温上升。

qi4wen1	shang4sheng1
air_temperature	rise

?The air temperature rises.

e. 气温正在上升。

qi4wen1	zheng4zai4	shang4sheng1
air_temperature	ZAI	rise

The air temperature is rising.

b. 气温开始上升。

qi4wen1	kai1shi3	shang4sheng1
air_temperature	start	rise

The air temperature started to rise.

It seems that we can find more than five categories based on the above evidence. This shows that it is not enough to classify verbs into the five categories in order to predict their aspectual behaviors. On the other hand, it suggests that we should first find out how many linguistic event types there are and then find out the ability of verbs to express possible linguistic event types. Based on the observation of the compatibility of verbs with different types of linguistic events, which I will call aspectual behaviors of verbs, we can then try to classify the verbs into different classes. In this sense, to study the situation aspect and viewpoint aspect and their combination with the aspectual markers will be the first step for the studies on verb classification.

I will adopt a corpus based study plus the intuition of a native Chinese speaker. The concern is to make the study more comprehensive and able to cover different cases. I first annotate a corpus to verify the theoretical framework I proposed. Especially, I will resort to the Sinica corpus, which is a balanced corpus compiled by Chen and Huang (1996). Sinica Treebank (Huang, et.al., 2000) is a sub corpus of Sinica, however, annotated with more syntactic and semantic information. For evaluation, this could be a good resource to make use of. Thus, my annotation will be conducted on a subset of Sinica Treebank.

After the annotation, I will adopt a machine learning approach to predict the type of a linguistic event automatically. The assumption is that the easier to classify a linguistic event, the higher the performance will be, then the better the theory is.

1.4. Thesis Organization

In Chapter 2, previous studies on aspect are discussed. Especially, I will mainly focus on the works on aspectual classification of verbs or different levels of constituents of sentences that follow Vendler's framework. Some new challenges, e.g. degree achievements that have been studied more and more recently in both English and Chinese will also be discussed. Finally, based on previous studies, I will propose a model that describes how aspect is connected from human's

perception of real world happenings to linguistic events, which will serve as the basic philosophical foundation of this thesis.

In Chapter 3, I will propose the main theoretical framework that incorporates two components, situation aspect and viewpoint aspect. I also suggested that viewpoint aspect is more than perfective and imperfective. As Smith said, we can focus on different parts of a situation, e.g. the start, the middle and the end, which turns out to be viewpoint aspect rather than situation aspect. In my theoretical framework, the study will be mainly focused on linguistic event that combines situation aspect and viewpoint aspect.

In Chapter 4, the main Chinese aspectual markers 着 *zhe0* 'ZHE', 了 *le0* 'LE', 过 *guo4* 'GUO' and 在 *zai4* 'ZAI' will be discussed based on the observation of their combination with different situation aspects. Finally, the semantics of the aspectual markers will be given. The semantics of negation by 不 *bu4* and 没有 *mei2you3* will also be discussed in this chapter.

Continued Chapter 3 and 4, Chapter 5 discusses the semantic representation of different linguistic event types which will be described with mostly the first-order logic and some second-order logic. Besides, the semantics of the aspectual markers, 着 *zhe0* 'ZHE', 了 *le0* 'LE', 过 *guo4* 'GUO' and 在 *zai4* 'ZAI' will be described in a formal way.

Chapter 6 describes an annotated corpus that is based on the theoretical framework proposed in Chapter 3 and 4. The corpus contains more than five thousand sentences that are extracted from Sinica Treebank. The discrimination of the aspectual classes of some representative examples will be discussed. The treatment of the examples will serve an annotation guideline. Finally, the distributional information of the corpus will be presented.

Chapter 7 explores machine learning approach to automatically classify a Chinese sentence into a linguistic event category. This first shows the possible application of the linguistic theory proposed in the thesis. Secondly, it can also evaluate the effectiveness of the linguistic theory. The higher performance we can get, the more useful the theory is to NLP applications.

Chapter 8 is the summarization of the whole thesis with some discussion on the theoretical framework proposed in terms of its advantages and disadvantages, based on which possible directions are proposed for my future studies.

Chapter 2

Previous Studies on Aspect

Vendler (1957) proposed four aspectual classes for English verbs: state, activity, accomplishment and achievement. Besides the four categories, another class which is usually called *semelfactive*, is discussed by other researchers (Comrie, 1976; Tai, 1984; Chen, 1988; Smith, 1991; Xiao, 2004). Most works following Vendler's framework then focused on the classification of verbs, phrases or generally predicates into the four or five categories. Three semantic parameters have been found crucial for the aspectual classification, namely telicity, dynamicity and durativity. Aspectual classification for different predicates is then to determine the values of the parameters, for which researchers usually resort to several linguistic tests, e.g. progressive test, *in*- and *for*- adverbial test, etc. Similar tests are used in Chinese aspectual classification as well. However, it is found that some predicates behave differently in different contexts, e.g. the well-known degree achievements, which show ambiguous telicity in certain context. Many predicates other than degree achievements also show different telicity values in different contexts. In this chapter, I will go through the previous studies on aspectual classification following Vendler's framework, and then give discussion on the remaining problems, which will serve as the main motivation of the study described in the thesis.

2.1. Situation Aspect and Vendler's Classes

Situation aspect, also called lexical aspect or aktionsart, is the study of the temporal structure of the meaning of verbs. Situation aspect should be differentiated from viewpoint aspect that the latter is usually related to the speaker's focus on a situation, e.g. start, middle, end and so on. The original concern of aspectual studies, e.g. (Vendler, 1957), is to give explanation to the linguistic phenomena that verbs behave differently in their compatibility with progressive form and time adverbials. For example, the verb 'run' is compatible with progressive form while 'know' is not, as shown in (1). The examples in (2) and (3) show that the ver 'run' is compatible with *for*-adverbial but not compatible with *in*-adverbial, which is contrary to the verb phrase 'write a letter'. All the comparisons imply that there must be differences in the nature of these verbs or verb phrases.

(1) He is running.
?He is knowing the truth.

(2) ?He ran in five minutes.
He ran for five minutes.

(3) He wrote a letter in half an hour.
?He wrote a letter for half an hour.

The assumption is that the syntactic differences of the verbs come from their semantic contents, which then reflect human's conceptualization of the different types of events in the world. The syntactic contrasts suggest that verbs form different categories according to their semantic properties, i.e. the internal temporal structures. For example, verbs, such as *know*, *love*, describe a state that don't go through any changes, while verbs, like *run*, *write*, describe a dynamic process, which usually contain a series of sub events. Verbs, such as *run*, *push*, don't have an encoded natural ending point, while phrases, such as *write a letter* and *build a house*, do. Based on these considerations, Vendler (1957) proposed four different situation types, namely state, activity, accomplishment and achievement as shown in (4).

(4)	believe, love	(state)
	run, push a cart	(activity)
	build a house, write a letter	(accomplishment)
	arrive, recognize	(achievement)

Besides the four categories, another class, which is usually called semelfactive, is found different from them (Comrie, 1976; Dowty, 1979; Smith, 1991). Semelfactive describes a situation that takes a very short time, exemplified in (5). However, the progressive form is compatible with it, which gives an iterative interpretation of a single semelfactive.

(5)	cough, sneeze	(semelfactive)

Some researchers suggest that accomplishment and achievement should be combined as their difference is not linguistically significant (Mourelatos, 1978; Pustejovsky, 1991). According to Mourelato, activity is called process; the combination of accomplishment and achievement is called *event*; the combination of activity, achievement and accomplishment is called *occurrence*. Ma (1981) and Deng (1986) also followed Vendler's theory and discriminated four categories of situation types in Chinese. Tai (1982) discriminates three aspectual classes for Chinese: *state*, *activity* and *result*. Chen (1988) discriminated five situation types also for Chinese: state, activity, accomplishment, complex change and simple change.

Recently, event structure is used to refer to the temporal structure that is not only related to situation types of verbs, but also a real world event that may be the composition of different sub events (Pustejovsky, 1991). An event type is a class of events that share the same event structure.

In this sense, event type is related to situation type when the discussion is focused on lexical or predicate level. From here in the thesis, I shall use situation aspect to refer to the linguistic issue and use situation type and aspectual class interchangeably. Event type will be reserved to refer to the linguistic event as I will discuss in the next chapter.

2.2. Aspectual Classification

2.2.1. Feature-Based Methodology

Vendler (1957) used progressive test to discriminate state and achievement from activity and accomplishment. Neither state nor achievement can appear in progressive form. However, the reasons are different. State is static without an ongoing process or happening in the world. Achievement occurs instantaneously that no process exists through time. Even though some achievements could appear in progressive, they don't actually describe an ongoing process. For example, 'he is arriving' actually means 'he will arrive soon', which is an achievement in the near future. A semantic entailment test could discriminate accomplishment and achievement from activity in terms of telicity, which is usually called imperfective paradox. For example, 'he is running' entails that 'he has ran', while 'he is writing a letter' doesn't entail 'he has written a letter'.

In summary, Vendler used three parameters to discriminate the four aspectual classes, which could also be used to discriminate semelfactive. Table 1 shows the five categories and their corresponding values of the three parameters.

	Dynamic	Telic	Durative
State	-	- (N/A)	+ (N/A)
Activity	+	-	+
Semelfactive	+	-	-
Accomplishment	+	+	+
Achievement	+	+	-

Table 1. Features for verb classification

The dynamic feature describes the dynamicity of the situation types. The telic feature describes whether a final state is encoded. The durative feature describes whether a situation takes time or not. Different studies may use different terms, although there are some subtle differences. The telic/atelic distinction is also called as bounded/unbounded (Jackendoff, 1990), culminated/non-culminated (Moens, 1987), delimited/non-delimited (Tenny, 1987, 1992 & 1994), etc. Comrie

(1978) suggested that state is irrelevant to time duration, and thus the durative feature is not applicable to state. Smith (1991) further proposed that telicity is not applicable to state as well.

2.2.2. The Conceptual Structure

Contrary to the feature-based analysis, another methodology for aspectual classification is to give representation of the event structures of different situation types, e.g. (Dowty, 1979; Pustejovsky, 1991; Jackendoff, 1987 and 1990; Huang, et.al., 2000 and many others).

Dowty (1979) proposed that three atomic operators DO, BECOME, CAUSE could discriminate Vendler's four categories as shown in (6). For example, kill is a causative verb that could be represented as DO CAUSE BECOME NOT ALIVE, while die can be represented as BECOME NOT ALIVE. So, the difference of *kill* and *die* is that *kill* has a DO operator which causes the death of the patient.

(6)	V()	(State)
	DO(a, V())	(Activity)
	DO(a, V()) CAUSE BECOME (V())	(Accomplishment)
	BECOME(V())	(Achievement)

The problem for Dowty's approach is that there is no position is for semelfactive based on this definition. In order to do that, the DO operator has to be further divided. Meanwhile, it cannot explain how one situation type could shift to another, e.g. the compositionality of verbs and their complements. In addition, the operator DO suggests agentivity which has been denied by current studies on situation aspect.

2.2.3. The Generative Lexicon

According to James (1991), an event could be represented with its sub events as shown in (7). A state is an atomic event which doesn't have sub events. An activity is made up of a series of sub events which is the same as the whole. He combined accomplishment and achievement to be transition. An accomplishment is made up of a process with a final state. An achievement is a change from one state to another. The advantage of the event structure approach is that it could provide an explicit represent of the internal structure of an event rather than a black box. By modeling the event structure explicitly, we can easily compare the different situation types and predict how one situation type could shift to another. Take activity verb *walk* for example. Why can it denote an accomplishment by adding a destination PP? From the event structure point of view, it is easy to explain that the destination gives a final state to the process of walking. It can also give explanation why accomplishment verbs are compatible with *for*-adverbial, i.e. the final state has not been achieved at some reference time.

(7) [s] := [e] (state)
[s] := [$e_1 \ldots e_n$] (activity)
[s] := [act(x) ∧ ! Q(y)] < [Q(y)] (accomplishment)
[s] := [!Q(y)] < [Q(y)] (achievement)

2.2.4. MARVS

The module-attribute representation of verbal semantics (MARVS), proposed by Huang et al. (2000), is another method to represent event structures. In MARVS, there are five primitive of events, defined as follows. The five primitives of events could be combined to form complex event types.

•: Boundary is an event module that can be identified by means of a temporal point and must be regarded as a whole. Examples are 死 *si3* 'die', 破 *po4* 'break'.

/: Punctual is an event module that represents a single occurrence of an activity that cannot be measured based on duration. Examples are 打算 *da3suan4* 'plan'.

////: Process is an event module that represents an activity that has a time course, i.e., that can be measured in terms of its temporal duration. Examples are 走 *zou3* 'walk', 跑 *pao3* 'run'.

___: State is a homogeneous event module in which the concept of temporal duration is irrelevant; i.e., it is neither punctual nor does it have a time course. Examples are 高兴 *gao1xing4* 'be happy', 疲倦 *pi2juan4* 'be tired'.

^^^: Stage is an event module consisting of iterative sub-events. Not found in Chinese. However, there is inchoative stage (•^^^) in Chinese, e.g. 上升 *shang4sheng1* 'rise', bounded stage (•^^^•), e.g. 凋谢 *diao1xie4* 'to wither'.

Based on MARVS, some Chinese verbs could be represented as the combinations of different modules. For example, 坐 *zuo4* 'sit' is represented as '/___', meaning a punctual event plus a static state. This means that the verb 坐 *zuo4* 'sit' can describe both an action of sitting down and a state of sitting. In other words, the representation of a verb is based on the lexicalization of its ability to denote possible phases (aspects) of events. As a consequence, a set of rules will be needed to describe how different aspects could be activated in different contexts, e.g. how the aspectual markers could cooperate with the verb to form different aspects.

2.3. Diagnostics for aspectual classification

There are some diagnostic tests to differentiate situation types. Progressive can be used to differentiate states from activity and accomplishment. Achievement is punctual and doesn't have an internal process. Thus, it cannot appear in progressive form either. For example, sentence (8.a) and (8.b) are acceptable, while sentence (8.c) and (8.d) are difficult to interpret.

(8) a. 他在跑步。

ta1	zai4	pao3bu4
he	ZAI	run

He is walking.

b. 他在盖一座房子。

ta1	zai4	gai4	yi1	zuo4	fang2zi0
he	ZAI	build	one	CL	house

He is building a house.

c. ?他在知道事实。

ta1	zai4	zhi1dao4	shi4shi2
he	ZAI	know	truth

*He is knowing the truth.

d. ?他在认出他的老朋友。

ta1	zai4	ren4chu1	ta1	de0	lao3	peng2you3
he	ZAI	recognize	he	DE	old	friend

He is recognizing his old friend.

On the other hand, progressive is not a reliable test (Comrie, 1976; Carlson, 1977; Moens, 1987; Verkuyl, 1993). Some state verbs and achievement verbs can appear in progressive form, e.g. (9.a) and (9.b). Semelfactives are also compatible with progressive form, e.g. (9.c). Although it is argued that achievement verbs in progressive form do not denote an ongoing process, it does not deny the fact that the progressive test is not reliable.

(9) a. ?他正在傻。

ta1	zheng4zai4	sha3
he	ZAI	foolish

He is being foolish.

b. ?他正在到达。

ta1	zheng4zai4	dao4da2
he	ZAI	arrive

He is arriving.

c. 他在咳嗽。

ta1	zai4	ke2sou0
he	ZAI	cough

He is coughing.

A different interpretation of (9.a) is that it expresses a dynamic event, which can be defined as foolish, meaning that *he is behaving foolish* (Smith, 1991). For (9.b), it also denotes a different situation from an achievement, which could be interpreted as *he is coming and will arrive soon*. For (9.c), it denotes an iterative semelfactives that have already formed a derived activity. In this sense, when appearing in progressive form, these verbs will be coerced to denote a different situation type.

The *in*-adverbial could be used to test the telicity of a situation. Only telic situations allow *in*-adverbials. For example, sentence (10.a) and (10.b) are usually not acceptable, while (10.c) and (10.d) are.

(10) a. ?他十分钟内相信了这个理论。

ta1	shi2	fen1zhong1	nei4	xiang1xin4	le0	zhe4	ge4
he	ten	minute	within	believe	LE	this	CL
li3lun4							
theory							

*He believed the theory in ten minutes.

b. ?他在十分钟内走路了。

ta1	zai4	shi2	fen1zhong1	nei4	zou3lu4	le0
he	PREP	ten	minute	within	walk	LE

*He walked in ten minutes.

c. 他一个月内盖了一座房子。

ta1	yi1	ge4	yue4	nei4	gai4	le0	yi1	zuo4
he	one	CL	month	within	build	LE	one	CL
fang2zi0								
house								

He built a house in one month.

d. 他十分钟认出了他的老朋友。

ta1	shi2	fen1zhong1	ren4chu1	le0	ta1	de0	lao3
he	ten	minute	recognize	LE	he	DE	old
peng2you3							
friend							

He recognized his old friend in ten minutes.

The 'imperative paradox' can also discriminate activity from accomplishment. In detail, progressive of an activity entails its perfective form, while accomplishment doesn't. For example, sentence (11.a) entails (11.b), while (12.a) doesn't entail (12.b).

(11) a. He is walking.
b. He has walked.

(12) a. He is building a house.
b. He has built a house.

The *for*-adverbial cannot test the duration of accomplishment for English. As in (13), both English sentences are ungrammatical. This shows that the past tense of an accomplishment in English always denotes a complete event with the final state achieved. Interestingly, the corresponding Chinese sentences in (13), which are the literal translation of the English ones, are well accepted. However, the sentence (13.b) is amibiguous in whether the time duration refers to the building process from its start or after the building is finished.

(13) a. 他到达了十分钟了。

ta1	dao4da2	le0	shi2	fen1zhong1	le0
he	arrive	LE	ten	minute	LE

*He has arrived for ten minutes.

b. 他这座房子盖了一個月了。

ta1	zhe4	zuo4	fang2zi0	gai4	le0	yi1	ge4
he	this	CL	house	build	LE	one	CL
yue4	le0						
month	LE						

*He has built the house for one month.

2.4. Difficulties in Aspectual Classification

The first problem in aspectual classification is what level should the classification be performed, namely lexical level, phrasal level or sentential level. Vendler (1957), Mourelatos (1978) and

Calson (1981) did aspectual classification on lexical level. However, researchers including them found that subjects and complements may also affect the situation types (Dowty, 1991; Verkuyl, 1993; Tenny, 1994; Ritter and Rosen, 2000). For example, the verb ‘drink’ and ‘push’ are used to express an acitivity in (14.a) and (15.a). But they can also be used to express accomplishments by incorporating an object, as in (14.b) and (15.b).

(14) a. 他在喝啤酒。

ta1	zai4	he1	pi2jiu3
he	ZAI	drink	beer

He is drinking beers.

b. 他在喝一瓶啤酒。

ta1	zai4	he1	yi1	ping2	pi2jiu3
he	ZAI	drink	one	CL	beer

He is drinking a beer.

(15) a. 他在推一个货车。

ta1	zai4	tui1	yi1	ge4	huo4che1
he	ZAI	push	one	CL	cart

He is pushing a cart.

b. 他正在把一个货车推到屋子里。

ta1	zai4	ba3	yi1	ge4	huo4che1	tui1dao4	wu1zi0
he	ZAI	BA	one	CL	cart	push-to	room
li3							
inside							

He is pushing a cart to the room.

This shows that the aspectual classification should be performed at least in phrase level rather than in lexical level. In addition, some activity verbs such as ‘run’ can also be telic in a special context. For example, the sentence (16.a) denotes an achievement with the adverbial ‘suddenly’. In this sense, aspectual classification is necessary to be performed in sentential level (Smith, 1991).

(16) a. Suddenly, Mary ran.

b. An hour later, she was still running. (Smith, 1991)

Some cases are complicated. For example, the sentence (17.a) can be either telic as in (17.b) or atelic as in (17.c).

(17) a. 他在唱一首歌。

ta1	zai4	chang4	yi1	shou3	ge1
he	ZAI	sing	one	CL	song

He is singing a song.

b. 他四分钟唱了一首歌。

ta1	si4	fen1zhong1	chang4	le0	yi1	shou3	ge1
he	four	minute	sing	LE	one	CL	song

He sang a song in four minutes.

c. 他唱一首歌唱了一整天。

ta1	chang4	yi1	shou3	ge1	chang4	le0	yi1
he	sing	one	CL	song	sing	LE	one
zheng3	tian1						
whole	day						

He sang a song for a whole day. (Comrie 1978)

In Chinese, it is even more complicated. A sentence in a single form can be interpreted as telic or atelic depending on context beyond the surface of the sentence. This is called neutral aspect by Smith (1991). For example, the sentence (18) could be interpreted in many different ways. However, in one single context, there should be only one reading. This suggests that the aspectual classification should be performed in discourse level for Chinese.

(18) 他看书。

ta1	kan4	shu1
he	read	book

He reads.

He is reading a book.

He wants to read.

…

Xiao (2004) discussed situation types in all three levels. He also proposed rules to describe the compositional regularities of the situation types on different levels. He starts from the lexical level and classify Chinese verbs based on the so-called neutral context (Mourelatos, 1978; Lys and Mommer, 1986), e.g. simple past with singular countable noun, etc. However it is problematic as sometimes it is not clear what context is neutral. In addition, even with clear neutral context, some verbs are still difficult to judge in terms of situation type.

2.4.1. Degree Achievements

Degree achievement has posed a difficulty for aspectual classification, as it fails to fall into the Vendler's framework (Dowty, 1979; Hay, 1999). It shows different telicity in different contexts. The evidence is that it is compatible with both *in*- and *for*-adverbials, meaning that their telicity changes in contexts. For example in (19) and (20), the verbs *lengthen* and *straighten* could be either telic or atelic.

(19) a. 他拉长那个绳子拉长了十分钟。

ta1	la1chang2	na4	ge4	sheng2zi0	la1chang2	le0
he	lengthen	that	CL	rope	lengthen	LE
shi2	fen1zhong1					
ten	minute					

He lengthened the rope for ten minutes.

b. 他十分钟拉长了那个绳子。

ta1	shi2	fen1zhong1	la1chang2	le0	na4	ge4
he	ten	minute	lengthen	LE	that	CL
sheng2zi0						
rope						

He lengthened the rope in ten minutes.

(20) a. 他拉直那个绳子拉直了十分钟。

ta1	la1zhi2	na4	ge4	sheng2zi0	la1zhi2	le0
he	straighten	that	CL	rope	straighten	LE
shi2	fen1zhong1					
ten	minute					

He straightened the rope for ten minutes.

b. 他十分钟拉直了那个绳子。

ta1	shi2	fen1zhong1	la1zhi2	le0	na4	ge4
he	ten	minute	straighten	LE	that	CL
sheng2zi0						
rope						

He straightened the rope in ten minutes.

Although both of them show variant telicity in different contexts, the imperfective paradox test shows that they are actually different, e.g. (21.a) entails (21.b), while (22.a) doesn't entail (22.b).

(21) a. He is lengthening the rope.
b. He has lengthened the rope.

(22) a. He is straightening the rope.
b. He has straightened the rope.

Hay (1999) proposed that degree achievements are usually associated with a scale. Whether the scale is open or not will affect the meaning of their perfect forms. The difference of *lengthen* and *straighten* is that, the former associates with an open scale, while the latter associates with a closed scale. The perfective form of degree achievement verbs implies the reaching of the boundary of the scale. This is why (22.a) doesn't entail (22.b). Hay also proposed tests to discriminate the different types of scales. Those verbs associating with closed scales are compatible with the adverb completely. For example, 'completely straight' is acceptable, but '*completely long' is not acceptable. Following Hay (1999), scalar structure has drawn attention of many other linguists to deal with more difficult examples, e.g. (Kennedy, 2005 and 2007; Beavers, 2001 and 2008; Rappaport, 2008; Peek et al., 2013).

2.4.2. More than Degree Achievements

Besides degree achievements, there are actually another set of verbs that also show variant telicity, however without corresponding any obvious scales, e.g. 吃饭 *chi1fan4* 'eat meal' as in (23), 洗澡 *xi3zao3* 'bathe' as in (24), 浇花 *jiao1hua1* 'water the flowers' as in (25), 打扫房间 *da3sao3 fang2jian1* 'clean the room' as in (26) and so on. Similar phenomena have been found by Næss (2007).

(23) a. 他五分钟吃了饭，然后去工作了。

ta1	wu3	fen1zhong1	chi1	le0	fan4	ran2hou4	qu4
he	five	minute	eat	LE	meal	then	go
gong1zuo4	le0						
work	LE						

He ate in five minutes, and then rushed off to work. (Næss 2007)

b. 他吃饭吃了十分钟。

ta1	chi1fan4	chi1	le0	shi2	fen1zhong1
he	eat_meal	eat	LE	ten	minute

He ate for ten minutes.

(24) a. 他十分钟洗了澡。

ta1	shi2	fen1zhong1	xi3	le0	zao3
he	ten	minute	wash	LE	bath

He showered in ten minutes.

b. 他洗澡洗了十分钟。

ta1	xi3zao3	xi3	le0	shi2	fen1zhong1
he	bathe	wash	LE	ten	minute

He showered for ten minutes.

(25) a. 他十分钟浇了花。

ta1	shi2	fen1zhong1	jiao1	le0	hua1
he	ten	minute	water	LE	flower

He watered the flowers in ten minutes.

b. 他浇花浇了十分钟。

ta1	jiao1	hua1	jiao1	le0	shi2	fen1zhong1
he	water	flower	water	LE	ten	minute

He watered the flowers for ten minutes.

(26) a. 他一个小时内打扫了房间。

ta1	yi1	ge4	xiao2shi2	nei4	da3sao3	le0
he	one	CL	hour	within	clean	LE

fang2jian1
room

He cleaned the room in one hour.

b. 他打扫房间打扫了一个小时。

ta1	da3sao3	fang2jian1	da3sao3	le0	yi1	ge4
he	clean	room	clean	LE	one	CL

xiao3shi2
hour

He cleaned the room for one hour.

In addition, some verbs that are commonly treated as activity verbs, such as run, can also give telic reading in some context as has been shown in example (16), repeated in (27.a) with the corresponding Chinese. In Chinese, many verbs that mainly denote activities can denote inceptive achievement by combing with the aspectual marker 了 le0 ‘LE’, e.g. (27.b) and (27.c).

(27) a. 突然，他跑了。一个小时后，他还在跑。

tu1ran2	ta1	pao3	le0	yi1	ge4	xiao3shi2	hou4
suddenly	he	run	LE	one	CL	hour	after

ta1	hai2	zai4	pao3
he	still	ZAI	run

Suddenly, he ran. An hour later, he was still running. (Smith 1991)

b. 他终于笑了。

ta1	zhong1yu2	xiao4	le0
he	finally	smile	LE

He finally smiled.

c. 看！他又抽烟了。

kan4	ta1	you4	chou1	yan1	le0
look	he	again	smoke	cigarette	LE

Look! He is smoking again.

From the discussion, we can see that telicity is dependent on the interpretation of an utterance within a context. A predicate without semantically encoded telicity could gain a telic reading from the context. On the other hand, a semantically encoded telicity could be cancelled by the context, e.g. *singing a song*.

2.4.3. Achievement vs. Accomplishment

There are also some other issues for aspectual classification. The first issue is whether accomplishment and achievement should be differentiated. Some researchers suggest that the two categories are the same and should be put in one category (Mourelatos, 1978; Tai, 1984; Pustejovsky, 1991). Mourelatos (1978) suggested that the difference of them is not linguistically significant, as they appear in similar context. For example, they are both compatible with the pattern “it takes time to V”. Thus, he also put causative verbs, e.g. *kill*, *break* etc., into the same category. Pustejovsky (1991) suggested that they both denote a change of state (i.e. transition), and the only difference is that accomplishment verb has an AGENTIVE role, which is an action that causes the change of state.

The debate is due to the unclear definition of achievement. Mourelatos (1978) treated achievement as instantaneous regardless of whether there is a causal action or not. Verkuyl (1993) gave an example of typing a letter ‘P’ and typing a business letter to argue that the boundary of accomplishment and achievement is not clear. He said that the former is an achievement because it is instantaneous, while the latter is an accomplishment. His argument shows that he also mixed up

the causative verbs such as *kill*, *break*, with pure change of state verbs, such as *arrive*, *die* etc. Similarly, Beavers (2008, 2012) also put *kill*, *break* into achievement category.

Based on the explanation of Pustejovsky (1991), achievement verb denotes pure change of state. This suggestion is consistent with Dowty's (1979) definition on accomplishment and achievement with the lexical conceptual structure, that accomplishment has DO and CAUSE operators while achievement only contains a BECOME operation. Theoretically, the verbs *kill*, *break* both encode a DO operation. Thus, they should be put into accomplishment. Later, researchers criticized this causative treatment of accomplishment and argued for the independence of 'accomplishment' and 'causative' (Pustejovsky, 1991; Van Valin and LaPolla, 1997; Levin, 2000). Nontheless, this issue whether the accomplishment and achievement should be differentiated and how causative verbs should be treated remain unsolved.

2.4.4. The term 'telicity'

The previous studies on aspectual classification use 'telicity' without a clear definition. Smith (1991), for example, regards it as encoding a resultant state. In fact, telicity has been mapped to the compatibility with in-adverbials. Telic event is compatible with in-adverbial, while atelic event is not compatible with in-adverbials. This treatment has implicitly put telicity in syntactic level.

Xiao (2004) differentiates *telic* and *result*. He treated all the accomplishment as [+telic] and [-result]. This is mainly to explain the fact that accomplishment can possibly denote terminative (stop, terminative) or completive (finish), while only the latter has a result. This feature setup for accomplishment, however, makes the definition of TELIC more similar to the GL theory. His discrimination of telic and result is based on their logical relation that result is realized telicity.

2.4.5. Intention and Perception

While it is almost a consensus that telicity has no direct relation with intentionality, Depraetere (2007) suggested that the telicity in some sentences is actually given by intentionality. For example, the sentence (28) actually describes an ongoing action, whose agent holds an intention of building a house. This is an issue when accomplishment situations appear in progressive form. A related study is to answer the question what progressive really means, e.g. (Engelberg, 2001). For example, if the subject died in the next moment, the house would never be finished by him.

(28) 他正在盖一座房子。

ta1	zheng4zai4	gai4	yi1	zuo4	fang2zi0
he	ZAI	build	one	CL	house

He is building a house.

So, the intentionality should be part of the meaning of the sentence (28). This is also the reason why some similar constructions are more difficult to be acceptable, such as (29). However, in a context where the subject is expected to smoke the fixed number of cigarettes, the sentence (29) will be acceptable then.

(29) ?他在抽五支烟。

ta1	zai4	chou1	wu3	zhi1	yan1
he	ZAI	smoke	five	CL	cigarette

?He is smoking five cigarette.

Alternatively, the sentence in (28) can also be interpreted as the perception of the speaker, regarding that the actions the subject made satisfy what could be called as 'building a house'. Once a speaker utters a sentence, it actually includes his own judgment of the situation or an evaluation of the agent's intention. The sentence (30.a) describes a perception of the speaker of an ongoing action being performed by the agent. It is possible that the speaker made a wrong judgment. For example, the agent stopped in the middle of the street and turned back. Thus, the speaker can further make a correction as (30.b).

(30) a. 他正在过马路。

ta1	zheng4zai4	guo4	ma3lu4
he	ZAI	cross	street

He is crossing the street.

b. 不是，他是到马路中间捡东西。

bu4shi4	ta1	shi4	dao4	ma3lu4	zhong1jian1	jian3
no	he	be	PREP	street	middle	pick_up
dong1xi1						
thing						

No, he is picking up something at the middle of the street.

I agree with the analysis by Depraetere (2007). However, I suggest that this analysis is in a different level from situation aspect, meaning that the telicity is still expressed by the verb constellation 盖一座房子 *gai4 yi1 zuo4 fang2zi0* 'build a house' and 抽五只烟 *chou1 wu3 zhi1 yan1* 'smoke five cigarettes', regardless of where it is from. This is not to deny that the intentionality can help us to analyze the acceptability of the constructions as in (29).

2.5. Aspectual Studies on Chinese

Tai (1984) discriminates three different situation types for Chinese: state, activity and result. The category result mainly refers to achievement. He argued that there is no accomplishment verb in Chinese. His concern is that while the phrase such as 'paint a picture' in English denotes accomplishment, the corresponding Chinese 画一张画 *hua4 yi1 zhang1 hua4* 'paint a picture' does not necessarily guarantee the goal to be achieved, which can be shown in (31).

(31) 我昨天画了一张画，可是没画完。

wo3	zuo2tian1	hua4	le0	yi1	zhang1	hua4
I	yesterday	paint	LE	one	CL	picture
ke3shi4	mei2	hua4	wan2			
but	not	paint	finish			

I painted a picture yesterday, but didn't finish it.

He also argued that Chinese Resultative Verbal Compounds (RVCs) are accomplishments with the focus on the result. The evidence is that they cannot appear in progressive form, e.g. (32). This is the reason why he used *result* to refer to both achievement verbs and RVCs.

(32) a. ?我在画完一张画。

wo3	zai4	hua4	wan2	yi1	zhang1	hua4
I	ZAI	paint	finish	one	CL	picture

I am finishing painting a picture.

b. ?他在写完一封信。

ta1	zai4	xie3	wan2	yi1	feng1	xin4
he	ZAI	write	finish	one	CL	letter

He is finishing writing a letter.

The problem of Tai's study is that if we change to a similar construction, the acceptability will be different. For example, the sentence (33) is difficult to be accepted. Although the example in (31) is more acceptable than (33), it doesn't mean that it is not an accomplishment. In other words, the telicity is not necessarily given by the object, but given by context, e.g. a presupposed task. However, he didn't explain what affects the acceptability of the constructions in (31) and (33).

(33) ?这本书我读了三四遍，可是没读完。

zhe4	ben3	shu1	wo3	du2	le0	san1	si4	bian4	ke3shi4
this	CL	book	I	read	LE	three	four	time	but

mei2 du2 wan2
not read finish
I have read this book for three to four times, but I didn't finish.

The acceptability of the pattern proposed by Tai depends on in what degree the object could be interpreted as an integral entity. Otherwise, the predicate '完' *wan2* 'finish' could not be qualified since there is nothing that is expected to be finished. In other words, the predicate 完 *wan2* 'finish' requires a presupposed task, which serves as the telicity of the situation. More examples are shown in (34). The objects in these examples are more likely the description of the results of the process, which, in other term (Tenny, 1994), measure out the events.

(34) a. ?他总共喝了七八两酒，可是没喝完。

ta1 zong3gong4 he1 le0 qi1ba1 liang3 jiu3
he in_total drink LE seven_to_eight liang wine
ke3shi4 mei2 he1 wan2
but not drink finish
?He drank seven to eight liang of wine in total, but didn't finish it.

b. ?温度升了五度，可是没升完。

wen1du4 sheng1 le0 wu3 du4 ke3shi4 mei2
temperature rise LE five degree but not
sheng1 wan2
rise finish
?The temperature rose for five degrees, but didn't finish it.

c. ?他游了 32 分钟，可是没游够 32 分钟。

ta1 you2 le0 32 fen1zhong1 ke3shi4 mei2 you2
he swim LE 32 minute but not swim
gou4 32 fen1zhong1
enough 32 minute
?He swam for 32 minutes, but less than 32 minutes.

Finally, we can conclude that the test given by Tai (1984) is only suitable for the telicity given by the object. The acceptability of his test does not prove that the sentence is atelic. Instead, I will argue that it is still telic. In Chapter 3, I will discuss more on what can give or serve as the telicity of situations.

Deng (1986) followed the Vendler's theory and discriminates five situation types on Chinese sentences. He treated the Chinese RVCs as accomplishment, based on the test shown in (35).

However, he still cannot explain why the corresponding progressive forms of the sentences in (35) show different acceptabilities as shown in (36).

(35) a. 他一下就煮好了饭。

ta1	yi1xia4	jiu4	zhu3	hao3	le0	fan4
he	quickly	then	make	finish	LE	meal

He quickly finished making the meal.

b. 他一小时搬了二十块砖。

ta1	yi1	xiao3shi2	ban1	le0	er4shi2	kuai4	zhuan1
he	one	hour	move	LE	twenty	CL	brick

He moved twenty bricks in an hour.

(36) a. ?他正在煮好饭。

ta1	zheng4zai4	zhu3	hao3	fan4
he	ZAI	make	finish	meal

He is finishing making the meal.

b. 他正在搬二十块砖。

ta1	zheng4zai4	ban1	er4shi2	kuai4	zhuan1
he	ZAI	move	twenty	CL	brick

He moving twenty bricks.

Chen (1988) proposed five situation types for Chinese: state, activity, accomplishment, complex change and simple change. In his theory, the definitions for state, activity and accomplishment are the same as that of Vendler's. He also used the three parameters to discriminate the five situations. The term 'complex change' is [+dynamic][+telic][-durative], which is actually the same as achievement defined by Vendler. The examples show that his definition for 'complex change' is actually what is referred to as degree achievement. The term 'simple change' is defined as [+dynamic][-telic][-durative]. His examples for this category are actually achievements. So, we can see that his definition for *telic* is different. He mainly adopted the theories of aspectual classification when talking about the effect of different types of objects. For example, he claimed that when the object is definite the whole sentence mainly denotes an accomplishment, such as the sentences in (37).

(37) a. 乐队正在演奏蓝色多瑙河

yue4dui4	zheng4zai4	yan3zou4	lan2se4duo1nao3he2
band	ZAI	play	The_Blue_Danube

The band is playing *The Blue Danube*.

b. 这本书我读了三四遍。

zhe4	ben3	shu1	wo3	du2	le0	san1	si4	bian4
this	CL	book	I	read	LE	three	four	time

I have read this book for three to four times

c. 他做了一只木箱。

ta1	zuo4	le0	yi1	zhi1	mu4xiang1
he	make	LE	one	CL	wooden_box

He made a wooden box.

However, if we compare the different forms of the same situations as in (38), we may find their differences. First, (38.a) is atelic. The sentences (38.b) and (38.c) show different compatibility with the progressive form, while the corresponding English sentences are all acceptable.

(38) a. 乐队演奏了一天的蓝色多瑙河

yue4dui4	yan3zou4	le0	yi1tian1	de0
band	play	LE	the_whole_day	DE

lan2se4duo1nao3he2

The_Blue_Danube

The band has played *The Blue Danube* for the whole day.

b. ?这本书我正在读三四遍。

zhe4	ben3	shu1	wo3	zheng4zai4	du2	san1	si4	bian4
this	CL	book	I	ZAI	read	three	four	time

I am reading this book for three to four times.

c. 他正在做一只木箱。

ta1	zheng4zai4	zuo4	yi1	zhi1	mu4xiang1
he	ZAI	make	one	CL	wooden_box

He is making a wooden box.

Whether the verb takes incremental theme (Dowty, 1991) also affects the situation type of the combination result of the verb and its object. The verbs given by Chen (1988) are mainly incremental theme verbs. Non-incremental theme verbs will behave differently. As in (39), even though the object is definite, the whole sentence is still an activity.

(39) a. 他在抚摸一只猫。

ta1	zai4	fu3mo1	yi1	zhi1	mao1
he	ZAI	fondle	one	CL	cat

He is fondling a cat.

b. 他抚摸了一只猫十分钟。

ta1	fu3mo1	le0	yi1	zhi1	mao1	shi2	fen1zhong1
he	fondle	LE	one	CL	cat	ten	minute

He fondled a cat for ten minutes.

c. ?他十分钟抚摸了一只猫。

ta1	shi2	fen1zhong1	fu3mo1	le0	yi1	zhi1	mao1
he	ten	minute	fondle	LE	one	CL	cat

?He fondled a cat in ten minutes.

In addition, when taking demonstrative NP, the combination rule is also different. For example, the sentence (40.a) doesn't imply that the object 'that bottle of wine' is finished or, in other words, measures out the drinking event. So, the Chinese sentence (40.b) is acceptable. However, the corresponding English of (40.a) does imply the finish of the wine, which then results in the semantically ill-formedness of the English sentence in (40.b). These examples show that the source of telicity of the situations expressed in Chinese is very complicated. The problems are however not discussed in (Chen, 1988).

(40) a. 他喝了那瓶酒。

ta1	he1	le0	na4	ping4	jiu3
he	drink	LE	that	bottle	wine

He drank that bottle.

b. 他喝了那瓶酒，但没喝完。

ta1	he1	le0	na4	ping4	jiu3	dan4	mei2	he1	wan2
he	drink	LE	that	bottle	wine	but	not	drink	finish

?He drank that bottle, but didn't finish it.

Smith (1999) discriminated five categories for both English and Chinese, namely state, activity, semelfactive, accomplishment and achievement. She also discussed how viewpoint aspect, in terms of perfective and imperfective, cooperates with situation aspect in Chinese sentences.

(41) 他昨天写完了一封信。

ta1	zuo1tian1	xie3	wan2	le0	yi1	feng1	xin4
he	yesterday	write	finish	LE	one	CL	letter

He finished writing a letter yesterday.

She claimed that the RVCs entail the dynamic process of the same situation. For example, the sentence (41), which denotes an achievement, entails the dynamic process, i.e. the writing process before the finishing point. This is true, however, with some time constraints, i.e. the process must be immediately followed by the final finishing time point. RVCs are intrinsically achievements as I will show in Chapter 3.

Besides the three parameters, dynamicity, telicity and duration, Xiao (2004) proposed another two parameters: boundedness and result. He used the five parameters in a hierarchical way, e.g. [+result] entails [+telic], which entails [+bounded]. With the feature [-result], a situation could be either [+telic] or [-telic]. Accomplishment has the feature values [-result], [+telic], [+bounded], while achievement is [+result], [+telic], [+bounded]. This is mainly to explain the fact that accomplishment can possibly denote terminative (stop, terminative) without reaching the final state while achievement always entails the result. Chinese Resultative Verbal Complements (RVCs) are also [+result] and thus are achievements, e.g. in (42). He also argues that semelfactives are [+bounded]. This is why the progressive form of semelfactive verbs is valid and generates iterative reading.

(42) a. 他写了一封信，可是没写完。

ta1	xie3	le0	yi1	feng1	xin4	ke3shi4	mei2	xie3
he	write	LE	one	CL	letter	but	not	write
wan2								
finish								

?He wrote a letter, hut didn't finish.

b. ?他打碎了一个杯子，可是杯子没碎。

ta1	da3sui4	le0	yi1	ge4	bei1zi0	ke3shi4
he	hit-break	LE	one	CL	cup	but
bei1zi0	mei2	sui4				
cup	not	break				

?He broke a cup, but the cup didn't break.

Xiao's methodology also has some problems. The parameter [result] is mainly invented for Chinese RVCs. If we change the object, the acceptance will change. This has been discussed above with the examples in (33) and (34).

Studies on Chinese aspectual markers, e.g. 着 *zhe0* 'ZHE', 了 *le0* 'LE', 过 *guo4* 'GUO', 在 *zai4* 'ZAI', are overwhelming and will not be discussed in detail here. Instead, the related work will be discussed whenever necessary.

2.6. Summary

In this chapter, I went through previous studies on aspectual classification following Vendler's framework including English and Chinese. Especially, different methods for aspectual classification have been discussed in terms of their advantages and disadvantages. Generally, we can see that the difficulties in aspectual classification have not been solved. Based on the examples discussed, we can see that the aspectual classification can only be performed on sentences in a detailed context. However, this has run out of the previous motivation of the studies on lexical aspect, i.e. the lexical representation of verbs.

On the other hand, sentences in context are actually corresponding to a real situation/event in the world perceived by human. As have been noticed that, Vendler's categories are ontological rather than linguistic (Verkuyl, 1993; Levin, 2000). To classify linguistic units to ontological event categories is doomed not to succeed. This inspires us that we need an ontological layer, i.e. the human perceived events, between the linguistic study of situation aspect and the real events in the world. Linguistic untis are devices that human can use in order to describe the events they perceived.

Chapter 3

Event Structure and Event Types

Before going into details of what I call linguistic event, I will first discuss the ontological situation types proposed by Vendler (1957), and then I will give a detailed description how situation aspect and viewpoint aspect could be combined to form linguistic event types (or just *event type*). I suggest that linguistic events express the whole aspectual meaning of a sentence and are universal across languages. The properties of each linguistic event type will be discussed with Chinese and English examples. Tests are also provided for discriminating what linguistic event type a Chinese sentence describes, especially those with some special constructions, e.g. RVCs and SVCs.

3.1. Ontological Situation Types

Following Vendler's (1957) framework, there are four situation types: state, activity, accomplishment and achievement. Although Vendler's purpose was to classify verbs into the four categories, it is suggested that the categories are actually ontological (Verkyul, 1993). Besides the four categories, I would also like to enclose semelfactive (Smith, 1991) in the system.

State is usually defined as a homogeneous process without internal changes. A subpart of a state is the same state. Activity is a process with internal changes/sub events. Usually, a subpart of a dynamic state is also the same activity which falls into the same predicate. For example, a part of running is also running. However, if the time duration within which it is observed is very short, it may not be recognized as the same activity. For example, if we observe a running person in one millisecond, we may only see that he is raising his left foot, but not necessary recognized as running (Smith, 1991). We may get the same picture, if we observe a person who is kicking for only one millisecond.

Accomplishment is a dynamic process which is followed by a final state (or culmination), while the final state is not a part of the accomplishment event. In other words, the accomplishment ends at the same time when the final state comes about. For example, 'he wrote a letter' describes an accomplishment which ends once the letter comes into existence. Similarly, achievement is an instantaneous change that only consists of a time point. Similarly, the states before and after the change are not a part of the event.

Different from activity, semelfactive is a dynamic process involving a very short time period, e.g. knock, cough etc. The duration of a semelfactive event is usually naturally decided. Take coughing or knocking for example, it is impossible to extend the duration. Iterative semelfactive events can form an activity, e.g. 'he is knocking the door'.

3.1.1. Representation of Ontological Situation Types

Smith (1991) used '-', 'I' and 'F', 'E' and '.' for the representation of the four situation types. 'F' could be further divided into 'F_{Arb}' and 'F_{Nat}' for arbitrary endpoint and natural endpoint respectively. Activity is then represented as 'I…F_{arb}', accomplishment is then represented as 'I…F_{Nat}'. States are represented as '(I)-----(F)', where the brackets meaning that the endpoints are not part of the state. Semelfactive is represented as 'E'. Achievements are represented as '…E…'.

Similarly, MARVS (Huang, et. al., 2000) also used event primitives to represent complex events. As discussed in Chapter 2, explicitly representing event structures make it easier for us to capture the relationship of different event types. Here, I would like to use a similar but slightly different set of symbols for the representation of different situation types as shown in Table 1. Especially, '-' is for static; '~' is for dynamic; '|' is for temporal boundary. The representation for semelfactive, i.e. '|~|', means that it is nearly instantaneous and countable as suggested by Comrie (1975). Situations with more than one unit are durative, e.g. the inner stages of a dynamic process |~~~|.

Ontological Situation Type	Representation
State	|------|
Process/Activity	|~~~~|
Semelfactive	|~|
Accomplishment	|~~~|---
Achievement	---|---

Table 1. The representation of the five situation types. '-' for static, '~' for dynamic, '|' for temporal boundaries.

Based on the representation in Table 1, we can easily observe the relationship among different situation types. For example, the difference of state and activity is their inner structures that the former is static while the latter is dynamic. The difference of activity and accomplishment is that the latter has a final state following the end of the dynamic process. The difference of semelfactive and activity is that the former is instantaneous while the latter is durative.

It should be noted that I have some different treatments from Smith's. First, I treat state as temporal bounded from an ontological point of view. This assumption is based on the observation that we can actually explicitly specify the duration of a state, e.g. he was ill for two weeks. Second,

semelfactive is not treated as logically instantaneous in this framework. We are actually able to refer to the time duration of semelfactive events, e.g. 在你一眨眼的时间里 *zai4 ni3 yi1 zha3yan3 de0 shi2jian1 li3* 'within the time you blink'. But similar expressions are not possible for achievements, which are logically instantaneous. For example, the sentence *在你到达的时间里 *zai4 ni3 dao4da2 de0 shi2jian1 li3* 'within the time that you arrive' is not acceptable. However, we can easily refer to the time point of achievements, e.g. 在你到达的那一刻 *zai4 ni3 dao4da2 de0 na4 yi1 ke4* 'at the time you arrive'. Third, Smith treated causative events such as 'break a cup' as achievement, while I will treat them as a special kind of accomplishment.

3.1.2. Progressive is Stative

It is suggested that progressive is stative and progressive expresses an event as a state (Vlatch, 1981; Borer, 1996; Demirdache, 1997). I agree with this statement in the sense that human can possibly perceive an ongoing process as a special state. For example, 'he is running' is equivalent to 'he is now in a running activity'. Besides, I would like to suggest that progressive is a viewpoint that refers to a time point (instantaneous viewpoint), at which the dynamic process is observed. Evidence for this is that progressive is compatible with time point adverbial, e.g. *he was running at nine this morning*. What is behind the progressive viewpoint is that the dynamic process is perceived as a special stative. Without confusion, I would like to use the notion 'dynamic state' to denote this ontological situation type. 'Staitic state' will be used to refer to the previous notion 'state' of Vendler's framework. 'State' will be used as a hypernym of 'satic state' and 'dynamic state', denoted by '|===|', where '=' can be either '-' or '~'. Based on this treatement, we will gain a great merit when we talk about change of state, which, as I will show, can refer to four different types.

3.1.3. Primitives of Events

Based on the representation I proposed, only two primitives are found: state and change of state as shown in Table 2. All events are made up of the two primitives. Activity is a temporal bounded durative dynamic state, meaning that there are three components for activities: the start of a dynamic process, the process within which the dynamic state holds and an end of the process. Accomplishment is composed by an activity and a final state.

Primitive	Representation
State	====
Change of State	==|==

Table 2. Primitives of events.

3.1.4. Theoretically Existing Situation Types

One consequence of the proposed representation is that, we may wonder whether there are situations with the form '|-|' (countable static state) as a counterpart of '|~|', '|~~~|~~' as a counterpart of '|~~~|--', and correspondingly '|~|---' and '|~|~~~'. For change of state, there are four possible categories: '---|---', '---|~~', '~~|---' and '~~|~~'. For '|~~~|~~', it describes an accomplishment whose final state is dynamic. Such type of event does exist. For example, 'he started up the computer in one minutes' describes an accomplishment with a dynamic final state, i.e. the normal working of the computer.

As for the '|~|---' and '|~|~~~', they can be interpreted as a semelfactive process which causes or is followed by a final state, either static or dynamic. In Chinese, there are many such cases, e.g. the RVCs 踢伤 *ti1shang1* 'kick-hurt', 戳破 *chuo1po4* 'poke-broken'. I would like to call them instantaneous accomplishment. In English, the causative verbs, such as kill, break can actually denote such kind of events.

For '---|~~', '~~|---' and '~~|~~', they are possible subtypes of change of state (achievement) '==|==='. '---|~~', the start of a dynamic process, has been treated as a special kind of achievement. Similarly, terminative actually refers to '~~|---', while the final state is not specified. All different subtypes of achievement will be discussed in detail later. Table 3 shows a more comprehensive catalogue of ontological situation types.

Ontological Event Type	Representation
Static State	|-----|
Dynamic State	|~~~|
Semelfactive	|~|
Accomplishment	|~~~|---- |~~~|~~~
Achievement	----|---- ----|~~~ ~~~|---- ~~~|~~~
Instantaneous Accomplishment	|~|---- |~|~~~

Table 3. The six situation types.

3.2. Linguistic Events

Viewpoint is like a camera, with which we can take a picture of a situation (Smith, 1991). Based on the viewpoint aspect, we focus a sub part of the whole event. A sentence is then like a photo taken by the speaker and presented to the hearer. The information included in the photo is then what the hearer got from the speaker. Unless the memory of the speaker obtained from his perception could be directly transferred into the hearer's brain, the photo then plays the most important role for the communication. Here, I will discuss how different viewpoints could be applied to the ontological event types to form different types of linguistic events.

3.2.1. Viewpoint Aspect

Previous studies on viewpoint aspect are usually syntactic based. So, viewpoint aspect is also called grammatical aspect. Smith (1991) extended the viewpoint aspect into more categories and suggested that viewpoint is also semantic and potentially universal across languages. I agree with Smith that speakers in the world use similar ways to describe what exists or is happening in the world, although such ways could be realized differently in different languages. Thus, another way to describe linguistic event types is a combination of a set of ontological situation types associated with different viewpoint aspects that are ready to be realized in any language.

Viewpoint aspect is a selected period of time through which a situation is described. The selected period of time could be very short, e.g. a time point, which we call instant viewpoint. For example, if we use an instant viewpoint to describe a static state *e*, whose lifetime is [t_1, t_2], as shown in Figure 1. Then, the resultant description has three possibilities. When the viewpoint is at t_1, we get an inchoative, e.g. (1.a). When the viewpoint is at t_2, we get a cessative, e.g. (1.c). When the viewpoint is at a time point within (t_1, t_2), we get an instant static state, e.g. (1.b).

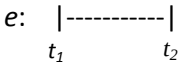

Figure 1: An ontological static state *e*, with a life time [t_1, t_2].

(1) a. 他是老师了。

ta1	shi4	lao3shi1	le0
he	be	teacher	LE

He becomes a teacher now.

b. 他是老师。

ta1	shi4	lao3shi1
he	be	teacher

He is a teacher.

c. 他不是老师了。

ta1	bu4	shi4	lao3shi1	le0
he	not	be	teacher	LE

He is not a teacher any more.

d. 他当了二十年老师，退休了。

ta1	dang1	le0	er4shi2	nian2	lao3shi1	tui4xiu1	le0
he	be	LE	twenty	year	teacher	retire	LE

He taught for twenty years, before he retired.

Contrary to instant viewpoint, there are also durative viewpoints. Theoretically, any period of time could be selected as a durative viewpoint. However, only meaningful ones are selected, such as a period of time that right frames the whole event, which we could call holistic viewpoint, e.g. (1.d) and (2.a). It could also be a period of time from a boundary of the situation to a reference time, e.g. the sentence (2.b) which describes the duration from the start of the illness to the reference time, which by default is the speech time.

(2) a. 他上次病了一个星期。

ta1	shang4ci4	bing4	le0	yi1	ge4	xing1qi1
he	last_time	ill	LE	one	CL	week

He was ill for one week last time.

b. 他病了一个星期了。

ta1	bing4	le0	yi1	ge4	xing1qi1	le0
he	ill	LE	one	CL	week	LE

He has been ill for one week.

Viewpoint aspect could also be treated as a mapping from one situation to another. For example, we can possibly get a change of state '|~~', or '~~|' from a dynamic state '|~~~|' by focusing on its start and end respectively. In Chinese, the mapping could be realized with some syntactic elements, e.g. by light verbs such as 开始 *kai1shi3* 'start', negators such as 不 *bu4* 'not', or perfective markers such as 了 *le0* 'LE' as in (1.a) and (1.c).

3.2.2. Linguistic Event: Combination of Situation and Viewpoint Aspect

Based on different viewpoint aspects and the ten extended situation types, we can get 18 linguistic event types as shown in Table 4. The linguistic event types |-- and --| could actually be treated as two different subtypes of --|--. Their difference is on the relation between the state before the change and after the change. The inchoative '|--' explicitly states the start of a static state P, which implies that the previous state is ¬P (not P). The cessative '--|' explicitly states the end of a static

state P, which implies that the final state is ¬P. The '--|--' explicitly states change from a static state P to another static state Q, where P->¬Q and Q->¬P holds. Similarly, the '|~~' is a type of '==|~~' with the previous state unspecified; '~~|' is a type of '~~|=='.

	|---|	|~~~|	|~~~|--	|~~~|~~	--|--	--|~~	~~|--	~~|~~	|~|	|~|---	|~|~~
---	√										
|---|	√										
|--	√				√						
--|	√				√						
--|--					√						
---|~~						√					
|~~		√	√	√		√					
|~~T~~		√	√	√							
~~		√	√	√							
|~~~|		√	√	√							
~~|		√	√	√			√				
~~|--			√				√				
~~|~~				√				√			
|~~~|--			√								
|~~~|~~				√							
|~|									√		
|~|---										√	
|~|~~											√

Table 4. The relation between situation aspect and viewpoint aspect. Columns are situation types (ontological event types); Rows are linguistic events.

3.2.3. What expresses the ontological situations and what to classify?

As has been discussed in Chapter 2, it is a question that what should be classified. Smith suggested the classification on verb constellation. In Chinese, I would define verb constellation as the main verb with its arguments and the viewpoint aspectual operators that may shift its situation type. The viewpoint aspectual operators include 开始 *kai1shi3* 'start', 结束 *jie2shu4* 'terminate' 停止 *ting2zhi3* 'stop', 完成 *wan2cheng2* 'finish' etc. As shown above, context is an important element of a situation. Thus, the classification should be based on the verb constellation of a sentence with the necessary context.

Let's suppose that a predicate P_s filled with necessary arguments expresses a situation. A predicate that assigns viewpoint aspectual information to P_s expresses linguistic event, denoted by P_v. For

example, an instance *e* of the event of writing a letter could be written as *write(e, x, a_letter)*. If we focus on the start of the event, i.e. start writing a letter, it could be denoted as *start(e', write(x, a_letter))*. By the way, the tense information could be further expressed by specify the relation of the time of *e'* and the speech time, e.g. the past: *time(e')* < SpeechTime.

The difference of predicate and verb constellation is that, the same verb constellation could be interpreted into different predicates in different contexts, while predicates are logically unambiguous. One predicate could be realized with different languages and even different verb constellations in one language. This has posed the main difficulty that has been encountered by previous studies in aspectual classification no matter what level of linguistic units are focused.

As an example, 'sing a song' could be interpreted as telic or atelic in different context. In the telic sense, the object song should be interpreted as an incremental theme (Dowty, 1979) that measures out the singing action (Tenny, 1987, 1992 & 1994). We can use the predicate *song(y)∧sing(x, y)* to denote it, meaning that the song here is a specific instance, thus the singing action only holds during the instance of the song. In the atelic sense, the content of the singing could be recognized as the song. Either the singer singing the whole song repeatedly or practicing a part of the song will falls into the same predicate, i.e. $sing(x, y) \wedge \forall_z[part\_of(z, y) \rightarrow part\_of(z, the\_song)]$. This means that any subpart the subject sang could be recognized as a part of the song. However, the whole procedure of the song is not necessarily to be followed.

Although verb constellations don't uniquely correspond to an ontological situation type, it usually does in a specific context. In other words, a verb constellation in a specific context could be translated into a unique situation predicate P_s. Thus, the identification of ontological situation type should be based on verb constellations within context. One problem it may raise is that it would lose generalization ability within this setting, which would make the classification a trivial task. On the other hand, I would suggest that verb constellations without context could be classified in a higher level based on the distribution of different ontological situation types or linguistic event types they can denote.

3.3. Where Is Telicity From?

By now, telicity is almost equivalent to boundedness, although some researchers differentiate them in their own theoretical framework, e.g. (Xiao, 2004). After the situation aspect and viewpoint aspect are separated into two layers, telicity in situation aspect level is clear as discussed in Section 2 that the predicate P_s expressed by a verb constellation in a specific context determines its situation type. The issue comes if we consider the telicity in linguistic event level especially with imperfective viewpoints.

(3) a. He started writing a letter.
b. He is writing a letter.
c. He is eating a sandwich.
d. He is eating sandwiches.

The sentences (3.a) (3.b) and (3.c) are telic, while (3.d) is atelic. We can see that the only concern by previous studies actually refers to its ontological situation type, which is actually only an intention of the subject. Thus, many researchers have found that there are many cases where the ontological situation will never be achieved. For example, the subject could die without finishing the letter. In that case, is the proposition expressed by sentence (3.b) or (3.c) is still true? It seems clear that the boundedness of the ontological situation type only cannot accurately model the semantics of progressives (Vlach, 1981; Landman, 1992; Asher, 1992; Engelberg, 2001). In other words, ontological boundedness may not be the appropriate interpretation of progressives. Filip (2008) suggested that telicity is associated with perfectivity which is the maximalization of events. Before going further, let's first look at different cases where telicity is from.

3.3.1. Intentionality

Some researchers argue that telicity is not related to intentionality. However, there are also some researchers insist that intentionality at least sometimes contribute the telicity (Depraetere, 2007). I agree with this treatment. For example, the sentences in (4) show that intention could be possible to fail or quit. However, the first parts of the sentences are still acceptable in that the syntactic object only serve as intention.

(4) a. 我本来在画一只老虎，结果画了个四不像。

wo3	ben3lai2	zai4	hua4	yi1	zhi1	lao3hu3
I	originally	ZAI	draw	one	CL	tiger
jie2guo3	hua4	le0	ge4	si4bu4xiang4		
as_a_result	draw	LE	GE	David's_deer		

I was originally drawing a tiger, but it turned out to be a David's deer.

b. 我本来在写一本小说，后来放弃了。

wo3	ben3lai2	zai4	xie3	yi1	ben3	xiao3shuo1
I	originally	ZAI	write	one	CL	novel
hou4lai2	fang4qi4	le0				
finally	give_up	LE				

I was originally writing a novel, but finally I gave up.

In Chinese, although the object can give telicity to the process, the object could only be interpreted as an entity rather than quantity. For example, the sentences (5.b) and (6.b) are not acceptable,

since the objects can only express quantity. The sentences (5.a) and (6.a) are acceptable because the object 一千米 *yi1 qian1 mi3* 'one thousand meters' and 一个苹果 *yi1 ge4 ping2guo3* 'an apple' can be both interpreted as entities. It seems that only incremental theme verbs, e.g. 画 *hua4* 'draw', 做 *zuo4* 'make' can give intentional telicity in Chinese. Other verbs, e.g. 摸 *mo1* 'touch', 打 *da3* 'hit' can hardly give intentional telicty.

(5) a. 他正在跑一千米。

ta1	zheng4zai4	pao3	yi1qian1	mi3
he	ZAI	run	one_thousand	meter

He is running one thousand meters.

b. ?他正在跑两三圈。

ta1	zheng4zai4	pao3	liang3	san1	quan1
he	ZAI	run	two	three	laps

He is running two or three laps.

(6) a. 他正在吃一个苹果。

ta1	zheng4zai4	chi1	yi1	ge4	ping2guo3
he	ZAI	eat	one	CL	apple

He is eating an apple.

b. ?他正在吃很多苹果。

ta1	zheng4zai4	chi1	hen3duo1	ping2guo3
he	ZAI	eat	many	apple

He is eating many apples.

3.3.2. Result

Sometimes, the objects can only be interpreted as result rather than intention. For example, the sentence (7.a) mainly describes a situation that the result of his drinking is a lot of wine (Depraetere, 2007), which is hard to be the preexisted intention as shown in (7.b)

(7) a. 他喝了不少酒。

ta1	he1	le0	bu4shao3	jiu3
he	drink	LE	not-little	wine

He drank much wine.

b.?他正在喝不少酒。

ta1	zhang4zai4	he1	bu4shao3	jiu3
he	ZAI	drink	not-little	wine

?He is drinking much wine.

On the other hand, once an intention is realized, it became a result, e.g. (8). In (Parsons, 1990), he also discriminated two different states which roughly correspond to intentionality and result: target state and resultant state.

(8) 他画了一只老虎。

ta1	hua4	le0	yi1	zhi1	lao3hu3
he	draw	LE	one	CL	tiger

He drew a tiger.

3.3.3. Perception and Prediction

It is observed that progressive includes modality of the speaker (Portner, 1998). This is true that the reported event is only the speaker's observation, meaning that speakers' perception or personal judgment sometimes contributes to the telicity. As shown in (9) and (10), the subject's intention may not be perceived by the reporter who is observing the process.

(9) a. 我在画一只老虎。

wo3	zai4	hua4	yi1	zhi1	lao3hu3
I	ZAI	draw	one	CL	tiger

I am drawing a tiger.

b. 你这是画老虎？你這是在画猫。

ni3	zhe4shi4	hua4	lao3hu3	
you	be	draw	tiger	
ni3	zhe4shi4	zai4	hua4	mao1
you	be	ZAI	draw	cat

Are you kidding? You are drawing a cat.

(10) a. 他在过马路。

ta1	zai4	guo4	ma3lu4
he	ZAI	cross	road

he is crossing the street.

b. 他不是过马路，他是捡马路上的东西。

ta1	bu4shi4		zai4	guo4	ma3lu4		
he	not		ZAI	cross	road		
ta1	shi4	jian3		ma3lu4	shang4	de0	dong1xi0
he	be	pick_up		road	on	DE	thing

He is not crossing the street. He is picking up something on the road.

In (11.a), the speaker perceived a tendency that the person who is playing a piano in a bad manner may break the piano. The perceived tendency provides the telicity of the event. The hearer didn't agree with the speaker and replied by denying the tendency. In Chinese, the tendency is expressed by an achievement, which implies an epistemic modality in a given context. The modality could be explicitly expressed with modal auxiliary verb 要 *yao4* 'will'.

(11) a. 停！你把钢琴弹坏了。

ting2	ni3	ba3	gang1qin2	tan2	huai4	le0
stop	you	BA	piano	play	broken	LE

Stop! You are breaking the piano.

b. 我只是在练习而已。

wo3	zhi3shi4	zai4	lian4xi2	er2yi3
I	only	ZAI	practice	SFP

I'm just practicing.

The examples in (9), (10) and (11) show that the objects in progressive form may not be the measuring out or logical boundary of the real events. Although the semantics of progressive is not the focus of the thesis, the examples here provide important cases to help understand the semantics of progressive.

3.3.4. Context

The verb 洗澡 *xi3zao3* 'shower' shows compatibility with both *in-* and *for-* adverbials, as in (12). However, this verb is not a degree achievement verb which may associate with a scalar (Hay, 1999; Peck, 2013). Instead, the compatibility with both in- and for- adverbials comes from the ambiguity of the verb's meaning that it can denote a process with or without telicity.

(12) a. 他洗澡洗了十分钟。

ta1	xi3zao3	xi3	le0	shi2	fen1zhong1
he	shower	wash	LE	ten	minute

He showered for ten minutes.

b. 他(用)十分钟洗了澡。

ta1	yong4	shi2	fen1zhong1	xi3	le0	zao3
he	spend	ten	minute	shower	LE	shower

He showered in ten minutes.

On the other hand, the verb 喝酒 *he1jiu3* 'drink' seems to be only compatible with *for*- adverbial but incompatible with *in*- adverbial normally as in (13). However, (13.b) could be interpreted in a context where the subject is required or intends to drink some wine, e.g. he could not leave before he finished the wine. In this context, the bare NP 酒 jiu3 'wine' becomes definite and serves as the telicity.

(13) a. 他喝酒喝了十分钟。

ta1	he1jiu3	he1	le0	shi2	fen1zhong1
he	drink_wine	drink	LE	ten	minute

He showered for ten minutes.

b.?他用十分钟喝了酒。

ta1	yong4	shi2	fen1zhong1	he1	le0	jiu3
he	spend	ten	minute	drink	LE	wine

(He drank the wine in ten minutes)

3.3.5. Summary of Telicity

We have seen that the progressive form is not simply an imperfective viewpoint of an ontological situation. It also encodes other semantic elements, e.g. subject's intention, speaker's modality etc. However, when talking about linguistic event types, I would say that sentences (3.b), (3.c) and (3.d) all express an instant dynamic state: ~~~, although they imply different ontological situation types in background. This treatment suggests that in imperfective viewpoints, the telicity issue should be treated differently, especially for the semantics of the whole sentences, because the semantic entailments of different types of telicity are different. This issue will be further discussed in Chapter 5.

3.4. Linguistic Event Types

In this section, I will go to the details on linguistic event types based on different ontological situation types. Without confusion, the notions for ontological situation types, static state, dynamic state, semelfactive, accomplishment and achievement, are also used for a linguistic event type with a holistic viewpoint.

3.4.1. Static State: |----|

Theoretically, static state is compatible with four viewpoint aspects, as shown in Figure 1, which have been referred to as inchoative achievement '|--', instant static state '---', cessative achievement '--|' and delimitative '|---|', a holistic viewpoint on an ontological static state.

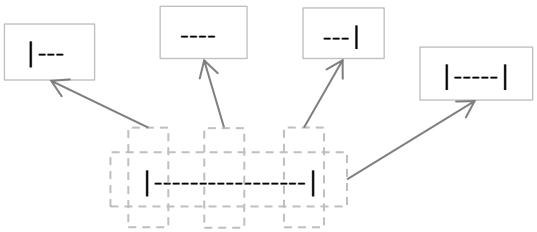

Figure 2: Static state with different viewpoint aspects.

3.4.1.1. Instant static state: ---

Static state is usually reported in an instant viewpoint, by default the speech time. In this case, the start of the static state or the end of the static state is not described. The corresponding Chinese examples are as in (14).

(14) a. 他很高。

ta1	hen3	gao1
he	very	tall

He is tall.

b. 他病着呢。

ta1	bing4	zhe0	ne0
he	ill	ZHE	NE

He is ill.

c. 他相信这个理论。

ta1	xiang1xin4	zhe4	ge4	li3lun4
he	believe	this	CL	theory

He believes this theory.

d. 他是老师。

ta1	shi4	lao3shi1
he	be	teacher

He is a teacher.

e. 本书有八个章节。

ben3	shu1	you3	ba1	ge4	zhang1jie2
this	book	have	eight	CL	chapter

This book includes eight chapters.

f. 门开着。

men2	kai1	zhe0
door	open	ZHE

The door is open.

g 他们是朋友。

ta1men2	shi4	peng2you3
they	be	friend

They are friends.

Habitual is a special kind of static state. For example, the sentences in (15) and (16) describe that there is a possibility that the subject be involved in this kind of events described by the predicate. The negation negates the relation of the entity and the event type rather than the happening of the event.

(15) a. 他抽烟。

ta1	chou1	yan1
he	smoke	cigarette

He smokes.

b. 他以前抽烟，现在不了。

ta1	yi3qian2	chou1yan1	xian4zai4	bu4	le0
he	before	smoke	now	not	LE

He smoked before, but he doesn't any more.

(16) a. 他盖房子。

ta1	gai4	fang2zi0
he	build	house

He builds houses.

b. 他杀人。

ta1	sha1	ren2
he	kill	people

He kills people.

Habitual event is compatible with frequency adverbs, e.g. (17).

(17) a. 他每天跑步。

ta1	mei3tian1	pao3bu4
he	every_day	run

He runs every day.

b. 他这段时间每天跑步。

ta1	zhe4	duan4	shi2jian1	mei3tian1	pao3bu4
he	this	CL	time	every_day	run

He runs every day recently.

3.4.1.2. Bounded static state: |---|

Bounded static state, which I will call delimitative, is a reported static state with the time period of the life time explicitly specified. In other words, delimitative describes a static state that holds in a time period, e.g. the examples in (18).

(18) a. 他上次病了两个星期。

ta1	shang4ci4	bing4	le0	liang4	ge4	xing1qi1
he	last_time	ill	LE	two	CL	week

He was ill for two weeks last time.

b. 他抽了二十年烟。

ta1	chou1	le0	er4shi2	nian2	yan1
he	smoke	LE	twenty	year	cigarette

He smoked for twenty years.

3.4.1.3. Inchoative: |---

Inchoative describes the start of a static state, e.g. (19). Inchoative is also possible for habitual state, e.g. (20).

(19) a. 他病了。

ta1	bing4	le0
he	ill	LE

He got ill.

b. 她漂亮了。

ta1	piao4liang4	le0
she	beautiful	LE

She has become more beautiful.

(20) a. 他开始抽烟了，以前不抽。

ta1	kai1shi3	chou1yan1	le0	yi3qian2	bu4	chou1
he	start	smoke	LE	before	not	smoke

He smokes now, but didn't before.

b. 他抽烟更频繁了。

ta1	chou1yan1	geng4	pin2fan2	le0
he	smoke	more	frequent	LE

He smokes more frequently now.

3.4.1.4. Cessative: ---|

Cessative describes the cessation of a state. Cessative is similar to inchoative that they are both achievements. The difference relies on which state is focused. Logically, if P=¬Q, then to say P ends is equivalent to say Q starts.

(21) a. 他病好了。

ta1	bing4	hao3	le0
he	ill	recover	LE

He recovered from the ill.

b. 他不抽烟了。

ta1	bu4	chou1yan1	le0
he	not	smoke	LE

He stopped smoking.

3.4.2. Dynamic State: |~~~|

Similar as static state, there are four possible viewpoint aspects for dynamiuc state: inceptive '|~~', instant dynamic state '~~~', terminative '~~|' and activity '|~~~|', a holistic viewpoint on an ontological dynamic state, as shown in Figure 3.

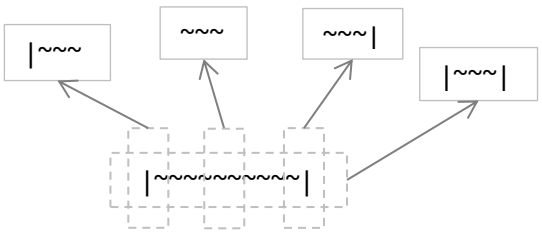

Figure 3. Dynamic state with different viewpoint aspects.

3.4.2.1. Instant dynamic state: ~~~

Instant Dynamic State describes an instant state of a dynamic state at a reference time, which is usually the speech time.

(22) 他正在吃面包。

ta1	zheng4zai4	chi1	mian4bao1
he	ZAI	eat	bread

He is eating sandwiches.

(23) a. 晚上九点，他正在跑步呢。

wan3shang4	jiu3dian3	ta1	zheng4zai4	pao3bu4	ne0
evening	9:00pm	he	ZAI	run	NE

He was running at 9:00pm.

b. 晚上九点，他正在看书呢。

wan3shang4	jiu3dian3	ta1	zheng4zai4	kan4shu1	ne0
evening	9:00pm	he	ZAI	read	NE

He was reading at 9:00am.

Progressive statives, such as the English sentences in (24), describe a situation that the agents are performing some actions which makes the agent to be like a hero or a fool. In this sense, they are dynamic states. I suggest that such use is a kind of creative use of language under the grammatical system of a specific language. In English, it uses a progressive form, which is not semantically compatible with static states, to express a special meaning, which is then actually a dynamic state. In Chinese, such use is not allowed.

(24) a. *他正在是英雄。

ta1	zheng4zai4	shi4	ying1xiong2
he	ZAI	be	hero

He is being a hero.

b. *他正在傻。

ta1	zheng4zai4	sha3
he	ZAI	foolish

He is being foolish.

3.4.2.2. Bounded dynamic state (activity): |~~~|

Bounded dynamic state, which I will call activity, describes a holistic dynamic state that holds for some time. Although, it is possible that the exact time points of the start and the end of the dynamic state are not explicitly specified, it is clear that they actually exist. For example, the sentences in (25) both describe a temporally bounded dynamic state.

(25) a. 他早上跑步了。

ta1	zao3shang4	pao3bu4	le0
he	morning	run	LE

He ran this morning.

b. 他刚才吃面包了。

ta1	gang1cai2	chi1	mian4bao1	le0
he	just_now	eat	bread	LE

He ate sandwiches.

In English, for-adverbials can be use to describe the lifetime of a dynamic state. It implies that the dynamic state only holds in that time period. In Chinese, the time period could be expressed as an adjunct the verb, e.g. (26).

(26) a. 他跑步跑了半个小时。

ta1	pao3bu4	pao3	le0	ban4	ge4	xiao3shi2
he	run	run	LE	half	CL	hour

He ran for half an hour.

b. 他写毕业论文写了半年。

ta1	xie3	bi4ye4lun4wen2	xie3	le0	ban4	nian2
he	write	thesis	write	LE	half	year

He wrote his thesis for half a year.

We should note that the sentences in (27) are not delimitative. They actually describe a time interval, within which a dynamic state holds. Whether the dynamic holds or not out of the period is not described. So, the time period is not the lifetime of the dynamic state, as shown in Figure 4.

(27) a. 晚上九点到十一点，他一直在跑步。

wan3shang4	jiu3dian3	dao4	shi2yi1dian3	ta1	yi1zhi2
evening	9:00pm	to	11:00pm	he	always

zai4 pao3bu4

ZAI run

He was building a house from 9:00am to 11:00am.

b. 晚上九点到十一点，他一直在看书。

wan3shang4	jiu3dian3	dao4	shi2yi1dian3	ta1	yi1zhi2
evening	9:00pm	to	11:00pm	he	always

kan4 shu1

read book

He was reading a book from 9:00am to 11:00am.

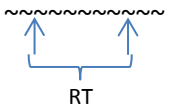

Figure 4: A continuous serial of instant viewpoints on a dynamic state.

3.4.2.3. Inceptive: |~~

Inceptive describes the start of a dynamic state as in (28).

(28) a. 他开始跑步了。

ta1	kai1shi3	pao3bu4	le0
he	start	run	LE

He started running.

b. 她开始用心地去认识这个世界 。

ta1	kai1shi3	yong4xin1	de0	qu4	ren4shi2	zhe4
she	start	attentively	DE	go	explore	this

ge0 shi4jie4

CL world

She started to explore this world attentively.

c. 台下响起如雷的掌声。

tai2	xia4	xiang3qi3	ru2lei2	de0	zhang3sheng1
stage	below	start	thunderous	DE	applause

Thunderous applause started below the stage.

3.4.2.4. Terminative: ~~|

Terminative describes the end of a dynamic state, as in (29).

(29) a. 他停止跑步了。

ta1	ting2zhi3	pao3bu4	le0
he	stop	run	LE

He stopped running.

b. 他停止盖房子了。

ta1	ting2zhi3	gai4	fang2zi0	le0
he	stop	build	house	LE

He stopped building the house.

3.4.3. Change of State: ==|==

Change of state is a change from one state to another. Change of state is logically instantaneous. There are four different changes of state: static-static '-|-', static-dynamic '-|~', dynamic-static '~|-' and dynamic-dynamic '~|~'. Each of them is compatible with three possible viewpoints as shown in Figure 5.

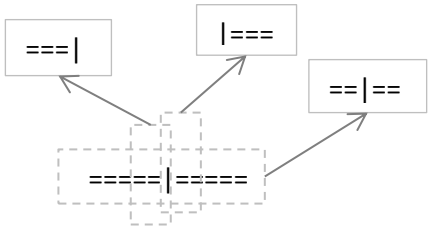

Figure 5: Change of State and possible viewpoint aspects.

3.4.3.1. Static-Static change: --|--

Static-static change, '-|-', describes a change from one static state to another different static state, e.g. (30) and (31).

(30) a. 他死了。

ta1	si3	le0
he	die	LE

He died.

b. 他赢了。

ta1	ying2	le0
he	win	LE

He won.

(31) a. 他火了。

ta1 huo3 le0

he famous LE

He has become famous.

b. 花红了。

hua1 hong2 le0

flower red LE

The flower has become red.

Although |-- is a subtype of ==|--, it is interesting that the verbs 火 *huo3* 'famous' and 红 *hong2* 'red' are different from 死 *si3* 'die' and 赢 *ying2* 'win' that the latter cannot be used to denote instant static state, as shown in (32) and (33). This actually suggests that the verbs 火 and 红 lexicalize the state. The inchoative is expressed with the pattern 'V+LE'. On the other hand, the verbs 死 and 赢 lexicalize the change, so they are not allowed to denote the final state of the changes. In English, it is different that the verb 'die' has its adjective form 'dead' which mainly denotes the static state.

(32) a. ?他(很)死。

ta1 hen3 si3

he very die

?he is very dead.

b. ?他(很)赢。

ta1 hen3 ying2

he very win

?He wins very much.

(33) a. 他很火。

ta1 hen3 huo3

he very famous

He is very famous.

b. 花很红。

hua1 hen3 hong2

flower very red

The flower is very red.

3.4.3.2. Static-Dynamic change: --|~~

Static-dynamic change, '-|~', describes a change from a static state to a dynamic state. Inceptive: |~~ is a typical static-dynamic change. There are also causatives that show this event structure. In most cases of the causatives, the causer state and the succeeding dynamic state overlap in time.

(34) a. 我们高兴得拍手欢呼。

wo3men2	gao1xing4	de0	pai1shou3	huan1hu1
we	happy	DE	clap_one's_hands	cheer

We are so happy that we clap our hands and cheer.

b. 鲑鱼们激动得又叫又跳。

gui1yu2men0	ji1dong4	de0	you4	jiao4	you4	tiao4
the_trout	excited	DE	also	shout	also	jump

The trout are so excited that they all shout and jump.

3.4.3.3. Dynamic-Static change: ~~|--

Dynamic-static change, '~|-', describes a change from a dynamic state to a static state, e.g. (35). Terminatives, completives are all dynamic-static changes.

(35) a. 他写完了作业。

ta1	xie3wan2	le0	zuo4ye4
he	write-finish	LE	homework

He has finished writing his assignment.

b. 他跑完了步。

ta1	pao3	wan2	le0	bu4
he	run	finish	LE	run

He has finished his running.

Some RVCs in Chinese also denote this event type, as shown in (36).

(36) a. 我们都长高了。

ni3men2	dou1	zhang3gao1	le0
you	all	grow-tall	LE

You have all grown taller.

b. 汗水湿透了衣服。

han4shui3	shi1tou4	le0	yi1fu2
sweat	wet-through	LE	clothes

The sweat wetted through the clothes.

Dynamic-Static change is often confused with accomplishment |~~~|--. For example, Ma Qingzhu (1981), Deng Shouxin (1986), all treated (35) as accomplishment. As I will show later, they should be treated as achievements.

3.4.3.4. Dynamic-Dynamic change: ~~|~~

Dynamic-dynamic change, '~|~', describes a change from one dynamic state to a different dynamic state.

(37) a. 汽车减速到八十迈继续行驶。

qi4che1	jian3su4	dao4	ba1shi2	mai4
car	startup	to	eighty	miles_per_hour
ji4xu4	xing2shi3			
continue	run			

The car slowed down to eight miles per hour.

b. 电脑启动好了。

dian4nao3	qi3dong4	hao3	le0
computer	startup	ready	LE

The computer successfully started up.

3.4.4. Semelfactive: |~|

Semelfactive is only compatible with holistic viewpoint rather than instant viewpoint as semelfactive is not logically instantaneous, e.g. (38).

(38) a. 他敲了一下门。

ta1	qiao1	le0	yi1	xia4	men2
he	knock	LE	one	CL	door

He knocked the door once.

b. 他踢了墙一脚。

ta1	ti1	le0	qiang2	yi1	jiao3
he	kick	LE	wall	one	foot

He kicked the wall once.

c. 小鸡啄了他一下。

xiao3	ji1	zhuo2	le0	ta1	yi1	xia4
little	chick	peck	LE	him	on	CL

The chick pecked him once.

In Chinese, the pattern ‘V+LE+V’ usually denotes derived semelfactives. The duplication of the verb actually gives an explicit temporal boundary to a dynamic state. It is also suggested that the second verb acts as a measure of the process, in which way some uncountable process is measured with an artifactual unit.

(39) a. 他摸了摸桌子。

ta1	mo1	le0	mo1	zhuo1zi0
he	touch	LE	touch	table

He touched the table once.

b. 他看了看张三。

ta1	kan4	le0	kan4	zhang1san1
he	look	LE	look	Zhangsan

He shot a glance at Zhangsan.

3.4.5. Accomplishment: |~~~|==

There are six possible viewpoints to describe an accomplishment as shown in Figure 6: inceptive ‘|~~’, instant dynamic state ‘~~~’, terminative ‘~~|’, completive ‘~~|==’, activity ‘|~~~|’, and accomplishment ‘|~~~|==’, a holistic viewpoint of an ontological accomplishment.

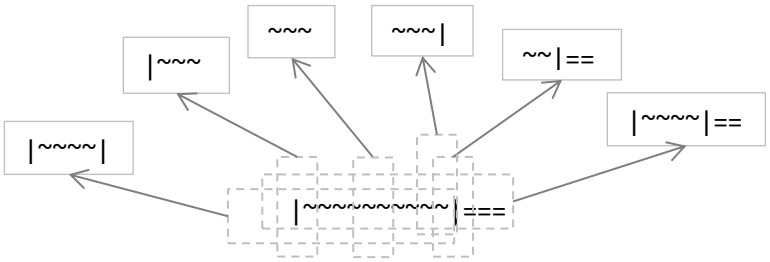

Figure 6: Accomplishment and different viewpoint aspects.

3.4.5.1. Accomplishment: |~~~|==

Accomplishments denote a process with a final state. The final state could be either static, e.g. (40.a) and (40.b), or dynamic e.g. (40.c).

(40) a. 他跑了 1000 米。

ta1	pao3	le0	1000	mi3
he	run	LE	1000	meter

He ran 1000 meters.

b. 他盖了一座房子。

ta1	gai4	le0	yi1	zuo4	fang2zi0
he	build	LE	one	CL	house

He built a house.

c. 他启动了一台电脑。

ta1	qi3dong4	le0	yi1	tai2	dian4nao3
he	start_upLE	one	CL	computer	

He started up a computer.

3.4.5.2. Instant dynamic state: ~~~

Instant dynamic state focuses on a time point when the dynamic state holds. The time point is by default the speech time or can be explicitly specified, e.g. (41).

(41) a. 他正在吃一个面包。

ta1	zheng4zai4	chi1	yi1	ge4	mian4bao1
he	ZAI	eat	one	CL	bread

b. He is eating a sandwich.

b. 他当时正在盖一座房子。

ta1	dang1shi2	zheng4zai4	gai4	yi1	zuo4	fang2zi0
he	that_time	ZAI	build	one	CL	house

He was building a house at that time.

c. 电脑正在启动。

dian4nao3	zheng4zai4	qi3dong4
computer	ZAI	start_up

The computer is starting up.

3.4.5.3. Inceptive: |~~

Inceptive describes the start of an accomplishment, e.g. (42)

(42) a. 他开始盖一座房子了。

ta1	kai1shi3	gai4	yi1	zuo4	fang2zi0	le0
he	start	built	one	CL	house	LE

He started building a house.

b. 电脑开始启动了。

dian4nao3	kai1shi3	qi3dong4	le0
computer	start	start_up	LE

The computer began to start up.

3.4.5.4. Terminative: ~~|

Terminative focuses on the exceptional end of an accomplishment. The final state is not realized, e.g. (43).

(43) a. 他不再写那本小说了。

ta1	bu4zai4	xie3	na4	ben3	xiao3shuo1	le0
he	no_longer	write	that	CL	novel	LE

He stopped writing that novel now.

b. 他不再盖那座房子了。

ta1	bu4zai4	gai4	na4	zuo4	fang2zi0	le0
he	no_longer	built	that	CL	house	LE

He stopped building that house.

b. 电脑开始启动。

dian4nao3	kai1shi3	qi3dong4
computer	start	start_up

The computer began to start up.

3.4.5.5. Completive: ~~|==

Completive focuses on the finishing (culmination) point of an accomplishment, e.g. (44).

(44) a. 他写完那本小说了。

ta1	xie3wan2	na4	ben3	xiao3shuo1	le0
he	write-finish	that	CL	novel	LE

He stopped writing that novel now.

b. 他盖好那座房子了。

ta1	gai4hao3	na4	zuo4	fang2zi0	le0
he	built-finish	that	CL	house	LE

He has finished building the house.

c. 电脑启动完成了。

dian4nao3 qi3dong4 wan2cheng2 le0
computer start_upfinish LE
The computer finally started up.

3.4.5.6. Bounded dynamic state (activity): |~~~|

Accomplishment can be reported as an activity, as a part of the whole accomplishment, e.g. (45).

(45) a. 他今天写那本小说写了两个小时。

ta1 jin1tian1 xie3 na4 ben3 xiao3shuo1 xie3 le0
he today write that CL novel write LE
liang3 ge4 xiao3shi2
two CL hour
He wrote that novel for two hours today.

b. 他今天盖那座房子盖了一上午。

ta1 jin1tian1 gai4 na4 zuo4 fang2zi0 gai4 le0
he today build that CL house build LE
yi1shang4wu3
the_whole_morning
He built that house the whole morning today.

3.4.6. Instantaneous Accomplishment: |~|==

Like semelfactive, instantaneous accomplishment is only compatible with holistic viewpoint as shown in Figure 7. It could not be pictured as a semelfactive, as it is not possible to express a semelfactive linguistic event while keeping the instantaneous accomplishment background ontological situation type. This can be proved by the example in (46).

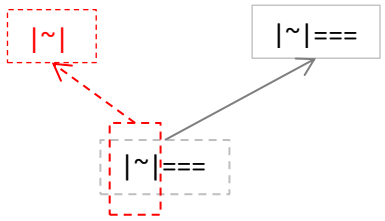

Figure 7: Instantaneous accomplishment and its viewpoint aspect.

Instantaneous accomplishments are usually expressed by RVCs, where the V usually expresses a

semelfactive. For example in (46), the RVC 敲碎 *qiao1sui4* ‘knock-broken’ is composed by a semelfactive verb 敲 *qiao1* ‘knock’ and a result 碎 *sui4* ‘broken’.

(46) a.?他敲碎一个杯子，但杯子没碎。

ta1	qiao1sui4	yi1	ge4	bei1zi0	dan4	bei1zi0	mei2	sui4
he	knock-break	one	CL	cup	but	cup	not	break

?He broke the cup but the cup didn’t break.

b.?他敲碎了一下杯子。

ta1	qiao1sui4	le0	yi1xia4	bei1zi0
he	knock-break	LE	one_time	cup

Instantaneous accomplishment is not compatible with instant dynamic state ‘~~~’, as shown in (47).

(47) ?他正在敲碎一个杯子。

ta1	zheng4zai4	qiao1sui4	yi1	ge4	bei1zi0
he	ZAI	knock-broken	one	CL	cup

?he is breaking a cup by knocking it.

In English, causative verbs such as ‘kill’, ‘break’, are not specially discussed. Dowty (1972) treated them as accomplishments with a conceptual structure ‘DO CAUSE BECOME’, while Smith (1997) treated them as achievements. The implicit issue is actually on the different understanding of whether there is an agentive action encoded in the verb ‘kill’ and ‘break’, e.g. ‘kill_act’ and ‘break_act’ (Pustejovsky, 1995). The agents of ‘kill’, ‘break’ are actually the agents of such actions, which is then the cause of the death and broken of the patients. The issue is raised because the action usually takes very short time and is not considered as important, while they sometimes do take noticeable time. In Chinese, the RVCs 杀死 *sha1si3* ‘kill-dead’ and 打碎 *da3sui4* ‘hit-broken’ clear encodes the action predicated by the action verb 杀 *sha1* ‘kill act’ and 打 *da3* ‘hit’. The test with 以前 *yi3qian2* ‘before’ as in (48) also shows that the time course is likely to be before the whole action rather than the final result.

(48) a. 他们在杀死野熊前就张罗着卖熊皮。

ta1men2	zai4	sha1si3	ye3	xiong2	qian2	jiu4
they	PREP	kill-dead	wild	bear	before	then
zhang1luo0	zhe0	mai4	xiong2	pi2		
arrange	ZHE	sell	bear	fur		

They had been preparing for selling the furs before they killed the wild bears.

b. 在打碎车窗之前需要保护好自己的双眼。

zai4	da3sui4	che1	chuang1	zhi1qian2	xu1yao4
PREP	break-broken	car	window	before	need

bao3hu4	hao3	zi4ji3	de0	shuang1yan3
protect	good	oneself	DE	eyes

You need to protect your eyes before you break the window of the car.

3.5. Constructions and Their Aspects

Here, I would like to discuss some particular Chinese constructions that are related to aspect. Espcially, RVCs, SVCs, BEI, BA and V+(ZHE/LE/GUO)+O+(LE) will be discussed.

3.5.1 Resultative Verbal Complements (RVCs)

In English, RVCs are usually realized by adding a resultative predicate after the verb phrase, e.g. in (49). English RVCs are compatible with progressive form, i.e. they can denote instant dynamic state (~~~), as in (50).

(49) He pushed the door open.
He ran tired.
He wiped the table clean.

(50) He is pushing the door open.
He is running tired.
He is wiping the table clean.

In Chinese, RVCs have been paid special attentions by linguists (Tai, 1982; Xiao, 2004; Peck, et.al., 2013). Tai even proposed that Chinese are results prevalent language. Different from English, Chinese RVCs are usually not compatible with progressive form, as in (51, 52, 53, 54).

(51) a. 他推倒了一辆车。

ta1	tui1dao3	le0	yi1	liang4	che1
he	push-over	LE	one	CL	car

He pushed over a car.

b.?他正在推倒一辆车。

ta1	zheng4zai4	tui1dao3	yi1	liang4	che1
he	ZAI	push-over	one	CL	car

?He is pushing over a car.

(52) a. 他杀死了一头牛。

ta1	sha1si3	le0	yi1	tou2	niu2
he	kill-dead	LE	one	CL	cattle

He killed a cattle.

b.?他正在杀死一头牛。

ta1	zheng4zai4	sha1si3	yi1	tou2	niu2
he	ZAI	kill-dead	one	CL	cattle

He is killing a cattle.

(53) a. 他写完了作业。

ta1	xie3wan2	le0	zuo4ye4
he	write-finish	LE	homework

He finished his homework.

b.?他正在写完作业。

ta1	zheng4zai4	xie3wan2	zuo4ye4
he	ZAI	write-finish	homework

He is finishing his homework.

(54) a. 他吃完了饭。

ta1	chi1wan2	le0	fan4
he	eat-finish	LE	meal

He finished eating the meal.

b.?他正在吃完饭。

ta1	zheng4zai4	chi1wan2	fan4
he	ZAI	eat-finish	meal

He is finishing the meal.

In English, it seems clear that RVCs denote accomplishments. I would suggest that most Chinese RVCs denote achievement (~~|-- or --|--) or instantaneous accomplishment (|~|==). The potential problem is that ~~|== is easy to be confused with |~~~|== and |~|== due to their similar structures. For example, Chinese RVCs, e.g. 跑到 *pao3dao4* 'run and arrive', 写完 *xie3wan2* 'finish writing', etc. have been treated as accomplishment, simply because there are two parts within these words, one for the activity and the other for the result. The difference is whether the start of the activity part is included in the viewpoint. Further test could show that the start is not actually encoded. First, these verbs are compatible with time point, which shows that the focus is only at the finishing part as shown in (48). The sentence (48.c) refers to the start of the writing.

(48) a. 他写完那封信的时候是三点整。

ta1	xie3wan2	na4	feng1	xin4	de0	shi2hou4	shi4
he	write-finish	that	CL	letter	DE	time	be
san1dian3	zheng3						
three_o'clock	right						

He finished that letter at three.

b. ?他在三点到四点写完了那封信。

ta1	zai4	san3dian3	dao4	si4dian3	xie3wan2	le0
he	prep	three_o'clock	to	four_o'clock	write-finish	LE
na4	feng1	xin4				
that	CL	letter				

?He finished that letter from three to four.

c. 他写那封信的时候是三点整。

ta1	xie3	na4	feng1	xin4	de0	shi2hou4	shi4
he	write	that	CL	letter	DE	time	be
san1dian3	zheng3						
three_o'clock	right						

He started writing that letter at three.

We can also use 之前 *zhi1qian2* 'before' to test the time period it refers to when combined with different verb constellations, e.g. 写完那封信 *xie3 wan2 na4 feng1 xin4* 'finish writing that letter', 写那封信 *xie3 na4 feng1 xin4* 'write that letter', as shown in (49). It is clear that the former as in (49.a) refers to the time period before the time point the letter comes about, while the latter as in (49.b) refers to the time period before the time point the writing starts.

(49) a. 他写完那封信之前接了个电话。

ta1	xie3wan2	na4	feng1	xin4	zhi1qian2	jie1
he	write-finish	that	CL	letter	before	receive
le0	ge4	dian4hua4				
LE	CL	call				

He received a call before finishing that letter.

b. 他写那封信之前接了个电话。

ta1	xie3	na4	feng1	xin4	zhi1qian2	jie1	le0
he	write	that	CL	letter	before	receive	LE

ge4 dian4hua4
CL call
He received a call before writing that letter.

Whether a RVC denotes an instantaneous accomplishment or achievement depends on the verb constellation. If the verb is semelfactive, then the RVC is an instantaneous accomplishment, because the start of the semelfactive is not possible to be disassociated with any viewpoint aspect, e.g. (51).

(51) a. 他杀死了一头牛。

ta1	sha1si3	le0	yi1	tou2	niu2
he	kill-dead	LE	one	CL	cattle

He killed a cattle.

b. 他敲碎了一个玻璃杯。

ta1	qiao1sui4	le0	yi1	ge4	bei1zi0
he	knock-break	LE	one	CL	cup

He broke a cup.

In some context, instantaneous accomplishments can appear in progressive form, such as the sentences in (52). In such metaphorical uses, the process of breaking takes noticeable time. The compounded predicate describes the tendency of the current process in the progressive.

(52) a. 高房价正在打碎老百姓的中国梦。

gao1	fang2jia4	zheng4zai4	da3sui4	lao3bai3xing4	de0
high	housing_price	ZAI	hit-break	people	DE
zhong1guo2meng4					
China_dream					

The high housing price is breaking the China dream of the people.

b. 互联网正在杀死美国中产阶级。

hu4lian2wang3	zheng4zai4	sha1si3	mei3guo2	zhong1chan3jie1ji2
Internet	ZAI	kill	American	middle_class

Internet is killing the middle class of the US.

Interestingly, in English, 'run to school' usually denotes accomplishment as in (53), while the Chinese counterpart 跑到学校 *pao3 dao4 xue2xiao4* doesn't. The progressive form also shows that it denotes a DS change (~~|--), as there is no progressive form as shown in (53.b), unless a different verb constellation is used as in (53.c). In this case, both the Chinese and English

sentences are related to an activity situation as background, as their holistic (perfective) viewpoint shows in (53.d).

(53) a. 他跑到了学校。

ta1	pao3dao4	le0	xue2xiao4
he	run-arrive	LE	school

He ran to school.

b. ?他正在跑到学校。

ta1	zheng4zai4	pao3dao4	xue2xiao4
he	ZAI	run-arrive	school.

He is running to school.

c. 他正在往学校跑。

ta1	zheng4zai4	wang3	xue2xiao4	pao3
he	ZAI	towards	school	run

He is running towards school.

d. 他往学校跑了。

ta1	wang3	xue2xiao4	pao3	le0
he	towards	school	run	LE

He ran towards school.

3.5.2. Resultative DE construction

The Chinese particle 得 *de0* 'DE' is usually attached to a verb forming a resultative event. The function of 得 *de0* 'DE' is to combine two predicates into one with the former one as the head and the latter as the result. Although the latter can be any kind of events, I don't consider complex events here. The former state could be either a static state as in (54.a) and (54.b) or dynamic state as in (54.c) and (54.d). The resultative state could be either a static state as (54.a) and (54.c) or dynamic state as (54.b) and (54.d).

(54) a. 他哭得眼睛都红了。

ta1	ku1	de0	yan3jing1	dou1	hong2	le0
he	cry	DE	eyes	all	red	LE

He cried his eyes red.

b. 他吃得大汗淋漓。

ta1	chi1	de0	da4han4lin2li2
he	eat	DE	sweat_profusely

His eating made him sweat profusely.

c. 他吃惊得说不出话来。

ta1	chi1jing1	de0	shuo1	bu4	chu1	hua4	lai2
he	surprised	DE	say	not	out	words	come

He is too surprised to say any words.

d. 他气得发抖。

ta1	qi4	de0	fa1dou3
he	angry	DE	shake

He is so angry that he started to shake.

One issue about resultative DE construction is that the starting of the final state is not necessarily the end of the first state. This issue will not be discussed in detail. However, this problem could be further modeled with additional theories, e.g. the extended event structure (Pustejovsky, 1995).

3.5.3. Serial Verb Constructions (SVCs)

SVCs refer to the constructions where two predicates are combined together without any conjunctions to form the main predicate in one sentence. Discussions about SVCs are usually focused on the question which one of the two predicates are the syntactic head. SVCs can be divided into different categories based on the event structure formed by the two sub-predicates. The first kind of SVCs is composed by two parallel states, e.g. the sentences in (55). In my framework, these sentences are treated as complex events that are composed by more than one event.

(55) 我们唱着歌跳着舞。

wo3men2	chang4	zhe0	ge1	tiao4	zhe0	wu3
we	sing	ZHE	song	dance	ZHE	dance

We are singing and dancing.

The second type of SVCs is composed by two events that take place one by one, while the two sub events are combined to be one meaningful linguistic event, e.g. (56.a). The first predicate can take ZHE, but cannot take LE, as shown in (56.b). When the first predicate takes ZHE and the second predicate takes LE, it usually expresses an inceptive event, e.g. (56.d). Without the second LE, the sentence usually expresses a habitual, as in (56.c). When only the second predicate takes LE, it also expresses an inceptive event, as in (56.e).

(56) a. 他坐车去买菜。

ta1	zuo4	che1	qu4	mai3	cai4
he	sit	bus	go	buy	vegetable

He is going to buy some vegetables by bus.

b. ?他坐了车去买菜。

ta1	zuo4	le0	che1	qu4	mai3	cai4
he	sit	LE	bus	go	buy	vegetable

?He took a bus to buy vegetables.

c. 他坐着车去买菜。

ta1	zuo4	zhe0	che1	qu4	mai3	cai4
he	sit	ZHE	bus	go	buy	vegetable

He goes to buy vegetables by bus.

d. 他坐着车去买菜了。

ta1	zuo4	zhe0	che1	qu4	mai3	cai4	le0
he	sit	ZHE	bus	go	buy	vegetable	LE

He has gone to buy vegetables by bus.

e. 他坐车去买菜了。

ta1	zuo4	che1	qu4	mai3	cai4	le0
he	sit	bus	go	buy	vegetable	LE

He has gone to buy vegetables by bus.

The third type of SVCs is composed by two events that take place one by one, while the head is usually on the second predicate, which determines the event type, e.g. (57.a). The 去 *qu4* 'go' is likely to be a co-verb or preposition which only indicates the location. It is difficult to add aspectual markers to the first predicate, as in (57.b) and (57.c).

(57) a. 他去北京玩了。

ta1	qu4	bei3jing1	wan2	le0
he	go	Beijing	travel	LE

He has gone to Beijing for travelling.

b. *他去了北京玩。

ta1	qu4	le0	bei3jing1	wan2
he	go	LE	Beijing	travel

?He has gone to Beijing for travelling.

c. ?他去了北京玩了。

ta1	qu4	le0	bei3jing1	wan2	le0
he	go	LE	Beijing	travel	LE

He has gone to Beijing for travelling.

3.5.4. V+(ZHE/LE/GUO)+O+(LE)

In Chinese, the pattern 'V+O' can be aspectualized into 'V+O', 'V+O+LE', 'V+(ZHE/LE/GUO)+O', 'V+(ZHE/LE/GUO)+O+LE' and their combination with preverbal aspectual operator 在 *zai4* 'ZAI'.

3.5.4.1. V+O

The pattern 'V+O' usually denotes static states including habitual. Numeral NPs and definite NPs are usually not compatible with the generic and habitual static state. RVCs are usually not possible to express habitual, as in (58). English shows different acceptance of habitual.

(58) a. ?他殺死人。

ta1	sha1si3	ren2
he	kill-dead	people

He kills people.

b. ?他打碎玻璃。

ta1	da3sui4	bo1li2
he	hit-break	glass

He breaks glasses.

c. ?火车到达北京。

huo3che1	dao4da2	bei3jing1
train	arrive_at	Beijing

?The train arrives at Bejing.

d. ?他写完作业。

ta1	xie3wan2	zuo4ye4
he	write-finish	homework

?He finishes homework.

On the other hand, these verb constellations show broader compatibilities when the frequency information is added as shown in (59).

(59) a. 他经常杀死人。

ta1	sha1si3	ren2
he	kill-dead	people

He kills people.

b. 他经常打碎玻璃。

ta1	da3sui4	bo1li2
he	hit-break	glass

He breaks glasses.

c. 火车总是准时到达北京。

chuo3che1	zong3shi4	zhun3shi2	dao4da2	bei3jing1
train	always	on_time	arrive_at	Beijing

The train always arrives at Bejing on time.

d. 他每次都写完作业。

ta1	xie3wan2	zuo4ye4
he	write-finish	homework

He finishes homework every time.

3.5.4.2. V+O+LE

This pattern can possibly denote ~~|--, |--, |~~~|, etc., depending on the verb constellation V+O. For example, V+Bare NP can possibly denote |~~~| type with V+O+LE as shown in (60).

(60) a. 他刚才吃苹果了。

ta1	gang1cai2	chi1	ping2guo3	le0
he	just_now	eat	apple	LE

He ate apples just now.

b. 他刚才看书了。

ta1	gang1cai2	kan4	shu1	le0
he	just_now	look	book	LE

He read book just now.

If V+O denotes a static state, then V+O+LE usually denotes an inchoative '|---', as shown in (61).

(61) a. 他喜欢音乐了。

ta1	xi3huan1	yin1yue4	le0
he	like	music	LE

He likes music now.

b. 他又抽烟了。

ta1	you4	chou1yan1	le0
he	again	smoke	LE

He smokes again.

c. 他是香港人了。

ta1	shi4	xiang1gang3	ren2	le0
he	be	Hong_Kong	people	LE

He is Hong Kong resident now.

V+O+LE can also denote |~|---, e.g. (62.a).

(62) a. 他刚才打碎杯子了。

ta1	gang1cai2	da3sui4	bei1zi0	le0
he	just_now	hit-break	cup	LE

He broke cups just now.

b. ?他刚才打碎杯子。

ta1	gang1cai2	da3sui4	bei1zi0
he	just_now	hit-break	cup

He broke cups just now.

As (62.b) shows, the sentence without 了 *le0* 'LE' is not acceptable. In (63), although LE is optional, the sentence without LE as in (63.a) has different meaning from the sentence with LE (63.b), which has the same meaning as the sentence (63.c). The sentence (63.b) and (63.c) could be interpreted as accomplishment that is current relevant. For example, (63.d) is a possible context. Another interesting phenomenon about (63) is that the time adverbial 刚才 *gang1cai2* 'just now' refers to the breaking event in Chinese. In English, it is not possible to do this in perfect aspect.

(63) a. 他刚才打碎一个杯子。

ta1	gang1cai2	da3sui4	yi1	ge4	bei1zi0
he	just_now	hit-break	one	CL	cup

He broke a cup just now.

b. 他刚才打碎一个杯子了。

ta1	gang1cai2	da3sui4	yi1	ge4	bei1zi0	le0
he	just_now	hit-break	one	CL	cup	LE

?He has already broken a cup just now.

c.他刚才打碎了一个杯子了。

ta1	gang1cai2	da3sui4	le0	yi1	ge4	bei1zi0	le0
he	just_now	hit-break	LE	one	CL	cup	LE

?He has already broken a cup just now.

d.他刚才打碎了一个杯子了，现在又打碎一个。

ta1	gang1cai2	da3sui4	le0	yi1	ge4	bei1zi0	le0
he	just_now	hit-break	LE	one	CL	cup	LE
xian4zai4	you4	da3sui4	yi1	ge4			
now	again	hit-break	one	CL			

?He has already broken a cup just now. Now he broke another one.

Numeral NPs are usually not compatible with this pattern. Some boundary cases are those when the Numeral NPs can give an object reading rather than quantity reading as in (64.a). On the other hand, the NPs that only denote quantity don't allow this pattern, as in (64.b). This suggests that the V+O+LE pattern is not compatible with quantity object.

(64) a. 他跑一千米了。

ta1	pao3	yi1	qian1	mi3	le0
he	run	one	thousand	meter	LE

He ran a 1000-meter race.

b.?他跑 3.5 公里了。

ta1	pao3	3.5	gong1li3	le0
he	run	3.5	kilometer	LE

He ran 3.5 meters.

c.?3.5 公里被他跑了。

3.5	gong1li3	bei4	ta1	pao3	le0
3.5	kilometer	BEI	he	run	LE

3.5 kilometers was ran by him.

When the numeral classifier NP could be interpreted as a presupposed entity, it usually takes a thematic role of patient, or theme. On the other hand, if it is preferable to be interpreted as a quantity, it then only serves a measurement of the action predicated by the verb. As the case of (64.b), the corresponding BEI-construction is even more unacceptable as in (64.c). Finally, it shows that the V+O+LE pattern prefers to take a presupposed entity as the object rather than a quantity as the measurement.

3.5.4.3. V+(ZHE/LE/GUO)+O

The pattern "V+LE+O" usually denotes accomplishment event the verb is the so-called activity verb. The object could be bare nouns, numeral NPs and definite NPs. The pattern could also denote changes, e.g. --|-- or --|~~ etc. The sentences (65.a) denotes |---, while (65.b) denotes static state ---.

(65) a. 墙上挂了一幅画。

qiang2shang4	gua4	le0	yi1	fu2	hua4
on_the_wall	hang	LE	one	CL	painting

b. 墙上挂着一幅画。

qiang2shang4	gua4	zhe0	yi1	fu2	hua4
on_the_wall	hang	ZHE	one	CL	painting

Previously, (65.a) and (65.b) are treated as equivalent. However, more and more studies have shown that they are different, e.g. (Song, 1988; Li, 1998). Wth LE, we can add an adverb to modify the change part, e.g. in (66.a), from non-existing of the kite to the existing of the kite in the tree. This is not possible for ZHE as shown in (66.b).

(66) a. 树上不小心挂了一只风筝。

shu4shang4	bu4xiao3xin1	gua4	le0	yi1	zhi1	feng1zheng1
in_the_tree	carelessly	hang	LE	one	CL	kite

There is a kite being caught in the tree by accident.

b. ?树上不小心挂着一只风筝。

shu4shang4	bu4xiao3xin1	gua4	zhe0	yi1	zhi1	feng1zheng1
in_the_tree	carelessly	hang	ZHE	one	CL	kite

There is a kite hanging in the tree by accident.

For other examples, the sentences in (67) could be differentiated by adding other constituents without changing the meaning of sentences as in (68).

(67) a. 开了窗户睡觉。

kai1	le0	chuang1hu4	shui4jiao4
open	LE	window	sleep

Open the window before you go to sleep.

b.开着窗户睡觉。

kai1	zhe0	chuang1hu4	shui4jiao4
open	ZHE	window	sleep

Keep the window open when you are asleep.

(68) a. 开了窗户再睡觉。

kai1	le0	chuang1hu4	zai4	shui4jiao4
open	LE	window	then	sleep

Open the window before you go to sleep.

b.?开着窗户再睡觉。

kai1	zhe0	chuang1hu4	zai4	shui4jiao4
open	ZHE	window	then	sleep

Keep the window open before you go to sleep.

Similarly, the sentence (69.a) denotes a SD change |~~, while (69.b) denotes a dynamic state ~~. The difference could be further tested with (70), where the difference of the meanings of LE and ZHE is clear. The difference of the two can also be tested when there is no clear start of the dynamic state, e.g. the circling of the moon around the earth as shown in (70).

(69) a. 他推了一辆自行车。

ta1	tui1	le0	yi1	liang4	zi4xing2che1
he	push	LE	one	CL	bicycle.

He wheeled a bicycle with him.

b.他推着一辆自行车。

ta1	tui1	zhe0	yi1	liang4	zi4xing2che1
he	push	ZHE	one	CL	bicycle.

He is wheeling a bicycle with him.

(70) a. ?地球周围绕了一个月亮。

di1qiu2	zhou1wei2	rao4	le0	yi1	ge4	yue4liang4
earth	around	circle	LE	one	CL	moon

The moon started circle around the earth.

b.地球周围绕着一个月亮。

di1qiu2	zhou1wei2	rao4	zhe0	yi1	ge4	yue4liang4
earth	around	circle	ZHE	one	CL	moon

The moon is circling around the earth.

Some verbs should be interpreted differently with LE and ZHE. For example, the crawling describes how the monkey got in the tree in (71.a), while it describes the instant dynamic state of the monkey in the tree in (71.b).

(71) a. 树上爬了一只猴子。

shu4	shang4	pa2	le0	yi1	zhi1	hou2zi0
tree	on	crawl	LE	one	CL	monkey

A monkey crawled in the tree.

b. 树上爬着一只猴子。

shu4	shang4	pa2	zhe0	yi1	zhi1	hou2zi0
tree	on	crawl	ZHE	one	CL	monkey

A monkey is crawling in the tree.

Tai (1984) showed that when taking numeral classifier NPs as objects, the result is not necessarily reached. For example, the sentence (72.b) is acceptable. However, the test has some flaws because the Numeral NPs tend to have different meanings in the two different sentences. The reason to cause this problem is that Numeral NPs in Chinese are ambiguous, i.e. quantity or entity. If the NP only denotes quantity, it cannot appear in such pattern as shown in (73). In this sense, the sentence (72.a) is ambiguous that 一封信 *yi1 feng1 xin4* 'a letter' can be a quantity or an entity. If (72.b) is acceptable, the object can only be interpreted as an entity.

(72) a. 他写了一封信。

ta1	xie3	le0	yi1	feng1	xin4
he	write	LE	one	CL	letter

He wrote a letter.

b. 他写了一封信，可是没写完。

ta1	xie3	le0	yi1	feng1	xin4	ke3shi4	mei2	xie3
he	write	LE	one	CL	letter	but	not	write
wan2								
finish								

?He wrote a letter, but didn't finish it.

The examples in (73) also show that such pattern doesn't hold when the object is preferred to be interpreted as a quantity that measures out an event. Finally, the contraries caused by different kinds of numeral classifier NPs show that the pattern in (72.b) only holds when the object could be interpreted as an entity.

(73) a. ?他喝了不少酒，可是没喝完。

ta1	he1	le0	bu4shao3	jiu3	ke3shi4	mei2	he1
he	drink	LE	a_lot	wine	but	not	drink
wan2							
finish							

?He drank a lot of wine, but didn't finish them.

b. ?他写了一千个字，可是没写完。

ta1	xie3	le0	yi1qian1	ge4	zi4	ke3shi4
he	write	LE	one_thousand	CL	character	but
mei2	xie3wan2					
not	write-finish					

?He wrote one thousand characters, but didn't finish them.

When the verb in V+LE+O is an RVC, it can denote instantaneous accomplishment such as (74) or DS achievement (~~|--) such as (75). The LE could be deleted when the object is a Numeral NP and V is a RVC. In other words, the numeral-classifier NP ends the action of breaking and thus implies a perfective aspect. However, it doesn't apply to RVCs with definite NPs and bare NPs, e.g. in (76) and (77). The reason is that with definite NPs, the verb constellation V+O tends to denote habituals which are incompatible with RVCs as shown in (58). With bare NPs, the verb constellation V+O forms a compound that denotes a habitual, which is also incompatible with RVCs.

(74) a. 他刚才打碎了一个杯子。

ta1	gang1cai2	da3sui4	le0	yi1	ge4	bei1zi0
he	just_now	hit-break	LE	one	CL	cup

He broke a cup just now.

b. 他刚才打碎一个杯子。

ta1	gang1cai2	da3sui4	yi1	ge4	bei1zi0
he	just_now	hit-break	one	CL	cup

He broke a cup just now.

(75) a. 他刚才写完了一封信。

ta1	gang1cai2	xie3wan2	le0	yi1	feng1	xin4
he	just_now	write-finish	LE	one	CL	letter

?He finished writing a letter just now.

b. 他刚才写完一封信。

ta1	gang1cai2	xie3wan2	yi1	feng1	xin4
he	just_now	write-finish	one	CL	letter

?He finished writing a letter just now.

(76) a. 他刚才打碎了(那个)杯子。

ta1	gang1cai2	da3sui4	le0	na4	ge4	bei1zi0
he	just_now	hit-break	LE	that	CL	cup

He broke a/(that) cup just now.

b.?他刚才打碎(那个)杯子。

ta1	gang1cai2	da3sui4	na4	ge4	bei1zi0
he	just_now	hit-break	that	CL	cup

He broke a/(that) cup just now.

(77) a. 他刚才写完了(那封)信。

ta1	gang1cai2	xie3wan2	le0	na4	feng1	xin4
he	just_now	write-finish	LE	that	CL	letter

?He finished writing a/(that) letter just now.

b. ?他刚才写完(那封)信。

ta1	gang1cai2	xie3wan2	na4	feng1	xin4
he	just_now	write-finish	that	CL	letter

?He finished writing a/(that) letter just now.

The pattern 'V+ZHE+O' denotes static state, e.g. (65.b) or dynamic states, e.g. (70.b) and (71.b), depending on the verb constellation. When denoting instant dynamic state with V+ZHE+O except for the existential constructions, e.g. (70.b) and (71.b), 在 *zai4* 'ZAI' is usually needed, e.g. (78). Achievements especially that denoted by the RVCs are not compatible with this pattern.

(78) 他在安静地喝着酒。

ta1	zai4	an1jing4	de0	he1	zhe0	jiu3
he	ZAI	silent	DE	drink	ZHE	wine

He is drinking silently.

Ontologically, an event is also an entity. The English perfect aspect and the Chinese 过 *guo4* 'GUO' with the pattern 'V+GUO+O' can describe such kind of state, which is an experience of the subject, e.g. (79) and (80). GUO performs as an existential quantifier '∃' and the existing instance doesn't have to be any particular instance.

(79) a. 他去过北京。

ta1	qu4	guo4	bei3jing1
he	go	GUO	Beijing

He has been to Beijing.

b. 他看过那部电影。

ta1	kan4	guo4	na4	bu4	dian4ying3
he	watch	GUO	that	CL	movie

He has watched that movie.

(80) a. 他抽过烟。

ta1	chou1	guo4	yan1
he	smoke	GUO	cigarette

He has smoked before.

b. 他教过书。

ta1	jiao1	guo4	shu1
he	teach	GUO	book

He has taught before.

Some studies suggest that GUO should be discriminated into experiential GUO and perfective GUO. For example, GUO in (79) and (80) is experiential, while GUO in (81.a) should be perfective because it could be substituted with LE with almost the same meaning, as (81.b).

(81) a. 他晚上吃过饭，上课去了。

ta1	wan3shang4	chi1	guo4	fan4	shang4ke4	qu4	le0
he	evening	eat	GUO	meal	go_for_class	go	LE

He went for the class after his meal in the evening.

b. 他晚上吃了饭，上课去了。

ta1	wan3shang4	chi1	le0	fan4	shang4ke4	qu4	le0
he	evening	eat	LE	meal	go_for_class	go	LE

He went for the class after his meal in the evening.

However, the discrimination of two different GUOs is actually problematic. For example, GUO and LE can actually both appear in the same sentence, e.g. (82). If GUO in (82) is a perfective marker, it is difficult to explain why two perfective markers are needed.

(82) 他吃过了饭，上课去了。

ta1	chi1	guo4	le0	fan4	shang4ke4	qu4	le0
he	eat	GUO	LE	meal	go_for_class	go	LE

He went for the class after his meal.

The confusion partly comes from the fact that 吃饭 *chi1fan4* 'eat meal' is ambiguous in that it could be telic (denoting accomplishment) or atelic (denoting activity). The telicity comes from the expectation of the three meals each day at different time slots. Within a specific time slot when a meal is expected, e.g. 5pm, the experiential action will be limited within this time slot. For example, it will be strange to utter the sentences (83.d) within the context given by (83.a).

(83) a. 你吃过饭了吗？

ni3	chi1	guo4	fan4	le0	ma0
you	eat	GUO	meal	LE	SFP

Have you eaten?

b.吃了。

chi1	le0
eat	LE

Yes.

c.什么时间吃的？

shen2me0	shi2jian1	chi1	de0
what	time	eat	DE

When?

d.?昨天。

zuo2tian1

yesterday

?Yesterday.

If we change a different event type, the case will be different. For example, GUO in the question (83.a) could not be substituted with LE as (84.a) as they have different meanings. The question (84.a) is ambiguous that the experience could refer to either the subject's life time or the time frame of the conversation. So, both (84.b) and (84.c) are valid answers of (84.a).

(83) a. 你是不是抽了烟？

ni3	shi4	bu4	shi4	chou1	le0	yan1
you	be	not	be	smoke	LE	cigarette

Did you smoke?

b. 是的，抽了一支。

shi4de0	chou1	le0	yi1	zhi1
yes	smoke	LE	one	CL

Yes, I smoked one cigrette.

c. ?是的，年轻时抽过。

shi4de0	nian1qing1	shi2	chou1	guo4
yes	young	when	smoke	GUO

Yes, I smoked when I was young.

(84) a. 你是不是抽过烟？

ni3	shi4	bu4	shi4	chou1	guo4	yan1
you	be	not	be	smoke	GUO	cigarette

?Have you ever smoked?

b. 是的，抽了一支。

shi4de0	chou1	le0	yi1	zhi1
yes	smoke	LE	one	CL

Yes, I smoked one cigrette.

c. 是的，年轻时抽过。

shi4de0	nian1qing1	shi2	chou1	guo4
yes	young	when	smoke	GUO

Yes, I smoked when I was young.

Time slot within which the GUO proposition is evaluated is important to give the right interpretation. In some contexts, the time slot must be explicitly mentioned, e.g. (85).

(85) a. 他十岁时就去过北京了，但后来就没去过了。

ta1	shi2sui4	shi2	jiu4	qu4	guo4	bei3jing1	le0
he	ten_years_old	when	then	go	GUO	Beijing	LE
dan4	hou4lai2	jiu4	mei2	qu4	guo4	le0	
but	after_that	then	not	go	GUO	LE	

He has been to Beijing since he was ten. But he has not been there since then.

b. 他去年看过电影，今年没看过电影。

ta1	qu4nian2	kan4	guo4	dian4ying3	jin1nian2	mei2
he	last_year	watch	GUO	movie	this_year	not
kan4	guo4	dian4ying3				
watch	GUO	movie				

He watched a movie last year. But he has not watched any this year.

Based on the time slot theory, we can predict that LE could be substituted with GUO only when the instance has a clear reference in the time slot given either explicitly or by context. Thus, a better way is then to keep the experiential meaning of GUO and maintain only one GUO.

3.5.4.4. V+(ZHE/LE/GUO)+O+LE

The first LE in 'V+LE+O+LE' is called verbal LE, which is usually treated as a perfective, while the second LE is called sentential LE, which is a sentence final particle that implies the coming about of a new state. As we know that the 'V+LE+O' pattern, with verbs such as 喝 *he1* 'drink', 写 *xie3* 'write' etc. and a numeral NP as the object, usually denote an accomplishment. However, the accomplishment is not reference time relevant. So, an explicit time adverbial is usually needed to complete the sentence. I suggest that the 'V+LE+O+LE' pattern describes the same event type as 'V+LE+O' except that the final state is reference time relevant, e.g. (86), (87) and (88). Similar as 'V+LE+O', the verbal LE could be deleted when the verb is a RVC, e.g. (87) and (88).

(86) a. 他喝了酒了。

ta1	he1	le0	jiu3	le0
he	drink	LE	wine	LE

He drank some wine.

b. 他喝了一瓶酒了。

ta1	he1	le0	yi1	ping2	jiu3	le0
he	drink	LE	one	bottle	wine	LE

He has drank a bottle of wine.

c. 他喝了那瓶酒了。

ta1	he1	le0	na4	ping2	jiu3	le0
he	drink	LE	that	bottle	wine	LE

He drank that bottle of wine.

(87) a. 他打碎(了)杯子了。

ta1	da3sui4	bei1zi0	le0
he	hit-break	cup	LE

He has broken some cup.

b. 他打碎(了)一個杯子了。

ta1	da3sui4	yi1	ge4	bei1zi0	le0
he	hit-break	one	CL	cup	LE

He has broken one cup.

c. 他打碎(了)那個杯子了

ta1	da3sui4	le0	na4	ge4	bei1zi0	le0
he	hit-break	LE	that	CL	cup	LE

He has broken that cup.

(88) a. 他写完(了)信了。

ta1	xie3wan2	le0	xin4	le0
he	write-finish	LE	letter	LE

He has finished the letter.

b. 他写完(了)一封信了。

ta1	xie3wan2	le0	yi1	feng1	xin4
he	write-finish	LE	one	CL	letter

He has finished a letter.

c. 他写完(了)那封信了。

ta1	xie3wan2	le0	na4	feng1	xin4	le0
he	write-finish	LE	that	CL	letter	LE

He has finished that letter.

Bare NPs with verbs such as 喝 *he1* 'drink', 写 *xie3* 'write' etc. (activity verb) is usually not acceptable by the pattern 'V+LE+O', e.g. in (89). The reason is that such sentences lack of tense (Gu, 2007). They must rely on other reference in order to get their tense information, e.g. in (90).

(89) a. ?他喝了酒。

ta1	he1	le0	jiu3
he	drink	LE	wine

He drank some wine.

b.?他写了信。

ta1 xie3 le0 xin4

he write LE letter

He wrote some letter.

(90) a. 他喝了酒，又接着抽烟。

ta1 he1 le0 jiu3

he drink LE wine

He drank some wine.

b.他写了信，然后出去了。

ta1 xie3 le0 xin4 ran2hou4 chu1qu4 le0

he write LE letter then go_out LE

He wrote some letter and then went out.

I agree with the analysis. In addition, the reference time for the 'V+LE+O+LE' pattern in (86), (87) and (88) is by default the speech time. In this way, the sentence is tensed. The question is then why the pattern 'V+LE+O' cannot be tensed by speech time. I suggest that the reference time of 'V+LE+O' is the culmination time. It is rarely the case that the speech time is the same as the culmination time. On the other hand, the reference time of 'V+LE+O+LE' is a variable which is after the culmination time. The difference of the reference times of the patterns 'V+LE+O' and 'V+LE+O+LE' could be shown in Figure 8.

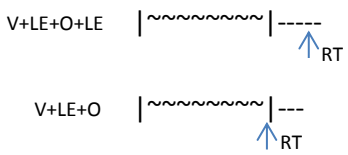

Figure 8: The reference times of the patterns 'V+LE+O' and 'V+LE+O+LE'.

The reference time of 'V+LE+O+LE' could be explicitly specified through a time point adverbial, e.g. in (91). In such cases, 已经 *yi3jing1* 'already' is usually needed. The reason is that 已经 *yi3jing1* 'already' usually implies a presupposed expectation. Without 已经 *yi3jing1* 'already', the sentence will give a resultative reading, which will be odd in the context, e.g. why 喝了酒了 *he1 le0 jiu3 le0* 'has drank' and 写了信了 *xie3 le0 xin4 le0* 'has written a letter' as in (91) would matter or be interesting to the hearer.

(91) a. 我见到他时，他已经喝了酒了。

wo3	jian4dao4	ta1	shi2	ta1	yi3jing1	he1	le0
I	see	he	when	he	already	drink	LE
jiu3	le0						
wine	LE						

?He had already drank some wine, when I saw him.

b. 你来的时候，他已经写了信了。

ni3	lai2	de0	shi2hou4	ta1	yi3jing1	xie3	le0
you	come	DE	when	he	already	write	LE
xin4	le0						
letter	LE						

?He has written the letter when you came.

When the verb is stative, the pattern 'V+LE+O+LE' usually denotes an inchoative '|---'. The reference time is after the start of the static state, as shown in Figure 9. In English, it is realized with perfect aspect, e.g. (92).

Figure 9: Perfect static state.

(92) a. 他病了两个星期了。

ta1	bing4	le0	liang3	ge4	xing1qi1	le0
he	ill	LE	two	CL	week	LE

He has been ill for two weeks.

b. 他喜欢小红三年了。

ta1	xi3huan1	xiao3hong2	san1	nian2	le0
he	like	Xiaohong	three	year	LE

He has liked Xiaohong for three years.

c. 他在北京待了三年了。

ta1	zai4	bei3jing1	dai1	le0	san1	nian2	le0
he	PREP	Beijing	stay	LE	three	year	LE

He has been in Beijing for three years.

The pattern ‘V+ZHE+O+LE’, ‘ZAI+V+O+LE’ or ‘ZAI+V+ZHE+O+LE’ usually denotes inceptive (|~~~), a dynamic state that has hold for some time since the start, as shown in Figure 10. In English, it is related to the perfective progressive aspect, e.g. (93).

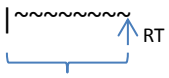

Figure 10: Perfective progressive.

(93) 我到的时候，他已经喝着酒了。

wo3	dao4	de0	shi2hou4	ta1	yi3jing1	he1	zhe0
I	arrive	DE	time	he	already	drink	ZHE
jiu3	le0						
wine	LE						

?He has been drinking when I arrived.

As we can see, the pattern ‘V+GUO+O’ usually denotes an experiential state, ‘V+GUO+O+LE’ then denotes an inchoative ‘|---‘, e.g. (94) and (95).

(94) a. 他去过北京了。

ta1	qu4	guo4	bei3jing1	le0
he	go	GUO	Beijing	LE

He has already been to Beijing.

b. 他看过那部电影了。

ta1	kan4	guo4	na4	bu4	dian4ying3	le0
he	watch	GUO	that	CL	movie	LE

He has already watched that movie.

(95) a. 他抽过烟了。

ta1	chou1	guo4	yan1	le0
he	smoke	GUO	cigarette	LE

He has already smoked.

b. 他教过书了。

ta1	jiao1	guo4	shu1	le0
he	teach	GUO	book	LE

He has already taught.

3.5.5. BA construction

把 *ba3* 'BA' construction is complicated in Chinese considering its selectional restriction on verbs and objects. The selectional restriction of BA construction is not the focus of the thesis. What is concerned here is what types of situations and events it denotes with different verb constellations.

What is not noticed in previous studies is that BA construction in imperative use and narrative use has quite different selectional restrictions, as shown in (96) and (97). (96.h) and (96.i) are not acceptable because of the non-volitional property of the events, which is required by directive speech act or imperative sentence. For discussion, these two cases are excluded since they are note related to aspectual properties.

(96) a. ?把他打了！

ba3 ta1 da3 le0

BA him beat LE

Beat him!

b.?把他骂了！

ba3 ta1 ma4 le0

BA him scold LE

Scold him!

c.把饭吃了！

ba3 fan4 chi1 le0

BA meal eat LE

Eat the meal!

d.把他杀了！

ba3 ta1 sha1 le0

BA him kill LE

Kill him!

f. 把苹果吃完。

ba3 ping2guo3 chi1 wan2

BA apple eat finish

Finish the apple.

g.把衣服洗干净。

ba3	yi1fu2	xi3	gan1jing4
BA	clothes	wash	clean

Wash the clothes to make them clean.

h.?把犯人跑了。

ba3	fan4ren2	pao3	le0
BA	prisoner	escape	LE

?Make the prisoner have escaped.

i. ?把书掉了。

ba3	shu1	diao4	le0
BA	book	lose	LE

?Make the book be lost.

(97) a. 他把张三打了。

ta1	ba3	zhang1san1	da3	le0
he	BA	Zhangsan	beat	LE

He beat Zhangsan.

b.他把张三骂了。

ta1	ba3	zhang1san1	ma4	le0
he	BA	Zhangsan	scold	LE

He scolded Zhangsan.

c.他把饭吃了。

ta1	ba3	fan4	chi1	le0
he	BA	meal	eat	LE

He ate the meal.

d.他把张三杀了。

ta1	ba3	zhang1san1	sha1	le0
he	BA	Zhangsan	kill	LE

He killed Zhangsan.

What is important is why verbs, such as 打 *da3* ‘beat’ and 骂 *ma4* ‘scold’, cannot appear in imperative sentences. If we compare the two group of sentences in (96) and (97), we can find that imperative BA construction requires situation types that involve change of state, e.g. achievement or accomplishment.

Beavers (2008) defined four levels of affectedness: quantized, non-quantized, potential and unspecified. The 'potential' is described as equivalent to the pattern 'What happens to X is Y'. It seems that potential is the right categories of the affectedness in (97.a) and (97.b). This comes to the fact that 'having been beaten/scolded' could be an experiential state of the patient. According to laws or morals and ethics, nobody could beat or scold anyone else. BA construction thus requires such anti-expectation in order to be accepted. Such affectedness as in (97.a) and (97.b), however, does not necessarily cause any change of state of the objects.

Sentences in (97.c) and (97.d) are different from (97.a) and (97.b) in that, the objects are not in the potential category, but belong to quantized category, which involves changes of states. Additional evidence to show the difference is that the interpretation of *potential* or *quantized* can sometimes raise ambiguities, e.g. in (98). The sentence (98.a) can be interpreted similar as (96.c) and (96.d), meaning that the book should not be read by default. Alternatively, it can be interpreted that the book is supposed to read through, and the agent finally finished the task.

(98) a. 他把书看了。

ta1	ba3	shu1	kan4	le0
he	BA	book	read	LE

He read the book.

b. 他把衣服洗了。

ta1	ba3	yi1fu2	xi3	le0
he	BA	clothes	wash	LE

He washed the clothes.

All the observations suggest that, sentences (96.a), (97.b) and possibly (98) express |~~~|, which is unexpected due to the restriction of BA, while (96.c), (96.d) and possibly (98) express |~~~|--. BA construction can also express static states, e.g. in (99) and dynamic states, e.g. in (100).

(99) a. 他把小红当朋友。

ta1	ba3	xiao3hong2	dang1	peng2you3
he	BA	Xiaohong	regard_as	friend

He regards Xiaohong as his friend.

b. 他把小红深深地爱着。

ta1	ba3	xiao3hong2	shen1shen1	de0	ai4	zhe0
he	BA	Xiaohong	deeply	DE	love	ZHE

He is in deep love with Xiaohong.

(100) a. 高房价正在把老百姓的中国梦打碎。

gao1	fang2jia4	zheng4zai4	ba3	lao3bai3xing4	de0
high	housing_price	ZAI	BA	people	DE
zhong1guo2meng4		da3sui4			
China_Dream		hit-break			

The high housing price is breaking the China dream of the people.

b. 他正在把饭慢慢吃掉。

ta1	zheng4zai4	ba3	fan4	man4man4	chi1	diao4
he	ZAI	BA	meal	slowly	eat	out

He is eating the meal slowly.

c. 微风正在把衣服慢慢吹干。

wei1feng1	zheng4zai4	ba3	yi1fu2	man4man4	chui1	gan1
breeze_wind	ZAI	BA	clothes	slowly	blow	dry

The wind is blowing the clothes dry slowly.

d. 太阳正在把水分蒸发。

tai4yang2	zheng4zai4	ba3	shui3fen4	zheng1fa1
sun	ZAI	BA	moisture	evaporate

The sun is evaporating the moisture.

e. 大火正在把大楼吞噬。

da4huo3	zheng4zai4	ba3	da4lou2tun1shi4	
big_fire	ZAI	BA	building	devour

The big fire is devouring the building.

3.5.6. BEI construction

Similar as BA construction, 被 *bei4* 'BEI' construction can denote static states '---', e.g. (101.a), and dynamic states '~~~', e.g. (101.b).

(101) a. 他一直被父母惦记着。

ta1	yi1zhi2	bei4	fu4mu3	dian4ji4	zhe0
he	all_the_time	BEI	parents	concern	ZHE

He was concerned by his parents all the time.

b.他正在被老师骂。

ta1	zheng4zai4	bei4	lao3shi1	ma4
he	ZAI	BEI	teacher	scold

He is being scolded by his teacher.

Different from BA construction, BEI construction cannot appear in imperative sentences because the subject doesn't take the agent role. The pragmatic issue about BEI construction will not be discussed here. But since the BEI construction is the counterpart of BA construction, it is reasonable to treat the sentences in (102) as |~~~|.

(102) a. 他被张三打了。

ta1	bei4	zhang1san1	da3	le0
he	BEI	Zhangsan	beat	LE

He was beaten by Zhangsan.

b.苹果被他咬了。

ping2guo3	bei4	ta1	yao3	le0
apple	BEI	he	bite	LE

The apple was bitten by him.

The sentences in (103) denote accomplishments |~~~|---.

(103) a. 他被张三杀了。

ta1	bei4	zhang1san1	sha1	le0
he	BEI	Zhangsan	kill	LE

He was killed by Zhangsan.

b.苹果被他吃了。

ping2guo3	bei4	ta1	chi1	le0
apple	BEI	he	eat	LE

The apple was eaten by him.

Interestingly, as the counterpart of BA construction in (98), the sentences in (104) only give reading of potential affectedness. Whether the book is finished or not is not encoded.

(104) a. 书被他看了。

shu1	bei4	ta1	kan4	le0
book	BEI	he	read	LE

The book is read by him.

b.衣服被他洗了。

yi1fu2	bei4	ta1	xi3	le0
clothes	BEI	he	wash	LE

The clothes are washed by him.

The contrary of (103) and (104) shows that verbs 吃 *chi1* 'eat' and 杀 *sha1* 'kill act' are different from 看 *kan4* 'look' and 洗 *xi3* 'wash' which have been all treated as activity verbs previously. The former does encode an implicit intention. The realization of such intentions in BEI constructions provides the telicity/logical boundary of the event. The verbs 吃 *chi1* and 杀 *sha1* are ambiguous in denoting an action with or without telicity. For example, situations denoted by 吃手指 *chi1 shou3zhi3* eat-finger 'lick finger', 吃口香糖 *chi1 kou3xiang1tang2* eat-gum 'chew gum', take the most important part of the telic 吃, e.g. swallow and digestion, away from its meaning and only keep the chewing part. Similarly, 杀 *sha1* can keep only the action part, typically in Taiwan, e.g. 杀了他两刀 *sha1 le0 ta1 liang3 dao1* kill him two knives 'stab twice with knife' etc. This shows that, for such verbs as 吃 *chi1* and 杀 *sha1* in Chinese, the object and background knowledge may play an important role in determining the event type of a sentence.

3.6. Summary

In this chapter, I first discussed different ontological situation types and represented them with two pimitives. Based on the two primitives, the six theorectically existing ontological situation types with subcategories are proposed. Then, the concept of ontological linguistic event is proposed, which is the combination of ontological situation types and viewpoint aspect. Eighteen linguistic event types are also proposed. Linguistic events are also ontological in the sense that they are specific for communication and ready to be realized in any language in the world. Thus, the linguistic events encode the whole aspectual meaning of a sentence.

To be specific, I discussed some special constructions of Chinese including RVCs, SVC, BA, BEI and the V+(ZHE/LE/GUO)+O+LE pattern, and gave analysis what linguistic event types they usually denote. I also showed that the same verb constellation can be used to denote different linguistic events in different context. In future, the classification verb or verb constellations without context could be performed based on the distribution of which linguistic event types they can possibly denote. The study described in this chapter could then serve as a preparing stage.

Chapter 4

Semantics of Aspectual Markers and Negators in Chinese

This chapter will discuss the semantics of Chinese aspectual markers, 着 *zhe0* 'ZHE', 了 *le0* 'LE', 过 *guo4* 'GUO', 在 *zai4* 'ZAI' and the negators, 不 *bu4* and 没有 *mei2you3*. Previous studies didn't pay enough attention to the systematic relation between the aspectual markers, negators and different event types. This led to the failure of understanding the semantics of them. I will show that they are actually the main devices with which different event types are expressed.

4.1. Introduction

Previous studies discussed the Chinese aspectual markers: 着 *zhe0* 'ZHE', 了 *le0* 'LE', 过 *guo4* 'GUO', 在 *zai4* 'ZAI' from the perspectives of both tense and aspect. For example, Li (1990) mixed tense with viewpoint aspect. His notions of 'past in past' and 'past in future' etc., should actually be 'past perfect' and 'future perfect'. It is clear that tense is orthogonal to aspect and could be discussed independently (Kearns, 2007). The problem for Chinese is not whether these markers here are only related to aspect or also related to tense. Some researchers think these words are pure aspectual markers (Wang, 1982; Gao, 1986), although they sometimes contribute the tense meaning of a sentence, e.g. (Lin, 2002; Lin, 2005). Some other researchers still think that these words are combined makers of tense and aspect (Li, 2002). I agree with Wang (1982) and Gao (1986) that they are aspectual markers.

Previous studies on Chinese aspectual markers only focus on ZHE, LE and GUO themselves. They lack of observation on the semantic categories of the predicates denoted by verb constellations (Smith, 1991) that co-occur with the aspectual markers. Jin (2002) tested the combination of different types of verbs with LE. However, the problem is then that verb classes are only discussed with features. The discussion doesn't reach the level of situation type. I will then propose that all the different interpretations of the semantics of the aspectual markers come from the cases when the predicates correspond to different event types. The aspectual markers are then treated as operators upon ontological situations forming a final linguistic event by incorporating a viewpoint aspect.

4.2. Aspectual Operators

Suppose that S denotes an ontological situation type of static state, dynamic state, accomplishment, or achievement. An aspectual operator could be defined as a predicate that can predicate on a complex situation in order to refer to a certain subpart of it (viewpoint aspect). For example, *Start()* is such a predicate that can take a dynamic state, e.g. running, to refer to its start which is then a simple change of state from static to dynamic (~~|--). Linguistically, this seems to be a way to refer to different stages, i.e. viewpoint aspect, rather than give totally different terms for different stages of the same ontological event type.

I. If S denotes static state (|---|), *Start*(S) = (|--), *Prog*(S) = (---), *End*(S) = (--|), *Holistic*(S) = (|---|).
II. If S denotes dynamic state (|~~~|), *Start*(S) = (|~~), *Prog*(S) = (~~~), *End*(S) = (~~|), *Holistic*(S) = (|~~~|).
III. If S denotes accomplishment (|~~~|==), *Start*(S) = (|~~), *Prog*(S) = (~~~), *End*(S) = (~~|), *Holistic*(S) = (|~~~|==), *Delimit*(S) = (|~~~|), *Culminate*(S) = (~~|==).
IV. If S denotes semelfactive (|~|), *Holistic*(S) = (|~|), *Start*(S) |=> (|~~), *Prog*(S) |=> (~~~), *End*(S) |=> (~~|).
V. If S denotes instantaneous accomplishment (|~|==), *Holistic*(S) = (|~|==), *Start*(S) |=> (|~~), *Prog*(S) |=> (~~~), *End*(S) |=> (~~|), *Culminate*(S) |=> (~~|==).

In sum, we have five different viewpoint predicates: *Start*(), *Prog*(), *End*(), *Holistic*(), *Delimit*(), *Culminate*(). However, it is usually not the case that a different word will be used for the different viewpoint of the same situation. On the other hand, the light verb 开始 *kai1shi3* 'start', 结束 *jie2shu4* 'terminate', etc., which serve as operators, could be used to shift the viewpoint to the start or the end. For example, if W_p denotes a dynamic state, W_p'=(开始 W_p) then denotes an achievement of |~~~. Table 1 shows some syntactic realization of different viewpoint aspects in Chinese.

Operators	Syntactic Realization in Chinese
Start()	开始 VO, VO 了
Prog()	在 VO, 正在 VO, VO 着
End()	停止 VO 了
Delimit()	VO 了 [Time Period]
Holistic()	VO, VO 了, V 了 O, V 了 O 了
Culminate()	V 完了 O, V 完 O 了, VO 完了

Table 1: Viewpoint aspect operators and their syntactic realizations in Chinese.

All the six predicates are subtypes of situation *S*. I then suggest that aspectual markers ZHE, LE and GUO are of type <*S*, *t*> that take a situation s of S, and output a proposition which is of type t. For example, LE(s) tends to say that the situation s is realized at a certain time t.

4.3. 了 LE

There are a tremendous amount of literatures discussing the semantics and syntactic properties of the perfective marker LE. The consensus is that there are two different LEs in Chinese, namely verbal LE (usually called LE1) and sentential LE (usually called LE2). The verbal LE marks the completeness of an action. Sentential LE marks the coming about of a new state. Recently studies, e.g. (Lin, 2000&2003; Wu, 2005&2010), have considered the different situation types when discussing LE. The discussion here will also be focused on the function of LE cooperating with different situation types. I will show that the two different LEs are due to its occurrence with telic or atelic situations. The LE itself actually functions the same way in semantics.

4.3.1. LE with static state

Firstly, let's discuss when LE takes static states. Logically, when it is stated that a state becomes true, it actually implies a change. For example, the sentence in (1.a) describes that the subject changes from not old to old. The sentence (1.b) describes a change before which the subject doesn't believe in Buddhism. The sentence (1.c) describes a change after that the subject doesn't smoke any more.

(1) a. 他病了。

ta1 bing4 le0
he ill LE
He has been ill.

b. 他信佛了。

ta1 xin4 fo2 le0
he believe_in Buddhism LE
He believes in Buddhism now.

c. 他不抽烟了。

ta1 bu4 chou1yan1 le0
he not smoke LE
He doesn't smoke any more.

When taking an object of a time period, LE will then mark the finish of static state. The time period then measures the time duration of the state, e.g. (2).

(2) a. 他病了一个星期。

ta1	bing4	le0	yi1	ge4	xing1qi1
he	ill	LE	one	CL	week

He was ill for one week.

When LE follows the object of a time period, LE marks the finish of the time period, but not necessarily the static state. So, the sentences in (3) mainly express that the static state as predicated still holds after the time period. From a different perspective, the situation as predicated by the VO, e.g. 信佛十年 *xin4 fo2 shi2 nian2* "believe in Buddhism for ten years", has been finished.

(3) a. 他信佛十年了。

ta1	xin4	fo2	shi2	nian2	le0
he	believe_in	Buddhism	ten	year	LE

He has believed in Buddhism for ten years.

b. 他不抽烟两年了。

ta1	bu4	chou1yan1	liang3	nian2	le0
he	not	smoke	two	year	LE

He has stopped smoking for two years.

4.3.2. LE with dynamic state

When taking a dynamic state, e.g. *s*, LE(s) will be ambiguous that whether it denotes the start of the state (|~~) or the whole dynamic state (|~~~|), e.g. (4.a). When there is a time adverbial, the ambiguity could possibly be eliminated, e.g. (4.b) for (|~~) and (4.c) for (|~~~|).

(4) a. 他笑了。

ta1	xiao4	le0
he	smile	LE

He smiled.

b. 他终于笑了。

ta1	zhong1yu2	xiao4	le0
he	finally	smile	LE

He finally smiled.

c. 他刚才笑了。

ta1	gang1cai2	xiao4	le0
he	just_now	smile	LE

He smiled just now.

Based on this fact, some researchers have argued that LE sometimes denotes start rather than finish. The problem is that the event is discussed in ontological level and the viewpoint aspect has been ignored. With the viewpoint aspect, the start of a state is an intrinsically an achievement. Verbs that denote dynamic state can possibly shift their meaning to refer to the start. The function of LE doesn't change, and it is still a perfective marker. In English, such shifting also occurs when the verb taking the adverb 'suddenly' e.g. 'he suddenly ran'.

LE usually marks the finish of the dynamic state predicated by the verb, e.g. (5.a). Previous studies argued that LE doesn't necessarily mark the finish, as (5.b). I agree with this argument that the finish meaning is cancelled by the second subsentence. However, since we are classifying sentences in context, the sentence (5.a) still entails the finish of the book.

(5) a. 他这本书写了一年。

ta1	zhe4	ben3	shu1	xie3	le0	yi1	nian2
he	this	CL	book	write	LE	one	year

He wrote this book in one year.

b. 他这本书写了一年，还没写完。

ta1	zhe4	ben3	shu1	xie3	le0	yi1	nian2
he	this	CL	book	write	LE	one	year

He wrote this book in one year.

Existential sentences can also denote an inchoative. For example, the final state expressed by the sentence (5.a) is the subject's lying on the bed; the final state expressed by (5.b) is the subject's raising a fish. Similarly, the sentence in (7) denotes the start of a dynamic state.

(6) a. 床上躺了一個人。

chuang2	shang4	tang3	le0	yi1	ge4	ren2
bed	on	lie	LE	one	CL	person

A person lied on the bed.

b. 他养了一条鱼。

ta1	yang3	le0	yi1	tiao2	yu2
he	raise	LE	one	CL	fish

He raised a fish.

(7) 他手里推了一辆自行车。

ta1	shou3	li3	tui1	le0	yi1	liang4	zi4xing2che1
he	hand	in	push	LE	one	CL	bicycle

He wheeled a bicycle in his hand.

Not all verbs can appear in existential sentences, e.g. (8). This shows that the verbs in (8) are different from the verbs in (6) and (7). The events described by (6) and (7) all involve a preparing stage. For example, before the state of lying on the bed, the subject has to make an action of lying; before raising a fish, it also nees some preparing actions. LE thus marks the finish of the preparing stage. However, for the events in (8), there is no obvious preparing action before the focused events.

(8) a. ?他嘴里吃了一个苹果。

ta1	zui3	li3	chi1	le0	yi1	ge4	ping2guo3
he	mouth	in	eat	LE	one	CL	apple

?He ate an apple in his mouth.

b. ?他眼睛看了一本书。

ta1	yan3jing1	kan4	le0	yi1	ben3	shu1
he	eye	look	LE	one	CL	book

?His eyes looked at a book.

b. ?他左脚踢了一个球。

ta1	zuo3	jiao3	ti1	le0	yi1	ge4	qiu2
he	left	foot	kick	LE	one	CL	ball

?He kicked a ball with his left foot.

4.3.3. LE with accomplishment

The sentences in (9) denote accomplishments. LE in these sentences marks the finish of the dynamic state, i.e. running, building, and the coming about of the final state, i.e. the distance being 1000 meters, and the existence of a house. The sentence (10) denotes an instantaneous accomplishment.

(9) a. 他跑了 1000 米。

ta1	pao3	le0	1000	mi3
he	run	LE	1000	meter

He ran 1000 meters.

b. 他盖了一座房子。

ta1	gai4	le0	yi1	zuo4	fang2zi0
he	build	LE	one	CL	house

He built a house.

(10) 他敲碎了一个杯子。

ta1	qiao1sui4	le0	yi1	ge4	bei1zi0
he	knock-break	LE	one	CL	cup

He broke a cup by knocking it.

For V+LE+O+LE, the first LE operates on the dynamic state predicated by V to indicate its completion. The second LE then operates on the final state and indicates its realization. The situation type expressed by the verb constellation sometimes depends on the interpretations in different context. The type of object can affect the interpretation. For example, in (11.a), the sentence LE indicates that the state that subject has some wine in him has become true. In (9.b), the most possible interpretation is that he has finished one bottle of wine. However, in a different context, e.g. tasting of different bottles of wines is expected, then (11.b) may have the interpretation that he has already tasted one bottle. For (11.c), it also has two different interpretations that the definite bottle of wine could be either finished or not depending on context. However, the functions of verbal LE and sentence LE don't change that the former indicates the completion of the dynamic state and the latter indicates the realization of the final state, although with different interpretations.

(11) a. 他喝了酒了。

ta1	he1	le0	jiu3	le0
he	drink	LE	wine	LE

He drank some wine.

b. 他喝了一瓶酒了。

ta1	he1	le0	yi1	ping2	jiu3	le0
he	drink	LE	one	bottle	wine	LE

He has drank a bottle of wine.

c. 他喝了那瓶酒了。

ta1	he1	le0	na4	ping2	jiu3	le0
he	drink	LE	that	bottle	wine	LE

He has drank that bottle of wine.

One consequence is that, for verb constellation VO that usually denotes past dynamic static state with V+O+LE pattern, e.g. (12), when taking another verbal LE, it can coerce it to be an accomplishment, e.g. (11.a).

(12) 他刚才喝酒了。

ta1	gang1cai2	he1	jiu3	le0
he	just_now	drink	wine	LE

He drank some wine just now.

4.3.4. LE with achievement

LE can also mark the perfect of achievements, which implies the end of one state and the start of another state, as shown in Figure 4.1. In (13.a), the first LE indicates the realization of the achievement. The second LE indicates the coming about of the state. The first LE in (13.a) could be deleted, as shown in (31.b). Without LE, the preparing stage, i.e. become to believe, is not expressed.

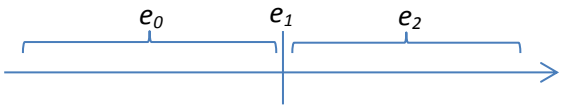

Figure 4.1. The event structure of achievements.

(13) a. 张三最后信了耶稣了。

zhang1san1	zui4hou4	xin4	le0	ye1su1	le0
ZhangSan	finally	believe	LE	Jesus	LE

b. 张三最后信耶稣了。

zhang1san1	zui4hou4	xin4	ye1su1	le0
ZhangSan	finally	believe	Jesus	LE

Achievements can also be expressed by a compound, e.g. 开始 *kai1shi3* 'start' + VO, 停止 *ting2zhi3* 'stop' + VO etc. LE can co-occur with the compound to express the perfect of an achievement, e.g. (14).

(14) a. 他开始盖一座房子了。

ta1	kai1shi3	gai4	yi1	zuo4	fang2zi0	le0
he	start	built	one	CL	house	LE

He started building a house.

b. 他不再盖那座房子了。

ta1	bu4zai4	gai4	na4	zuo4	fang2zi0	le0
he	no_longer	built	that	CL	house	LE

He stopped building that house.

In summary, the function of LE is to mark the finish of an event. Here, *finish* can be interpreted differently with different situation types. The following describes the function of LE when taking verb constellations corresponding to different situation types with different viewpoint aspects.

- When VO denotes static state, LE usually indicates the coming about of the state.
- When VO denotes dynamic static states with an object of bare NP, e.g. 喝酒 *he1jiu3* 'drink wine', 抽烟 *chou1yan1* 'smoke cigarette':
  - LE in V+O+LE indicates the coming about of the state or completion of the dynamic state depending on contexts including other components such as adverbials.
  - LE in the pattern V+LE+O usually indicates the completion of an accomplishment depending on the verb.
  - The first LE in the pattern V+LE+O+LE usually indicates the completion of the dynamic state. The second LE usually indicates the coming about of the final state. The whole pattern usually denotes an accomplishment.
- When the object O in VO is a numeral NP, e.g. 一杯酒 *yi1 bei1 jiu3*, 三支烟 *san1 zhi1 yan1*:
  - The pattern V+O+LE is usually not accepted.
  - LE in the pattern V+LE+O usually indicates the finish of an accomplishment depending on the verb.
  - The first LE in the pattern V+LE+O+LE usually indicates the finish of the dynamic state. The second LE usually indicates the coming about of the final state. The whole pattern usually denotes an accomplishment.
- When the object O in VO is a demonstrative NP, e.g. 那杯酒 *na4 bei1 jiu3*, 那支烟 *na4 zhi1 yan1*:
  - LE in the pattern V+O+LE indicates the coming about of the dynamic state or completion of the dynamic state depending on contexts including other components such as adverbials.

- LE in the pattern V+LE+O usually indicates the completion of an accomplishment or achievement depending on the verb.
- The first LE in the pattern V+LE+O+LE usually indicates the finish of the dynamic state. The second LE usually indicates the coming about of the final state. The whole pattern usually denotes an accomplishment.

4.3.5. The Two LEs: LE_1 and LE_2

In above discussion, I didn't discriminate different LEs because semantically they are similar. The difference is mainly caused by the different situation types it combines with. However, syntactically, it is usually thought that there are two different LEs in Chinese. As in the pattern 'V+LE+O+LE' that is discussed in Chapter 3, the first LE is usually called LE_1 or verbal LE and the second is called LE_2 or sentential LE. The function of LE_1 is usually to indicate the completion of an event, while the function of LE_2 is reference time relevant marker, which is similar as the English perfect aspect.

Due to this, the LE in the example (15.a) is ambiguous whether it is LE_1, LE_2 or treated as the combination of LE_1 and LE_2. When there is a time point adverbial as in (15.b), the LE is usually treated as LE1 or the combination of LE1 and LE2. It is also interesting that when LE is the combined one in (15.b), the corresponding English translation must use 'since' rather than 'at' for the time point adverbial, which is actually not the directly translation of the sentence.

(15) a. 他吃药了。

ta1	chi1	yao4	le0
he	eat	medicine	LE

He has already eaten the medicine.

He ate some medicine.

b. 他九点吃药了。

ta1	jiu3dian3	chi1	yao4	le0
he	9:00	eat	medicine	LE

He has already eaten the medicine since/*at 9:00.

He ate the medicine of that bottle at nine.

c. 他九点吃了药了。

ta1	jiu3dian3	chi1	le0	yao4	le0
he	9:00	eat	LE	medicine	LE

He has already eaten the medicine since/*at 9:00.

The ambiguity comes from the bare NP object 药 *yao4* 'medicine'. In other words, it could combine with the verb 吃 *chi1* 'eat' to form a compound 吃药 *chi1yao4* 'eat medicine'. In this case, the morpheme 药 *yao4* 'medicine' is non-referential. When there is another LE as in (14.c), then the object 药 *yao4* 'medicine' is definite and the second LE must be LE_2. In this sense, the discrimination is mainly syntactically based.

There is one problem when the object is demonstrative NP, e.g. 那瓶药 *na4 ping2 yao4* 'that bottle of medicine' as in (16). In this case, the LE in (16.a) can only be LE_2 due to the syntactic theory, i.e. the reference time relevant meaning. However, the two different readings similar as that of (15.a) still exist. Similar contrary also holds for (16.b) regarding to (15.b).

(16) a. 他吃那瓶药了。

ta1	chi1	na4	ping2	yao4	le0
he	eat	that	CL	medicine	LE

He has already eaten the medicine of that bottle.

He ate the medicine of that bottle.

b. 他九点吃那瓶药了。

ta1	jiu3dian3	chi1	na4	ping2	yao4	le0
he	9:00	eat	that	CL	medicine	LE

He has already eaten the medicine of that bottle since/*at 9:00.

He ate the medicine of that bottle at nine.

c. 他九点吃了那瓶药了。

ta1	jiu3dian3	chi1	le0	na4	ping2	yao4	le0
he	9:00	eat	LE	that	CL	medicine	LE

He has already eaten the medicine of that bottle since/*at 9:00.

4.3.6. LE is not a tense marker

It is suggested that sentence LE is not a tense marker (Li and Thompson, 1981; Lin, 2002&2006; Wu, 2009). Some studies, e.g. (Li, 1990), suggested that (17.b) is past in past. However, tense actually only refers to the position of reference time relevant to the speech time. If the reference time is before the speech time, it is then past tense; if the reference time is after the speech time, it is then future tense. The present perfect is confusing due to the fact that the speech time is also the reference time which then implies that the event that has finished is before the speech time, meaning that the event is in past. However, this doesn't mean that LE mark the past. Evidence is that LE can also appear in present, e.g. (17.a). It can also appear in a sentence with future tense,

e.g. (17.c). In addition, LE doesn't have to appear in past tense, e.g. (17.d). See (Lin, 2002, 2005) for more details on how the tense information could be specified with aspect and other factors.

(17) a. 他已经完成考试了。

ta1	yi3jing1		wan2cheng2	kao3shi4	le0
he	already	finish	exam	LE	

He has already finished the exam.

b. 那个時候他已经完成考试了。

na4	ge4	shi2hou0	ta1	yi3jing1	wan2cheng2
that	CL	time	he	already	finish
kao3shi4	le0				
exam	LE				

He has already finished the exam at that time.

c. 明天这个时候他已经完成考试了。

ming2tian1	zhe4	ge4	shi2hou0	ta1	yi3jing1
tomorrow	this	CL	time	he	already
wan2cheng2	kao3shi4	le0			
finish	exam	LE			

He will have already finished the exam at this time tomorrow.

d. 那个时候他在考试。

na4	ge4	shi2hou0	ta1	zai4	kao3shi4
that	CL	time	he	ZAI	exam

He was taking an exam at that time.

4.3.7. Non-Aspectual LE

There are some non-aspectual LEs that should be differentiated from aspectual LE. For example, LE in the sentences in (18) doesn't express meaning components related to aspect. Evidence is that LE in this sentence could be deleted or replaced by 啦 *la1* without changing the meaning. Non aspectual LEs are not discussed in the thesis.

(18) a. 这件衣服长了，给我换一件。

zhe4	jian4	yi1fu2	chang2	le0	gei3	wo3	huan4	yi1	jian4
this	CL	clothes	long	LE	give	I	change	one	CL

This piece of clothes is too long. Please change another one.

b. 太漂亮了，也不好。

tai4	piao4liang4	ye3	bu4	hao3
too	beautiful	also	not	good

It is not good to be too beautiful.

4.4. 着 *zhe0* ‘ZHE’, 在 *zai4* ‘ZAI’ and 正在 *zheng4zai4* ‘ZAI’

着 *zhe0* ‘ZHE’ in Chinese is an aspectual marker that is usually used after verbs to express a static or dynamic state. The test of its combination with 正在 *zheng4zai4* ‘ZAI’ could discriminate whether the state is static or dynamic. The verbs that are incompatible with 正在 are static, e.g. (19) and (20). The verbs that are compatible with 正在 are dynamic, e.g. (21) and (22).

(19) a. 娇小的贵宾狗，身上穿着红格子背心 。

jiao1xiao3	de0	gui4bin1gou3	shen1shang4	chuan1	zhe0	hong2
small	DE	poodle	body	wear	ZHE	red
ge2zi0	bei4xin1					
lattice	vest					

The small poodle wears a vest with red lattice.

b. ?娇小的贵宾狗，身上正在穿着红格子背心。

jiao1xiao3	de0	gui4bin1gou3	shen1shang4	zheng4zai4	chuan1
small	DE	poodle	body	ZAI	wear
zhe0	hong2	ge2zi0	bei4xin1		
ZHE	red	lattice	vest		

The small poodle is wearing a vest with red lattice.

(20) a. 他坐着沙发。

ta1	zuo4	zhe0	sha1fa1
he	sit	ZHE	sofa

He sits on the sofa.

b. ?他正在坐着沙发。

ta1	zheng4zai4	zuo4	zhe0	sha1fa1
he	ZAI	sit	ZHE	sofa

He is sitting on the sofa.

(21) a. 他正在唱着歌。

ta1	zheng4zai4	chang4	zhe0	ge1
he	ZAI	sing	ZHE	song

He is singing.

b. 他正在看着一幅画。

ta1	zheng4zai4	kan4	zhe0	yi1	fu2	hua4
he	ZAI	look	ZHE	one	CL	painting

He is staring at a painting.

(22) a. 他正在唱一首歌。

ta1	zheng4zai4	chang4	yi1	shou3	ge1
he	ZAI	sing	one	CL	song

He is singing a song.

b. 他正在唱着一首歌。

ta1	zheng4zai4	chang4	zhe0	yi1	shou3	ge1
he	ZAI	sing	ZHE	one	CL	song

He is singing a song.

4.4.1. The difference of 在 *zai4* 'ZAI' and 正在 *zheng4zai4* 'ZAI'

It is usually thought that the meanings of 在 *zai4* and 正在 *zheng4zai4* are the same. For example, mostly they can be exchanged without changing the meaning of the sentences, e.g. (23). However, further tests in (24) and (25) show that they are actually different in that 在 *zai4* is compatible with both durative time adverbial and time point, while 正在 *zheng4zai4* is only compatible with time point. The reason is that the meaning of 正 *zheng4* in 正在 *zheng4zai4* which roughly means 'just right / just in time' still exists. The meaning of 正 *zheng4* is logically compatible with a time point; 在 on the other hand is logically compatible with duration (Xiao, 2002), e.g. 一直 *yi1zhi2* 'all the time' as shown in (24) and (25).

(23) a. 我去的时候，他在看书。

wo3	qu4	de0	shi2hou4	ta1	zai4	kan4	shu1
I	arrive	DE	when	he	ZAI	read	book

He was reading when I arrived there.

b. 我去的时候，他正在看书。

wo3	qu4	de0	shi2hou4	ta1	zheng4zai4	kan4	shu1
I	arrive	DE	when	he	ZAI	read	book

He was reading when I arrived there.

(24) a. ?我去的时候，他一直在看书。

wo3	qu4	de0	shi2hou4	ta1	yi1zhi2	zai4	kan4
I	arrive	DE	when	he	all_the_time	ZAI	read
shu1							
book							

?He was reading all the time when I arrived there.

b. ?我去的时候，他一直正在看书。

wo3	qu4	de0	shi2hou4	ta1	yi1zhi2	zheng4zai4
I	arrive	DE	when	he	all_the_time	ZAI
kan4	shu1					
read	book					

?He was reading all the time when I arrived there.

(25) a. 今天上午，他一直在看书。

jin1tian1	shang4wu3	ta1	yi1zhi2	zai4	kan4
today	morning	he	all_the_time	ZAI	read
shu1					
book					

He was reading all the time in this morning.

b. ?今天上午，他一直正在看书。

jin1tian1	shang4wu3	ta1	yi1zhi2	zheng4zai4
today	morning	he	all_the_time	ZAI
kan4	shu1			
read	book			

He was reading all the time in this morning.

ZHE is also compatible with accomplishment situations to refer to its dynamic process as in (26).

(26) a. 他写着一封信。

ta1	xie3	zhe0	yi1	feng1	xin4
he	write	ZHE	one	CL	letter

He is writing a letter.

b. 他喝着一杯酒。

ta1	he1	zhe0	yi1	bei1	jiu3
he	drink	ZHE	one	glass	wine

He is drinking a cup of wine.

Semelfactive can also take ZHE to denote iterative events, which is a derived dynamic state, e.g. (27).

(27) a. 他敲着门。

ta1	qiao1	zhe0	men2
he	knock	ZHE	door

He is knocking the door.

b. 他咳嗽着。

ta1	ke2sou4	zhe0
he	cough	ZHE

He is coughing.

RVCs usually are not compatible with ZHE, since the situation cannot be interpreted as repeated events, as shown in (28).

(28) ?他写完着一封信。

ta1	xie3wan2	zhe0	yi1	feng1	xin4
he	write-finish	ZHE	one	CL	letter

He is finishing writing the letter.

?他打碎着一个杯子。

ta1	da3sui4	zhe0	yi1	ge4	bei1zi0
he	hit-break	ZHE	one	CL	cup

He is breaking a cup by hitting it.

?雨水湿透着衣服。

yu3shui3	shi1tou4	zhe0	yi1fu2
rain	wet-through	ZHE	clothes

The rain is wetting through the clothes.

4.4.2. The Difference of Static State with and without ZHE and their relation with Negators

As pointed by previous studies, ZHE implies that the state is changeable. Thus, it is incompatible with individual level states, e.g. (29). However, the boundary of stage-level state and individual-level state is not clear. Thus, the selectional restrictions of ZHE need further discussions.

(29) a. ?她漂亮着。

ta1	piao4liang4	zhe0
she	beautiful	ZHE

She is being beautiful.

b. ?他高着。

ta1	gao1	zhe0
he	tall	ZHE

He is being tall.

Some verbs with ZHE can only be negated by 没有, as (30) and (31). Without ZHE, both 不 and 没有 could be used for the negation, as in (32) and (33). The reason for this is that such verbs indicate non-volition of the subject on keeping or avoiding the corresponding state. So, it is predicted that volitional verbs with ZHE allows negation by both 没有 and 不, e.g. (34) and (35).

(30) a. 他没有爱着小红。

ta1	mei2you3	ai4	zhe0	xiao3hong2
he	not	love	ZHE	Xiaohong

He doesn't love Xiaohong.

b.?他不爱着小红。

ta1	mei2you3	ai4	zhe0	xiao3hong2
he	not	love	ZHE	Xiaohong

He doesn't love Xiaohong.

(31) a. 门没有开着。

men2	mei2you3	kai1	zhe0
door	not	open	ZHE

The door is not open.

b. ?门不开着。

men2 bu4 kai1 zhe0

door not open ZHE

?The door is not open.

(32) a. 他没有爱小红。

ta1 mei2you3 ai4 zhe0 xiao3hong2

he not love ZHE Xiaohong

He didn’t ever love Xiaohong.

b.他不爱小红。

ta1 mei2you3 ai4 zhe0 xiao3hong2

he not love ZHE Xiaohong

He doesn’t love Xiaohong.

(33) a. 门没有开。

men2 mei2you3 kai1

door not open

The door didn’t open.

b. 门不开。

men2 bu4 kai1

door not open

The door won’t open. / ?The door doesn’t open.

(34) a. 他没有看着窗外。

ta1 mei2you3 kan4 zhe0 chuang1wai4

he not look ZHE out_of_window

He is not looking out of the window.

b. 他不看着窗外。

ta1 bu4 kan4 zhe0 chuang1wai4

he not look ZHE out_of_window

He does not look out of the window.

(35) a. 他没有喝着酒。

ta1 mei2you3 he1 zhe0 jiu3

he not drink ZHE wine

He is not drinking.

b. 他不喝着酒。

ta1 bu4 he1 zhe0 jiu3

he not drink ZHE wine

He does not want to be drinking.

The fact that non-volitional verbs with 着 *zhe0* 'ZHE' should be negated by 没有 *mei2you3* 'not' suggests that ZHE has a strong meaning of indicating an existing instance which is perceived as an independent event. With ZHE, the subject is the experiencer or theme of the state. In other words, ZHE is actually an existential quantifier especially for state. 没有 thus negates the existence of the event instance.

The reason that the sentences in (29) are not acceptable is that they are hard to be interpreted as stage-level state. Individual-level state, as it is, is usually a property of the subject, and is hard to be perceived as an independent event. Thus, stage-level predicate usually should be negated with 不 *bu4* 'not', as in (36). Similar, the sentences in (37) can only be interpreted as negating the existence of the changes of state, i.e. getting beautiful and getting tall, rather than negating the existence of a state nor negating the property of the subject.

(36) a. 她不漂亮。

ta1 bu4 piao4liang4

she not beautiful

She is not beautiful.

b. 他不高。

ta1 bu4 gao1

he not tall

He is not tall.

(37) a. ?她没有漂亮。

ta1 mei2you3 piao4liang4

she not beautiful

She didn't get beautiful.

b. ?他没有高。

ta1 mei2you3 gao1

he not tall

He didn't get tall.

Without ZHE, the state is an attribute of the subject. In this case, the instance *e* is the subject with regards to his certain attribute. For example, the sentence 她很聪明 *ta1 hen3 cong1ming2* 'she is clever' means that the subject is an instance of being clever rather than that there is a state predicated as being clever, where the subject is the theme of the event. The latter interpretation is contradictory to our intuition. On the other hand, 他病着 'he is ill' means that there is a state predicated as illness, while the theme of the illness is the subject. There is no description like *他病 *ta1 bing4* 'he gets ill'. Thus, (32.a) is different from (32.b) that the former negates the existence of a moment at which the subject loves the object, while the latter negates the property predicated as being in love with the object of the subject.

4.4.3. The difference of ZHE and LE in existential sentences

Some previous studies treated the sentences (38.a) and (38.b) as the same. Similarly, we can use the tests in (39) and (40) to show that the sentence (38.a) is a change that refers to a time point and the sentence (38.b) is a state.

(38) a. 墙上挂了一幅画。

qiang2shang4	gua4	le0	yi1	fu2	hua4
on_the_wall	hang	LE	one	CL	painting

A painting is hang on the wall

b. 墙上挂着一幅画。

qiang2shang4	gua4	zhe0	yi1	fu2	hua4
on_the_wall	hang	ZHE	one	CL	painting

A painting hang on the wall

(39) a. 墙上挂了一幅画以后。

qiang2shang4	gua4	le0	yi1	fu2	hua4	yi3hou4
on_the_wall	hang	LE	one	CL	painting	after

after a painting is hang on the wall

b. ? 墙上挂着一幅画以后。

qiang2shang4	gua4	zhe0	yi1	fu2	hua4	yi3hou4
on_the_wall	hang	ZHE	one	CL	painting	after

after a painting hang on the wall

(40) a. 床上什么时候躺了一个人。

chuang2	shang4	shen2me0	shi2hou0	tang3	le0
bed	on	what	time	lie	LE

yi1 ge4 ren2
one CL person
A person lied on the bed.

b. 他什么时候养了一条鱼。

ta1	shen2me0	shi2hou0	yang3	le0	yi1	tiao2	yu2
he	what	time	raise	LE	one	CL	fish

He raised a fish.

c. 他什么时候手里推了一辆自行车。

ta1	shen2me0	shi2hou0	shou3	li3	tui1	le0	yi1
he	what	time	hand	in	push	LE	one

liang4 zi4xing2che1
CL bicycle
He wheeled a bicycle in his hand.

Similarly, the sentence (41.a) denotes an inchoative and the sentence (41.b) denotes a static state; (42.a) denotes the start of a dynamic state, and (42.b) denotes a dynamic state.

(41) a. 他手里提了一个箱子。

ta1	shou3	li3	ti2	le0	yi1	ge4	xiang1zi0
he	hand	in	carry	LE	one	CL	box

He carried a box in his hand.

b. 他手里提着一个箱子。

ta1	shou3	li3	ti2	zhe0	yi1	ge4	xiang1zi0
he	hand	in	carry	ZHE	one	CL	box

He carried a box in his hand.

(42) 他手里推了一辆自行车。

ta1	shou3	li3	tui1	le0	yi1	liang4	zi4xing2che1
he	hand	in	push	LE	one	CL	bicycle

He wheeled a bicycle in his hand.

他手里推着一辆自行车。

ta1	shou3	li3	tui1	zhe0	yi1	liang4	zi4xing2che1
he	hand	in	push	ZHE	one	CL	bicycle

He wheeled a bicycle in his hand.

4.5. 过 *guo4* 'GUO'

过 *guo4* 'GUO' is usually treated as an experiential marker, meaning the kind of events happened at least once in the specified time frame (usually the past). For example, (43.a) means that there is at least one event instance in past that could be predicated as *he being on a plane*. Similarly, (43.b) means that there is at least one event instance in past that could be described as *he is in Beijing*; the sentence (43.c) means that there is at least one event instance in past that could be described as *he killed a person*.

(43) a. 他坐过飞机。

ta1	zuo4	guo4	fei1ji1
he	sit	GUO	plane

He has been on a plane.

b. 他去过北京。

ta1	qu4	guo4	bei3jing1
he	go	GUO	Beijing

He has been to Beijing.

c. 他杀过人。

ta1	sha1	guo4	ren2
he	kill	GUO	people

He once killed a person.

4.5.1. Grammaticality and World Knowledge

The most recent studies proposed that discontinuity/terminability is a semantic component of GUO (Lin, 2007; Wu, 2008). For example, the sentences in (44) are considered as unacceptable.

(44) a. ?他杀死过张三。

ta1	sha1si3	guo4	zhang1san1
he	kill	GUO	Zhangsan

He has killed Zhangsan before.

b. ?他死过。

ta1	si3	guo4
he	die	GUO

He died before.

c. ?恐龙灭绝过。

kong3long2	mie4jue2	guo4
dinosaur	become_extinct	GUO

Dinosaur once became extinct.

These different GUOs have been discussed carefully in (Zhang, 1995; Yeh, 1996; Dai, 1997; Pan and Lee, 2004; Lin, 2006&2007; Wu, 2008&2009). Yeh (1996), for example, suggested that GUO is a temple quantifier, which requires that the event happens at lease once. Pan and Lee (2004) suggested that all the observations in (44) are due to pragmatic factors. Lin (2007) gave a complicated explanation and proposed discontinuity as the semantics of GUO. Wu (2008) proposed terminability as the semantics of GUO. I would like to agree with Pan and Lee (2004) that all the effects are due to pragmatic factors and the semantics of GUO is pure experiential. For example, (44.c) is treated as unacceptable because it gives a reading that the dinosaur exists at the speech time, which is not true. However, it is not a part of the semantics of GUO. It is only implicature triggered by the contrast meaning of LE and GUO. In detail, if the dinosaur doesn't exist at the speech time, then the speaker should use LE which is current relevant rather than saying that there was a time point, at which the dinosaur became extinct, which is not current relevant. Due to the principles prosed by Grice, if the speaker chose to use GUO rather than LE, then he is probably avoiding to provide the information, which implicates that the situation should not be true as the speech time. In this sense, the (44.c) violates the cooperative principle. When the speaker is not sure whether the final state is still relevant to current, GUO could be naturally used, e.g. in (45.a). If LE is used as in (45.b), it is likely that the speaker is quite certain about the result. Once the result is clear, LE is then preferred as in (45.d).

(45) a. 你有没有偷过她的钱包？

ni3	you3mei2you3	tou1	guo4	ta1	de0	qian2bao1
you	whether_or_not steal	GUO	she	DE	purse	

Did you steal her purse / Have you stolen her purse?

b. 你是不是偷了她的钱包？

ni3	you3mei2you3	tou1	guo4	ta1	de0	qian2bao1
you	whether_or_not steal	GUO	she	DE	purse	

Did you steal her purse / Have you stolen her purse?

c. 确实偷过。

que4shi2	tou1	guo4
indeed	steal	GUO

Yes, I did.

d.偷了(/过)就还给她！

tou1	le0/guo4	jiu4	huan2	gei3	ta1	
steal	LE/GUO		then	return	give	she

Return it back if you did!

The sentences in (46) are also treated as unacceptable. I suggest that they are semantically well-formed. The unacceptance is due to tis violation to the world knowledge, e.g. human cannot become alive again once died. However, in context where resurgence is allowed, e.g. in a game, GUO could be perfectly used, as in (46.c).

(46) a. 他死过。

ta1	si3	guo4
he	die	GUO

He once died.

b. 人类存在过。

ren2lei4	cun2zai4	guo4
human	exist	GUO

Humans once existed.

c. 我杀死过他两次，他来报仇了。

wo3	sha1si3	guo4	ta1	liang3	ci4	ta1	lai2
I	kill	GUO	he	two	CL	he	come
bao4chou2	le0						
revenge	LE						

I have killed him twice. Now he comes to revenge.

4.5.2. Time Frame of GUO

There are some cases where GUO is exchangeable with LE, e.g. (47). Due to this, it was suggested that GUO here describes a perfective meaning and should be discriminated with the experiential GUO.

(47) a. 他吃过饭了。

ta1	chi1	guo4	fan4	le0
he	eat	GUO	meal	LE

He has eaten.

b. 他吃了饭了。

ta1	chi1	le0	fan4	le0
he	eat	LE	meal	LE

He has eaten.

Here, I would like to suggest that the two GUOs are the same. The implicit factor is the time frame within which GUO is discussed. Pragmatic factors have been affecting the interpretation of the sentences by providing a contextual time frame. A meal within a certain time frame implied by a certain speech time will refer to a specific event. Similarly, expectations or traditions can also provide the definiteness of the object, e.g. (48). In this example, it is expected that the cattle is expected to be castrated, e.g., in order to be able to grow faster. In addition, the repeatability is not required and even impossible in such cases.

(48) a. 这头牛阉过了。

zhe4	tou2	niu2	yan1	guo4	le0
this	CL	cattle	castrate	GUO	LE

This cattle has been castrated.

b. 这头牛阉了。

zhe4	tou2	niu2	yan1	le0
this	CL	cattle	castrate	LE

This cattle has been castrated.

It will be interesting when one kind of event is expected in one group of people while not in the other. For example, it will be common to utter sentences in (49) in a society where service in army is obligatory. However, in a society without obligatory service in army, only (49.c) could be uttered without any special context. It will need special context to utter (49.a) and (49.b).

(49) a. 他服过兵役了。

ta1	fu2	guo4	bing1yi4	le0
he	serve	GUO	serve_in_army	LE

He has served in army already.

b. 他服了兵役了。

ta1	fu2	le0	bing1yi4	le0
he	serve	LE	serve_in_army	LE

He has served in army already.

c. 他服过兵役。

ta1	fu2	guo4	bing1yi4
he	serve	GUO	serve_in_army

He has served in army already.

It is obvious that when the event doesn't imply any time frame such as meals in every day or expectations that make the object to be specific, then the time frame of GUO could be the whole past. In such cases, GUO and LE will give different interpretations.

In summary, we can see that the meaning of GUO doesn't change. If the event is only expected once in a certain time frame, then the experience of such event and the finishing of the expectation have the same consequence. Otherwise, they are different. Without context, ambiguities may be caused due to the unclear time frame, e.g. (50.a) and (51.a).

(50) a. 他吃过螃蟹了。

ta1	chi1	guo4	pang2xie4	le0
he	eat	GUO	crab	LE

He has eaten crabs before.

He has eaten the crabs.

b. 他吃了螃蟹了。

ta1	chi1	le0	pang2xie4	le0
he	eat	LE	crab	LE

He has eaten the crabs.

(51) a. 喝过酒的人才可以说话。

he1	guo4	jiu3	de0	ren2	cai2	ke3yi3	shuo1hua4
drink	GUO	wine	DE	people	then	can	speak

Only people who have drank before can speak.

Only people who have drank some wine can speak.

b. 喝了酒的人才可以说话。

he1	le0	jiu3	de0	ren2	cai2	ke3yi3	shuo1hua4
drink	LE	wine	DE	people	then	can	speak

Only people who have drank some wine can speak.

4.5.3. The Truth Condition of GUO

Now, let's discuss the semantics of GUO from the truth condition perspective. Firstly, I would suggest that experiential is intrinsically static state. Thus, it can combine with LE to denote change

of state. For example, when someone is on a plane for the first time, he can utter (52.a) to assert that he has changed his state by experiencing being on a plane. This serves as a counter example of previous suggestion that discontinuity should be a semantic element of GUO.

(52) a. 他坐过飞机了。

ta1	zuo4	guo4	fei1ji1	le0
he	sit	GUO	plane	LE

He has been on a plane.

b. 他去过北京了。

ta1	qu4	guo4	bei3jing1	le0
he	go	GUO	Beijing	LE

He has been to Beijing.

c. 他杀过人了。

ta1	sha1	guo4	ren2	le0
he	kill	GUO	people	LE

He has killed a person.

Previous discussion on discontinuity of GUO is applicable when no LE is added, e.g. in (53). In a different context, the effect could disappear. For example, if we were counting the person who has been on a plane at a reference time *t* and we saw a person was on a plane at that time, we will certainly count him in.

(53) a. 他坐过飞机。

ta1	zuo4	guo4	fei1ji1
he	sit	GUO	plane

He has been on a plane.

b. 他去过北京。

ta1	qu4	guo4	bei3jing1
he	go	GUO	Beijing

He has been to Beijing.

c. 他杀过人。

ta1	sha1	guo4	ren2
he	kill	GUO	people

He once killed a person.

Once the proposition expressed with GUO becomes true at time *t*, then it will be true at any time *t' > t*. It could be predicted that it is impossible to change from a state of having an experience to not having this experience. So, the sentences in (54) are not acceptable, unless we setup a new time frame within which the non-experience becomes true, as in (55), in which the propositions have been changed by adding an extra temporal condition.

(54) a. ?他没见过张三了。

ta1	mei2	jian4	guo4	zhang1san1	le0
he	not	meet	GUO	Zhangsan	LE

b. ?他没爱过小红了。

ta1	mei2	ai4	guo4	xiao3hong2	le0
he	not	love	GUO	Xiaohong	LE

c. ?他没写过小说了。

ta1	mei2	xie3	guo4	xiao3shuo1	le0
he	not	write	GUO	novel	LE

(55) a. 之后，他没见过张三(了)。

zhi1hou4	ta1	mei2	jian4	guo4	zhang1san1	le0
after_that	he	not	meet	GUO	Zhangsan	LE

He didn't see Zhangsan any more since then.

b. 之后，他没爱过小红(了)。

zhi1hou4	ta1	mei2	ai4	guo4	xiao3hong2	le0
after_that	he	not	love	GUO	Xiaohong	LE

He didn't love Xiaohong any more since then.

c. 之后，他没写过小说(了)。

zhi1hou4	ta1	mei2	xie3	guo4	xiao3shuo1	le0
after_that	he	not	write	GUO	novel	LE

He didn't write any novel any more since then.

The LE in (55) could be deleted. However, the sentences with and without LE are different. With LE, the pronoun 之 must be the last time the subject had the experience, which serves as the start of the state ¬GUO(P). The start qualifies the appearance of LE. Otherwise, even with a time frame the sentences are still unacceptable, as in (56).

(56) a. 周末，他没见过张三(?了)。

zhou1mo4	ta1	mei2	jian4	guo4	zhang1san1	le0
weekend	he	not	meet	GUO	Zhangsan	LE

He didn't see Zhangsan this weekend.

b. ?周末，他没爱过小红(?了)。

zhou1mo4	ta1	mei2	ai4	guo4	xiao3hong2	le0
weekend	he	not	love	GUO	Xiaohong	LE

?He didn't love Xiaohong this weekend.

c. 周末，他没写过小说(?了)。

zhou1mo4	ta1	mei2	xie3	guo4	xiao3shuo1	le0
weekend	he	not	write	GUO	novel	LE

He didn't write any novel this weekend.

One interesting phenomenon for GUO is its truth condition when taking accomplishments. Take (57) for example, it seems that GUO only requires the process part of the accomplishment to hold at a time point, rather than the result. Such phenomenon doesn't hold for achievements. It should be noted that if we change GUO into LE, the ambiguity still exist.

(57) a. 他写过(/了)一部小说，但没写完。

ta1	xie3	guo4/le0	yi1	bu4	xiao3shuo1	dan4	mei2
he	write	GUO/LE	one	CL	novel	but	not
xie3wan2							
write-finish							

?He once wrote a novel, but didn't finish it.

b. 他写过(/了)一部小说，并且出版了。

ta1	xie3	guo4/le0	yi1	bu4	xiao3shuo1	bing4qie3
he	write	GUO/LE	one	CL	novel	and
chu1ban3	le0					
publish	LE					

He once wrote a novel, and published it.

c. ?他今天看见过(/了)张三，但没见到张三。

ta1	jin1tian1	kan4jian4	guo4/le0	zhang1san1	dan4
he	today	see	GUO/LE	Zhangsan	but

mei2 dian4dao4 zhang1san1
not see Zhangsan
?He saw Zhangsan today, but didn't see him.

Finally, based on above observation, I suggest that GUO(P) actually implies LE(P) that is true at a certain time point. The ambiguity of GUO(P) is thus inherited from that of LE, e.g. when P is ambiguous in denoting different types of situations. In other words, the meaning of GUO is the same as LE except for cancelling the reference time relevant implication.

4.6. Negations

Chinese has two main different negators: 不 *bu4* and 没有 *mei2you3*. Here, I will give an analysis by observing their compatibility with different types of events. Generally, 不 has two different usages, modality and negation. With modality, it expresses a meaning of 'not willing to'. Regardless of when 不 expresses a modal meaning, I found that 不 negates static state, meaning that the state doesn't hold, while 没有 negates the existence of an event instance, meaning the event as predicated by a verb constellation doesn't exist. Negations are intrinsically static state although different negations express different types of static states.

4.6.1. 不 *bu4*

In Chinese, 不 *bu4* is complicated in terms of its syntactic properties and the verbs that it can combine with. Here, I would like to propose two different sense of 不. The first 不 negates static states in a general sense including habitual. The second 不 expresses a modality of the speaker or a modal state of the subject. The modal 不 can be substituted with some explicit modal auxiliaries, while the negator 不 cannot. For example, sentences in (58) express non-modal negation, while sentences in (59) express subject's modality.

(58) a. 他不在。
ta1 bu4 zai4
he not be_at
He is not here.

b. 他不抽烟。
ta1 bu4 chou1 yan1
he not smoke cigarette
He doesn't smoke.

c. 他不喜欢那本书。

ta1	bu4	xi3huan1	na4	ben3	shu1
he	not	like	that	CL	book

He doesn't like that book.

(59) a. 他不抽完那只烟。

ta1	bu4	chou1	wan2	na4	zhi1	yan1
he	not	smoke	finish	that	CL	cigarette

He doesn't finish that cigarette.

b. 他不抽那只烟。

ta1	bu4	chou1	na4	zhi1	yan1
he	not	smoke	that	CL	cigarette

He doesn't smoke that cigarette.

It is possible that some sentences can be ambiguous on whether expressing modality or negating a general state, as in (60.a) which could be interpreted as either modality in (60.b) or generic in (60.c).

(60) a. 他不给我钱。

ta1	bu4	gei3	wo3	qian2
he	not	give	me	money

He doesn't give me money.

b. 我给了他书，他不给我钱。

wo3	gei3	le0	ta1	shu1	ta1	bu4	gei3	wo3	qian2
I	give	LE	he	book	he	not	give	me	money

He doesn't give me money.

c. 上大学以后，他不给我钱。

shang4	da4xue2	yi3hou4	ta1	bu4	gei3	wo3	qian2
go	university	after	he	not	give	me	money

He doesn't give me money after I went to university.

As discussed in previous chapter that some verb constellations with pattern 'V+Num+CL+NP' usually cannot denote generic or habitual static state. It is then predicted that they are not compatible with 不 *bu4* to denote generic states, e.g. (61). The only possible interpretation for (61) is the modal reading, while 一 *yi1* 'one' should be interpreted as universal quantifier, similar as 'every' or 'any'.

(61) a. ?他不抽完一只烟。

ta1	bu4	chou1	wan2	yi1	zhi1	yan1
he	not	smoke	finish	one	CL	cigarette

He doesn't smoke.

b. ?他不抽一只烟。 (universal quantifier rather than a specific entity)

ta1	bu4	chou1	yi1	zhi1	yan1
he	not	smoke	one	CL	cigarette

He doesn't smoke.

c. ?他不打碎一个杯子。

ta1	bu4	da3sui4	yi1	ge4	bei1zi0
he	not	hit-broken	one	CL	cup

He broke a cup.

Some events that we cannot control to let them happen, but we can control not to let them happen. For example, the non-volitional verb 赢 *ying2* 'win' once negated will show volitional possibility or modality of the subject, e.g. willingness.

(62) 他不赢那场比赛。

ta1	bu4	ying2	na4	chang3	bi3sai4
he	not	win	that	CL	game

He doesn't win that game.

Some verbs cannot show this possibility, meaning that whether it happens or not cannot be directly controlled, e.g. (63). One possible interpretation for (63) is the anti-expectation modality of the speaker as in (64).

(63) a. ?他不死。

ta1	bu4	si3
he	not	die

He doesn't die.

b. ?他不掉进坑里。

ta1	bu4	diao4	jin4	keng1	li3
he	not	fall	into	pit	inside

He doesn't fall into the pit.

(64) a. 我希望他死，可是他不死。

wo3	xi1wang4	ta1	si3	ke3shi4	ta1	bu4	si3
I	wish	he	die	but	he	not	die

I wish he die, but he doesn't.

b. 我希望他掉进坑里，可是他不掉进去。

wo3	xi1wang4	ta1	diao4	jin4	keng1	li3	ke3shi4
I	wish	he	fall	into	pit	inside	but

ta1	bu4	diao4	jin4	keng1	li3
he	not	fall	into	pit	inside

I wish he fall into the pit, but he doesn't.

Another observation is that 不 *bu4* is preferred to be used to negate static state, e.g. (65). Dynamic state is more preferred to be negated with 没 *mei2* or 没有 *mei2you3*, although 不 *bu4* is also acceptable with 在 *zai4* 'ZAI' by some native speakers.

(65) a. 他不在抽烟。

ta1	bu4	zai4	chou1yan1
he	not	ZAI	smoke

He doesn't smoke that cigarette.

b. 他不抽着烟。

ta1	bu4	chou1	zhe0	yan1
he	not	smoke	ZHE	cigarette

He doesn't smoke that cigarette.

Usually, LE and GUO could not be negated by 不 *bu4*, e.g. (66). The reason is that GUO basically denotes the existence quantifier ∃ referring to a fact in the past. LE denotes the finishing of a situation, which also implies the existential quantifier '∃'. It would be odd for the subject to express a willingness to change a fact.

(66) a. ?他不抽过烟。

ta1	bu4	chou1	guo4	yan1
he	not	smoke	GUO	cigarette

He doesn't want to have smoked.

b. ?他不爱过张三。

ta1	bu4	ai4	guo4	zhang1san1
he	not	love	GUO	Zhangsan

He doesn't want to have loved Zhangsan.

(67) a. ?他不抽了烟。

ta1	bu4	chou1	le0	yan1
he	not	smoke	LE	cigarette

He doesn't want to have smoked some cigarette.

b. ?他不打碎了一个杯子。

ta1	bu4	da3sui4	le0	yi1	ge4	bei1zi0
he	not	hit-broken	LE	one	CL	cup

He doesn't want to have broken a cup.

In summary, the function of 不 is to negate a state. Whether a verb constellation is compatible with 不 depends on whether it could possibly denote a state. Habitual can be negated by 不 *bu4*, e.g. (68.a). However, 打碎一个杯子 *da3sui4 yi1 ge4 bei1zi0* 'break a cup' is not possible to denote a state, thus it is incompatible with 不 negation, as (68.b). Meanwhile, the negated state by 不 *bu4* contains volitional or modality meaning held either by the speaker (non-volitional predicates) or the subject (volitional predicates).

(68) a. 他不经常抽烟。

ta1	bu4	jing1chang2	chou1yan1
he	not	often	smoke

He doesn't smoke that cigarette.

b. ?他不打碎一个杯子。

ta1	bu4	da3sui4	yi1	ge4	bei1zi0
he	not	break	one	CL	cup

?He doesn't break a cup.

4.6.2. 没有 *mei2you3*

Generally, 没有 *mei2you3* is much simpler than 不 *bu4*. 没有 negates the existence of an event instance, e.g. (69). It is a meta-negator '¬∃' and doesn't contain any modal meaning. 没有 can

negate static state, (69.a), dynamic state, (69.b), activity, (69.c), achievement, (69.d), accomplishment (69.e), habitual (69.f) and experiential (69.g).

(69) a. 他没有喜欢那本书。

ta1	mei2you3	xi3huan1	na4	ben3	shu1
he	not	like	that	CL	book

He doesn't like that book.

b. 他没有在抽烟。

ta1	mei2you3	zai4	chou1yan1
he	not	ZAI	smoke

He doesn't smoke that cigarette.

c. 他没有抽烟。

ta1	mei2you3	chou1yan1
he	not	smoke

He doesn't smoke that cigarette.

d. 他没有死。

ta1	mei2you3	si3
he	not	die

He didn't die.

e. 他没有写一封信。

ta1	mei2you3	xie3	yi1	feng1	xin4
he	not	write	one	CL	letter

He doesn't like that book.

f. 他没有经常抽烟。

ta1	mei2you3	jing1chang2	chou1yan1
he	not	often	smoke

He didn't smoke very often.

g. 他没有抽过烟。

ta1	mei2you3	chou1	guo4	yan1
he	not	smoke	GUO	cigarette

He didn't ever smoke.

When the static state is an individual predicate, e.g. the negation by 没有 *mei2you3* should actually be interpreted as the meaning of 'becoming' whose positive form is (70.b) rather than (70.c). Although (69.a) also has similar interpretation, (70.a) doesn't have the similar interpretation as (69.a).

(70) a. 她没有漂亮。

ta1	mei2you3	piao4liang4
she	not	beautiful

She didn't become more beautiful.

b. 她漂亮了。

ta1	piao4liang4	le0
she	beautiful	LE

She has become more beautiful.

c. 她很漂亮。

ta1	hen3	piao4liang4
she	very	beautiful

She didn't become more beautiful.

The object with pattern 'V+Num+CL+NP' in negation by 没有 *mei2you3* should usually be interpreted as specific entity as 'some' or universal quantifier as 'every' or 'any'. With the universal quantifier interpretation, the sentences in (71) are the same as that with GUO in (72).

(71) a. 他没有喜欢一本书。

ta1	mei2you3	xi3huan1	yi1	ben3	shu1
he	not	like	one	CL	book

He didn't like some book/he didn't like any books.

b. 他没有写完一封信。

ta1	mei2you3	xie3	wan2	yi1	feng1	xin4
he	not	write	finish	one	CL	letter

He didn't finish writing some letter/he didn't finish writing any letters.

c. 他没有打碎一个杯子。

ta1	mei2you3	da3sui4	yi1	ge4	bei1zi0
he	not	hit-break	one	CL	cup

He didn't break some cup/he didn't break any cups.

b. 他没有写一封信。

ta1	mei2you3	xie3	yi1	feng1	xin4
he	not	write	one	CL	letter

He didn't write some letter/he didn't write any letters.

(72) a. 他没有喜欢过一本书。

ta1	mei2you3	xi3huan1	guo4	yi1	ben3	shu1
he	not	like	GUO	one	CL	book

He doesn't like any books.

b. 他没有写完过一封信。

ta1	mei2you3	xie3	wan2	guo4	yi1	feng1	xin4
he	not	write	finish	GUO	one	CL	letter

He didn't finish writing any letters.

c. 他没有打碎过一个杯子。

ta1	mei2you3	da3sui4	guo4	yi1	ge4	bei1zi0
he	not	hit-break	GUO	one	CL	cup

He didn't break any cups.

d. 他没有写过一封信。

ta1	mei2you3	xie3	guo4	yi1	feng1	xin4
he	not	write	GUO	one	CL	letter

He didn't write any letters.

In summary, the function of 没有 *mei2you3* is to negate the existence of instances of events, which is a meta-negator functioning as '¬∃', while 不 bu4 is a static predicate negator. 不 *bu4* can also be a modal auxiliary to express the unwillingness of the speaker to perform some actions. For some individual level predicates, e.g. 漂亮 *piao4liang4*, 矮 *ai3* 'low', etc., when negated by 没有, they will be coerced into the meaning of 'becoming' which is actually achievement rather than state.

4.7. Summary

In this chapter, I discussed the semantics of Chinese aspectual markers, 着 *zhe0* 'ZHE', 了 *le0* 'LE', 过 *guo4* 'GUO', 在 *zai4* 'ZAI' and the negators, 不 *bu4* and 没有 *mei2you3*. I showed that that they are the linguistic devices with which different linguistic event types are expressed.

I also discussed the compatibilities between aspectual markers and different situation types. I suggested that, semantically, there is only one single LE and GUO. I also argued that the semantics of GUO are different from LE in that GUO is an experiential marker, while LE is a perfective marker. The different meanings of them that have been discussed in previous studies are due to their combination with different situation types and the positions they are placed, e.g. V+LE+O, V+O+LE.

Finally, I discussed the functions of two Chinese negators BU and MEI also from the perspective of their compatibility with different situation types. I also explained why some situation types are incompatible with BU or MEI.

Chapter 5

Formal Representation of Aspect

In this chapter, I will give formal representations for different ontological situations and the corresponding linguistic event types discussed in Chapter 3. The aspectual markers and negators discussed in Chapter 4 will also be revisited in the perspective of formal representation. The purpose for doing this is first to describe the situations more accurately, based on which we can study their semantic entailments. Secondly, with the formal representation, we could understand how situation aspect and viewpoint aspect cooperate with each other to form linguistic events.

5.1. Introduction

5.1.1. Second Order Logic

In the formal representation, I adopt the second order logic. Compared with first order logic, second order logical allows the following form.

$$\lambda_P \lambda_x [P(x)]$$

This formula says that there exists a predicate P, such that there is an individual x that is an instance of type P. In other words, second order allows individuals in different domains appear in the same formula. In this formula, P is an individual in the domain of predicate, while x is an individual in the domain defined by P. Actually, mostly the first order logic can satisfy the semantic representation. However, I will show that the representation of habitual and the semantics of Chinese aspectual marker 过 *guo4* 'GUO' all require second order logic.

5.1.2. Predicates and Parameters

According to Parsons (1989), which follows and improves Davidson (1967)'s convention, an event *e* could be represented with the following frame.

$$\exists_e [P(e) \wedge \Theta_1(x, e) \wedge \Theta_2(y, e) \wedge \Theta_3(z, e) \wedge \zeta(e)]$$

Where P is the event type, e.g. running, Θ_i stands for the thematic roles and ζ encodes the grammatical aspect information, including the relation between event time and reference time, speech time etc. Here, I will adopt the treatment of event instance *e* as an independent argument. An event instance *e* of class *P* is represented as $P(e)$.

For example, *raining(e)* denotes a raining event *e*. Generally, a predicate corresponds to a class (kind). Physical objects could also be represented in this way. For example, *human(ZhangSan)* denotes a human instance (individual) Zhang San. Sometimes, a predicate also requires parameters in various numbers. To avoid the controversy of identification of thematic role types, I don't split them into different predicates but encode them in the predicate *P*. This is reasonable since the focus here is not to deal with semantic entailments and other issues than aspect. So, two independent brackets could be used. The first is for the instance, the second is for the parameters. For example, the following formula could be interpreted as '*e* is an instance of type *P(x,y,z)*'.

$$P(e)(x, y, z)$$

All and only the situation aspect information are then encoded in the instance parameter *e*. Such kind of predicates only corresponds to ontological information and viewpoint aspect that may change the situation type. The grammatical aspect in terms of perfective and imperfective will be given by the predicates that reflect the temporal relations between situation instance *e* and the reference time. This means that I will give definition for the details of the predicate $\zeta(e)$ as shown above.

5.1.3. Class, Instance and Subclass

For the definitions of basic concepts, I adopt (Pease 2011). Class is defined as a category of objects that have several characteristics fundamental to their identities. *A is an instance of Class B* means that *A* is an existing object in the domain of *B*. *Class* and *instance* are relative. It is possible that *A* is an instance of *B* in the domain of *B'*, while *B* is an instance of *C* in the domain of *C'*. For example, *concept* is an instance of *class*; *class* is an instance of *concept*. *Class* is an instance of *class*. *Concept* is an instance of *concept*.

Take the sentences in (1) for example. *Swimming* is a class that covers all individual swimming event instances that happened in the world as (1.a). *Swimming* is also a subclasss of *sport* as (1.b). S*wimming* is also an instance of *concept* as (1.c).

(1) a. 张三刚才游泳了。

zhang1san1	gang1cai2	you2yong3	le0
Zhangsan	just_now	swim	LE

Zhangsan swam just now.

b. 游泳是一种很健康的运动。

you2yong3	shi4	yi1	zhong3	hen3	jian4kang1	de0
swim	be	one	kind	very	healthy	DE
yun4dong4						
exercise						

Swimming is a kind of healthy exercise.

c. 游泳是一个重要的概念。

you2yong3	shi4	yi1	ge4	zhong4yao4	de0	gai4nian4
swim	be	one	CL	important	DE	concept

Swimming is an important concept.

The subclass relation has the property of transitivity. If *A* is a subclass of *B*, *B* is a subclass of *C*, then *A* is also a subclass of *C*. For example, if human is a subclass of mammal and mammal is a subclass of sentient beings, then human is a subclass of sentient beings. Correspondingly, if *a* is an instance of *A*, then for any class *X* that *A* is a subclass of *X*, *a* is also an instance of *X*. For example, Zhang San is an instance of human. Then Zhang San is also an instance of mammal and sentient beings. As for the example in (2), Zhang San's swimming is an instance of swimming, and swimming is a subclass of exercise. So Zhang San's swimming is an instance of exercise.

Instance relation doesn't show the property of transitivity. If *A* is an instance of *B*, *B* is an instance of *C*, then it is not necessary the case that *A* is an instance of *C*. Actually, the relation of '*A* is an instance of *B*' and that of '*B* is an instance of *C*' must be in different domains. For example in (2), Zhang San's swimming is an instance of swimming, and swimming is an instance of concept. However, it is not the case that Zhang San's swimming is an instance of *concept*.

From linguistic perspective, the subclass relation is usually described by the pattern 'A is a kind of B', while the instance of relation is usually described by the pattern 'A is a B'. In Chinese, we can use 种 'kind' and 个 'individual' to express subclass and instance respectively.

5.1.4. Attributes, Functionalities and Habits

5.1.4.1. Attributes

An attribute is a meta-relation between two classes. It says that if class *A* is an attribute of class *B*, then for any instance *x* of type *B*, there is always an instance *x'* of type *A*, that is an attribute of the instance *x*. The formula is shown as follows.

$$Attribute(P,Q) \vDash \lambda_A\lambda_B\left[class(P) \wedge class(Q) \wedge \forall_e\left[Q(e) \rightarrow \exists_{e'}[P(e')(e)]\right]\right]$$

The symbol '⊨' in the formula means 'imply' or 'entail' rather than 'equal to', i.e. the succedent of the formula only shows a part of the semantics of the antecedent. For example, height is an attribute of physical objects. Then, all instances of sentient beings, e.g. a dog, have an instance of age. Attribute corresponds to its possessor and cannot stand alone without its possessor. This can be represented as follows.

$$Attribute(height, physical\_obj) \vDash \forall_x [physical\_obj(x) \rightarrow \exists_h [height(h, \mathrm{x})]]$$

Attribute instance has a value as what can describe it. For example, 'John is 1.8 meters high' could be represented as follows. Values can change according to time

$$height(1.8m, John)$$

This formula says that *e* is an instance of the attributive state of Zhang San being 1.8 meters high.

Physical objects have spatial attribute. The value of the location depends on a specific spatial system. Events have temporal location a starting time and an ending time. Similar as spatial attribute, the value of the temporal location relies on a specific time system, e.g. the Gregorian system. In a general sense, every entity has its life time in a time system. Like events, physical objects also have a life time in which they exist.

$$Attribute(time\_location, entity)$$

5.1.4.2. Functionalities

Functionality is defined as a relation between a situation type and a class, meaning that this kind of situation can happen on an individual of the class. Generally, we can treat functionality a special kind of attribute, which refers to dynamic situations that may occur on the subject. The representation for functionality is shown as follows.

$$functionality(P, Q) \vDash \lambda_A \lambda_B \left[class(Q) \wedge event\_class(P) \wedge \forall_x \left[Q(x) \rightarrow \Diamond \exists_y [P(y)(x)] \right] \right]$$

For example, 'humans run' describe a possibility that for any individual of human, it is possible that he could be the agent (in this case) of a running situation. It can be shown as follows.

$$functionality(running, human) \vDash \forall_x \left[human(x) \rightarrow \Diamond \exists_e [running(e)(x)] \right]$$

It is possible that some actions or situations are only possibly performed by certain individuals. In other words, the situation is not in the class level, but only specific to some individuals. For example, 'John smokes' can be defined as follows.

$$functionality(smoking, John) \vDash \Diamond \exists_e [smoking(e)(x)]$$

5.1.4.3. Habituals

Habituals also describe a relation between a situation type and a class or individual. However habit is different from functionality that it requires that there is at least one instance of such kind of situation in the period within which the habit is talked about. Formally, habit can be defined as follows.

$$habit(e)(P,x) \vDash \lambda_e\lambda_A\lambda_x\big[static\_state(e) \wedge situation\_type(P) \wedge individual(x) \wedge \square\exists_{e'}[P(e')(x)]\big]$$

This formula says that habitual requires that the predicated situation should have happened for some times. We can also add further conditional to constrain the predicate *P*. For example, we can add time constrain as follows.

$$habit(e)(P,i,x) \vDash \lambda_e\lambda_A\lambda_x\big[static\_state(e) \wedge time\_inverval(i) \wedge situation\_type(P) \wedge individual(x) \wedge \square\exists_{e'}\exists_{i'}[P(e')(x) \wedge time\_location(i',e') \wedge i' \subset i]\big]$$

The sentence (2.a) shows an example of habitual. The sentence (2.b) is acceptable that the first sub sentence describes a function while the second describe that he doesn't have the habit of smoking last year. The two sentences don't contradict to each other.

(2) a. 张三每天早上锻炼。

zhang1san1	mei3tian1	zao3shang4	duan4lian4
ZhangSan	every_day	morning	do_exercises

$\exists_e[habit(e)(do\_exercise, Morning, ZhangSan)]$

b. 张三抽烟，但他去年没抽。

zhang1san1	chou1yan1	dan4	ta1	qu4nian2	mei2	chou1
ZhangSan	smoke	but	he	last_year	not	smoke

ZhangSan smokes, but he didn't smoke last year.

5.1.5. Instances of Situations

An instance of an ontological situation has the property of life time as its intrinsic attribute. For example, an instance of a static or dynamic state includes the whole period within which the state holds. An instance of change of state is an object, whose life period is logically instantaneous. For example, 'Zhang San died' describes a change from the state of Zhang San being alive to the state of Zhang San being dead. The time point where the change happens is focused. The whole period

where Zhang San is alive and the whole period where Zhang San is dead are not encoded but only implied by the event of *dying*.

The boundary of the instances of complex situations, e.g. accomplishment, should be discussed independently. Take accomplishment for example. Accomplishment is composed by a dynamic state with a final state. Similar as the treatment of change of state that the previous stat and succeeding state are not parts of the situation although they are implied, the final state of an accomplishment is also not a part of the situation, but only implied by it. For example, an instance of writing a letter ends immediately when the letter comes about.

It is not necessary that an instance of a certain situation type must have a reference in the real world. It can be possibly an imaginary or a specific one that is expected or arranged, e.g., 'there is a meeting tomorrow morning', 'we need to have a meeting' etc. Once an instance has a reference in the real world, it then has the attribute of location in both time axis and possibly space in terms of its participants.

For situations with a specific viewpoint aspect, the life time is considered based on the resultant situation. For example, 'he started running' describes an instantaneous situation, the final state of which is the dynamic state of *running*. The treatment is quite straight forward that 'start running' and 'running' are two different instances which have their referents overlapped in real world. In this way, we can easily capture the fact that different linguistic events actually correspond to parts of the same situation.

5.1.6. Multi-modal Predicates in Natural Language

The phenomena that a verb that corresponds to one certain situation type could be realized in sentences with different numbers of arguments in different contexts are called multi-modality. Take the sentences in (3) for example, different constituents could be added. Although some of them are treated as adjuncts, we still need a way to differentiate them in the formal representation. Meanwhile, it is also important to discuss why some arguments could be omitted in some context and which kinds of optional arguments could be possibly added.

(3) a. 张三在看书。

zhang1san1	zai4	kan4	shu1
Zhangsan	ZAI	read	book

Zhangsan is reading a book.

b. 张三在家里看书。

zhang1san1 zai4 jia1li3 kan4 shu1

Zhangsan ZAI home read book

Zhangsan is reading a book at home.

c. 张三晚上在家里看书。

zhang1san1 wan3shang4 zai4 jia1li3 kan4 shu1

Zhangsan evening ZAI home read book

Zhangsan was reading a book at home in the evening.

d. 张三晚上在家里戴着眼睛看书。

zhang1san1 wan3shang4 zai4 jia1li3 dai4 zhe0 yan3jing4

Zhangsan evening ZAI home wear ZHE glasses

kan4 shu1

read book

Zhangsan was reading a book with glasses at home in the evening.

In (3), we have four different predicates that describe the same situation type. However, this is not what we want. One solution is to give an abstract definition for event, e.g. *event(e)* means that *e* is an event instance. Reading is then generalized as an event *e*, which could be performed by an agent *a*. The time and spatial location of *e* are then explicitly assigned through some basic spatial and temporal systems.

$$reading(e) \vDash \lambda_e \left[dyn(e) \wedge \exists_{x,y}[agent(x,e) \wedge theme(y,e)]\right]$$

Through lamda extraction, we can produce a two-place predicate as follows.

$$reading(e)(x,y) \vDash \lambda_e \lambda_{x,y}[dyn(e) \wedge agent(x,e) \wedge theme(y,e)]$$

If the instrument part is expressed in the formula, we can also produce a three-place predicate as follows.

$$reading(e)(x,y,z) \vDash \lambda_e \lambda_{x,y,z}[dyn(e) \wedge agent(x,e) \wedge theme(y,e) \wedge instrument(z,e)]$$

In this way, a basic predicate can be used to generate more predicates which refer to the same situation type.

5.2. The Basic Predicates Related to Time

Time *t* refers a point located in a time axis. The predicate *timepoint* is an atomic predicate that is a reference linked to an external system.

$$time(t) \equiv \lambda_t \exists_T [timesystem(T) \wedge timepoint(t)(T)]$$

Time interval is a set of continuous time points in an implicit time system. The following definition is based on the predicate *time*.

$$time\_interval(i)(t_1, t_2) \equiv \lambda_i \lambda_{t_1,t_2} [time(t_1) \wedge time(t_2) \wedge \mathrm{i} = \{t | t_1 \leq t \leq t_2\}]$$

The boundary of the time interval could be hidden in the expression. This concerns that fact that we can use '一段时间' to refer to a time interval with indefinite start and end.

$$time\_interval(i) = \lambda_i \exists_{t_1,t_2} [time\_interval(i)(t_1, t_2)]$$

The duration rather than the period of time could be explicitly stated by producing a new predicate with two arguments.

$$duration(d, i) \equiv \lambda_d \lambda_i \exists_{t_1,t_2} [time(t_1) \wedge time(t_2) \wedge time\_interval(i)(t_1, t_2) \wedge d = t_2 - t_1]$$

The start and the end of a time interval could also be referred to by the following predicates.

$$i\_start(t, i) \equiv \lambda_t \lambda_i \left[time(t) \wedge \exists_{t_2} [time(t_2) \wedge time\_interval(i)(t, t_2)]\right]$$

$$i\_end(t, i) \equiv \lambda_d \lambda_i \left[time(t) \wedge \exists_{t_1} [time(t_1) \wedge time\_interval(i)(t_1, t)]\right]$$

The following is an axiom to say that every entity have a time location attribute. As discussed before, every entity actually takes an area in the 4-D space. For some entities, it is hard to say when their starts and ends are in the time axis. However, it is assumed that everything has a lifetime, defined as follows, for its existence in the 3-D space.

$$lifetime(d, e) \equiv \lambda_d \lambda_e \exists_i [time\_interval(i) \wedge time\_location(i, e) \wedge duration(d, i)]$$

5.3. Representations for Ontological Situations

In this section, the representations for ontological situations, which only concern the internal structures without considering external elements including reference time and speech context, are given with some illustrative examples.

5.3.1. Representations for state and change of state

Static state is homogeneous. Every sub event of a static state is the same kind of state. It can be defined as follows.

$$static(e) \equiv \lambda_e \exists_P \Big[P(e) \ \wedge \nexists_{r,P'}[subclass(r,P',P) \wedge P'(e)] \\ \wedge \forall_{e'}[\exists_r[subevent(r,e',e)] \rightarrow P(e')]\Big]$$

Different static state, dynamic state is not completely homogeneous (Smith 1991). For some of its sub events that are short enough, they could not be called the same kind of state. For example, in a running process, the agent performs a serial of actions which together could be called as running. Suppose we can only make an observation for one second. It is hard to say what the agent is doing, if we only perceived an action of raising a leg by the agent.

$$dyn(e) \equiv \lambda_e \exists_P \Big[P(e) \ \wedge \nexists_{r,P'}[subclass(r,P',P) \wedge P'(e)] \\ \wedge \exists_{e'} \exists_r[subevent(r,e',e) \wedge \neg \mathrm{P}(\mathrm{e}')]\Big]$$

A general state is defined as either a static state or a dynamic state.

$$state(e) \equiv \lambda_e[static(e) \vee dyn(e)]$$

Similarly, we can refer to the start time and end time of a state by defining the following predicates.

$$start\_time(t,e) \\ \equiv \lambda_t \lambda_e[state(e) \wedge time(t) \wedge \exists_i[time\_interval(i) \wedge time\_location(i,e)] \\ \wedge i\_start(t,i)]$$

$$end\_time(t,e) \equiv \lambda_t \lambda_e\big[state(e) \wedge time(t) \\ \wedge \exists_i[time\_interval(i) \wedge time\_location(i,e) \wedge i\_end(t,i)]\big]$$

As mentioned above, a change is an instant event which encodes a start of one state and an end of another state. However, the two implied states are not a part of the change event. This is similar to the object 门 *men2* ‘door’, which could be defined as something that is embedded in a wall. However, the concept of 门 *men2* doesn’t encode any part of the wall. Another evidence for this treatment is that changes do allow no explicitly specifying of any states before or after the change, the first predicate exists, e.g. 他变了 *ta1 bian4 le0* ‘He changed’. An instant event can be defined as follows.

$$instant(e) \equiv \lambda_e \exists_{t,i}[time\_interval(i)(t,t) \wedge time\_location(i,e)]$$

An instant event that happens at time *t* could be defined as follows.

$$instant(e)(t) \equiv \lambda_t[instant(e)](t)$$

A change is defined as an instant event that happens at time *t*, at which one state ends and the other state starts.

$$change(e) \equiv \lambda_e \exists_t \exists_{e_1,e_2}[state(e_1) \wedge state(e_2) \wedge time(t) \wedge instant(e)(t) \wedge end\_time(t, e_1) \wedge start\_time(t, e_2)]$$

Similarly, we can define some related predicates with explicit arguments as follows.

$$change(e)(t) \vDash \lambda_e \lambda_t[change(e)](t)$$

$$change(e)(e_1, e_2) \vDash \lambda_e \lambda_{e_1,e_2}[change(e)](e_1, e_2)$$

$$change(e)(t, e_1, e_2) \vDash \lambda_e \lambda_{t,e_1,e_2}[change(e)](t, e_1, e_2)$$

Semelfactive is a special kind of dynamic state. Although semelfactive is usually treated as instantaneous, it also takes some time. However, the duration is very short and is usually naturally determined. For example, we cannot imagine lengthening the duration of a cough. Semelfactive is defined as follows, while the symbol '∼' means that they are very close to each other.

$$semel(e) \equiv \lambda_e \Big[dyn(e) \wedge \exists_{t_1,t_2} \exists_i [time(t_1) \wedge time(t_2) \wedge t_1 \sim t_2 \wedge time\_interval(i)(t_1, t_2) \wedge time\_location(i, e)]\Big]$$

We can see that it is necessary that a semelfactive is generally a dynamic state, i.e. the following formula holds.

$$\forall_e[semel(e) \rightarrow dyn(e)]$$

5.3.2. Representations for Complex Situations

5.3.2.1. Accomplishment

Accomplishment is defined as a combination of a dynamic process, with a final change from the dynamic state and a final state, which could be either static or dynamic. Thus, an accomplishment e encodes the whole dynamic state e_1 and a change e_2 from e_1 to e'.

$$accs(e) \vDash \lambda_e \exists_{e',e_1,e_2} \exists_{t_1,t_2} [dyn(e_1) \wedge start(t_1)(e_1) \wedge end(t_2)(e_1) \wedge static(e') \wedge change(e_2)(t_2, e_1, e') \wedge e = e_1 + e_2]$$

$$accd(e) \vDash \lambda_e \exists_{e',e_1,e_2} \exists_{t_1,t_2} [dyn(e_1) \wedge start(t_1)(e_1) \wedge end(t_2)(e_1) \wedge dyn(e') \wedge change(e_2)(t_2, e_1, e') \wedge e = e_1 + e_2]$$

A general term for accomplishment could be defined by generalized the final state e_2 as follows.

$$acc(e) \vDash \lambda_e \exists_{e',e_1,e_2} \exists_{t_1,t_2} [dyn(e_1) \wedge start(t_1)(e_1) \wedge end(t_2)(e_1) \wedge state(e') \wedge change(e_2)(t_2, e_1, e') \wedge e = e_1 + e_2]$$

5.3.2.2. Instantaneous Accomplishment

Similarly, instantaneous accomplishment is defined as a combination of a semeflactive with a final change from the dynamic state and a final state, which could be either static or dynamic.

$$insaccs(e) \vDash \lambda_e \exists_{e',e_1,e_2} \exists_{t_1,t_2} [semel(e_1) \wedge start(t_1)(e_1) \wedge end(t_2)(e_1) \wedge static(e') \wedge change(e_2)(t_2, e_1, e') \wedge e = e_1 + e_2]$$

$$insaccd(e) \vDash \lambda_e \exists_{e',e_1,e_2} \exists_{t_1,t_2} [semel(e_1) \wedge start(t_1)(e_1) \wedge end(t_2)(e_1) \wedge dyn(e') \wedge change(e_2)(t_2, e_1, e') \wedge e = e_1 + e_2]$$

A general term for instantaneous accomplishment could be defined by generalized the final state e_2 as follows.

$$insacc(e) \vDash \lambda_e \exists_{e',e_1,e_2} \exists_{t_1,t_2} [semel(e_1) \wedge start(t_1)(e_1) \wedge end(t_2)(e_1) \wedge state(e') \wedge change(e_2)(t_2, e_1, e') \wedge e = e_1 + e_2]$$

5.4. Linguistic Event Types

In this section, semantic representation of linguistic events will be given. As we mentioned in Chapter 3, linguistic events are actually predicates of relations between an ontological situation and a reference time or duration. In other words, a linguistic event is an ontological situation that is put in a specific position in time axis.

$$holds(e, t) \equiv \lambda_e \lambda_t \big[state(e) \wedge time(t) \wedge \exists_i [time\_location(i, e) \wedge t \in i] \big]$$

The above formula says that based on the perception of the speaker, time *t* is within the time location of *e*. Even though the end of the time location of ontological state *e* is in future, the speaker is still sure about his judgment. This happens when the speaker refers to an ongoing state, e.g. “Look! He is running”. The speaker doesn’t know when the subject started his running. Neither does he know when he will stop. However, the statement he made is still true.

$$holds(e,i) \equiv \lambda_e \lambda_i \left[state(e) \wedge time\_interval(t) \wedge \exists_{i'} [time\_location(i', e) \wedge i \subset i'] \right]$$

For convenience, I will use '$' to indicate a contextual variable, meaning that the value of the variable should be determined in the conversational context. For example, '*$Yesterday*' refers to the date before the day of the utterance. Without confusing, I will also use capitalized constant without detailed explanation. For example, '*AnHour*' and '*ThreeWeeks'* are two time periods; 'ZhangSan' and 'Lisi' are two individual persons.

5.4.1. Static State: ---

5.4.1.1. Attributive

The following formula defines a new ontological static state 'uncomfortable' based on static(e).

$$uncomfortable(e)(x) \vDash \lambda_e \lambda_x [static(e) \wedge animal(x) \wedge experiencer(x, e)]$$

A linguistic event based on this is shown in (4). The corresponding logical form shows that it actually implies a predicate stating that the corresponding state holds at the speech time although it is not explicitly uttered. The meaning component '$holds(e, SpeechTime)$' in (4.a) is given by a pragmatic factor, while '$holds(e, JustNow)$' is explicitly expressed in sentence.

(4) a. 张三不舒服。

zhang1san1	bu4	shu1fu2
Zhangsan	not	comfortable

$\exists_e [uncomfortable(e)(ZhangSan) \wedge holds(e, \$SpeechTime)]$

b. 张三刚刚不舒服。

zhang1san1	gang1gang1	bu4	shu1fu2
Zhangsan	just_now	not	comfortable

$\exists_e [uncomfortable(e)(ZhangSan) \wedge holds(e, \$JustNow)]$

This following formula says that for a linguistic event of static state, there is an argument of time *t*, which is usually the speech time unless an explicit time is specified and necessarily within the life cycle of the static state *e*.

$$tall(e)(x) = \lambda_x \exists_h \exists_c [static(e) \wedge phy\_obj(x) \wedge height(h, x) \wedge h > c]$$

In this formula, c is the criteria based on which being tall is defined. This formula tells us that when we say a physical object is tall, we actually refer to its height attribute. An example is shown in (5).

(5) a. 张三很高。

zhang1san1	hen3	gao1
Zhangsan	very	tall

$\exists_e[tall(e)(ZhangSan) \wedge holds(e, \$SpeechTime)]$

b. ?张三刚才很高。

zhang1san1	gang1cai2	hen3	gao1
Zhangsan	just_now	very	tall

$\exists_e[tall(e)(ZhangSan) \wedge holds(e, \$JustNow)]$

Comparing to (4), we can see the difference of 高 *tao1* 'tall' and 不舒服 *bu4 shu1fu2* 'uncomfortable', which suggests that they are different kinds of predicates. As implied by previous linguistic studies, 高 *tao1* 'tall' is an individual level predicate; while 不舒服 *bu4 shu1fu2* 'uncomfortable' is stage-level predicates. However, I would suggest that this is caused beyond semantic level. Pragmatic factors may introduce some other semantic elements when a time adverbial is used. For example, 刚才 *gang1cai2* 'just now' may implicate that the predicated state only holds at time period that 'just now' refers to. The difference of stage-level and individual-level state will not be discussed.

Attributive for class is usually called generic statement as exemplified in (6) and (7). According to the definition of attributes, we cannot interpret (6) as $\forall_h[human(h) \rightarrow has\_two\_legs(h)]$ and (7) as $\forall_s[\ student(s)(PolyU) \rightarrow clever(s)]$.

(6) 人有两条腿。

ren2	you3	liang3	tiao2	tui3
human	have	two	CL	leg

$attribute(has\_two\_legs, human)$

(7) 理工的学生很聪明。

li3gong1	de0	xue2sheng1	hen3	cong1ming2
PolyU	DE	students	very	clever

$attribute\big(clever, student(PolyU)\big)$

5.4.1.2. Relational

Relational static states are expressed by predicates that involve two or more individuals as the arguments. For example, we can define symmetric relation as in (8) and asymmetric relation as in (9). There are also relations between physical object and abstract object as in (10).

(8) 张三和李四是朋友。

zhang1san1	he2	li3si4	shi4	peng2you3
Zhangsan	and	Lisi	be	friend

$\exists_e[friends(e)(ZhangSan, LiSi) \wedge holds(e, \$SpeechTime)]$

(9) 张三是李四的老师。

zhang1san1	shi4	li3si4	de0	lao3shi1
Zhangsan	be	Lisi	DE	teacher

$\exists_e[teacher(e)(ZhangSan, LiSi) \wedge holds(e, \$SpeechTime)]$

(10) 张三相信这个理论。

zhang1san1	xiang1xin4	zhe4	ge4	li3lun4
Zhangsan	believe	this	CL	theory

$\exists_e[believe(e)(ZhangSan, \$the\_theory) \wedge holds(e, \$SpeechTime)]$

Pragmatically, it will be strange to state that a certain relation holds in a time point. So, although the time interval of the state is not explicitly stated in (8) (9) and (10), the state should have held for some time and still holds at the speech time. The unspecified information is actually free to be interpreted depending on world knowledge and specific conversational context.

5.4.1.3. Habitual

Habitual describe a static state within whose life time, a certain situation may occur at any time or with a certain frequency. Thus, frequency adverbials, such as 经常 *jing1chang2* 'often', can be used to modify it, e.g. (11).

(11) a. 张三喝酒。

zhang1san1	he1jiu3
Zhangsan	drink

$\exists_e[habit(e)(drinking, ZhangSan) \wedge holds(e, \$SpeechTime)]$

b. 张三经常抽烟。

zhang1san1	jing1chang2	chou1yan1
ZhangSan	often	smoke

$\exists_e[habit(e)(smoking, ZhangSan) \wedge often(e) \wedge holds(e, \$SpeechTime)]$

5.4.1.4. Experiential

Experiential is usually expressed by 过 *guo4* 'GUO' in Chinese. It is similar as the existential quantifier to indicate the existence of at least one instance of a certain situation type at an indefinite time within the corresponding time frame, e.g. (12).

(12) a. 张三去过北京。

zhang1san1	qu4	guo4	bei3jing1
Zhangsan	go	GUO	Beijing

$\exists_e \exists_t [go(e)(ZhangSan, Beijing) \wedge end\_time(t, e) \wedge t < \$SpeechTime]$

b. 张三喝过酒。

zhang1san1	he1	guo4	jiu3
Zhangsan	drink	GUO	wine

$\exists_e \exists_t [drinking(e)(ZhangSan) \wedge holds(e, t) \wedge t < \$SpeechTime]$

The example (12.a) defines a telic situation 'go', whose final state is the subject's being at the destination. The example (12.b) defines a dynamic state 'drinking'. According to the interpretation, we can see that the aspectual marker GUO behaves differently when combines different types of situations. The semantics of GUO will be discussed later in this chapter.

5.4.2. Delimitative State: |---|

Delimitative state is a linguistic event of a static state whose lifetime is explicitly specified. The definition is shown as follows.

$$delimit(e)(i) \equiv \lambda_e \lambda_i [static(e) \wedge time\_interval(i) \wedge time\_location(i, e)]$$

This formula says that the static state *e* is located in the interval *i* according to the time system I which *i* is evaluated. Similarly, we can also explicit define the start and the end of the time interval as follows.

$$delimit(e)(t_1, t_2) \equiv \lambda_e \lambda_{t_1, t_2} \exists_i [static(e) \wedge time\_interval(i)\ (t_1, t_2) \wedge time\_location(i, e)]$$

The lifetime of a state could also be described with duration rather than the start and the end of a time interval.

$$delimit(e)(d) \equiv \lambda_e \lambda_d \exists_i [static(e) \wedge time\_interval(i) \wedge time\_location(i, e) \wedge duration(d, i)]$$

An example for delimitative state is shown in (13). '*$ThatTime*' should be replaced by what 那段时间 *na4 duan4 shi2jian1* 'that time' in the sentence refers to according to the speaker. Similarly, we can focus on the duration of the time interval as in (14) or explicitly refer to the specific time interval as in (15).

(13) 张三就病了那段时间。

zhang1san1	jiu4	bing4	le0	na4	duan4	shi1jian1
Zhangsan	then	ill	LE	that	CL	time

$\exists_e[ill(e, ZhangSan) \wedge delimit(e)(\$SpeechTime, \$ThatTime)]$

(14) 张三病了三个星期。

zhang1san1	bing4	le0	san1	ge4	xing1qi1
Zhangsan	ill	LE	three	CL	week

$\exists_e[ill(e)(ZhangSan) \wedge delimit(e)(\$SpeechTime, ThreeWeeks)]$

(15) 张三从上午 9 点一直难受到下午 5 点。

zhang1san1	cong2	shang4wu3	9-dian3	yi1zhi2
Zhangsan	from	morning	9:00	all_the_time
nan2shou4		dao4	xia4wu3	5-dian3
uncomfortable		to	afternoon	5:00

$\exists_e[uncomfortable(e, ZhangSan) \wedge delimit(e)(9{:}00am, 5{:}00pm)]$

The example (16) shows that this sentence doesn't denote a delimitative, but only a serial of instant static state, meaning that during the time period 'yesterday' the state holds. Nothing is stated about the state other than 'yesterday'.

(16) 昨天张三一直病着。

zuo2tian1	zhang1san1	yi1zhi2	bing4	zhe0
yesterday	Zhangsan	all_the_time	ill	ZHE

$\exists_e[ill(e, ZhangSan) \wedge holds(e, \$Yesterday)]$

5.4.3. Instant Dynamic State: ~~~

Instant dynamic state is defined as a dynamic state with the viewpoint aspect focused on a time point. The definition is shown as follows.

$$progressive(e)(t) \equiv \lambda_e \lambda_t [dyn(e) \wedge holds(e, t)]$$

This formula says that for a linguistic event of dynamic state, there is always an argument of time *t*, which is usually the speech time unless an explicit time is specified and necessarily within the lifetime of the dynamic state *e*.

Irrealis issue is actually involved in instant dynamic event when the corresponding situation is an accomplishment, e.g. *he is writing a letter*. As we have discussed in Chapter 3, such description of dynamic static actually involves the subject's intention or the speaker's perception. For example, one possible interpretation is: he is writing something with a pen and as far as I can imagine what

he wrote will form a letter. From this interpretation, we can clearly see that the writing dynamic state is the realis part, while the irrealis part is actually an epistemic modality on what will happen in future. However, such meaning is encoded in the progressive form with the object as the target.

5.4.4. Activity: |~~~|

Similar as delimitative, activity is defined as a linguistic dynamic state whose lifetime is explicitly specified in the sentence. The formula is shown as follows.

$$process(e)(i) \equiv \lambda_e \lambda_i \, [dyn(e) \wedge time\_interval(i) \wedge time\_location(i, e)]$$

An example is shown in (17).

(17) 张三看书看了一上午。

zhang1san1	kan4shu1	kan4	le0	yi1	shang4wu3
ZhangSan	read_book	read	LE	one	morning

$\exists_e[reading(e)(ZhangSan) \wedge process(e)(\$Morning)]$

The corresponding predicate with different parameters can also be defined as follows, which can be exemplified in (18) and (19) respectively.

$$process(e)(d) \equiv \lambda_e \lambda_d \exists_i [dyn(e) \wedge time\_interval(i) \wedge process(e)(i) \wedge duration(d, i)]$$

$$process(e)(t_1, t_2) \equiv \lambda_e \lambda_{t_1, t_2} \big[dyn(e) \wedge \exists_i [time\_interval(i)(t_1, t_2) \wedge process(e, i)]\big]$$

(18) 张三跑了一个小时。

zhang1san1	pao3	le0	yi1	ge4	xiao3shi2
Zhangsan	run	LE	one	CL	hour

$\exists_e[running(e, ZhangSan) \wedge process(e, AnHour)]$

(19) 张三看书从八点一直看到十一点。

zhang1san1	kan4shu1	cong2	ba1dian3	yi1zhi2	kan4
ZhangSan	read_book	from	8:00	all_the_time	read
dao4	shi2yi1dian3				
to	11:00				

$\exists_e[reading(e, ZhangSan) \wedge process(e)(8{:}00, 11{:}00)]$

Similar as (16), the example in (20) doesn't denote a process, but a serial of dynamic state, the fact that during the time period, the state holds.

(20) 那段时间张三在跑步。

na4	duan4	shi1jian1	zhang1san1	zai4	pao3bu4
that	CL	time	Zhangsan	ZAI	run

$\exists_e[running(e)(ZhangSan) \wedge holds(e, \$ThatTime)]$

5.4.5. Semelfactive: |~|

Semelfactive is different from process that its time duration is perceived by the speaker as very short that it is difficult to refer to its internal stage.

$$semel(e) \equiv \lambda_e \exists_{t_1,t_2} \exists_i [dyn(e) \wedge time(t_1) \wedge time(t_2) \wedge t_1 \sim t_2 \wedge time\_interval(i)(t_1, t_2) \wedge time\_location(i, e)]$$

$$semel(e)(t) \equiv \lambda_e \lambda_t \left[\lambda_{t_2}[semel(e)](t)\right]$$

The sentence (21) is an example of semelfactive. In Chinese, 一下 *yi1xia4* 'once', is usually used to express the number of semelfactive situations occurred.

(21) 张三敲了一下门。

zhang1san1	qiao1	le0	yi1	xia4	men2
Zhangsan	knock	LE	one	CL	door

$\exists_{e,t}[knock\_act(e)(ZhangSan, the\_door) \wedge semel(e)(t)]$

5.4.6. Change of State: --|--, --|~~, ~~|--, ~~|~~

The following are the definitions of the four different types of changes of states, namely static-static change, static-dynamic change, dynamic-static change and dynamic-dynamic change.

$$sschange(e) \equiv \lambda_e \exists_{t,e_1,e_2}[static(e_1) \wedge static(e_2) \wedge change(e)(t, e_1, e_2)]$$

$$sdchange(e) \equiv \lambda_e \exists_{t,e_1,e_2}[static(e_1) \wedge dyn(e_2) \wedge change(e)(t, e_1, e_2)]$$

$$dschange(e) \equiv \lambda_e \exists_{t,e_1,e_2}[dyn(e_1) \wedge static(e_2) \wedge change(e)(t, e_1, e_2)]$$

$$ddchange(e) \equiv \lambda_e \exists_{t,e_1,e_2}[dyn(e_1) \wedge dyn(e_2) \wedge change(e)(t, e_1, e_2)]$$

Some extended predicates could be defined as follows.

$$sschange(e)(t) \equiv \lambda_e \lambda_t \exists_{e_1,e_2}[static(e_1) \wedge static(e_2) \wedge change(e)(t, e_1, e_2)]$$

$$sdchange(e)(t) \equiv \lambda_e \lambda_t \exists_{e_1,e_2}[static(e_1) \wedge dyn(e_2) \wedge change(e)(t, e_1, e_2)]$$

$$dschange(e)(t) \equiv \lambda_e \lambda_t \exists_{e_1,e_2}[dyn(e_1) \wedge static(e_2) \wedge change(e)(t, e_1, e_2)]$$

$$ddchange(e)(t) \equiv \lambda_e \lambda_t \exists_{e_1,e_2}[dyn(e_1) \wedge dyn(e_2) \wedge change(e)(t, e_1, e_2)]$$

The predicates could be further extended with the time parameter as follows.

$$sschange(e)(t, e_1, e_2) \equiv \lambda_e \lambda_t \lambda_{e_1,e_2}[static(e_1) \wedge static(e_2) \wedge change(e)(t, e_1, e_2)]$$

$$sdchange(\text{e})(t, e_1, e_2) \equiv \lambda_e \lambda_t \lambda_{e_1,e_2}[static(e_1) \wedge dyn(e_2) \wedge change(e)(t, e_1, e_2)]$$

$$dschange(e)(t, e_1, e_2) \equiv \lambda_e \lambda_t \lambda_{e_1,e_2}[dyn(e_1) \wedge static(e_2) \wedge change(e)(t, e_1, e_2)]$$

$$ddchange(e)(t, e_1, e_2) \equiv \lambda_e \lambda_t \lambda_{e_1,e_2}[dyn(e_1) \wedge dyn(e_2) \wedge change(e)(t, e_1, e_2)]$$

As an example, the static-static change ‘die’ could be defined as follows.

$$die(e)(t, x) \equiv \lambda_e \lambda_x \lambda_t [sentient\_being(x) \wedge alive(e_1)(x) \wedge dead(e_2)(x) \wedge sschange(e)(t, e_1, e_2)]$$

One example is shown in (22). In this sentence, the time adverb 昨天 *zuo2tian1* ‘yesterday’ usually denote a time interval. However, the achievement situation 死 *si3* ‘dying’ requires a time point, which we can clearly see in the logical form.

(22) 张三昨天死了。

zhang1san1	si3	le0
ZhangSan	die	LE

Zhang San died yesterday.

$\exists_{e,t}[die(e)(t, ZhangSan) \wedge t \in \$Yesterday]$

The static-dynamic change ‘start laughing’ could be defined as follows.

$$start\_laugh(e)(t, x) \equiv \lambda_e \lambda_x \lambda_t [human(x) \wedge \neg laugh(e_1)(x) \wedge laugh(e_2)(x) \wedge sdchange(e)(t, e_1, e_2)]$$

We should note that while ‘laugh()’ is dynamic predicate, ‘¬laugh()’ is actually a static predicate. One example is shown in (23).

(23) 张三最后终于笑了。

zhang1san1	zui4hou4	zhong1yu2	xiao4	le0
ZhangSan	finally	finally	laugh	LE

$\exists_{e,t}[start\_laugh(e)(t, ZhangSan) \wedge t = \$ThatTime]$

The dynamic-static change ‘stop talking’ could be defined as follows.

$$stop\_talk(e)(t,x)$$
$$\equiv \lambda_e\lambda_x\lambda_t[human(x) \wedge talk(e_1)(x) \wedge \neg talk(e_2)(x) \wedge dschange(e,t,e_1,e_2)]$$

One corresponding example is shown in (24).

(24) 张三停止讲话了。

zhang1san1	ting2zhi3	jiang3hua4	le0
ZhangSan	stop	talk	LE

$$\exists_{e,t}[stop\_talk(e)(t,ZhangSan) \wedge t < \$SpeechTime]$$

A dynamic-dynamic change 'finish startup' could be defined as follows.

$$finish\_startup(e)(t,x)$$
$$\equiv \lambda_e\lambda_x\lambda_t[computer(x) \wedge startup(e_1)(x) \wedge work(e_2)(x)$$
$$\wedge ddchange(e,t,e_1,e_2)]$$

One example of dynamic-dynamic change is shown in (24).

(25) 电脑启动好了。

dian4nao3	qi3dong4	hao3	le0
computer	setup	finish	LE

$$\exists_{e,t}[finish\_startup(e)(t,\$TheComputer) \wedge t < \$SpeechTime]$$

5.4.7. Accomplishment: |~~~|--, |~~~|~~

Accomplishment here refers to a linguistic event of accomplishment situation, which could be defined as follows.

$$acc(e) \equiv \lambda_e\exists_{e_1,e_2,e_3,t_1,t_2}\exists\ [dyn(e_1) \wedge start\_time(t_1,e_1) \wedge end\_time(t_2,e_1) \wedge state(e_3)$$
$$\wedge start\_time(t_2,e_3) \wedge change(e_2)(t_2,e_1,e_3) \wedge e = e_1 + e_2]$$

We can see that the final state e_2 is not a part of the accomplishment but is only implied by the final change. As we know that most accomplishment situations are described by a verb with an object, thus we need to explicitly specify the two sub events of an accomplishment as follows.

$$acc(e)(e_1,e_2) \equiv \lambda_{e,e_1,e_2}\exists_{e_3,t_1,t_2}[dyn(e_1) \wedge start(t_1,e_1) \wedge end(t_2,e_1) \wedge state(e_3)$$
$$\wedge change(e_2)(t_2,e_1,e_3) \wedge e = e_1 + e_2]$$

We can also define extended predicates as follows, which means that the accomplishment ends at time *t*.

$$acc(e)(t, e_1, e_2)$$
$$\equiv \lambda_{e,e_1,e_2}\exists_{e_3,t_1,t_2}[dyn(e_1) \wedge start(t_1, e_1) \wedge end(t_2, e_1) \wedge state(e_3)$$
$$\wedge change(e_2)(t_2, e_1, e_3) \wedge e = e_1 + e_2 \wedge t_2 = t]$$

The sentence (24.a) is an example and accomplishment.

(24) 张三写了一封信。

zhang1san1	xie3	le0	yi1	feng1	xin4
Zhangsan	write	LE	one	CL	letter

$\exists_{e,t,e_1,e_2}[writing(e_1, ZhangSan) \wedge letter(e_2) \wedge acc(e)(t, e_1, e_2) \wedge t <$ $SpeechTime]$

5.4.8. Instantaneous Accomplishment: |~|--, |~|~~

The definition for instantaneous accomplishment is quite similar to accomplishment. The only difference is that the first dynamic state becomes semelfactive. The corresponding definitions are shown as follows.

$$insacc(e) \equiv \lambda_e\exists_{e_1,e_2,e_3,t_1,t_2}\exists\ [semel(e_1) \wedge start\_time(t_1, e_1) \wedge end\_time(t_2, e_1) \wedge state(e_3)$$
$$\wedge start\_time(t_2, e_3) \wedge change(e_2)(t_2, e_1, e_3) \wedge e = e_1 + e_2]$$

$$insacc(e)(e_1, e_2)$$
$$\equiv \lambda_{e,e_1,e_2}\exists_{e_3,t_1,t_2}[semel(e_1) \wedge start(t_1, e_1) \wedge end(t_2, e_1) \wedge state(e_3)$$
$$\wedge change(e_2)(t_2, e_1, e_3) \wedge e = e_1 + e_2]$$

$$insacc(e)(t, e_1, e_2)$$
$$\equiv \lambda_{e,e_1,e_2}\exists_{e_3,t_1,t_2}[semel(e_1) \wedge start(t_1, e_1) \wedge end(t_2, e_1) \wedge state(e_3)$$
$$\wedge change(e_2)(t_2, e_1, e_3) \wedge e = e_1 + e_2 \wedge t_2 = t]$$

An example of instantaneous accomplishment is shown in (26).

(26) 张三踢碎了一只瓶子。

zhang1san1	ti1sui4	le0	yi1	zhi1	ping2zi0
Zhangsan	kick-break	LE	one	CL	bottle

$\exists_{b,e_1,e_2}[bottle(b) \wedge kick\_act(e_1)(ZhangSan, b) \wedge broken(e_2, b) \wedge$ $insaccs(e)(e_1, e_2)]$

The predicate '*kick_act*' in the logical form of (26) could be defined as follows.

$$kick\_act(e)(x,y)$$
$$\vDash \lambda_e\lambda_{x,y}\exists_z[semel(e) \wedge agent(e,x) \wedge patient(e,y) \wedge foot(z) \wedge instrument(e,z) \wedge part\_of(z,y)]$$

5.5. Chinese Aspectual Markers

In last chapter, I gave analysis for the meaning of Chinese aspectual markers. Following the point that LE is a perfective markers, ZHE and ZAI is a progressive marker and GUO is experiential marker, I will give a formal description for them that are the same as but in different representations. I will also compare Lin's representation with what I propose here.

5.5.1. 了 *le0* 'LE'

LE mainly indicates the finish of an event instance *e*, which is the linguistic event from the combination of ontological situation and viewpoint aspect. When talking about finish, we must select a reference time *t* at which the event instance is observed.

Perfective is defined as follows.

$$perfective(e,t) \vDash \lambda_e\lambda_t\exists_i[time(t) \wedge situation(e) \wedge time\_interval(i) \wedge time\_location(i,e) \wedge ends(t,i)]$$

Reference time relevant state is defined on a state.

$$relevant(e,t) \vDash \lambda_e\lambda_t\exists_{e'}\exists_{t'}[state(e) \wedge start\_of(e',e) \wedge perfective(e',t') \wedge holds(e,t) \wedge t' < t]$$

For a telic situation, we can define the perfect aspect as follows.

$$perfect(e,t) \vDash \lambda_e\lambda_t\exists_{e'}\exists_{t'}[situation(e) \wedge perfective(e,t') \wedge final\_state(e',e) \wedge relevant(e',t)]$$

This says that the relevant LE actually implies a perfective LE. This can be proved by the example (27.b), which is semantically well-formed, however contradictory to our world knowledge. In this sentence, the relevant LE should not be used.

(27) a. 地球绕太阳转。

di4qiu2	rao4	tai4yang2	zhuan4
earth	around	sun	rotate

The earth now rotates around the sun.

$\exists_e[rotating(e)(Earth,Sun) \wedge holds(e,\$SpeechTime)]$

b. 地球绕太阳转了。

di4qiu2	rao4	tai4yang2	zhuan4	le0
earth	around	sun	rotate	LE

The earth now rotates around the sun.

$\exists_e[rotating(e)(Earth, Sun) \wedge relevant(e, \$SpeechTime)]$

$\exists_e \exists_t[rotating(e)(Earth, Sun) \wedge perfective(e, t) \wedge t < \$SpeechTime]$

Theoretically, two different readings are both available for (27.b) as it shows in the bottom. However, both of them are contradictory to our knowledge. When taking dynamic state, the viewpoint aspect operator 开始 *kai1shi3* 'start' is usually used to shift the whole situation to the start, e.g. (28).

(28) 我们四点开始了组会。

wo3men2	si4dian3	kai1shi3	le0	zu3hui4
we	4:00	start	LE	group_meeting

$\exists_e \exists_{e'}[meeting(e)(\$we) \wedge start\_of(e', e) \wedge perfective(e', 4{:}00)]$

The viewpoint aspect operator '*start_of()*' sometimes can be omitted in the sentence when the ontological situation is static state, e.g. (29). Again, both of the readings as indicated are possible. However, without context the first one is preferred. In a different, e.g. to answer the question 'why didn't he come yesterday?' the second interpretation should be chosen.

(29) 他病了。

ta1	bing4	le0
he	ill	LE

$\exists_e[ill(e)(\$he) \wedge revelant(e, \$SpeechTime)]$

$\exists_e \exists_t[ill(e)(\$he) \wedge perfective(e, t) \wedge t < \$SpeechTime]$

In Chinese, it is possible to use two LEs at the same sentence. In (30), the first LE indicates the perfective of the eating activity and the second LE indicates the relevance of the final state of 'eating medicine'. In other words, sentence (30) describes a telic situation, i.e. accomplishment. The telicity comes from the expectation of the subject eating a certain kind of medicine. In addition, it is allowed in Chinese to use time adverbial to describe the time when the eating happens. There is no straightforward way to translate it into English.

(30) 他早上九点吃了药了。

ta1	zao3shang4	jiu3dian3	chi1	le0	yao4	le0
he	morning	9:00	eat	LE	medicine	LE

?He has eaten the medicine at 9:00am.

He has eaten the medicine. He did it at 9:00am.

$\exists_e \exists_{e'} [eating\_medicine(e)(\$he) \wedge perfective(e, 9{:}00am) \wedge final\_state(e', e) \wedge revelant(e', \$SpeechTime)]$

When the object is a demonstrative NP with 这 *zhe4* 'this' and 那 *na4* 'that', the sentence final LE usually gives the perfective interpretation, such as (31). Similar as (30) when there are two LEs, the whole sentence (31.b) describes a telic situation. However, the telicity is not given by the volume of the bottle of wine, but also by the expectation. For the sentences in (31), whether that bottle of wine is finished is unknown without context.

(31) a. 他昨天喝那瓶酒了。

ta1	zuo2tian1	he1	na4	ping2	jiu3	le0
he	yesterday	drink	that	bottle	wine	LE

He drank that bottle of wine yesterday.

He had a drink of that bottle of wine yesterday.

$\exists_e \exists_t [drinking(e)(\$he, \$that\_wine) \wedge perfective(e, t) \wedge t \in \$yesterday]$

$\exists_e \exists_x \exists_t [drinking(e)(\$he, x) \wedge x \subseteq \$that\_wine \wedge perfective(e, t) \wedge t \in \$yesterday]$

b. 他昨天喝了那瓶酒了。

ta1	zuo2tian1	he1	le0	na4	ping2	jiu3	le0
he	yesterday	drink	LE	that	bottle	wine	LE

$\exists_e \exists_{e'} [drinking(e)(\$he, \$that\_wine) \wedge perfective(e, \$yesterday) \wedge final\_state(e', e) \wedge revelant(e', \$SpeechTime)]$

Similar as (29), when a verb that usually denotes dynamic state, the sentence also shows ambiguity whether it describes the start which is the relevant reading, or the perfective of the whole dynamic state, such as (32.a). If we add an explicit time adverbial, the relevant reading is more difficult to get although possible in specific context, as in (32.b). However, there is another interpretation for (32.b) that everyone is supposed to smile. Then it could be interpreted as a relevant reading. In previous studies, the LE in (32.b) is usually treated as a combination of LE_1 and LE_2.

(32) a. 他笑了。

ta1	xiao4	le0
he	smile	LE

He smiled.

$\exists_e [smiling(e)(\$he) \wedge revelant(e, \$SpeechTime)]$

$\exists_e [smiling(e)(\$he) \wedge perfective(e, \$JustNow)]$

b.他刚才笑了。

ta1 gang1cai2 xiao4 le0

he just_now smile LE

$\exists_e[smiling(e)(\$he) \wedge perfective(e, \$JustNow)]$

$\exists_e \exists_{e'}[smiling(e)(\$he) \wedge perfective(e, \$JustNow) \wedge final\_state(e', e) \wedge relevant(e', \$SpeechTime)]$

5.5.2. 着 *zhe0* 'ZHE' and 在 *zai4* 'ZAI'

The aspectual markers 着 *zhe0* 'ZHE' and 在 *zai4* 'ZAI' focuses on a time point when describing a state. ZHE can be used for both static state and dynamic state as follows.

$$continuous(e, t) \vDash \lambda_e \lambda_t[state(e) \wedge holds(e, t)]$$

For example, (33.a) describes a dynamic state that holds at the speech time while (33.b) describes a static state that holds at the speech time.

(33) a. 他抽着烟。

ta1 chou1 zhe0 yan1

he smoke ZHE cigarette

$\exists_e[smoking(e)(\$he) \wedge continuous(e, \$SpeechTime)]$

b. 他爱着小红。

ta1 ai4 zhe0 xiao3hong2

he love ZHE Xiaohong

$\exists_e[love(e)(\$he, Xiaohong) \wedge continuous(e, \$SpeechTime)]$

The aspectual marker 在 *zai4* 'ZAI' has a similar function as ZHE. However, it is only compatible with dynamic state as follows.

$$continuous\_dyn(e, t) \vDash \lambda_e \lambda_t[dyn(e) \wedge continuous(e, t)]$$

The (34) are some examples of ZAI.

(34) a. 他在看书。

ta1 zai4 kan4 shu1

he ZAI read book

$\exists_e[reading(e)(\$he) \wedge continuous(e, \$SpeechTime)]$

b. 他晚上十点时在看书。

ta1	wan3shang4	shi2dian3	shi2	zai4	kan4	shu1
he	evening	10:00	when	ZAI	read	book

$\exists_e[reading(e)(\$he) \wedge continuous(e, 10{:}00pm)]$

c. 他今天上午一直在看书。

ta1	jin1tian1	shang4wu3	yi1zhi2	zai4	kan4	shu1
he	today	morning	always	ZAI	read	book

$\exists_e\big[reading(e)(\$he) \wedge \forall_t[t \in \$morning \rightarrow continuous(e,t)]\big]$

Another difference of ZHE and ZAI is that ZHE usually could not be the focus of a sentence. So, the sentences in (33) sound odd if there are no other corresponding elements that could sever as the focus. This problem will not be discussed in details.

5.5.3. 过 *guo4* 'GUO'

The Chinese 过 *guo4* 'GUO' mainly functions as an experiential marker. Lin (2007) proposed that GUO requires that the inner stage of a situation should hold within the time interval for the evaluation and the time interval should be before the reference time *t*. The inner stage (IStage) is defined as: 1) if the situation is atelic, the IStage equals the whole situation; 2) if the situation is telic, the IStage is the situation excluding the final time (culmination) point. This is problematic when the situation is instantaneous, e.g. achievements, in which case the IStage will be empty.

On the other side, I would agree with Lin's analysis that GUO does not necessarily require the final state of a telic situation to be achieved. The semantics of GUO could be described as follows.

$$expriential(e,i)\big(P(a)\big)$$
$$\vDash \lambda_e\lambda_i\lambda_P\exists_{e',t}[state(e) \wedge time\_interval(i) \wedge time(t) \wedge situation(e')$$
$$\wedge P(e')(a) \wedge perfective(e',t) \wedge t \in i]$$

This formula shows the intrinsic nature of GUO that it implies the existence of an event instance in indefinite past. The time interval *i* is what we referred to as time frame in Chapter 4. It also says that GUO itself is a static state situation which takes a predicate argument. The second order logic form could be transform into a first order logic form by creating another predicate as follows. The parameter of P becomes that of new predicate. In this way, the experiential GUO becomes a predicate operator, which combines a predicate *P* to form a new predicate *exp_P*. For example, the predicate 写 *xie3* 'write', can generate an experiential predicate 写过 *xie3guo4* 'exp_write'.

$$expriential\_P(e,i)(a)$$
$$\vDash \lambda_e\lambda_i\lambda_P\exists_{e',t}[state(e) \wedge time\_interval(i) \wedge time(t) \wedge situation(e')$$
$$\wedge P(e')(a) \wedge perfective(e',t) \wedge t \in i]$$

It is also possible that one subject has two experienced instances of the predicated situation. We can add another parameter that shows the frequency as follows.

$$expriential(e,i,f)\big(P(a)\big)$$
$$\vDash \lambda_e\lambda_i\lambda_P\exists_{(e',t)*f}[state(e) \wedge time\_interval(i) \wedge time(t) \wedge situation(e')$$
$$\wedge P(e')(a) \wedge perfective(e',t) \wedge t \in i]$$

This can describe some sentences that describes more than one instances of the same situation type, e.g. in (35).

(35) 他去年去过两次北京。

ta1	qu4nian2	qu4	guo4	liang3ci4	bei1jing1
he	last_year	go	GUO	twice	Beijing

He went to Beijing twice last year.

$\exists_{e*2}\,[go(e)(\$he, Beijing) \wedge perfective(e,t) \wedge t \in \$LastYear]$

From the representation of GUO, we can see that it implies the perfective LE. Although the sentence in (36) is debatable in terms of acceptability, they actually have the same degree of acceptability with GUO and LE.

(36) 他写过(/了)一本书，可是没写完。

ta1	xie3	guo4/le0	yi1	ben3	shu1	ke3shi4	mei2
he	write	GUO/LE	one	CL	book	but	not
xie3	wan2						
write	finish						

?He has written a book, but he didn't finish it.

When LE is used, the instance *e* is 'definite' that it usually has a clear reference in some world. For GUO, it only implies that at least one existing instance of the situation type predicated in a given time frame. In some cases where the time frame is fixed, LE and GUO will give similar meaning if only one happening is expected, e.g. (37).

(37) 他吃过(/了)饭了。

ta1	chi1	guo4/le0	fan4	le0
he	eat	GUO/LE	meal	LE

He has had his meal already.

With the representation of GUO I presented, the examples discussed by Lin (2007) could also be explained, as shown in (38).

(38) a. 谁都年轻过。

shui2	dou1	nian2qing1	guo4
who	all	young	GUO

Everyone has been young before.

$\forall_x \exists_e \exists_i [time\_interval(i) \wedge young(e)(x) \wedge perfective(e,t) \wedge t \in i \wedge time\_location(i,x)]$

b. 他丢过这本书。

ta1	diu1	guo4	zhe4	ben3	shu1
he	lose	GUO	this	CL	book

He lost this book once before.

$\exists_e \exists_i [time\_interval(i) \wedge lost(e)(\$he, \$this\_book) \wedge perfective(e,t) \wedge t \in i \wedge ends(\$SpeechTime, i)]$

c. 恐龙存在过。

kong3long2	cun2zai4	guo4
dinosaur	exist	GUO

The dinosaur once existed.

$\exists_e \exists_i [time\_interval(i) \wedge existing(e)(\$Dinosaur) \wedge perfective(e,t) \wedge t \in i \wedge ends(\$SpeechTime, i)]$

d. 他死过。

ta1	si3	guo4
he	die	GUO

He has been dead before.

$\exists_e \exists_i [time\_interval(i) \wedge die(e)(\$he) \wedge perfective(e,t) \wedge t \in i \wedge ends(\$SpeechTime, i)]$

e. 他打死过这个人。

ta1	da3	si3	guo4	zhe4	ge4	ren2
he	beat	dead	GUO	this	CL	person

He once killed this person.

$\exists_e \exists_i [time\_interval(i) \wedge kill(e)(\$he, \$this\_person) \wedge perfective(e,t) \wedge t \in i \wedge ends(\$SpeechTime, i)]$

However, I don't agree the analysis of Lin (2007) that the sentence (38.d) and (38.e) are semantically ill-formed. Firstly, the fact that a person could not become alive again once died belongs to the world knowledge. In an imaginary world, e.g. a game, such sentences then become acceptable. Secondly, with a special context they are also acceptable in real world, e.g. (39).

(39) 他不仅打死过这个人，还打死过好几个人。

ta1	bu4jin3	da3	si3	guo4	zhe4	ge4	ren2	hai2
he	not_only	beat	dead	GUO	this	CL	person	also
da3	si3	guo4	hao3ji3		ge4	ren2		
beat	dead	GUO	many		CL	person		

He not only killed this person, but also killed many other people.

In summary, Chinese GUO is a pure experiential marker. The so-called repeatability and change out of state are in pragmatic level (Pan, 2004).

5.5.4. Negators

Generally, negation is defined as: If P is the negation of Q, if and only if:

$$\neg P(e) \rightarrow Q(e)$$

$$P(e) \rightarrow \neg Q(e)$$

This means that I won't discuss the relationship among different concepts. For example, the negation of the predicate *beautiful(x)* is ¬*beautiful(x)*, the relation between ¬*beautiful(x)* and e.g. *ugly(x)* will not be discussed. There are two negators in Chinese, 不 *bu4* 'not' and 没(有) *mei2*(*you3*) 'not have/exist'. Following the analysis in Chapter 4, the corresponding formal representations will be given here.

5.5.4.1. 不 *bu4*

The negator 不 *bu4* 'not' mainly negates static state. Dynamic state is a boundary case, which is usually negated by 没有 *mei2you3* 'not have/exist'. When negated by 不 *bu4*, it is usually to make a correction which implicates the existing of another state. The sentence (40.a) is an example of negation of static state. The negator 不 *bu4* operates on the existential quantifier. For sentence (40.b), there are two different interpretations. However, the second interpretation is more appropriate, which is approximately to say that 不高 *bu4gao1* 'not tall' has become one predicate that modifies the height attribute of the subject. The first interpretation mainly states that being tall is not an attribute of the subject. It can be proved that the second interpretation entails the first one.

(40) a. 张三不信耶稣。

zhang1san1 bu4 xin4 ye1su1

ZhangSan not believe Jesus

$\neg\exists_e[believe(e)(ZhangSan, Jesus) \wedge holds(e, \$SpeechTime)]$

b. 张三不高。

zhang1san1 bu4 gao1

ZhangSan not tall

$\neg\exists_e[tall(e)(ZhangSan) \wedge holds(e, \$SpeechTime)]$

$\exists_e[\neg tall(e)(ZhangSan) \wedge holds(e, \$SpeechTime)]$

Functionality negation is also implemented with 不 *bu4*. For example, (41.b) is the negation of (41.a). The negation can also refer to a certain period, such as (41.c). The sentence (41.d) shows that the attribute function is compatible with exceptional cases.

(41) a. 张三喝酒。

zhang1san1 he1jiu3

ZhangSan drink

$\exists_e[functionality(e)(drinking, ZhangSan) \wedge holds(e, \$SpeechTime)]$

b. 张三不喝酒。

zhang1san1 bu4 he1jiu3

ZhangSan not drink

$\neg\exists_e[functionality(e)(drinking, ZhangSan) \wedge holds(e, \$SpeechTime)]$

c. 张三以前不喝酒。

zhang1san1 yi3qian2 bu4 he1jiu3

ZhangSan previously not drink

$\neg\exists_{e,t}[functionality(e)(drinking, ZhangSan) \wedge holds(e, t) \wedge t < \$SpeechTime]$

d. 张三不喝酒，所以喝了一口就醉了。

zhang1san1	bu4	he1jiu3	suo3yi3	he1	le0	yi1
ZhangSan	not	drink	so	drink	LE	one
kou3	jiu4	zui4	le0			
mouth	then	drank	LE			

Zhang San doesn't drink. So, he got drank for only a small sip.

The negator 不 *bu4* can also negate dynamic state in some context. For example, the sentence (42.b) is the negation of (42.a).

(42) a. 张三在喝酒。

zhang1san1 zai4 he1jiu3

ZhangSan ZAI drink

$\exists_e[drinking(e)(ZhangSan) \wedge holds(e, \$SpeechTime)]$

b. 张三不在喝酒。

zhang1san1 bu4 zai4 he1jiu3

ZhangSan not ZAI drink

$\neg\exists_e[drinking(e)(ZhangSan) \wedge holds(e, \$SpeechTime)]$

5.5.4.2. 没有 *mei2you3*

没有 *mei2you3* negates the existence of an instance of a certain situation. The sentences in (43) are examples of negation by 没有 *mei2you3*. For (43.a), it usually negates the start of state of believing. It also has the interpretation of negation of the state, which is the same as 不 *bu4*. For (43.b), it negates the existence of the event instance expressed by GUO.

(43) a. 张三没有信耶稣。

zhang1san1 mei2you3 xin4 ye1su1

ZhangSan not believe Jesus

$\neg\exists_{e,t}[start\_believe(e)(ZhangSan, Jesus) \wedge time\_location(t, e) \wedge t < \$SpeechTime]$

$\neg\exists_e[believe(e)(ZhangSan, Jesus) \wedge holds(e, \$SpeechTime)]$

b. 张三没有信过耶稣。

zhang1san1 mei2you3 xin4 guo4 ye1su1

ZhangSan not believe GUO Jesus

$\neg\exists_{e,t}[believe(e)(ZhangSan, Jesus) \wedge holds(e, t) \wedge t < \$SpeechTime]$

Dynamic state is more likely to be negated by 没有 *mei2you3*, such as (44). For (44.a), it usually implies a reference time *t*, at which the situation of smoking occurs. The reference time needs to be specified within a context. Mostly, the reference time of (44.a) is close before the speech time. For (44.b), the speech time is set as the reference time with ZAI.

(44) a. 张三没有抽烟。

zhang1san1	mei2you3	chou1yan1
Zhangsan	not	smoke

$\neg\exists_e[smoking(e)(ZhangSan) \wedge holds(e, \$RT)]$

b. 张三没有在抽烟。

zhang1san1	mei2you3	zai4	chou1yan1
Zhangsan	not	ZAI	smoke

$\neg\exists_e[smoking(e)(ZhangSan) \wedge holds(e, \$SpeechTime)]$

Alternatively, the reference time could be explicitly specified in the sentence, as in (45).

(45) a. 张三刚才没有抽烟。

zhang1san1	gang1cai2	mei2you3	chou1yan1
Zhangsan	just_now	not	smoke

$\neg\exists_e[smoking(e)(ZhangSan) \wedge holds(e, \$JustNow)]$

b. 张三刚才没有在抽烟。

zhang1san1	gang1cai2	mei2you3	zai4	chou1yan1
Zhangsan	just_now	not	ZAI	smoke

$\neg\exists_e[smoking(e)(ZhangSan) \wedge holds(e, \$JustNow)]$

When taking achievement situations, 没有 *mei2you3* negates its happening. For example, the sentence (46) only negates the finishing part of the subject's smoking a specific cigarette. However, it doesn't negate the existing of the smoking activity. Mostly, it actually presuppose the existing of the smoking activity.

(46) 张三没有抽完那支烟。

zhang1san1	mei2you3	chou1	wan2	na4	zhi1	yan1
Zhangsan	not	smoke	finish	that	CL	cigarette

$\neg\exists_e[finish\_smoking(e)(ZhangSan, \$TheCigarette) \wedge perfective(e, \$RT)]$

When taking accomplishment situation, 没有 *mei2you3* negates the happening of the whole situation. For example, the sentence (47) states that no writing activity exists.

(47) 张三没有写一封信。

zhang1san1	mei2you3	xie3	yi1	feng1	xin4
Zhangsan	not	write	one	CL	letter

$\neg\exists_{e,x}[letter(x) \wedge writing(e)(ZhangSan, x) \wedge holds(e, \$RT)]$

5.6. Summary

In this chapter, I give the formal representation for different ontological situation types and linguistic event types. Especially, for a described linguistic event, there must be a reference time, according to which the event is described. From linguistic perspective, the formal representation can provide a clearer explanation for semantics. From ontological and computational perspective, the representation can be adopted in an ontology system, e.g. SUMO (Pease et.al., 2002). By doing this, it can further contribute to Natural Language Processing (NLP) by providing aspectual reasoning. It is also useful then for automatic language generation and machine translation.

Chapter 6

Annotating a Chinese Corpus for Aspectual Study

The best way to test a theory is to resort to the real data. In this chapter, I will first present a guideline for annotating a Chinese corpus based on the theory I proposed in Chapter 3 and 4. The original data comes from Sinica Treebank, which is a subset of Sinica Corpus. To keep the source format, all the corresponding examples in this chapter will be in traditional Chinese characters. Finally, the annotation result will be described and summarized with some statistical information.

6.1. Introduction

Firstly, we should note that not every sentence deontes event. It is proposed that there are two different kinds of sentences: constative and performative (Austin 1975). Sentences that denote events in a broader sense refer to constative, while sentences that describe speech act refer to performatives. For annotating a real corpus, the best way is to include all kinds of sentences in order to allow us to get the real distribution information of the data.

Illocutionary act is an important category of sentences, with which people perform actions by speech. In corpus, speech acts are usually quoted in text. For annotation, the theory of Searle (1976) will be adopted for the basis. He proposed five different categories of illocutionary acts: commissive, directive, assertive, expressive and declarative. Besides these five categories, questions are also put in the speech act category, in the consideration that it also needs feedback from the listeners.

Modality is another category that is mainly used to describe speakers' attitudinal state, which is a little different from sentences to denote other events. Modality could be treated as a higher order predicate upon propositions. It is usually expressed through certain modal operators such as modal verbs, auxiliary or adverbs. Different modalities could cascade in levels. Modality will be annotated as an independent category. I will mainly adopt Palmer (2001)'s theory as the basis and then make some revision based on it.

In all, the annotation will include three kinds of sentences: event, modality and speech act in the high level. Support to discriminate the three kinds of sentences could be found in other languages. For example, Sanskrit has three moods for verbs, namely indicative, optative and imperative.

Although the three moods are in syntactic level, they actually correspond to the three types of sentences described here in the semantic level.

6.2. Annotation Framework

In this section, the annotation guideline of the three sentence types, namely event, modality and speech act will be given.

6.2.1. Event Annotation

Event is talked about in sentence level. Event annotation is then to annotate the situation types that are described in sentences with certain viewpoint aspects. The annotation guideline here mainly concerns the identification of a certain situations types and veiewpoint aspect based on the verbs and the syntactic information.

The sentences without explicit aspectual markers are in neutral aspect (Smith, 1991). For example, sentence (1.a) can possibly denote different event types in different contexts. Sentence (1.b) describes a fact that the subject previously did something (but now he doesn't). Sentence (1.c) describes a dynamic state that the subject is doing something. The aspects of these examples are given by the specified contexts. For such cases, the annotator will decide its real aspectual type based on his judgment.

(1) a. 他看小说。

ta1 kan4 xiao3shuo1

he read novel

He reads novels

b. 以前, 他看小说。

yi3qian2 ta1 kan4 xiao3shuo1

previously he read novel

He read novel before.

c. 大家都很忙，小孩儿写作业, 他看小说。

da4jia1 dou1 hen3 mang2 xiao3hai2er0 xie3 zuo4ye4

everyone all very busy children write homework

ta1 kan4 xiao3shuo1

he read novel

Everyone is busy. Children are doing homework, and he is reading novels.

6.2.1.1. Static State

In the annotation, the subcategories of static state are not discriminated. However, the identification of static state still requires the annotator to be able to identify each subcategory. So, I will still provide the subcategorization details, which could be a framework for further studies on this category.

6.2.1.1.1. Stative verbs

Stative verbs, e.g. 愛 *ai4* 'love', 表示 *biao3shi4* 'show', 是 *shi4* 'be' etc., mainly denote static state as shown in (2).

(2) a. 我們愛這美麗的世界 。

wo3men2	ai4	zhe4	mei3li4	de0	shi4jie4
we	love	this	beautiful	DE	world

We love this beautiful world.

b. 這表示有某些因素在左右著這局部正確率的擺盪。

zhe4	biao3shi4	you3	mou3xie1	yin1su4		zai4
this	show	have	some	factor		PREP
zuo3you4	zhe0	zhe4	ju2bu4	zheng4que4lv4	de0	bai3dong4
control	ZHE	this	local	precision	DE	fluctuate

This means some factors are controlling the fluctuation of the local precision.

Phrases that describe the attribute of entity or relation between entities are also static state. Since the attributes are related to specific entity, there is always an instance *e* for this static state.

(3) a. 我們兩家是好鄰居 。

wo3men2	liang3	jia1	shi4	hao3	lin2ju1
we	two	family	be	good	neighbor

We two families are good neighbors.

b. 這個人很聰明。

zhe4	ge4	ren2	hen3	cong1ming2
this	CL	person	very	clever

This person is quite clever.

6.2.1.1.2. Functional attribute by dynamic verbs

Some attributes are actually related to a generic event that is fuctional attribute of an entity, a set of entities or a class. It means that the subject could perform a specific kind of event defined by the

predicate. They are usually in neutral viewpoint aspect (without specifying any aspectual markers), and there is no event instance. The sentences in (4) are all static state rather than dynamic events.

(4) a. 她自己買菜。

ta1	zi4ji3	mai3	cai4
she	oneself	buy	vegetable

She buys vegetables by herself.

b. 我 跑 得 比 太陽 還 快。

wo3	pao3	de0	bi3	tai4yang2	hai2	kuai4
I	run	DE	than	sun	still	fast

I run faster than the sun.

c. 編 壁報 並 不 難 。

bian1	bi4bao4	bing4	bu4	nan2
make	wall_poster	actually	not	difficult

It is not difficult to make wall posters.

d. 當地人 仍 以 最 原始 的 工具 雙腳 為主 。

dang1di1ren2	reng2	yi3	zui4	yuan2shi3	de0	gong1ju4
local_people	still	PREP	most	primary	DE	tool
shuang1jiao3	wei4zhu3					
feet	mainly					

The local people still travel on foot.

e. 教會 人士 都 不 抽菸 。

jiao4hui4	ren2shi4	dou1	bu4	chou1yan1
church	people	all	not	smoke

Church people don’t smoke.

f. 南非 還 出產 許多 由 海鮮 製成 的 罐頭 。

nan2fei1	hai2	chu1chan3	xu3duo1	you2	hai3xian1
South_Africa	also	produce	many	PREP	sea_food
zhi4cheng2	de0	guan4tou2			
made	DE	canned_food			

South Africa also produces many canned products made of see food.

6.2.1.1.3. Metaphor

Some verbs denoting dynamic events, e.g. accomplishment, are also used to denote a static state with a metaphorical use, e.g. the sentences in (5). For example, 連接 *lian2jie1* 'connect', 排列 *pai2lie4* 'arrange' are used to denote array of lamp posts, trees etc. which could not move at all. 穿梭 *chuan1suo1* 'shuttle' describes an intersecting spacial relation of a park and the roads in it.

We treated such metaphorical uses as static state in the annotation guideline, as we expect that there could be a set of rules for metaphor generation and such sentences could be treated as one way to express a real world situation that is intrinsically a static state.

(5) a. 狹窄 的 小徑 穿梭 於 花園 和 遺跡 間 。

xia2zhai3	de0	xiao3jing4	chuan1suo1	yu2	hua1yuan2
narrow	DE	trial	shuttle	PREP	garden

he2	yi2ji4	jian1
and	relic	middle

Narrow trails shuttle across the garden and the relic.

b. 幽幽 的 弱 光 從 屋頂 撒落 下來

you1you1	de0	ruo4	guang1	cong2	wu1ding3	sa3luo4
soft	DE	weak	light	from	roof	splash

xia4lai2
down

Soft light lights splash down from the roof.

c. 夕陽將天邊染成一片紅色

xi1yang2	jiang1	tian1	bian1	ran3	cheng2	yi1
the_setting_sun	PREP	sky	edge	dye	into	one

pian	hong2se2
CL	red

The setting sun dyed the sky red.

d. 此園以水取勝 。

ci3	yuan2	yi3	shui3	qu3sheng4
this	garden	PREP	water	win

This garden wins by its water.

6.2.1.1.4. Non-aspectual LE

Some sentences, although containing sentence final particle (SFP) 了 *le0*, don't denote change of state. Some of them express comparative meaning, e.g. the sentences in (6).

(6) a. 法令 的 配合 也 慢 了 一步 。

fa3ling4	de0	pei4he2	ye3	man4	le0	yi1	bu4
decree	DE	coordination	also	slow	LE	one	step

The corresponding decree is a little late than expected.

b. 他 的 雕花 圖案 就 更 富有 變化 了。

ta1	de0	diao1hua1tu2an4	jiu4	geng4	fu4you3
he	DE	carved_pattern	then	more	have
bian4hua4	le				
variation	LE				

His carved patterns have more variations.

c. 森林覆蓋面積佔了學校一半。

sen1lin2	fu4gai4	mian4ji1	zhan4	le0	xue2xiao4
forest	cover	area	take	LE	school
yi1ban4					
half					

The area of forest takes half of the school.

d. 其中 包括 了 １５種 鷹類 。

qi2zhong1	bao1han2	le0	15	zhong3	ying1lei4
among	include	LE	15	kind	hawk

There are fifteen kinds of hawks.

6.2.1.1.5. Conditional

Some sentences describe some general rules or conditionals, e.g. the sentences in (7). Formally, they can usually be denoted as P->Q conditionals.

(7) a. 能 領到 工資 就 阿彌陀佛 了。

neng4	ling3dao4	gong1zi1	jiu4	a1mi2tuo2fo2	le0
can	get	salary	then	Amitabha	LE

It would be good enough if I could get the salary.

b. 頂端 抹上 麵糊 並 沾 椰子粉 即是 玉蔥包。

ding3duan1	mo3shang4	mian4hu2	bing4	zhan1
top	smear	panada	and	paste
ye1zi0fen3	ji4	shi4	yu4cong1bao1	
coconut_powder	then	be	onion_bun	

With some flour and coconut powder on the top, it becomes onion bun.

6.2.1.1.6. GUO

As we discussed in Chapter 4, the semantics of GUO is to indicate the existing of an instance of a particular situation type, which is intrinsically a static state, such as the sentences from (8.a) to (8.c). Since GUO denotes static state, it can possibly combine with LE to describe a change of state such as sentence (8.d) and (8.e).

(8) a. 拉塞克在法國公開賽擊敗過尹凡尼塞維克 。

la1sai4ke4	zai4	fa3guo2gong1kai1sai4	ji1bai4	guo4
Lassek	PREP	Frech_Open	beat	GUO
yi2fan2ni2sai4wei2ke4				
Goran_Ivanisevic				

Lassek beat Goran Ivanisevic before in Frech Open。

b. 丈夫確曾這麼說過 。

zhang4fu1	que4	ceng2	zhe4me0	shuo1	guo4
husband	indeed	once	like_this	say	GUO

My husband indeed said that before.

c. 二次大戰 期間 , 日本人 曾 佔領 過 金邊 。

er2ci4da4zhan4	qi1jian1	ri4ben3ren3	ceng2
the_Second_World_War	during	the_Janpanese	once
zhan4ling3	guo4	jin1bian1	
occupy	GUO	Phnom_Penh	

During the Second World War, the Japanese once occupied Phnom Penh.

d. 已經 有 人 嘗試 過 了 。

yi3jing1	you3	ren2	chang2shi4	guo4	le0
already	have	people	try	GUO	LE

Someone has already tried it.

e. 我 已 稟 過 三爺 了 。

wo3	yi3	bing3	guo4	san1ye2	le0
I	already	tell	GUO	San_Ye	LE

I have already told San Ye.

6.2.1.1.7. Habitual

Habitual sentences describe the occurrence of a general event type, which is usually associated with the frequency of the occurrences, described by adverbs such as 常常 *chang2chang2* 'often', 每天 *mei3tian1* 'every day', etc. For example, sentence (9.a) entails sentence (9.b).

(9) a. 我 常常 在 樹 下 看書 。

wo3	chang2chang2	zai4	shu4	xia4	kan4shu1
I	often	PREP	tree	under	read

I often read under the tree.

b. 我 在 樹 下 看 過 書 。

wo3	zai4	shu4	xia4	kan4	guo4	shu1
I	PREP	tree	under	read	GUO	book

I once read under the tree.

c. 他 每天 一定 要 吃 一碗 牛肉麵 。

ta1	mei3tian1	yi1ding4	yao4	chi1	yi1	wan3
he	everyday	must	need	eat	one	bowl

niu2rou4mian4

beef_noodles

He ate a bowl of beef noodles every day.

d. 他們就每天晚上在一起實驗 。

ta1men0	jiu4	mei3tian1	wan3shang4	zai4yi1qi3	
they	then	everyday	evening	together	

shi2yan4

do_experiment

They then do experiments every evening.

e. 在 青年 時代 , 他 時常 通宵 作畫 到 天明 。

zai4	qing1nian2	shi2dai4	ta1	shi2chang2	tong1xiao1
PREP	young	time	he	often	all_night

zuo4hua4	dao4	tian1ming2
paint	PREP	dawn

When he was young, he ofen painted all night.

ZHE with dynamic verb can also express habitual rather than dynamic state. This is similar to the English example: he is recently writing a novel. It is rarely the case that it describes an instance of dynamic state without any interruption. Sentences in (10) are some examples of such kind of habituals.

(10) a. 陳美麗與房東阿婆彼此照料著 。

chen2mei3li4	yu3	fang2dong1	a1po2	bi3ci3	zhao4liao4
Chen_Meili	and	landlord	lady	each_other	take_care_of
zhe0					
ZHE					

Chen Meili and the landlord lady take care of each other.

b. 他最近正在看一部小說。

ta1	zui4jin4	zheng4zai4	kan4	yi1	bu4	xiao3shuo1
he	recently	ZAI	read	one	CL	novel

He is reading a novel recently.

6.2.1.1.8. Generic

Generic statements usually describe an attribute to a class rather than individuals. However, such attribute could not be guaranteed to be the case for each individual of the class. The sentences in (11) are some examples.

(11) a. 人有两条腿。

ren2	you3	liang3	tiao2	tui3
human	have	two	CL	leg

$attribute(has\_two\_legs, human)$

b. 理工的学生很聪明。

li3gong1	de0	xue2sheng1	hen3	cong1ming2
PolyU	DE	students	very	clever

$attribute\big(clever, student(PolyU)\big)$

6.2.1.1.9. Negations

There are mainly two different kinds of negations, corresponding to 沒有 *mei2you3* 'not have/exist' and 不 *bu4* 'not' respectively. Both negations mostly describe static states, e.g. (12). Modal negations are still modality. This will be discussed later in this chapter.

(12) a. 他今天沒有出去。

ta1	jin1tian1	mei2you3	chu1qu4
he	today	didn't	go_out

He didn't go out today.

b. 他不抽煙。

ta1	bu4	chou1yan1
he	doesn't	smoke

He doesn't smoke.

6.2.1.2. Dynamic State

Dynamic states are usually denoted by dynamic verbs. The viewpoint is focused on an instantaneous state about what is going on. Dynamic state is usually expressed with light verbs 在 *zai4* 'ZAI', 正在 *zheng4zai4* 'ZAI' or post-verbal aspectual markers 著 *zhe0* 'ZHE', 中 *zhong1* 'ZHONG' (Di in Sinica), ing. It is an instantaneous viewpoint that is a slice cut from a durative situation aspect, e.g. activity and accomplishment. Examples are shown in (13).

(13) a. 母親 正在 收拾 櫃臺 裡 的 東西 。

mu3qin1	zheng4zai4	shou1shi2	gui4tai2	li3	de0
mother	ZAI	clear_up	counter	inside	DE
dong1xi1					
thing					

My mother is clearing up the things in the counter.

b. 昨晚 漏夜 由 警方 偵訊 中 。

zuo2wan3	lou4ye4	you2	jing3fang1	zhen1xun4
last_night	midnight	PREP	police	investigate
zhong1				
ZHONG				

The police were investigating (the case) last night.

c. 我們 計畫 著 要 送 什麼 禮物 給 媽媽 。

wo3men2	ji4hua4	zhe0	yao4	song4	shen2me0	li3wu4
we	plan	ZHE	want	give	what	present
gei3	ma1ma1					
PREP	mum					

We are planning about what present we should give to mum.

d. 他 把 大 榕樹 的 鬍子 一根 一根 的 數 著 玩 。

ta1	ba3	da4	rong2shu4	de0	hu2zi0	yi1gen1yi1gen1
he	BA	big	banyan	DE	beard	one_by_one
de0	shu3	zhe0	wan2			
DE	count	ZHE	play			

He is counting the beards of the banyan one by one.

Light verbs and post-verbal aspectual markers could be combined together. For example, in (14.a) the light verb 在 *zai4* 'ZAI' is combined with durative marker 著 *zhe0* 'ZHE'; in (14.b), 在 *zai4* 'ZAI' is combined with durative marker 中 *zhong1* 'ZHONG'.

(14) a. 還有幾隻在吵著吃肉好還是吃草好 。

hai2	you3	ji3	zhi1	zai4	chao3		zhe0	chi1
also	have	some	CL	ZAI	quarrel		ZHE	eat
rou4	hao3	hai2shi4		chi1	cao3	hao3		
meat	good	or		eat	grass	good		

Some (animals) are discussing whether it is better to eat meat or eat grass.

b. 至於 其他 地區 尚 在 考慮 中 。

zhi4yu2	qi2ta1	di4qu1	shang4	zai4	kao3lv4
as_for	other	district	still	ZAI	consider
zhong1					
ZHONG					

As for the other districts, it is still being considered.

Dynamic state could also be expressed with idioms, e.g. (15).

(15) a. 各方仍各說各話。

ge4	fang1	reng2	ge4shuo1ge4hua4
every	side	still	talk_without_listening

Parties are still talking what they concern without listening to others.

b. 各地慕名而來的潛水好手絡繹不絕。

ge4	di4	mu4ming2er2lai2	de0	qian3shui3
every	district	come_due_to_the_reputation	DE	diving
hao3shou3	luo4yi4bu4jue2			
expert	keep_coming			

Diving experts keep coming here because of its reputation.

6.2.1.3. Delimitative

Delimitative describes a temporally bounded static state, which clearly implies a start and an end. Temporal boundary should be discriminated from logical boundary. The former is implied or could be explicitly stated. The latter is logically encoded in the predicate itself. Examples could be found in (16).

(16) a. 我就齋戒了五天。

wo3	jiu4	zhai1jie4	le0	wu3	tian1
I	then	fast	LE	five	day

I then fasted for five days.

b. 可惜戰果僅曇花一現 。

ke3xi1	zhan4guo3	jin3	tan2hua1yi1xian4
unfortunately	victory	just	a_flash_in_the_pan

Unfortunately, the victory is but a flash in the pan.

c. 碎石瓦礫就在此地躺了４５年。

sui4shi2wa3li4	jiu4	zai4	ci3di4	tang3	le0	45	nian2
debris	then	PREP	here	lie	LE	fourty_five	year

The debris lied here for 45 years.

Delimitative is related to static state that it describes the lifecycle of a static state, meaning that the static state only holds in this period. The example (17) is not treated as delimitative, but a simple dynamic state.

(17) 這兩天，他一直在齋戒。

zhe4	liang3	tian1	ta1	yi1zhi2 zai4	zhai1jie4
this	two	day	he	all_the_time	fast

He is fasting these days.

6.2.1.4. Activity

An activity (process) describes a temporally bounded dynamic state. Similar as delimitative, activity doesn't have a logical ending point (atelic). Activities are usually expressed by 'V+O+LE' pattern. Previous studies have used the compatibility with progressive and in-adverbials to identify activities. In our framework, activity is a different linguistic event type from dynamic state (in progressive). However, it could still be a mapping rule from activity and dynamic state. The difference of activity and dynamic state is that the former has a viewpoint that covers the whole period of time in which the dynamic state holds. In other worlds, activity describes the life time of a dynamic state.

Some examples do not contain any aspectual markers. In such a case, the interpretation depends on context. For example, (18.a) usually denotes a habitual static state. With a sentential LE as in (18.b), which is perfective LE, the whole situation denotes an activity, which is similary to (18.c).

(18) a. 祖父也教我認識北斗七星。

zu3fu4	ye3	jiao1	wo3	ren4shi2	bei3dou3qi1xing1
granpa	also	teach	me	identify	the_Big_Dipper

Granpa also teaches me to identify the Big Dipper.

b. 祖父教我認識北斗七星了。

zu3fu4	jiao1	wo3	ren4shi2	bei3dou3qi1xing1	le0
granpa	teach	me	identify	the_Big_Dipper	LE

Granpa also taught me to identify the Big Dipper.

c. 祖父教我認識北斗七星教了十分鐘。

zu3fu4		jiao1	wo3	ren4shi2	bei3dou3qi1xing1	jiao1
granpa		teach	me	identify	the_Big_Dipper	teach
le0	shi2	fen1zhong1				
LE	ten	minute				

Granpa also taught me for ten minutes to identify the Big Dipper.

With verbal LE, the sentence then describes an accomplishment, e.g. (19.a). The sentence (19.b) shows its compatibility with in-adverbial.

(19) a. 祖父教我認識了北斗七星。

zu3fu4	jiao1	wo3	ren4shi2	bei3dou3qi1xing1	le0
granpa	teach	me	identify	the_Big_Dipper	LE

Granpa taught me to identify the Big Dipper.

b. 祖父十分鐘內教我認識 了北斗七星。

zu3fu4	shi2	fen1zhong1	nei4	jiao1	wo3	ren4shi2
granpa	ten	minute	within	teach	me	identify
le0	bei3dou3qi1xing1					
LE	the_Big_Dipper					

Granpa taught me to be able to identify the Big Dipper in ten minutes.

The sentences in (20) are some other exmaples.

(20) a. 別人硬是來提親。

bie2ren2	ying4shi4	lai2	ti2qin1
the_man	still	come	propose_a_marriage

The man just came to propose the marriage.

b. 我還陪她去看了好久的精神科醫生。

wo3	hai2	pei2	ta1	qu4	kan4	le0	hao3jiu3
I	also	accompany	her	go	see	LE	a_long_time
de0	jing1shen2ke1yi1sheng1						
DE	phychiatrist						

I also accompanied her to see a psychiatrist for a long time.

When the main verb takes a proposition as object, the proposition actually indicates the property of the content. In this case, the whole sentence still denotes an activity, e.g. (21.a). If we remove the proposition, the sentence is still acceptable, e.g. (21.b). The in-adverbials and for-adverbial test in (21.c) and (21.d) support the treatment.

(21) a. 鄰居 都 稱讚 他 是 個 巧 童 。

lin2ju1	dou1	cheng1zan4	ta1	shi4	ge4	qiao3	tong2
neighbors	all	praise	he	be	CL	clever	child

Neighbors all praise him to be a clever child.

b.鄰居 都 稱讚 他。

lin2ju1	dou1	cheng1zan4	ta1
neighbors	all	praise	he

Neighbors all praised him.

c.*鄰居 都 在 五分鐘內 稱讚 了 他 是 個 巧 童 。

lin2ju1	dou1	zai4	wu3	fen1zhong1	nei4	cheng1zan4
neighbors	all	PREP	five	minute	within	praise

le0	ta1	shi4	ge4	qiao3	tong2
LE	he	be	CL	clever	child

Neighbors all praised him in five minutes.

d.鄰居 都 稱讚 他 是 個 巧 童 稱讚 了 五分鐘。

lin2ju1	dou1	cheng1zan4	ta1	shi4	ge4	qiao3	tong2
neighbors	all	praise	he	be	CL	clever	child
cheng1zan4	le0	wu3	fen1zhong1				
praise	LE	five	minute				

Neighbors all praised him for five minutes to say that he is a clever child.

The sentence in (22) is another example of this kind of sentences.

(22) 但 也 有 人 嘲笑 它 只 是 散文 的 分行 。

dan4	ye3	you3	ren2	chao2xiao4	ta1	zhi3shi4
however	also	YOU	people	mock	it	only
san3wen2	de2	fen1hang2				
prose	DE	branch				

However, there is also someone who mock it and state that it is only a sub type of prose.

6.2.1.5. Semelfactive

Besides the verbs that are semantically semelfactives, some constructions in Chinese such as V+LE+V, VV, V+[一下] etc. can also denote semelfactive. e.g. (23).

(23) a. 她就親親他的手指。

ta1	jiu4	qin1qin1	ta1	de0	shou3zhi3
she	then	kiss	he	DE	finger

She then kissed his finger.

b. 她拍拍他。

ta1	pai1pai1	ta1
she	pat	he

She patted him.

c. 媽媽也點點頭 。

ma1ma1	ye3	dian3dian3tou2
mum	also	nod

Mum nodded as well.

6.2.1.6. Achievement

6.2.1.6.1. Static-Static Change: --|--

Static-Static (SS) change could be further divided into three subcategories: change of state (--|--) in the traditional use, inchoative (|--), cessative (--|). The difference of the three subcategories is not significant. Logically, the inchoative of a static state P, implies that the previous state is ¬P. SS change is surely related to static state that it focuses on the boundary, either the start or the end, of the static state. SS change is usually expressed with the pattern V了 or 不V了. Examples of SS change could be found in (24).

(24) a. 遠親 與 近鄰 也 沒有 什麼 分別 了

yuan3qin1	yu3	jin4lin2	ye3	mei2you3	shen2me0
far_relatives	and	close_neighbors	not_have	what	
fen1bie2	le0				
difference	LE				

Far relatives and close neighbors don't have any difference any more.

b. 大家 更 肯定 他們 是 真的 醉 了

da4jia1	geng4	ken3ding4	ta1men2	shi4
everyone	even_more	sure	they	be
zhen1de0	zui4	le0		
really	drank	LE		

People become more confident that they are drank.

c. 強調 的 重點 也 從 個人 情操 的 卓絕 偉大 轉為 眾志成城 的 奉獻

qiang2diao4	de0	zhong4dian3	ye3	cong2	ge4ren2
emphasize	DE	point	also	from	individual
qing2cao1	de0	zhuo1jue2	wei3da4		zhuan3wei4
sentiment	DE	extraordinary	great		change_to
zhong4zhi4cheng2cheng2		de0	feng4xian4		
unity_is_strength		DE	contribute		

The emphasis was changed from individual's extraordinary sentiment to collaborative contribution.

d. 於是 我 達成 了 心願

yu2shi4	wo3	da2cheng2	le0	xin1yuan4
then	I	achieve	LE	wish

Finally, I achieved my wish.

SS change may also involve causative relation between the previous state and the final state. The sentence in (25) is also treated as an achievement. The confusing issue is that 接近 *jie1jin4* ‘get close to’ doesn’t mean ‘reached’. The state that has come true is to get close rather than to reach. The corresponding English translation clearly shows a change of state achievement.

(25) 南北韓 關係 已 接近 重要 轉捩點

nan2	bei3	han2	guan1xi4	yi3	jie1jin4
south	north	Korea	relationship	already	approach
zhong4yao4		zhuan3lie4dian3			
important		turning_point			

The relationship between South Korea and North Korea has been approaching to a turning point.

In addition to the example that the change of state is actually syntactically realized with an adverb ‘已’ or ‘已經’, there are also other examples that also express change with adverbs, e.g. the sentences in (26).

(26) a. 日本 不再 是 唯一 貸款給 中共 的 工業 國家

ri4ben3	bu4zai4	shi4	wei2yi1	dai4kuan3	gei3
Japan	no_longer	be	only	loan	give
zhong1gong4			de0	gong1ye4	guo1jia2
the_Communist_Party_of_China			DE	industry	country

Japan is no longer the only industrial country who loans money to China.

b. 修 法 已 是 當務之急

xiu1	fa3	yi3	shi4	dang1wu4zhi1ji2
revise	law	already	be	urgent_affairs

It has been an urgent affair to revise the laws.

c. 國內 重大 公共 工程 得以 採用 進口 水泥

guo2nei4	zhong4da4	gong1gong4	gong1cheng2	de2yi3
domestic	significant	public	project	so
cai3yong4	jin4kou3	shui3ni2		
adopt	import	cement		

The big public projects in the country managed to adopt imported cements.

d. 生活 領域 也 隨著 寬廣 遼闊

sheng1huo2	ling3yu4	ye3	sui2zhe0	kuan1guang3
life	field	also	accordingly	wide

liao2kuo4

extensive

The life fields also are also widening accordingly.

6.2.1.6.2. Static-Dynamic Change: --|~~

Static-Dynamic (SD) change usually describes an inceptive, i.e. the start of a dynamic state. SD changes are usually expressed by some light verbs, e.g. 開始 *kai1shi3* 'start', 繼續 *ji4xu4* 'continue', and also the patterns, such as V-le, V 起來 V-*qi3lai2* 'V-up', V 起 O 來 *V-qi3-O-lai2* 'V-up-O', etc. The sentences in (27) are some examples.

(27) a. 她 開始 用心 的 去 認識 這個 世界 。

ta1	kai1shi3	yong4xin1	de0	qu4	ren4shi2	zhe4
she	start	attentively	DE	go	explore	this
ge4	shi4jie4					
CL	world					

She started to explore this world attentively.

b. 昨天 天氣 開始 轉晴 。

zuo2tian1	tian1qi4	kai1shi3	zhuan3	qing2
yesterday	weather	start	change_to	sunny

The weather started to becoming sunny yesterday.

c. 大家 都 叫 起來 了 。

da4jia1	dou1	jiao4	qi3lai2	le0
everyone	all	shout	QILAI	LE

Everyone started to shout.

d. 連 神木 也 顫動 起來 。

lian2	shen2mu4	ye3	chan4dong4	qi3lai2
even	mysterious_wood	also	shake	QILAI

Even the mysterious wood started to shake.

e. 稀飯 裡 的 水 很 快 就 沸騰 起來

xi1fan4	li3	de0	shui3	hen3	kuai4	jiu4	fei4teng2
porridge	in	DE	water	very	quick	then	boil
qi3lai2							
QILAI							

The water in the porridge quickly started to boil.

For 繼續 *ji4xu4* ‘continue’, there are two different ‘continue’. The first is to express a situation continues without stop. The second is to express a situation that a process starts again after stopped for a while. However, sometimes it is hard to discriminate the two different cases as in the following example. For annotation, this is treated as the continuity without stop. Only if there is an explicit marker, e.g. adverb 又 *you4* ‘again’ and 然後 *ran2hou4* ‘then’ etc., to indicate a stop, it is then annotated as inceptive achievement, eg. (28).

(28) a. 四名 代表 繼續 和 大陸 交涉

si4	ming2	dai4biao3	ji4xu4	he2	da4lu4
four	CL	representative	continue	PREP	mainland
jiao1she4					
negotiate					

The four representatives continued to negotiate with the mainland.

b. 四名 代表 又 繼續 和 大陸 交涉

si4	ming2	dai4biao3	you4	ji4xu4	he2	da4lu4
four	CL	representative	again	continue	PREP	mainland
jiao1she4						
negotiate						

The four representatives continued to negotiate with the mainland again.

c. 右手 繼續 在 蛇 身 上 畫 起 腳 來

you4shou3	ji4xu4	zai4	she2	shen1	shang4	hua4	qi3
right_hand	continue	PREP	snake	body	POSTP	draw	QI-
jiao3	lai2						
feet	-LAI						

His right hand continued to draw feet for the snake.

d. 臺 下 響起 如雷 的 掌聲 。

tai2	xia4	xiang3qi3	ru2lei2	de0	zhang3sheng1
stage	POSTP	start	thunderous	DE	applause

Thunderous applause started below the stage.

Since V-LE pattern can both express activity and the start of a state, a sentence will be ambiguous when it lacks of aspectual makers. For example, the sentence (30.a) has two different interpretations: (30.b) and (30.c). In such cases, the annotator may choose the most possible interpretation. For this example, the interpretation (30.b) is preferred. With this treatment, it will

allow us in future to make statistics to see which interepation will be preferred with a certain context.

(30) a. 我們 的 心 顫抖 了

wo3men2	de0	xin1	chan4dou3	le0
we	DE	heart	shake	LE

Our hearts started to shake.

b. 我們 的 心 開始 顫抖 了

wo3men2	de0	xin1	kai1shi3	chan4dou3	le0
we	DE	heart	start	shake	LE

Our hearts started to shake.

c. 剛才 我們 的 心顫抖 了

gang1cai2	wo3men2	de0	xin1	chan4dou3	le0
just_now	we	DE	heart	shake	LE

Our hearts shaked just now.

The sentences in (31) describe a situation with a dynamic state overlapping with the previous static state. In such cases, they are still annotated as SD change. However, an additional mark will be specified to indicate the overlap.

(31) a. 我們 高興 得 拍手 歡呼

wo3men2	gao1xing4	de0	pai1shou3	huan1hu1
we	happy	DE	clap_one's_hands	cheer

We are so happy that we clap our hands and cheer.

b. 鮭魚 們 激動 得 又 叫 又 跳

gui1yu2men0	ji1dong4	de0	you4	jiao4	you4	tiao4
the_trout	excited	DE	also	shout	also	jump

The trout are so excited that they all shout and jump.

c. 小 山羊 高興 得 跑來跑去

xiao3	shan1yang2	gao1xing4	de0	pao3lai2pao3qu4
little	goat	happy	DE	run_back_and_forth

The little goat is so happy that he is run back and forth.

6.2.1.6.3. Dynamic-Static Change: ~~\|--

Dynamic-Static (DS) change usually describes a terminative or completive of a dynamic state. Completive is usually the culminating point of an accomplishment. Terminative usually refers to a

dynamic state that does not have a logical ending point or the ending point is not achieved. DS change could be expressed by light verbs, 停止 *ting2zhi3* 'stop', 結束 *jie2shu4* 'end', e.g. (32).

(32) a. 該 財團 也 已 停止 腳步 。

gai1	cai2tuan2	ye3	yi3	ting2zhi3	jiao3bu4
the	consortium	also	already	stop	step

The consortium also has stopped its step.

b. 其他 推 石頭 的 也 停住 了 手 。

qi2ta1	tui1	shi2tou2	de0	ye3	ting2zhu4	le0	shou3
other	push	stone	DE	also	stop	LE	hand

The other people who were pushing the stone also stopped.

c. 抗議 活動 在 中午 一時 左右 結束 。

kang4yi4	huo2dong4	zai4	zhong1wu3	yi1shi2
protest	activity	at	noon	1:00pm
zuo3you4	jie2shu4			
approximate	stop			

The protest ended at about eleven at noon.

RVCs are basically treated as DS changes. For example, the dynamic state before the result as describe by (33.a) is the process of the sweat wetting the clothes; the dynamic state before 學會 *xue2hui4* 'learnt' is learning.

(33) a. 汗水 溼透 了 衣服 。

han4shui3	shi1tou4	le0	yi1fu2
sweat	wet-through	LE	clothes

The sweat wetted through the clothes.

b. 你們 都 長高 了 。

ni3men2	dou1	zhang3gao1	le0
you	all	grow-tall	LE

You have all grown taller.

c. 關公 被 曹軍 打敗 了 。

guan1gong1	bei4	cao1jun1	da3bai4	le0
Guangong	BEI	Cao_Army	defeat	LE

Guangong was defeated by the Cao Army

d. 我 很 快 就 學會 了 。

wo3	hen3	kuai4	jiu4	xue2hui4	le0
I	very	quick	then	learn	LE

I quickly learned it.

e. 雙方 打成 廿七 比 廿七 平手

shuang1fang1	da3cheng2	nian4qi1	bi3	nian4qi1
the_two_sides	compete-as	twenty_seven	to	twenty_seven
ping2shou3				
draw				

The two sides finished the game in a draw at 27 to 27.

RVCs don't encode the starting point of the dynamic state. It only describes the culmination point of the background accomplishment situation type. We can test it with adverbial 以前 *yi3qian2* 'before' as follows. In this case, the time period described by 學會法語以前 *xue2hui4 fa3yu3 yi3qian2* 'before you have learnt French' includes the learning process. For example, the sentence (34.b) has a different meaning from (34.a).

(34) a. 在 你 學會 法語 之前， 你 不能 去 法國。

zai4	ni3	xue2hui4	fa3yu3	zhi1qian2	ni3
PREP	you	study-learn	French	before	you

bu4neng2	qu4	fa3guo2
cannot	go	France

You cannot go to France before you learn French.

b. 在 你 學 法語 之前， 你 不能 去 法國。

zai4	ni3	xue2	fa3yu3	zhi1qian2	ni3	bu4neng2
PREP	you	study	French	before	you	cannot
qu4	fa3guo2					
go	France					

You cannot go to France before you study French.

It is possible that the final state overlaps with the previous dynamic state. In such cases, there is usually a causative relation between the two states. For example, the sentences in (35) describe an achievement of reaching a certain state, while the dynamic state may still holds. In this case, a tag will also be assigned to indicate the overlap.

(35) a. 我們 已經 走到 娃娃谷 的 附近 。

wo3men2	yi3jing1	zou3dao4	wa2wa2gu3	de0	fu4jin4
we	already	walk_to	Wawa_Valley	DE	around

We have arrived around the Wawa Valley.

b. 我 和 妹妹 聽 得 臉 都 紅 了 。

wo3	he2	mei4mei4	ting1	de0	lian3	dou1	hong2	le0
I	and	sister	listen	DE	face	even	red	LE

My sister and I all got red on face while listening.

c. 車 行至 板橋 文化路 。

che1	xing2zhi4	ban3qiao2	wen2hua4lu4
car	run_to	Banqiao	Wenhua_Road

The car arrived at the Wenhua Road of Banqiao.

d. 大量 的 土石流 還 將 馬槽橋 都 沖垮 了 。

da4liang4	de0	tu3shi2liu2	hai2	jiang1	ma3cao2qiao2	dou1
large_amount	DE	debris_flow	also	PREP	Macao_Bridge	even
chong1kua3	le0					
wash-collapse	LE					

A large amount of debris flow collapsed the Macao Bridge as well.

Similarly, there are also overlap causatives that is basically an inchoative, e.g. (36).

(36) 所以 忙 得 沒有 時間 給 你 寫信

suo3yi3	mang2	de0	mei2you3	shi2jian1	gei3	ni3
so	busy	DE	not_have	time	give	you
xie3	xin4					
write	letter					

So, I was too busy to write to you.

6.2.1.6.4. Dynamic-Dynamic Change: ~~\|~~

This event structure is rarely attested in Chinese. But it does exist, e.g. the sentence in (37).

(37) 我發動好了汽車。

wo3	fa1dong4	hao3	le0	qi4che1
I	start_upfinish	LE	car	

I started up the car.

This event type is different from |~~~|~~ that the start point is not encoded. This could be tested by 以前 *yi3qian2* 'before' and 以後 *yi3hou4* 'after' adverbial as in (38). The time adverbial 汽車發動好以前 *qi4che1 fa1dong4 hao3 yi3qian2* 'before the engine is started' refers to the time period including the starting up process.

(38) 汽車發動好以前，他不能離開。

qi4che1	fa1dong4	hao3	yi3qian2	ta1	bu4neng2
car	start_up	finish	before	he	cannot
li2kai1					
leave					

He cannot leave before the car is started up.

6.2.1.6.5. Perfect static state: |--T--

This category differs from inchoative in that they have different reference time *t* to describe the change. It is called perfect state because it usually corresponds to the perfect aspect when translated into English. For annotation, this category is discriminated. The adverbs, e.g. 已經 yi3jing1 'already' or other time adverbials are usually used for durative state. For example, 他已經病了 *ta1 yi3jing1 bing4 le0* 'he has been sick' vs. 他病了 *ta1 bing4 le0* 'he got sick'. Examples could be found in (39).

(39) a. 電報 已經 通行 了 三十多年。

dian4bao4	yi3jing1	tong1xing2	le0	san1shi2duo1
telegraph	already	be_in_use	LE	more_than_thirty
nian2				
year				

Telegraph has been in use for more than thirty years.

b. 這 已經 是 連續 四年 和 決賽 無緣 了。

zhe4	yi3jing1	shi4	lian2xu4	si4	nian2	he2
this	already	be	continuously	four	year	PREP
jue2sai4	wu2yuan2	le0				
finals	fated	LE				

It has been four years that we are not in the finals.

c. 我們 已經 許久 沒 見面 了。

wo3men2	yi3jing1	xu3jiu3	mei2	jian4mian4	le0
we	already	long_time	not	meet	LE

We haven't seen each other for a long time.

d. 他 在 那裡 賣 肉丸 已經 有 二十多年 的 歷史 了。

ta1	zai4	na4li4	mai4	rou4wan2		yi3jing1	you3
he	PREP	there	sell	meatball		already	YOU
er4shi2duo2			nian2	de0	li4shi3	le0	
more_than_twenty			year	DE	history	LE	

He has been there selling meatball for more than twenty years.

6.2.1.6.6. Perfect dynamic state: |~~T~~

Different from inceptive, this category has a different reference time. Similar as perfect static state, it also corresponds to the perfect aspect in English, e.g. (40.a). When a time period is added to describe the duration of the dynamic state, it actually describes an accomplishment, e.g. (40.b).

(40) a. 他已經在跑步了。

ta1	yi3jing1		zai4	pao3bu4	le0
he	already	ZAI	run	LE	

'He has been running'

b. 你已經睡了兩個小時了。

ni3	yi3jing1	shui4	le0	liang4	ge4	xiao3shi2	le0
you	already	sleep	LE	two	CL	hour	LE
bu4yao4	zai4	shui4	le0				
don't	anymore	sleep	LE				

You have slept for two hours and should not sleep any more.

6.2.1.7. Accomplishment

6.2.1.7.1. Static final accomplishment

Static final accomplishment (AccS) is composed by a dynamic process with a final static state. It is a holistic viewpoint on an ontological accomplishment situation type, e.g. the sentences in (41).

(41) a. 醫護 人員 很 快 的 將 她 的 媽媽 抬上 救護車 。

yi1hu4ren2yuan2	hen3	kuai4	de0	jiang1	ta1	de0
medical_worker	very	quick	DE	PREP	she	DE

ma1ma1	tai2shang4	jiu4hu4che1
mother	carry-onto	ambulance

The medical workers quickly moved her mother to the ambulance.

b. 他 的 作品 與 生活 情形 被 拍成 了 電影 。

ta1	de0	zuo4pin3	yu3	sheng1huo2	qing2xing2	bei4
he	DE	work	and	life	circumstance	BEI
pai1cheng2	le0	dian4ying3				
shoot-into	LE	movie				

His work and life were shoot to be a movie.

c. 他 用 魔法 移動 了 北斗七星 的 位置 。

ta1	yong4	mo2fa3	yi2dong4	le0	bei3dou3qi1xing1
he	use	magic	move	LE	Big_Dipper
de0	wei4zhi4				
DE	position				

He moved the position of Big Dipper with magic.

d. 妹妹 幫 她 把 餅盒 提了進來 。

mei4mei4	bang1	ta1	ba3	bing3he2	ti2	le0	jin4lai2
sister	help	she	BA	cookie_box	lift	LE	into

Her sister help her carry the cookie box in.

e. 她 只 縫製 了 一面 國旗 ;

ta1	zhi3	feng2zhi4	le0	yi1	mian4	guo2qi2
she	only	tailor	LE	one	CL	national_flag

She only tailored one national flag.

Since this is a holistic viewpoint aspect, which could be decomposed into a serial of instant sub events, which could be dynamic state '~~~', achievement |~~ or ~~|-- etc. The sentence with holistic viewpoint entails that with partial viewpoint aspect. Examples are shown in (42).

(42) a. 老馬 從 三點 到 四點 生 了 一匹 小馬 。

lao3ma3	cong2	san1dian3	dao4	si4dian3	sheng1
old_horse	from	3:00	to	4:00	give_birth_to
le0	yi1	pi1	xiao3ma3		
LE	one	CL	small_horse		

The old horse gave birth to a small horse from three to four.

b. 老馬 三點半 時 正在 生 一匹 小馬 。

lao3ma3	san1dian3ban4		shi2	zheng4zai4	sheng1
old_horse	3:30		when	ZAI	give_birth_to
yi1	pi1	xiao3ma3			
one	CL	small_horse			

The old horse is giving birth to a small horse at half past three.

c. 四點時， 一匹 小馬 出生 了。

si4dian3	shi2	yi1	pi1	xiao3ma3	chu1sheng1	le0
4:00	when	one	CL	small_horse	be_born	LE

The small horse was born at four.

Besides, the pattern V+LE+O mostly expresses an accomplishment as suggested in Chapter 3. There are verbs that can denote a situation type that could be either telic or atelic. For example, 提親 *ti2qin1* 'propose a marriage' could be telic in that it usually includes some traditional routines, e.g. sending gifts, declaring the proposal of a marriage. Thus, it could be the telic in the sense that all the routines are finished, leaving an illocutionary force that the receipient needs to make a decision whether to accept it or not. The internal aspectual marker LE can serve as an indicator of the telicity. For example, the sentences in (43) are treated as accomplishments.

(43) a. 別人 硬是 來 提 了 親。

bie2ren2	ying4shi4	lai2	ti2	le0	qin1
the_man	still	come	propose	LE	marriage

The man still came to propose the marriage.

b. 別人 硬是 來 在 十分鐘 內 提 完 了 親。

bie2ren2	ying4shi4	lai2	zai4	shi2	fen1zhong1	nei4
the_man	still	come	PREP	ten	minute	within

ti2	wan2	le0	qin1
propose	finish	LE	marriage

The man still came to propose the marriage in ten minutes.

On the other hand, without LE, it is usually atelic as shown in (44).

(44) a. 別人 硬是 來 提親。

bie2ren2	ying4shi4	lai2	ti2	qin1
the_man	still	come	propose	marriage

The man still came to propose the marriage.

b. 別人 硬是 來 提親 提了 一個小時， 不過 最後 沒 答應 他。

bie2ren2		ying4shi4		lai2	ti2qin1		ti2	
the_man		still		come	propose_marriage		propose	
le0	yi1	ge4	xiao3shi2					
LE	one	CL	hour					
bu4guo4		zui4hou4		mei2	da1ying4	ta1		
however		finally		not	accept	he		

The man still came to propose the marriage for one hour, but is not accepted.

Similarly, when it lacks of aspectual markers, the sentence could be ambiguous, e.g. the sentence (45.a) has two possible interpretations: (45.b) and (45.c). In this case, the annotator can decide which interpretation is preferred based on context, intuition or other information. If it is difficult to decide, the sentence could be put into OTHER category.

(45) a. 他 又 把 那首 詩 的 意思 解釋 給 我 聽 。

ta1	you4	ba3	na4	shou3	shi1	de0	yi4si1	jie3shi4
he	again	BA	that	CL	poem	DE	meaning	explain
gei3	wo3	ting1						
give	I	listen						

He then explained the poem to me.

b. 他 又 把 那首 詩 的 意思 解釋 了 給 我 聽 。

ta1	you4	ba3	na4	shou3	shi1	de0	yi4si1	jie3shi4
he	again	BA	that	CL	poem	DE	meaning	explain
le0	gei3	wo3	ting1					
LE	give	I	listen					

He then explained the poem to me.

c. 他 又 開始 把 那首 詩 的 意思 解釋 給 我 聽 。

ta1	you4	kai1shi3	ba3	na4	shou3	shi1	de0
he	again	start	BA	that	CL	poem	DE
yi4si1		jie3shi4	gei3	wo3	ting1		
meaning		explain	give	I	listen		

He then started to explain the poem to me.

The sentence (46) is also ambiguous. It can denote both an accomplishment and its start.

(46) 他們 已經 在 大 操場 上 集合 了 。

ta1men2	yi3jing1	zai4	da4cao1chang3	shang4
they	already	PREP	playground	on
ji2he2	le0			
gather	LE			

They have gathered at the playground already.

They have started gathering at the playground now.

Some Serial Verb Constructions (SVCs) can also express AccS, e.g. (47.a), which can be supported through the test in (47.b) and (47.c) by trying to add a perfective LE. SVCs will be discussed more in the following section.

(47) a. 許多 和 我國 沒有 邦交 的 國家 也 都 紛紛 到 台灣 成立 觀光 辦事處 。

xu3duo1	he2	wo3guo2	mei2you3	bang1jiao1	de0
many	PREP	our_country	not_have	diplomacy	DE
guo2jia1	ye3	dou1	fen1fen1	dao4	tai2wan1
country	also	all	one_by_one	come	Taiwan
cheng2li4	guan1guang1ban4shi4chu4				
establish	tourist_office				

Many countries that don't have diplomatic relation with us also come to Taiwan and establish tourist offices.

b. ?許多和我國沒有邦交的國家也 都 紛紛 到 了 台灣 成立 觀光 辦事處 。

xu3duo1	he2	wo3guo2	mei2you3	bang1jiao1	de0	
many	PREP	our_country	not_have	diplomacy	DE	
guo2jia1	ye3	dou1	fen1fen1	dao4	le0	tai2wan1
country	also	all	one_by_one	come	LE	Taiwan
cheng2li4	guan1guang1ban4shi4chu4					
establish	tourist_office					

Many countries that don't have diplomatic relation with us also come to Taiwan and establish tourist offices.

c. 許多和我國沒有邦交的國家 也 都 紛紛 到 台灣 成立 了 觀光 辦事處 。

xu3duo1	he2	wo3guo2	mei2you3	bang1jiao1	de0
many	PREP	our_country	not_have	diplomacy	DE
guo2jia1	ye3	dou1	fen1fen1	dao4	tai2wan1
country	also	all	one_by_one	come	Taiwan
cheng2li4	le0	guan1guang1ban4shi4chu4			

establish LE tourist_office

Many countries that don't have diplomatic relation with us also come to Taiwan and establish tourist offices.

6.2.1.7.2. Dynamic final accomplishment: |~~|~~

Dynamic final accomplishment (AccD) is composed by a dynamic process with a final dynamic state, e.g. (48).

(48) 他把電腦打開了。

ta1	ba3	dian4nao3	da3kai1	le0
he	BA	computer	start_up	LE

I started up the computer.

6.2.1.8. Instantaneous Accomplishment

Some accomplishment is done instantaneously by a speech act or guesture etc. The sentence is a report of this act without any details.

6.2.1.8.1. Static final instantaneous accomplishment: |~|---

Static final instantaneous accomplishment (InsAccS) is composed by a semelfactive action with a static final state, e.g. the following sentence. As has been discussed in the previous chapter 3, verbs like 殺死 *sha1si3* 'kill', 打碎 *da3sui4* 'break', 答應 *da1ying4* 'accept', etc. should be treated as instantaneous accomplishment rather than pure change of state, since an action is surely implied. Examples are shown in (49) and (50).

(49) a. 二姐 和 我 都 答應 了 。

er4jie3	he2	wo3	dou1	da1ying4	le0
second_sister	and	I	all	accept	LE

My second sister and I all accepted.

b. 二姐 和 我 都 在 一分鐘內 答應 了 。

er4jie3	he2	wo3	dou1	zai4	yi1	fen1zhong1	nei4
second_sistem	and	I	all	PREP	one	minute	within
da1ying4	le0						
accept	LE						

My second sister and I all accepted in one minute.

c. ?二姐 和 我 都 正在 答應。

er4jie3	he2	wo3	dou1	zheng4zai4	da1ying4
second_sistem	and	I	all	ZAI	accept

*My second sister and I are all accepting.

(50) a. 他們 三 人 最後 以 一千萬 達成 協議。

ta1men2	san1	ren2	zui4hou4	yi3	yi1qian1wan4
they	three	people	finally	PREP	ten_million
da2cheng2	xie2yi4				
reach	agreement				

They three finally reached an agreement at ten million dollars.

b. 絢爛 美豔 的 櫻花 吸引 了 無數 愛 花 人士 前來 觀賞 。

xuan4lan4	mei3yan4	de0	ying1hua1	xi1yin3	le0
gorgeous	beautiful	DE	sakura	attract	LE
wu2shu4	ai4	hua1	ren2shi4	qian2lai2	guan1shang3
many	love	flower	people	come	see

The gorgeous and beautiful sakura attracted many people to come to enjoy.

The sentence (51) is ambiguous that whether the friends have been in the family or it only describes a state that the invitation is sent, with the following proposition is only the content of the invitation.

(51) 建華 和 建國 也 邀 了 幾個 同學 到 家 裡 來 玩 。

jian4hua2	he2	jian4guo2	ye3	yao1	le0	ji3
Jianhua	and	Jianguo	also	invite	LE	several
ge4	tong2xue2	dao4	jia1li3	lai2	wan2	
CL	classmate	PREP	home	come	play	

Jianhua and Jianguo also invited some classmates to come home to play.

6.2.1.8.2. Dynamic final instantaneous accomplishment: |~|~~

Dynamic final instantaneous accomplishment (InsAccD) is composed by a semelfactive action with a dynamic final state. Although, this event type theoretically exists, it is rarely lexicalized intuitionally. In Chinese, such event could be expressed by RVCs. Similar examples also exist in English, e.g. in (52).

(52) a. 我踢飛了一塊石頭。

wo3	ti1fei1	le0	yi1	kuai4	shi2tou2
I	kick-fly	LE	one	CL	stone

I kicked a stone fly.

b. 我擰轉了一個骰子。

wo3	ning2zhuan4	le0	yi1	ge4	shai3zi0
I	twist-spin	LE	one	CL	dice

I putted a spin on a dice.

6.2.2. Illocutionary Acts

For speech act, we adopt the theory by Searle (1976). Speech act includes five different categories: assertive, expressive, directive, commissive and declaration. Questions especially interrogatives are also put under the category of speech act.

6.2.2.1. Assertive

Assertive is used by a speaker to inform the listeners that the proposition is the case. It is different from other linguistic events that it is usually typical spoken language, e.g. the sentence in (53).

(53) a. 我 只是 和 孩子 開開玩笑 罷了。

wo3	zhi3shi4	he2	hai2zi0	kai1kai1wan2xiao4	ba4le0
I	only	PREP	children	joking	SFP

I'm just kidding with the children.

b. 這 是 一個 小 祕密 哦！

zhe4	shi4	yi1	ge4	xiao3	mi4mi4	o0
this	be	one	CL	little	secret	SFP

This is a little secret.

c. 這 就 是 我 說 的 方法 呀！

zhe4	jiu4	shi4	wo3	shuo1	de0	fang1fa3	ya0
this	then	be	I	say	DE	method	SFP

This is the approach I meant.

6.2.2.2. Directive

Directive is used by a speaker to issue a command, requirement etc. to commit the listeners to perform some actions. Directives are usually expressed by imperative sentences, but non-imperative sentences can also express direct illocutionary act. The sentences in (54) are some examples.

(54) a. 大家 都 坐好 。

da4jia1 dou1 zuo4hao3

everyone all sit_well

Everyone, sit well please.

b. 你 看 。

ni3 kan4

you look

Look!

c. 我們 來 比賽 !

wo3men2 lai2 bei3sai4

we come compete

Let’s compete.

d. 你 去 追 。

ni3 qu4 zhui1

you go chase

You go and chase it.

e. 我們 來 數數看 吧 。

wo3men2 lai2 shu3shu3kan4 ba0

we come count_and_see SFP

Let’s try to count.

f. 你們 放心 走 好了 。

ni3men2 fang4xin1 zou3 hao3le0

you be_at_ease go SFP

You can go at ease.

6.2.2.3. Expressive

Expressive is used by a speaker to express his attitude on a real event. The sentences in (55) are some examples.

(55) a. 歡迎光臨 !

huan1ying2 guang1lin2

welcome come

Welcome here!

b. 妳 好 呀！

ni3	hao3	ya0
you	good	SFP

How are you.

c. 媽媽 過節 快樂！

ma1ma1	guo4jie2	kuai4le4
mum	festival	happy

Happy festival mum!

d. 您 回來 啦！

nin2	hui2lai2		la0
you	return	SFP	

You come back!

6.2.2.4. Commissive

Commissive is used by a speaker to commit himself to a particular action in future, e.g. making promises or oaths, etc. It is different from assertive that assertive is to inform the truth of a proposition, while commissive is to make a promise that will take effect in future. Some examples are shown in (56).

(56) a. 開羅 仍 將 賡續 其 和平 努力 。

kai1luo2	reng2	jiang1	geng1xu4	qi2	he2ping2	nu3li4
Cairo	still	will	continue	its	peace	efforts

Cairo will still contine its efforts on peace.

b. 我 一定 記住 。

wo3	yi1ding4	ji4zhu4
I	promise	remember

I promise to keep it in mind.

c. 我 給 你們 說 一個 螢火蟲 的 故事 吧！

wo3	gei3	ni3men2	shuo1	yi1	ge4	ying2huo3chong2
I	give	you	say	one	CL	firefly
de0	gu4shi4	ba0				
DE	story	SFP				

Let me say a story about fireflies.

d. 我 一定 會 報答 您 。

wo3	yi1ding4	hui4	bao4da2	nin2
I	promisewill	pay_back	you	

I will pay back to you.

e. 我 去 叫 小英 來 幫忙 。

wo3	qu4	jiao4	xiao3ying1	lai2	bang1mang2
I	go	call	Xiaoying	come	help

Let me go to find Xiaoying for help.

6.2.2.5. Declarative

Declarative is used by a speaker to make a proposition to be a fact, e.g. to setup a rule for an activity, to declare the foundation of a nation or party, to nominate an entity a role, to announce the guilty or innocence of a person etc. declarative is only valid by the authorized person who has the right to do so. The sentences in (57) are two examples.

(57) a. 我宣布被告張三無罪！

wo3	xuan1bu4	bei4gao4	zhang1san1	wu2zui4
I	declare	defendant	Zhangsan	innocent

I declare that Zhangsan is innocent.

c. 到 時候 後果 自行 負責 ！

dao4	shi2hou0	hou4guo3	zi4xing2	bu4ze2
by	then	consequence	by_oneself	take_responsibility

I declare that we shall take our own responsibilities.

6.2.2.6. Interrogative

Interrogative is used by a speaker to ask questions to the hearer and request an answer from the hearer, e.g. the sentences in (58).

(58) a. 汽車 是 誰 發明 的 ？

qi4che1	shi4	shui2	fa1ming2	de0
car	be	who	invent	DE

Who invented car?

b. 你們 想 知道 身體 的 變化 嗎？

ni3men2	xiang3	zhi1dao4	shen1ti3	de0	bian4hua4
you	want	know	body	DE	change
ma0					
SFP					

Do you want to know the changes of our body?

c. 將軍， 你 為什麼 急 著 去 找 劉備？

jiang1jun1	ni3	wei4shen2me0	ji2	zhe0	qu4	zhao3
general	you	why	hurry	ZHE	go	find
liu2bei4						
Liubei						

General, why you are in such a hurry to find Liubei?

d. 你 還 記得 我們 在 樹蔭 下 乘涼 、 聊天 的 情形 嗎？

ni3	hai2	ji4de0	wo3men2	zai4	shu4yin1	xia4
you	still	remember	we	PREP	tree_shade	POSTP
cheng2liang2		liao2tian1	de0	qing2xing2	ma0?	
enjoy_the_cool		chat	DE	situation	SFP	

Do you still remember when we are chatting in the tree shade?

Some questions doesn't request any answer from the hearer, e.g. rhetorical questions as follows. On the other hand, the answer has already been implied which actually describes an attitude of the speaker. So, the sentences in (59) will be labeled as modality, which will be discussed later.

(59) a. 你 怎麼 可以 離開 他 呢？

ni3	zen3me0	ke3yi3	li2kai1	ta1	ne0
you	how	could	leave	he	SFP

How could you leave him?

b. 那 還 有 什麼 不能 忍受 的 事 呢？

na4	hai2	you3	shen2me0	bu4neng2	ren3shou4	de0
then	still	have	what	cannot	endure	DE
shi4		ne0				
matter		SFP				

Then what cannot we endure?

c. 誰 能 數得完 ？

shui2	neng2	shu3	de0	wan2
who	can	count	DE	finish

Who can count that?

d. 我 怎麼 可以 不 盡心 照顧 ？

wo3	zen3me0	ke3yi3	bu4	jin4xin1	zhao4gu4
I	how	can	not	try_best	take_care_of

How could I not take care of him carefully?

6.2.3. Modalities

Some sentences express a modality of the speaker rather than a description of a real event. Modality is important due to its interaction with factuality and truth of the embedded events and propositions. For example, ‘he can eat two sandwiches’ describes a dynamic modality of the subject’s ability of eating. However, no eating event has actually happened. ‘He might be in his office now’ describes an epistemic modality of the speaker’s judgment or guess. Modality has drawn attention of formal semanticists for a long time in linguistic studies. Recently, modality has been considered in computational applications such as sentiment analysis (Benamara, et al., 2012), machine translation (Baker, et al., 2012), etc.

I will mainly adopt the modal theory by Palmer (2001) with minor revision. According to him, modality could be divided into epistemic, evidential, deontic and dynamic. Epistemic modality expressed the speaker’s opinion on the truth of the embedded proposition in terms of necessity and possibility. Informally, epistemic modality expresses what may be in the world.

Deontic modality expresses what should be in our world, according to speaker’s expectations, certain rules, laws and so on. For example, ‘you can’t read my notebook’, ‘you should not go outside at midnight’ and ‘killing dogs is not allowed in this country’ all describe a denotic modality. Dynamic modality describes the abilities of a subject or that in a certain condition. For example, ‘he can swim’ and ‘you can see the ocean from my office’ are two different kinds of deontic modalities.

Besides, the four modalities, attitude is also treated as a modality. More specifically, attitude is here narrowed down as evaluative. Evaluative is different from epistemic modality. Epistemic modality is a judgment on the truth value of a proposition, while evaluative modality suggests the truth of a proposition. Thus, the proposition in evaluative modality is usually subjective which may corresponds to different criteria for different people. With epistemic modality, the response is right or wrong; while with evaluative modality, the response could only be agree or disagree. The

different consequences are very important especially in discourse computing, e.g. an intelligent conversation system.

Exclamations are treated as a subtype of attitude. For example, 年輕人啊! nian2qing1ren2 a0 'Young people!' Mostly, it expresses an implicit evaluation, i.e. only young people could do crazy things based on which the exclamation is expressed.

Modality could be expressed by main verbs, adverbs, auxiliaries, sentences final particles and other constituents. In what follows, each modality will be discussed with more details. Some sentences could also express modality without any explicit markers. For example, the sentence (60) describes an epistemic modality.

(60) 在 這個 節骨眼 中， 談判 收效 不 大 。

zai4	zhe4	ge4	jie2gu3yan3	zhong1	tan2pan4
PREP	this	CL	moment	POSTP	negotiation
shou1xiao4		bu4	da4		
effects		not	significant		

At this moment, negotiation may not be effective.

6.2.3.1. Epistemics and Evidentials

Epistemic modality describes a subjective judgment of the speaker on the truth value of a proposition. Epistemic modality in Chinese could be described by adverbs or modal verbs such as 彷彿 *fang3fu2* 'seem', 好像 *hao3xiang4* 'seems', 或許 *huo4xu3* 'maybe', 肯定 *ken3ding4* 'must', 可能 *ke3neng2* 'possibly', 一定 *yi1ding4* 'must', 也許 ye3xu3 'maybe', 應該 *ying1gai1* 'should', 听说 *ting1shuo1* 'it is heard', 可望 *ke3wang4* 'can be expected', 会 *hui4* 'will', etc. The sentences in (61) are some examples.

(61) a. 他會來的。

ta1	hui4	lai2	de0
he	will	come	DE

He will come.

b. 城牆 似乎 依然 警戒 著 舊 城 外 的 大西洋 。

cheng2qiang2	si4hu1	yi1ran2	jing3jie4	zhe0	jiu4	cheng2
rampart	seem	still	guard	ZHE	old	city
wai4	de0	da4xi1yang1				
outside	DE	Atlantic				

It seems that the rampart is still guarding Atlantic Ocean outside the old city.

d. 我 猜 他們 不會 吵架 。

wo3	cai1	ta1men2	bu4	hui4	chao3jia4
I	guess	they	not	will	quarrel

I guess that they won't quarrel.

e. 似乎 其它 玩具 在 今年 都 受到 了 冷落。

si4hu1	qi2ta1	wan2ju4	zai4	jin1nian2	dou1
it_seems	other	toy	PREP	this_year	all
shou4dao4	le0	leng3luo4			
sustain	LE	ignore			

It seems that all the other toys have been ignored in this year.

g. 但是 夢魘 往往 一樣 。

dan4shi4	meng4yan3	wang3wang3	yi1yang4
however	nightmare	usually	same

However, nightmares are usually the same.

i. 這種 主張 也 必 不能 見容 於 國法 與 國人 。

zhe4zhong3	zhu3zhang1	bi4	bu4neng2	jian4rong2
this_kind_of	proposal	actually	cannot	tolerate
yu2	guo2fa3	yu3	guo2ren2	
PREP	national_law	and	compatriot	

This kind of proposal won't be tolerated by the people and the law.

j. 其 根據 顯然 是 對 小動脈 、 小靜脈 及 神經 分枝 的 觀察 。

qi2	gen1ju4	xian3ran2	shi4	dui4	xiao3dong4mai4
its	evidence	obviously	be	PREP	arteriole
xiao3jing4mai4		ji2	shen2jing1	fen1zhi1	de0
venule		and	nerve	branch	DE
guan1cha2					
observe					

The evidence comes from the observation on the arterioles, venules and the nerve branches.

Some epistemic modality is based on a premise in conditional structures, e.g. the sentences in (62). In such cases, they are also treated as epistemics. They all have the logic form 'P→Epi(Q)', which is equivalent to 'Epi(P→Q)'.

(62) a. 否則 國際 油價 極 可能 在 明年 大幅 滑落 。

fou3ze2	guo2ji4	you2jia4	ji2	ke3neng2	zai4
otherwise	international	oil_price	very	possible	PREP
ming2nian2	da4fu2	hua2luo4			
next_year	significantly	decrease			

Otherwise, the international oil prices will probably decrease significantly in the next year.

b. 這樣 房市 跌價 危機 對 金融 體系 的 隱藏性 風險 就 會 大大 加深 了 。

zhe4yang4	fang2shi4	die1jia4	wei1ji1	dui4	jin1rong2
in_this_case	house_market	fall_in_price	crisis	PREP	financial
ti3xi4 de0	yin3cang2xing4	feng1xian3	jiu4	hui4	
system DE	potential	risk	then	will	
da4da4	jia1shen1	le0			
significantly	deepen	LE			

In this case, the fall in the housing price caused more potential risks to the financial system.

The sentences in (63) have both epistemic modality and interrogative modality. In this case, it is treated as interrogative, as it still needs the answer from the listener. Mostly, illocutionary force is treated as higher order predicate than modality. In this example, the question is actually made based on the modality.

(63) a. 看來 你 已 和 雲飄飄 有所 遭遇 了 ？

kai4lai2	ni3	yi3	he2	yun2piao1piao1
it_seems	you	already	PREP	Yun_Piaopiao

you3suo3	zao1yu4	le0
somewhat	encounter	LE

It seems that you have encountered with Yun Piaopiao.

b. 看來 你 已 和 雲飄飄 那個 魔頭 有所 遭遇 了 ， 是不是？

kai4lai2	ni3	yi3	he2	yun2piao1piao1
it_seems	you	already	PREP	Yunpiaopiao
you3suo3	zao1yu4	le0	shi4bu4shi4	
somewhat	encounter	LE	whether_or_not	

It seems that you have encountered with Yun Piaopiao, haven’t you?

6.2.3.2. Deontics

Deontic modality describes the suggestion, requirement, wish and some other external factors that are a potential force to affect the action of the subject. Deontics are usually expressed with some adverb, such as 應該 *ying1gai1* 'should', 必須 *bi4xu1* 'must', 要 *yao4* 'need', 得 *dei3* 'ought', 可以 *ke3yi3* 'can', 想要 *xiang3yao4* 'want to', 不准 *bu4zhun3* 'not allowed', 严禁 *yan2jin4* 'not allowed', etc., sentence final particles such as 吧 *ba0*, 啊 *a0* etc. and some other constructions, e.g. 若 … 更好 *ruo4…geng4hao3* 'it will be better if…'. Deontic is different from directive illocutionary act in that the former is a description of the speaker's attitude. However, the speaker doesn't care about whether the listener follows the suggestions or not. Directive illocutionary act is used by the speaker to issue a command that would urge the listener to perform perticular actions. Some examples of deontic modality are shown in (64).

(64) a. 這些 問題 是 每個 社會 成員 應該 關心 和 省思 的 。

zhe4xie1	wen4ti2shi4	mei3ge4		she4hui4	
these	issue	be	every	society	
cheng2yuan2	ying1gai1	guan1xin1	he2	xing3si1	de0
member	should	care	and	think_deeply	DE

These questions should be cared and thought by all members of the society.

b. 如果 我 有 像 模仿 貓 那樣 的 黑 毛 就 好 了 。

ru2guo3	wo3	you3	xiang4	mo2fang3mao1		na4yang4
if	I	have	like	copycat		like_that
de0	hei1	mao2	jiu4	hao3	le0	
DE	black	hair	then	good	LE	

How I wish to own the black hair just ly the copy cats.

c. 外出 業務 人員 最多 也 不要 超過 四次 。

wai4chu1	ye4wu4	ren2yuan2	zui4duo1	ye3
go_out	business	personnel	at_most	also
bu4yao4	chao1guo4	si4	ci4	
should_not	exceed	four	time	

The business personnel should not go out for more than four times.

d. 凡 需要 家屬 服務 的 乘客， 於 訂位 時 事先 聲明 即 可 。

fan2	xu1yao4	jia1shu3	fu2wu4	de0
for_those	need	family	service	DE

cheng2ke4	yu2	ding4wei4	shi2	shi4xian1	sheng1ming2
passenger	PREP	booking	when	beforehand	claim
ji4	ke3				
then	ok				

For those who nees family service, it is only required to claim it when booking the seats.

e. 那 偌大 的 廠房 總 可以 拍賣 吧 。

na4	ruo4da4de0	chang3fang2	zong3	ke3yi3	pai1mai4	ba0
that	big	plant	always	can	auction	SFP

Shall the plants be able to be auctioned?

f. 若 能 用 鞋盒 裝起來 更 好 。

ruo4	neng2	yong4	xie2he2	zhuang1qi3lai2	geng4hao3
if	can	use	shoe_box	pack_up	better

It would be better to pack it up with shoe box.

Deontic modality can also be based on a premise in a conditional structure, e.g. the sentences in (65). The logical form could be described as 'P->Deo(Q)', which is equivalent to 'Deo(P->Q)'.

(65) a. 投資人 若 不 願 觀望 只有 採用 這種 方式 操作 了 。

tuo2zi1ren2	ruo4	bu4	yuan4	guan1wang4	zhi3you3	
investor	if	not	want	wait_and_see	only	
cai3yong4	zhe4zhong3		fang1shi4	cao1zuo4	le0	
adopt	this_kind_of		way	operate	LE	

Investors who don't want to wait and see can only operate in this way.

b. 外籍 人士 需 在 台灣 設有 聯絡 地址 方 可 申請 加入 。

wai4ji2ren2shi4	xu1	zai4	tai2wan1	she4you3	
foreigner	need	PREP	Taiwan	have	
lian2luo4	di4zhi3	fang1	ke3	shen1qing3	jia1ru4
contact	address	then	can	apply	join

Foreigners are required to provide their Taiwan address in order to join.

The sentence (66) is ambiguous due to the modal verb 要 yao4 'need/want'. It could be a deontic modality or the subject's willingness to perform an action. So, the annotator could make decision with additional information or could put it into OTHER category.

(66) 每個 人 都 要 到 學校 來 幫忙 張貼

mei3ge4ren2	dou1	yao4	dao4	xue2xiao4	lai2
everyone	all	should	PREP	school	come
bang1mang2	zhang1tie1				
help	paste				

Everyone should (/want to) come to school for help with the paste.

Some sentences could express a deontic modality by using neutral viewpoint. For example, the sentence (67) lacks of an aspectual marker. However, the neutal viewpoint aspect now carries a willingness of the subject.

(67) 商人 只 給 十塊 金子 。

shang1ren2	zhi3	gei3	shi2	kuai4	jin1zi0
the_merchant	only	give	ten	CL	gold

The merchant only gives ten piece of gold.

6.2.3.3. Dynamics

Dynamic modality describes the subject's capabilities, e.g. (68) or that with a certain conditions, e.g. (69).

(68) a. 他會游泳。

ta1	hui4	you2you3
he	can	swim

He can swim.

b. 很多人都可以背誦《心經》。

hen3duo1	ren2	dou1	ke3yi3	bei4song4	xin1jing1
many	people	all	can	recite	The_Sutra_of_Mind

Many people can recite “The Sutra of Mind”.

(69) a. 那些 在 飲食 中 缺少 鐵 的 婦女 時常 會 在 晚間 醒來 。

na4xie1	zai4	yin3shi2	zhong1	que1shao3	tie3
those	PREP	diet	POSTP	lack_of	iron
de0	fu4nv3	shi2chang2	hui4	zai4	wan3jian1
DE	women	often	will	PREP	night
xing3lai2					
wake_up					

Those women who lack of iron elements often wake up at night.

b. 牠 想 玩 的 時候 會 弓起 背 來 叫 。

ta1	xiang3	wan2	de0	shi2hou4	hui4	gong1qi3	bei4
it	want	play	DE	time	will	arch	back
lai2	jiao4						
LAI	meow						

It will arch its back whenever it want to play.

c. 大 黃 貓 也 不會 走開 。

da4huang2mao1	ye3	bu4	hui4	zou3kai1
the_big_yellow_cat	also	not	will	leave

The big yellow cat won't leave.

We should note that 会 hui4 'will' and 不会 *bu4hui4* 'will not' usually denote the subject's willingness, which is basically a deontic modality, e.g. (70). However, for the sentenes (69.b) and (69.c), the situation has been described as a fact under a certain condition.

(70) a. 我 不會 走開 。

wo3	bu4	hui4	zou3kai1
I	not	will	leave

I won't leave.

b. 我會一直守在她身邊。

wo3	hui4	yi1zhi2	shou3	zai4	ta1	shen1bian1
I	will	always	stay	PREP	she	side

I'll be always by her side.

6.2.3.4. Evaluatives

Evaluative also describes the speaker's attitude on a proposition. Different from epistemic modality that describes the judgment of the truth value of the proposition, evaluation suggests the truth of the proposition. Evaluatives are usually expressed with adverbs, sentence final particles or some other constructions, such as 算是 *suan4shi4* 'should be', 確實 *que4shi2* 'indeed', 簡直 *jian3zhi2* 'definitely', 可谓 *ke3wei4* 'should be', 竟是 *jing4shi4* 'unexpectedly', 可说是 *ke3shuo1shi4* 'should be', 莫怪 *mo4guai4* 'unsurprisingly', 乃 *nai3* 'actually', 乃是 *nai3shi4* 'actually', 堪称 *kan1cheng1* 'shoud be', etc. For example, the sentence (71) expresses the speaker's suggestion that most of the people who like to fantasy have a lot of time.

(71) 那些 喜歡 幻想 的 人， 恐怕 大部分 都 是 比較 清閒 的 人。

na4xie1	xi3huan1		huan4xiang3	de0	ren2	kong3pa4	
those	like		fantasy	DE	people	I'm_afraid	
da4bu4fen4	dou1	shi4	bi3jiao3	qing1xian2		de0	ren2
most	all	be	very	idle		DE	people

Those who like fantasy are probably idle people.

More examples are shown in (72).

(72) a. 美國 增兵 波斯灣 應 屬 合法 行為。

mei3guo2	zeng1bing1	bo1si1wan1	ying1	shu3
USA	surge	the_Persian_Gulf	should	belong
he2fa3	xing2wei4			
legal	behavior			

The surge of the USA should be a legal action.

c. 政府 當然 有 義務 派軍 保護 台灣 人民 的 安全。

zheng4fu3	dang1ran2	you3	yi4wu4	pai4jun1	
government	surely	have	obligation	send_troops	
bao3hu4	tai1wan1	ren2min2	de0	an1quan2	
protect	Taiwan	people	DE	security	

The government surely has the obligation to send troops to pretect the Taiwanese people.

d. 獲益 最多 的 要 算是 實際 經驗 了。

huo4yi4	zui4duo1	de0	yao4	suan4shi4
benefit	most	DE	should	be_counted_as
shi2ji4	jing1yan4	le0		
real	experience	SFP		

The most benefit should be the real experience.

e. 所謂 開發 影響 原住民 社會 最 深 的 大概 要 數 價值觀 的 崩解。

suo3wei4	kai1fa1		ying3xiang3	yuan2zhu4min2		
so-called	development		effect	original_inhabitant		
she4hui4	zui4	shen1	de0	da4gai4	yao4	shu3
society	most	deep	DE	probably	should	be
jia4zhi2guan1	de0	beng1jie3				
values	DE	disintegration				

What is most effected for the original inhabitant society should be the distintegration of the values.

f. 只有 白痴 才 會 相信 國民黨 會 獨力 實踐 改革 。

zhi3you3	bai2chi1	cai2	hui4	xiang1xin4	
only	fool	then	will	believe	
guo2min3dang3	hui4	du2li4	shi2jian4	gai3ge2	
Kuo_Min_Tang	will	by_oneself	carry_out	reform	

Only fool would believe KMT would carry out reform by itself.

g. 法令 規定 仍 是 必要 的 嘛！

fa3ling4	gui1ding4	reng2	shi4	bi4yao4	de0	ma0
decree	stipulation	still	be	necessary	DE	SFP

Decree stipulation should still be necessary.

h. 風險 未免 太 大 。

feng1xian3	wei4mian3	tai4	da4
risk	truly	too	big

The risk is truly too big.

i. 莫怪 日本人 要 對 櫻花 如癡如狂 了 。

mo4guai4	ri4ben3ren2	yao4	dui4	ying1hua1
not_surprisingly	Janpanese	would	PREP	sakura
ru2chi1ru2kuang2	le0			
crazy	LE			

Not surprisingly that Japanese like sakura so crazy.

j. 幸好 叢雌 過來 解圍 。

xing4hao3	cong2su1	guo4lai2	jie3wei2
luckily	Congsu	come	rescue_from_a_siege

Luckily, Congsu came and helped.

k. 還好 溫度 沒有 降到 冰點 。

hai2hao3	wen1du4	mei3you3	jiang4dao4	bing1dian3
luckily	temperature	not	lower_to	freezing_point

Luckily, the temperature didn’t lower to the freezing point.

l. 我 打 一隻 又 不會 怎樣

wo3	da3	yi1	zhi1	you4	bu4hui4	zen3yang4

I	kill	one	CL	actually	won't	matter

I won't matter if I killed one of them.

m. 咱 其實 像 熊貓 一樣 溫馴 。

zan2	qi2shi2	xiang4	xiong2mao1	yi1yang4	wen1shun4
we	actually	like	panda	the_same	docile

We are actually as docile as panda.

6.2.3.5. Exclamations

Exclamations are also treated as an evaluation. For example, the sentence (73.a) describes an evaluation of the speaker's actions that are not explicitly stated that all these actions are done for him. The sentence (73.b) describes an evaluation for some events that mostly happens on young people, e.g. some crazy actions done by someone.

(73) a. 這些 大半 還不是 為 了 他 ！

zhe4xie1	da4ban4	hai2bu4shi4	wei4	le0	ta1
these	mostly	indeed	be_for	LE	he

It is indeed him that we did these things for.

b. 年輕人啊!

nian2qing1	ren2	a0
young	people	SFP

Young people!

Other examples are shown in (74).

(74) a. 這座 廟 好 大 呀 ！

zhe4	zuo4	miao4	hao3	da4	ya0
this	CL	temple	so	big	SFP

This temple is so big!

b. 天 上 的 星星 太多 啦 ！

tian1shang4	de0	xing1xing1	tai4	duo1	la0
in_the_sky	DE	start	too	many	SFP

There are so many stars in the sky.

c. 人類 對於 天氣 真 是 無可奈何 。

ren2lei4	dui4yu2	tian1qi4	zhen1shi4	wu2ke3nai4he2
human	PREP	weather	really	helpless

Human is so helpless at the front of weather.

6.2.4. Sentence Type Hierarchy

The overall hierarchy is shown in Figure 1. The perfect static state (|--T--) is treated as a sub category of SSChange; and the perfect dynamic state (|~~T~~) is treated as a sub category of SDChange. The category OTHER is mainly for sentences that could not fit into the other three categories. Accomplishment and achievement are also added as two middle layers.

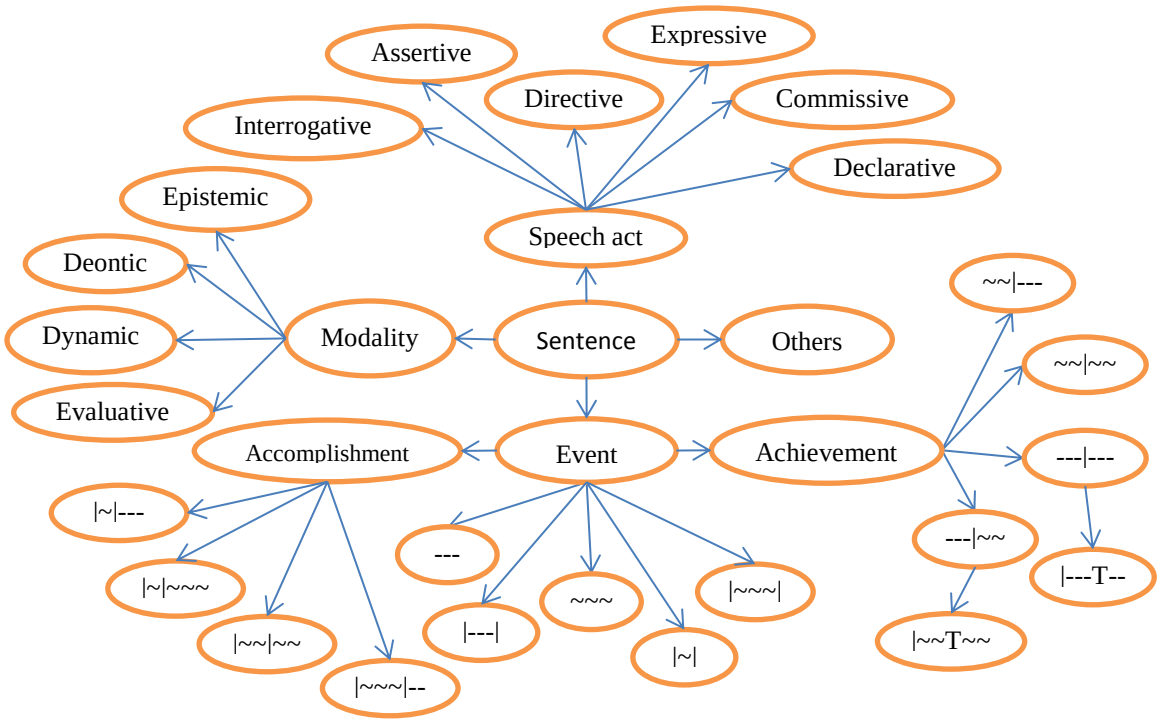

Figure 1. Sentence type hierarchy.

6.3. Some Constructions in Chinese

6.3.1. Serial Verb Constructions (SVCs)

The Serial verb constructions (SVCs) concerned here are those in which the predicates could be treated as a combined predicate to express one event instance (Lin, et. al., 2012). The construction should have three properties: 1) share the same subject; 2) the two predicates cannot change order; 3) the two predicates are syntactically connected. It is suggested by Li (1991) that in a Chinese SVC, the verb suffixed with aspect markers is the head. When the aspectual marker LE is attached with the first verb, the event structure is usually determined by the first predicate, the second predicate is then the purpose or describes the final state of the final predicate. For example, the

following sentence describes an event that a person named Zhang Qian selected 100 persons and started off with them. So, the event structure could be represented as |~~~|~~.

(75) 張騫 帶 了 部下 一百多 人 上路 。

zhang1qian1	dai4	le0	bu4xia4	yi1bai3duo0
Zhangqian	take	LE	subordinate	one_than_one_hundred
ren2	shang4lu4			
people	start_off			

Zhangqian took more than one hundred subordinates when starting off.

The following test shows that 以前 *yi3qian2* 'before' and 以後 *yi3hou4* 'after' refer to the time point when 上路 *shang4lu4* 'start off' occur, which is after the first event since it takes an aspectual marker LE.

(76) a. 張騫 帶 了 部下 一百多 人 上路 以前

zhang1qian1	dai4	le0	bu4xia4	yi1bai3duo0
Zhangqian	take	LE	subordinate	one_than_one_hundred
ren2	shang4lu4	yi3qian2		
people	start_off	before		

before Zhangqian took more than one hundred subordinates when starting off.

b. 張騫 帶 了 部下 一百多 人 上路 以後

zhang1qian1	dai4	le0	bu4xia4	yi1bai3duo0
Zhangqian	take	LE	subordinate	one_than_one_hundred
ren2	shang4lu4	yi3hou4		
people	start_off	after		

after Zhangqian took more than one hundred subordinates when starting off.

If the aspectual marker LE is attached to the second predicate, the event structure is determined by the second predicate, 上了路 *shang4 le0 lu4* 'have started off'. The first predicate becomes a background static state. Thus, the sentence has the same meaning with the second sentence with -zhe aspectual marker attached with the first predicate. The event structure could be represented as ---|~~.

(77) a. 張騫 帶 部下 一百多 人 上 了 路 。

zhang1qian1	dai4	bu4xia4	yi1bai3duo0	ren2
Zhangqian	take	subordinate	one_than_one_hundred	people
shang4	le0	lu4		

start- LE -off

Zhangqian started off with more than one hundred subordinates.

b. 張騫 帶 著 部下 一百多 人 上 了 路 。

zhang1qian1	dai4	zhe0	bu4xia4	yi1bai3duo0
Zhangqian	take	ZHE	subordinate	one_than_one_hundred
ren2	shang4	le0	lu4	
people	start-	LE	-off	

Zhangqian started off with more than one hundred subordinates.

Once the second predicate takes LE, 以前 *yi3qian2* 'before' is not valid any more.

(78) a. ?張騫 帶 部下 一百多 人 上 了 路 以前。

zhang1qian1	dai4	bu4xia4	yi1bai3duo0		ren2
Zhangqian	take	subordinate	one_than_one_hundred	people	
shang4	le0	lu4	yi3qian2		
start-	LE	-off	before		

before Zhangqian started off with more than one hundred subordinates.

b. 張騫 帶 部下 一百多 人 上 了 路 以後。

zhang1qian1	dai4	bu4xia4	yi1bai3duo0	ren2
Zhangqian	take	subordinate	one_than_one_hundred	people
shang4	le0	lu4	yi3hou4	
start-	LE	-off	after	

after Zhangqian started off with more than one hundred subordinates.

It sounds a little odd when each predicate of the two is attached with an aspectual marker -le. As also observed in (Lin, et. al., 2012), only a few examples are found in Sinica corpus. However, once it occurs, it is treated as two independent events and will be put in OTHER category by now.

(79) ?張騫 帶 了 部下 一百多 人 上 了 路 。

zhang1qian1	dai4	le0	bu4xia4	yi1bai3duo0
Zhangqian	take	LE	subordinate	one_than_one_hundred
ren2	shang4	le0	lu4	
people	start-	LE	-off	

Zhangqian took more than one hundred subordinates and started off.

SVCs with the co-verbs, e.g. 經過 *jing1guo4* ‘go through’, 用 *yong4* ‘use’ as the first predicate, are treated as right-headed unless the first predicate has an aspectual marker LE. In such case and the second predicate describes a result of the first predicate, it is treated as a SVC, with an accomplishment event structure |~~~|--. Otherwise, it is treated as multiple events.

(80) a. 中油 經過 評估 覺得 並 不 划算 。

zhong1you2				jing1guo4	ping2gu1
Chinese_Petroleum_Corporation				go_through	assessment
jue2de0	bing4	bu4	hua2suan4		
think	actually	not	cost-efficient		

The CPC thought it not cost-efficient after making an assessment.

b. 中油 經過 了 評估 覺得 並 不 划算 。

zhong1you2				jing1guo4	le0 ping2gu1
Chinese_Petroleum_Corporation				go_through	LE assessment
jue2de0	bing4	bu4	hua2suan4		
think	actually	not	cost-efficient		

The CPC thought it not cost-efficient after making an assessment.

The example as in (81) is not treated as SVCs as the two parts don’t share the same subject.

(81) 後來 寒浞 又 派 人 把 逃出去 的 夏帝 相 殺掉 。

hou4lai2	han2zhuo2	you4	pai4ren2	ba3	tao2chu1qu4
afterwards	Hanzhuo	also	send_people	BA	escape
de	xia4	di4	xiang4	sha1diao4	
DE	Xia_dynasty	emperor	ministers	kill	

Afterwards, Hanzhuo sent people to kill the escaped emperor and ministers of Xia.

6.3.1.1. 到/去[LOC](去)[V]

The sentence (82.a) is different from SVCs that the first predicate can hardly take aspectual LE as in (82.b). This suggests that the pattern 到/去[LOC] *dao4/qu4* [LOC] ‘go to [LOC]’ only indicates location where the situation happens. Thus, the event structure of this construction is determined by the final predicate. The sentence (82.a) denotes an activity, so does (82.c). However, this construction cannot appear in progressive form as in (82.d) and (82.e). It is because that the viewpoint aspect has been limited to holistic for this construction. The sentence (83.a) is a similar example as (82.a).

(82) a. 我們 一家人 到 自然 科學 博物館 去 參觀 。

wo3men2 yi1jia2ren2 dao4 zi4ran2ke1xue2bo2wu4guan3 qu4
we whole_family PREP Museum_of_Natural_Science go
can1guan1
visit
My family went to visit the Museum of Natural Science.

b. ?我們 一家人 到 了 自然 科學 博物館 去 參觀 。

wo3men2 yi1jia2ren2 dao4 le0 zi4ran2ke1xue2bo2wu4guan3
we whole_family PREP LE Museum_of_Natural_Science
qu4 can1guan1
go visit
My family went to the Museum of Natural Science for looking around.

c. 我們 一家人 到 自然 科學 博物館 去 參觀 了。

wo3men2 yi1jia2ren2 dao4 zi4ran2ke1xue2bo2wu4guan3 qu4
we whole_family PREP Museum_of_Natural_Science go
can1guan1 le0
visit LE
My family went to visit the Museum of Natural Science.

d. ?我們 一家人 正在 到 自然 科學 博物館 去 參觀 。

wo3men2 yi1jia2ren2 zheng4zai4 dao4
we whole_family ZAI go
zi4ran2ke1xue2bo2wu4guan3 qu4 can1guan1
Museum_of_Natural_Science go visit
My family is going to the Museum of Natural Science for looking around.

e. ?我們 一家人 到 自然 科學 博物館 正在 參觀 。

wo3men2 yi1jia2ren2 dao4 zi4ran2ke1xue2bo2wu4guan3
we whole_family PREP Museum_of_Natural_Science
zheng4zai4 can1guan1
ZAI visit
*My family went to the Museum of Natural Science and is looking around.

(83) a. 張良 像 往常 一樣 去 橋 上 散心 。

zhang1liang2 xiang4 wang3chang2 yi1yang4 qu4 qiao2shang4
Zhangliang as normal the_same go on_the_bridge

san4xin1

relax

Zhangliang went to the bridge for relax as normal.

b. 張良 像 往常 一樣 去 橋 上 散心 了。

zhang1liang2	xiang4	wang3chang2	yi1yang4	qu4	qiao2shang4
Zhangliang	as	normal	the_same	go	on_the_bridge
san4xin1	le0				
relax	LE				

Zhangliang went to the bridge for relax as normal.

The sentence (84.a) denotes an accomplishment according to the second predicate 成立觀光辦事處 cheng2li4 guan1guang1 ban4shi4chu4 ‘establish tourist office’. The sentences (84.b) and (84.c) are the corresponding test to show that the whole construction is right-headed.

(84) a. 許多和我國沒有邦交 的 國家 也 都 紛紛 到 台灣 成立 觀光 辦事處 。

xu3duo1	he2	wo3guo2	mei2you3	bang1jiao1	de0
many	PREP	our_country	not_have	diplomacy	DE
guo2jia1	ye3	dou1	fen1fen1	dao4	tai2wan1
country	also	all	one_by_one	come	Taiwan
cheng2li4	guan1guang1ban4shi4chu4				
establish	tourist_office				

Many countries that don’t have diplomatic relation with us also come to Taiwan and establish tourist offices.

b. ?許多和我國沒有邦交的國家 也 都 紛紛 到 了 台灣 成立 觀光 辦事處 。

xu3duo1	he2	wo3guo2	mei2you3	bang1jiao1	de0	
many	PREP	our_country	not_have	diplomacy	DE	
guo2jia1	ye3	dou1	fen1fen1	dao4	le0	tai2wan1
country	also	all	one_by_one	come	LE	Taiwan
cheng2li4	guan1guang1ban4shi4chu4					
establish	tourist_office					

Many countries that don’t have diplomatic relation with us also come to Taiwan and establish tourist offices.

c. 許多和我國沒有邦交的國家 也 都 紛紛 到 台灣 成立 了 觀光 辦事處 。

xu3duo1	he2	wo3guo2	mei2you3	bang1jiao1	de0
many	PREP	our_country	not_have	diplomacy	DE

guo2jia1	ye3	dou1	fen1fen1	dao4	tai2wan1
country	also	all	one_by_one	come	Taiwan
cheng2li4	le0	guan1guang1ban4shi4chu4			
establish	LE	tourist_office			

Many countries that don't have diplomatic relation with us also come to Taiwan and establish tourist offices.

We can also use 以前 *yi3qian2* 'before' and 以後 *yi3hou4* 'after' to test the event structure of this construction. For example, the test in (85) shows that the time period by 以前 *yi3qian2* 'before' refers to that before the whole event taking place, and the time period by 以後 *yi3hou4* 'after' refers to that after all the whole event ends.

(85) a. 我們 一家人 到 自然 科學 博物館 去 參觀 以前, …

wo3men2	yi1jia2ren2	dao4	zi4ran2ke1xue2bo2wu4guan3	qu4
we	whole_family	PREP	Museum_of_Natural_Science	go
can1guan1	yi3qian2			
visit	before			

before my family went to visit the Museum of Natural Science.

b. 我們 一家人 到 自然 科學 博物館 去 參觀 以後, …

wo3men2	yi1jia2ren2	dao4	zi4ran2ke1xue2bo2wu4guan3	qu4
we	whole_family	PREP	Museum_of_Natural_Science	go
can1guan1	yi3hou4			
visit	after			

after my family went to visit the Museum of Natural Science.

Similarly, the test in (86) shows that the time period by 以前 *yi3qian2* 'before' refers to that before the whole event taking place, and the time period by 以後 *yi3hou4* 'after' refers to that after all the whole event ends.

(86) a. 許多 和 我國 沒有 邦交 的 國家 到 台灣 成立 觀光 辦事處 以前

xu3duo1	he2	wo3guo2	mei2you3	bang1jiao1	de0
many	PREP	our_country	not_have	diplomacy	DE
guo2jia1	dao4	tai2wan1	cheng2li4		
country	come	Taiwan	establish		
guan1guang1ban4shi4chu4		yi3qian2			
tourist_office		before			

before many countries that don't have diplomatic relation with us come to Taiwan to establish tourist offices.

b. 許多 和 我國 沒有 邦交 的 國家 到 台灣 成立 觀光 辦事處 以後

xu3duo1	he2	wo3guo2	mei2you3	bang1jiao1	de0
many	PREP	our_country	not_have	diplomacy	DE
guo2jia1	dao4	tai2wan1	cheng2li4		
country	come	Taiwan	establish		
guan1guang1ban4shi4chu4		yi3hou4			
tourist_office		after			

after many countries that don't have diplomatic relation with us also came to Taiwan and established tourist offices.

6.3.1.2. 帶…到/去[LOC](去)[V]

A related pattern 帶…到…V *dai4...dao4...V* 'take…to…to V' could be treated as a normal SVCs, i.e. 帶…(到…V) *dai4...(dao4...V)* 'take…(to go to…to V)' and analyzed with the methods proposed above. For example, the sentences in (87) are all activities.

(87) a. 老師 帶 我們 到 海邊 去 玩 。

lao3shi1	dai4	wo3men2	dao4	hai3bian1	qu4	wan2
teacher	take	we	PREP	seaside	go	play

The teacher took us to go to the seaside to play.

b. 爸爸 就 帶 我 和 弟弟 去 看 龍船 比賽 。

ba4ba4	jiu4	dai4	wo3	he2	di4di4	qu4	kan4
father	then	take	I	and	brother	go	watch
long2chuan2	bi3sai4						
dragon_boat	race						

My father then took my brother and me to go to watch the dragon boat race.

c. 他 帶 著 我 和 弟弟 去 谷關 賞 鳥 。

ta1	dai4	zhe0	wo3	he2	di4di4	qu4	gu3guan1
he	take	ZHE	I	and	brother	go	Kukuan
shang3	niao3						
watch	bird						

He took my brother and me to go the watch birds at Kukuan.

6.3.2. Resultative Verbal Constructions (RVCs)

Resultative Verbal Constructions (RVCs), similar as SVCs, also contain two predicates. Different from SVCs, RVCs imply a causal/agentive relation between the two sub events. It is observed that RVCs could not be separated syntactically. It is thus treated as compound (Smith, 1991; Huang and Lin, 1992; Cheng and Huang, 1994). The two predicates combine together to form a new argument structure are related to both predicates (Huang and Lin 1992). RVCs don't allow progressive viewpoint aspect, as shown in (88).

(88) a. 他喝醉了。

ta1 he1zui4 le0
he drink-drank LE
He has got drank.

b. ?他喝了醉。

ta1 he1 le0 zui4
he drink LE drank
He has got drank.

c. ?他正在喝醉。

ta1 zheng4zai4 he1zui4
he ZAI drink-drank
he is getting drank.

Previous studies have mistakenly treated sentences with RVCs as accomplishment. However, RVCs are intrinsically achievements, especially a dynamic-static change. We can use 之前 *zhi1qian2* 'before' to test it. For example, the time period indicated by (89) includes the drinking activity before the time point when he finally got drank.

(89) 他喝醉之前

ta1 he1zui4 zhi1qian2
he drink-drank before
before he got drank

On the other hand, accomplishment shows a different testing result with 之前 *zhi1qian2* 'before'. The comparison in (90) shows the difference when we use a verb 写 *xie3* 'write' and a related RVC 写完 *xie3wan2* 'write-finish'. Similar as (89), the time period indicated in (90.a) refers to the time before the finishing point including the whole writing process. However, the time period indicated by (90.b) refers to the time before the start of the writing process.

(90) a. 他寫完信之前還接了一個電話。

ta1	xie3wan2	xin4	zhi1qian2	hai2	jie1	le0
he	write-finish	letter	before	also	answer	LE
yi1	ge4	dian4hua4				
one	CL	call				

He received a call before he finished the letter.

b. 他寫(那封)信之前還接了一個電話。

ta1	xie3	na4	feng1	xin4	zhi1qian2	hai2	jie1
he	write	that	CL	letter	before	also	answer
le0	yi1	ge4	dian4hua4				
LE	one	CL	call				

He received a call before he wrote the letter.

There are two different kinds of RVCs, overlap and non-overlap. Overlap means that the first state may still hold when the resultative state starts. The sentences in (91) are several examples of overlapping achievements.

(91) a. 這種 情景 把 我 嚇壞 了 。

zhe4	zhong3	qing2jing3	ba3	wo3	xia4huai4	le0
this	kind	situation	BA	I	scare	LE

This kind of situation scared me.

b. 一陣 吱吱 的 叫聲 ， 把 他 的 思想 攪亂 了 。

yi1	zhen4	zhi1zhi1	de0	jiao4sheng1	ba3	ta1	de0
one	CL	squeak	DE	sound	BA	he	DE
si4xiang3		jiao3luan4	le0				
thought		interrupt	LE				

The squeak interrupted my though.

c. 車 行至 板橋 文化路 。

che1	xing2zhi4	ban3qiao2	wen2hua4lu4
car	run_to	Banqiao	Wenhua_Road

The car arrived Wenhua Road of Banqiao.

d. 小 海龜 漸漸 長大 。

xiao3	hai3gui1	jian4jian4	zhang3da4
small	turtle	gradually	grow_up

The small turtle has gradually grown up.

6.4. Annotating a Chinese Corpus

6.4.1. Data Selection

For annotation, I choose Sinica Treebank 3.0 (Huang et al., 2000), which contains more than 60,000 trees. Sinica Treebank is a subset of Sinica Corpus (Chen et al., 1996), which is a balanced corpus that contains different genres of materials, including news, novels and some transcription of spoken Chinese. Sinica Treebank is a sub set of Sinica corpus which is further annotated with syntactic and semantic information with Information-based Case Grammar (ICG) by Chen and Huang (1990).

There are several considerations to choose Sinica Treebank for the annotation. Firstly, Sinica corpus is a balanced corpus, which contains text different different domains, such as transcripts of spoken language from Taiwan. Such data is rich in sentences that involve speech act and modality. Secondly, Sinica Treebank is annotated with rich semantic information, including thematic roles. Examples are shown in (92). With such information, we can further study the relationship between aspect and other semantic information of a sentence, which could potentionally make the corpus more valuable. Thirdly, as will be shown in the next chapter, such information can serve as gold standard of the sentence structures and can provide an upper bound analysis when used the gold standard information as features for sentence classification.

(92) #2:2.[4123] NP(property:Ndabc:十月份|Head:N(DUMMY1:Ndabd:一|Head:Caa:到
|DUMMY2:Ndabd:二十日))#，(COMMACATEGORY)

#3:3.[4124] S(theme:NP(property:Ncb:我國|property:Nv1(DUMMY1:Nv1:出口|Head:Caa:及
|DUMMY2:Nv1:進口)|Head:Nad:金額)|comparison:PP(Head:P49:比起
|DUMMY:NP(property:Ndaba:去年|Head:Nac:同期))|quantity:Dab:均|deontics:Dbab:有
|Head:VH16:增加)#，(COMMACATEGORY)

In Sinica Treebank, one instance could be a sentence or a phrase. This is due to the processing methodology of Sinica Treebank that split sentences with punctuations including comma. For annotation, we only select the sentences that are labeld as S and end with punctuations of period '。', exclamation '！', semicolon '；' and question mark '？'. Some sentences that are labeled with S may still lost some information, e.g. time adverbials, subjects which are important to study aspect. Since the paragraph information and the order of sub sentences processed are still kept after processed, a heuristic method is developed to recover the whole sentence. In detail, for each sentence labeled with S, its previous sentence in the same paragraph is observed. If the previous sentence is labeled with NP and end with comma, it is selected as the part of the sentence S.

This will involve some examples that wrongly combine unrelated constituents. In the annotation phase, the annotator could delete the added constituent if it is not related to the core sentence S. Finally, there left 5874 sentences after removing invalid sentences.

6.4.2. Data Annotation

Each sentence is labeled with a specific finer-grained category from the all 25 categories. Whenever an example could not be decided by the annotator, it is discussed with another two linguistic experts to make the final decision. For some ungrammatical or unclear sentences, the annotator could also discard the sentence. Sentences with neutral viewpoint aspect, except for those sentences that could be resovled during the annotation, are put into in an independent category.

6.4.3. Annotation Result

Finally, I annotated 5612 sentences in all categories except for NEUTRAL and OTHER. Table 1 shows the statistical information of the annotated corpus.

Sentences	Different Verbs	Word Types	Tokens	Characters
5612	2127	11681	45728	75960

Table 1: Statistical information of the corpus.

The annotation information is shown in Table 2. We could see that some of the finer-grained categories contain very few examples. The category of static state contains more than 40% instances. However, this may reflects the real distribution of event types since there is no bias for selecting data from the Sinica corpus. On the other hand, as we have discussed, static state can be further divided into several subcategories. However, since our focus is to study the event structure, they are put together by now.

Coarse Type	Subtype	Number of Examples
Modality	Epistemic	303
	Deontic	219
	Dynamic	111
	Evaluative	411
Speech Act	Question	559
	Assertive	64
	Expressive	13
	Directive	65
	Commissive	58
	Declarative	2

Static	---	2475
	|---|	6
Dynamic	~~~	166
	|~~~|	48
	|~|	4
Achievement	---|---	431
	|----T--	40
	---|~~~	84
	|~~~T~~	12
	~~|---	79
	~~|~~~	2
Instantaneous Accomplishment	|~|---	257
	|~|~~~	0
Accomplishment	|~~~|---	163
	|~~~|~~~	40

Table 2: Distribution of annotated event types.

Some event structure, although theorectially exist, doesn't encounter any examples, i.e. |~|~~~. However, such situation should exist. The sentence (92) is an example of this kind.

(93) 他轉了一下骰子。

ta1	zhuan4	le0	yi1	xia4	shai3zi0
he	spin	LE	one	CL	dice

He putted a spin on the dice.

Table 3 shows how many different event types one single verb may correspond to. We can see that most of the verbs only correspond to one event type. There are still more than 200 verbs that may denote different event types.

No. of Event Types	1	2	3	4	5	6	7
No. of Verbs	1395	155	44	9	7	1	1

Table 3: Number of verbs regarding to how many situation types they can denote.

6.4.4. Agreement Test

To test the agreement of the annotation, I random select 2000 examples from the corpus. The examples are divided into two parts, each part containing 1000 examples. The two subsets of the corpus are annotated by two different annotators respectively. The final agreement test result is shown in the following table with three different measures, Kappa, Accuracy and Relative F-

Measure. We can see that there is a strong agreement between the main annotator and the two tested annotators. There are 862 examples that are agreed by the main annotator and annotator 1. There are 821 xamples that are agreed by the main annotator and annotator 2.

	Kappa	**Accuracy**	**F1-Measure**
Annotator 1	0.837	0.862	0.762
Annotator 2	0.784	0.821	0.677
Annotator 1+2	0.811	0.842	0.716

Table 4: Annotation agreements between the main annotator and annotator 1, 2 and 1+2.

6.5. Summary

In this chapter, I proposed a guideline for annotating a Chinese corpus based on the theoretical framework described in Chapter 3 and 4. Then, following this guideline, a Chinese corpus containing more than 5600 sentences from Sinica Treebank is built. Especially, the guideline covers most complex constructions in Chinese and provides a clear treatement to deal with them. The agreement test among three annotators showed that the framework can guarantee a high reliabity and can be potentially adopted in future studies.

In the next chapter, I will use a machine learning classifier to test whether computers can learn a reliable model to predict the modal and aspectual information automatically. The assumption is that the higher performance the classification gains, the more the categories are differentiable, and then the better the background theory is.

Chapter 7

Automatic Aspectual Classification of Chinese Sentences

The generalization and ability to predict unseen data is a criterion to evaluate a theory. This chapter will provide a set of experiments on the automatic classification of sentence event types. The classification has different levels. The first is a coarse-grained level of sentence types, namely speech act, modality and events. In the second level, the classification is done on the finer-grained categories, including discriminating different modalities, different speech acts and different event types. Finally, the experimental results will be discussed.

There are two concerns for conducting the experiments in this chapter. Firstly, it can help test the theory I proposed in previous chapters. It is assumed that the better performance the classification obtains, the better the theory is. Secondly, the experiments can disclose what the best linguistic features are to discriminate sentence types.

7.1. Introduction

Many works have been done on aspectual classification (Siegel, 1999; Siegel and McKeown, 2000; Palmer et al., 2007; Zarcone and Lenci, 2008; Cao et al., 2006; Zhu et al., 2000). In these studies, there are four to five categories, namely state, activity, accomplishment, achievement, (semelfactive). These categories could be discriminated with three features, stativity, telicity and duration. The classification task is usually formalized as discriminating the values of the three features, e.g. (Cao et.al., 2006).

Siegel (1999) tried three machine learning approaches to classify clauses into the four categories with two parameters: culminated/nonculminated and punctual/extended, which is equivalent to telicity and duration. He also argues that categorizing verbs should be the first step before classifying clauses, since many clauses in certain domains can be categorized based on their main verb only. However, this is not true. The more information we have, the easier we can perform the classification. Sentences in context surely have more information than verb only. Siegel also assumes that each verb has a default event type excluding all aspectual operations. However, this assumption violate the findings of current linguistic studies that one verb could show different telicity in different context. This is the reason he has to rule out the high ambiguous verbs, e.g. have, that could be specified a default event type.

Meanwhile, based on his assumption, the classification becomes less significant since the main verbs only could predict most of the instances. Only the verbs that don't appear in test set would have to rely on the other linguistic indicators for the classification of their aspectual class. It is then hard to imagine how his study could reveal linguistic insights and help develop linguistic theory as he said.

Zarcone (2008) uses the Maximum Entropy (ME) model to classify verbs into four categories: state, activity, accomplishment and achievement considering three parameters: telicity, durativity and dynamicity. Semelfactive is also not included in the classification. The experiments are conducted on 3129 clauses that cover 28 Italian verbs. Different from Siegel, Zarcone considers the aspectual ambiguity of verbs, which is more useful for both real computational applications and linguistic studies.

Palmer (2007) adopted a scheme from (Smith 2003) that is different from the Vendler categories. He used a sequential labeling model to discriminate four broad categories (situation entities): eventualities, general statives, abstract entities, speech act types. Eventualities include three subcategories: events (E), particular states (S) and reports (R). General statives include two subcategories: Generics (G) and generalizing sentences (GS). Abstract entities include two subcategories: facts (F) and propositions (P). Speech act types include questions (Q) and imperatives (IMP). However, the framework is not absolutely related to aspectual classification.

Zhu (2000) tries to make classification on clauses without context and differentiate five categories: attribute, mentality, activity, instantaneous and ambiguity. However, their target is mainly for information processing. Some of the categories correspond to more than one aspectual class as shown by themselves. Thus, the classification framework is not absolutely related to aspectual classification which concerns the event structure described by sentences.

Cao (2006) used three parameters, dynamicity, telicity and duration to categorize Chinese sentences into four aspectual classes, state, achievement, accomplishment and process. He also adopted a hierarchical way for the aspectual classification. First, the dynamicity value is predicted. The instances with static value are classified into state category. Then, the telicity value is predicted for dynamic instances. The instances with atelic value are classified into process category. Finally, the duration value is predicted for the instances with telic value. The instances with durative value are classified into accomplishment and the non-durative instances are classified into achievement.

The main drawback of all the previous works in aspectual classification is that they don't consider viewpoint aspect (perfective, imperfective and others). This will be a problem for computational applications, e.g. machine translation. It is not possible to compile simple linguistic rules to

identify viewpoint aspect. Even for English the aspect coercion problem, e.g. semelfactive, achievement verbs in progressive, etc. In Chinese, the problem is even worse since there is not explicit inflectional form for different viewpoint aspects.

Another main drawback is that the classification is limited to situation types. Modalities and speech acts are not considered in the classification task. As in real NLP applications, the first step should be discriminating the sentences in terms of their functions. Modality is a functional category that mainly describes speaker's attitude and have different entailments from other event types. It is important due to its interaction with truth of the embedded events and propositions. An additional modal adverb could dramatically change the meaning a sentence. For example, (1.a) is totally different from. Modality has drawn attention of formal semanticists for a long time, e.g. (Partee et al., 1990). Recently, modality has been considered in sentiment analysis (Benamara et al., 2012), machine translation (Baker et al., 2012), etc. However, not enough attention has been paid in computational applications such as event identification and classification.

(1) a. 他在辦公室。

ta1 zai4 ban4gong1shi4

he PREP office

He is at office.

b. 他可能在辦公室。

ta1 ke3neng2 zai4 ban4gong1shi4

he probably PREP office

He is probably at office.

Speech act is another independent category that has different functions from events. Speech acts are actions that are done by speech. As in "*I declare that the new policy will take effect from now on*", the authorized speaker brings a new policy into effect by uttering this sentence. In such cases, the sentence itself is an event rather than describing an event. In this work, speech act sentences will be put into one independent category. This is necessary when an application requires identification of speech acts, such as human computer conversations (Morelli et al., 1991).

There are also some works for verb classification, however in different perspectives. One framework is trying to classify verbs based on the argument structure, i.e. the linking of the thematic roles and syntactic subject and object (Stevenson, 1999; Merlo and Stevenson, 2001). Eric (2003) tries to classify verbs into Levin verb classes (Levin, 1993). As these works are not directly related to aspectual classification here, I will not discuss the details of their methods.

Instead of classifying verbs directly, the aspectual classification here will be performed in sentence level as previous studies have shown that verbs themselves don't correspond to one particular aspectual class (Dowty, 1991; Smith, 1991). Event type is not only dependent on verbs, but also their complements and other factors.

In this chapter, I will propose a more comprehensive classification framework of sentences by differentiating event, modality and speech act in the first level. Finer-grained categories are integrated in a hierarchical way. After the sentences are classified into the three functional categories, finer-grained classifications could be done separately in the three categories.

Different linguistic indicators will be discussed. Firstly, experiments will be done to test the effectiveness of different features with a classification task on a manually annotated Chinese corpus described in the previous chapter which includes about 5612 sentences. Then, the result also shows a good performance in classifying sentences in different levels.

7.2. Linguistic indicators for sentence type classification

As automatic aspectual classification is intrinsically semantic computing which rely on deep understanding of the syntactic structures of the sentences and the semantics of the constituents, such as the meaning of the main verbs and their arguments etc. Thus, using bag-of-words features doesn't make any sense and is not expected to obtain good performance. In addition, one of the most important purposes of the experiments here is to reveal the linguistic insights and help us understand the most important factors that could determine the aspectual class. In this concern, the bag-of-words features are not explored here.

Another purpose of the experiments is to study the lexical semantics of verbs. If the semantics of verbs have already been well defined, we can then expect that a set of linguistic rules could precisely predict the aspectual class of sentences. In other words, studying the lexical semantics of verbs is our final goal beyond the aspectual classification. So, we aim to study the lexical semantics based on the syntactic behaviors of verbs, which is also the principle for doing verb classification including the Levin verb classes based on alternations.

7.2.1. Indicators for different event types

7.2.1.1. Main Verbs and Argument Structure

Main verbs and their complements including argument structure is the most important indicator to an event type based on previous linguistic studies and used for event type classification in previous works.

As shown in the previous chapter, many verbs (more than 200 verbs among about 1500 verbs) correspond to more than one category. Thus, maintaining a dictionary that stores the default aspectual class of a verb could gain an accuracy of more than 75%. If we don't consider modalities and speech acts, there are still 217 main verbs from 1612 that correspond to more than one aspectual category. A dictionary then could obtain more than 85% accuracy.

However, the accuracy obtained by this dictionary is only guaranteed in this corpus. As the frequency distribution shows that few of those verbs (157/1674=9.4%) (Events only: 194/1395 =13.9%) that only appear in one category actually occurs more than once in the corpus. On the other hand, the verbs that correspond to more than one category while occurring more than once take up 53% ((1612 – 1395)/(194 + 1612 – 1395) = 0.53). This means that most of the verbs that correspond to one category just because they occur only once. Thus, for evaluations, it is not good to main a dictionary.

Argument structure features include the subject and object and their syntactic structure. For example, the temporal adverbial and locational features used by Cao (2008) are all included in this feature set. The potentially capture the linguistic phenomena that aspectual class is also related to the argument of a verb. For example, (2.a) denotes an activity, while (2.b) denotes an accomplishment. So, the structures of NPs, e.g. numeral classifier NP and appearance of demonstratives by 這 *zhe4* 'this', 那 *na4* 'that', are also important features.

(2) a. 他喝酒了。

ta1	he1jiu3	le0
he	drink	LE

He got drank.

b. 他喝了一瓶酒。

ta1	he1	le0	yi1	ping2	jiu3
he	drink	LE	one	bottle	wine

He drank a bottle of wine.

7.2.1.2. Aspectual Light Verbs and Aspectual Markers

開始 *kai1shi3* 'start', 繼續 *ji4xu4* 'continue', 停止 *ting2zhi3* 'stop', 結束 *jie2shu4* 'end' etc. However, light verbs mean that they are verbs. Once they appear, they become the head of sentence. The verbs or event nouns that determine the event structure will be the argument of the aspectual light verb. Linguistically, light verbs are usually treated as semantically bleached in some degrees. For aspectual light verbs, the left part of their semantics is only the aspectual part. Different from these light verbs that usually denote dynamic events, 變得 *become* can express an

inchoative by taking a static state as its ‘argument’. For example, sentence (3) denotes an inchoative.

(3) 他變得高興了。

ta1	bian4	de0	gao1xing4	le0
he	become	DE	happy	LE

He became happy.

Aspectual markers, 著 *zhe0* ‘ZHE’, 了 *le0* ‘LE’, 過 *guo4* ‘GUO’, in Chinese are a strong indicator of different event types. They behave like a verb suffix. 起來 *qi3lai2* ‘up’ and 下去 *xia4qu4* ‘down’ can also function like aspectual markers, as shown in (4) and (5). They are not typical ones as they can co-occur with an aspectual marker 了 in the middle. However, they there is no typical aspectual markers, they can still indicate aspect.

(4) a. 大家都叫起來了 。

da4jia1	dou1	jiao4	qi3lai2	le0
everyone	all	shout	QILAI	LE

Everyone started shouting.

b. 整個村落都歡動起來。

zheng3ge4	cun1luo4	dou4	huan1dong4	qi3lai2
the_whole	village	all	cheer_up	QILAI

All the people of the village cheered up.

(5) a. 心情 就 開朗 起來。

xin1qing2	jiu4	kai1lang3	qi3lai2
mood	then	clear_up	QILAI

The mood cleared up.

b. 人人 都 富 起來 。

ren2ren2	dou1	fu4	qi3lai
everyone	all	rich	QILAI

Everyone became rich.

The constructions of ‘V+LE+O+LE’, ‘V+LE+O’ and ‘V+O+LE’ are good indicators for expressing different event types. Their combination with other aspectual markers 著 *zhe0* ‘ZHE’, 了 *le0* ‘LE’, 過 *guo4* ‘GUO’, 起來 *qi3lai2* ‘up’ and 下去 *xia4qu4* ‘down’, are also an important indicators to different event types. For example, sentence (6.a) indicates a delimitative. If we add

sentence final *-le* in this sentence, i.e. sentence (6.b), it then expresses a durative static state. Sentence (7.a) expresses an activity, while sentence (7.b) expresses an accomplishment.

(6) a. 他病了一個星期。

ta1	bing4	le0	yi1	ge4	xing1qi1
he	ill	LE	one	CL	week

He was ill for one week.

b. 他病了一個星期了。

ta1	bing4	le0	yi1	ge4	xing1qi1	le0
he	ill	LE	one	CL	week	LE

He has been ill for one week.

(7) a. 他喝酒了。

ta1	he1jiu3	le0
he	drink	LE

He drank.

b. 他喝了酒了。

ta1	le0	he1jiu3	le0
he	LE	drink	LE

He drank some wine.

Some verb suffix such as 完 *wan2* ‘finish’, 好 *hao3* ‘ready’, 成 *cheng2* ‘succeed’ also behaves similar as an aspectual marker. They are strong evidence for dynamic-static change/achievement. Similar 起來 *qi3lai2* ‘up’ and 下去 *xia4qu4* ‘down’, they can also co-occur with aspectual marker 著 *zhe0* ‘ZHE’, 了 *le0* ‘LE’, 過 *guo4* ‘GUO’. However, when they appear, the event structure is mostly determined by them. They could actually be treated as a special kind of RVCs. In Sinica corpus, they are not segmented as independent words, but attached to the previous verbs to from compounds. So, this indicator is inner lexical features and thus in morphological level. The extraction of such features will need extra linguistic resources to predict the structure of a compound. Thus, by now this linguistic indicator is not explored.

7.2.1.3. Temporal Adverbials

Temporal adverbial includes instant time point, e.g. 上午 10 點 *shang4wu3 10 dian3* ‘10:00am’, and time duration, e.g. 一個星期 *yi1 ge4 xing1qi1* ‘one week’. The time point is an indicator for change, instantaneous accomplishment and dynamic state. Time duration is an indicator for

dynamic state, durative static state, activity, when it functions like a for-adverbial. It indicates change when it functions as an in-adverbial.

Some neutral sentences could be disambiguated by context. Temporal adverbial is one of the important elements of context. For example, the sentence (8.a) is in neutral viewpoint aspect, for which we cannot decide this event type it expresses. However, when a time point adverbial is added, the sentence then expresses an inceptive as shown in (8.b) and (8.c). Some conjunctions have similar functions, e.g. 於是 *then*, 便 *then*, etc.

(8) a. 他坐父親的車去學校。

ta1	zuo4	fu4qin1	de0	che1	qu4	xue2xiao4
he	sit	father	DE	car	go_to	school

He takes (took) his father's car to go to school.

b. 早上 8 點，他坐父親的車去學校。

zao3shang4	ba1dian3	ta1	zuo4	fu4qin1	de0	che1
morning	eight_o'clock	he	sit	father	DE	car

qu4	xue2xiao4
go_to	school

He took his father's car to go to school at 8:00am.

c. 於是，他坐父親的車去學校。

yu2shi4	ta1	zuo4	fu4qin1	de0	che1	qu4
then	he	sit	father	DE	car	go_to

xue2xiao4
school

Then, he took his father's car to go to school.

Some adverbs can also indicate change, such as 便 *bian4* 'then', 於是 *yu2shi4* 'then', 不再 *bu4zai4* 'no longer', 更加 *geng4jia1* 'even more', etc. For example, sentence (9) describes a cessation of a static state, which is a Static-static change.

(9) 他不再是老師了。

ta1	bu4zai4	shi4	lao3shi1	le0
he	no_longer	be	teacher	LE

He is not a teacher any more.

Some explicit causative markers, e.g. 使 *shi3* 'cause', 造成 *zao4cheng* 'cause' etc. can also indicator inchoative when they are followed by static states. These verbs actually only indicate

causative relation. Logically, if the event caused is a static state, it must be an inchoative. For example, sentence (10) expresses an inchoative. The subject in this sentence 這件事 *zhe4 jian4 shi4* 'this matter' is an entity that takes the causer role of the event and doesn't contribute to the event structure.

(10) 這件事使他很苦惱。

zhe4	jian4	shi4	shi3	ta1	hen3	ku3nao3
this	CL	matter	cause	him	very	sad

This matter made him blue.

7.2.1.4. Other indicators

Frequency adverbs, such as 常常 *chang2chang2* 'often', 經常 *jing1chang2* 'often', 反复 *fan3fu4* 'iteratively', 很少 *hen3shao3* 'rarely', etc. as used by Cao (2008) are important indicators for habitual events. Negation adverbs, such as 沒有 *mei2you3* 'not have/exist', 不 *bu4* 'not', are also important indicators to static state.

7.2.2. Indicators for modalities

Modalities could be expressed by auxiliaries, adverbs, verbs and even sentence final particles in Chinese. Deontic and dynamic ones are usually expressed by auxiliaries, such as 能 *neng2* 'can', 會 *hui4* 'will/can', 可以 *ke3yi3* 'can', 應該 *ying1gai1* 'should', 必須 *bi4xu1* 'must' etc. Epistemic modality is usually expressed by adverbs, such as 可能 *ke3neng2* 'possibly', 大概 *da4gai4* 'possibly', 應該 *ying1gai1* 'should' etc. As previous studies don't deal with modalities, these features are not specially considered.

Some adverbs are indicators for exclamations, such as 真 *zhen1* 'truly', 好 *hao3* 'so', 太 *tai4* 'too' etc. Some sentence final particles, such as 啊 *a0*, 呀 *ya0* can also indicate exclamation. Exclamation mark '！' is an indicator for exclamations. Question mark '？' is not unique for questions, a subtype of speech act. Non-interrogative questions as exemplified in the table don't require an answer from the hearer. They intrinsically express an evaluation. Such questions usually include a sentence final particle 啊 *a0* or the combination of question mark and exclamation mark '？！' or '？？'.

7.2.3. Indicators for speech acts

Speech act only refer to utterances, which is usually double quoted in text. This is a little problem in our study that the quoting information is not kept. However, some sentences are obviously spoken, e.g. the following.

Sentence final particles such as 哦 *o0* as in (11.a) are usually indicators for assertive sentences. Adverbs such as 就是 *jiu4shi4* 'surely' as in (11.b) are used by a speaker to emphasize that the truth of the proposition and thus is an indicator of assertive. The second person pronouns such as 你 *ni3* 'you' as exemplified in (11.c) sometimes are also an indicator for assertive.

(11) a. 這是一個小祕密哦！

zhe4	shi4	yi1	ge4	xiao3	mi4mi4	o0
this	be	one	CL	little	secret	O

This is a little secret!

b. 秦國的軍隊就是要來打鄭國的 。

qin2guo2	de0	jun1dui4	jiu4shi4	yao4	lai2	da3
Qin_Empire	DE	army	surely	want	come	invade
zheng4guo2	de0					
Zheng_Empire	DE					

The Qin Empire is surely coming to invade the Zheng Empire.

c. 你來得正好。

ni3	lai2	de0	zheng4hao3
you	come	DE	opportune_moment

I must say that you come just at an opportune moment.

Some verbs can only be used in expressive sentences, such as 您好 *nin2hao3* 'how are you', 萬歲 *wan4sui4* 'long live' etc. as shown in (12). Punctuation is also a possible indicator for expressive sentences, e.g. sentence.

(12) 高爾夫萬歲！

gao1er3fu1	wan4sui4
golf	long_live

Long live golf!

Lack of subjects is usually an indicator for imperative, thus is a good feature to identify directive sentences, such as (13.a). Exclamations are sometimes used to specify a stronger degree of requirement or demand. Some sentences contain subjects, which are mostly vocative. Proper nouns and third person pronouns don't appear as the subject of directive sentences. Meanwhile, such sentences are usually lack of aspectual markers, e.g. (13.b).

(13) a. 過來!

guo4lai2

come_here

Come here!

b. 我們 來 比賽 。

wo3men2	lai2	bi3sai4
we	come	compete

Let's take a competition.

The first person pronoun is an indicator to commissive sentences. The lack of aspectual markers, sentence final particles, punctuations and some auxiliaries are all possible indicators to commissive sentences. Examples are shown in (14).

(14) a. 我 給 你 倒 一杯 水 。

wo3	gei3	ni3	dao4	yi1	bei1	shui3
I	give	you	pour	one	CL	water

I will serve you a cup of water.

b. 我 來 澆水 。

wo3	lai3	jiao1shui3
I	come	water

I will perform the watering.

c. 我 一定 會 報答 您 。

wo3	yi1ding4	hui4	bao4da2	nin2
I	definitely	will	pay_back	you

I'll definitely pay you back.

Some verbs, such as 宣布 *xuan1bu4* 'announce', 聲明 *sheng1ming2* 'claim', are indicators to declaratives. However, some sentences don't contain such verbs, e.g. the sentences in (15).

(15) a. 我宣布我們的科研小組正式成立。

wo3	xuan1bu4	wo3men2	de0	ke1yan2	xiao3zu3
I	declare	we	DE	research	group
zheng4shi4	cheng2li4				
formally	found				

I hereby declare that our research group is founded.

b. 到時候後果自行負責!

dao4shi2hou0 hou4guo3 zi4xing2 fu4ze2
that_time consequence by_oneself be_responsible_for
I declare that everyone will take his own responsibilities!

c. 不達收復釣魚台目的絕不終止。

bu4 da2dao4 shou1fu4 diao4yu2tai2 mu4di4
not achieve resume Diaoyutai purpose
jue2bu4zhong1zhi3
never stop
I declare that we will never stop until we got Diaoyutai back.

7.3. Aspectual Classification

7.3.1. Grounding the Features

Based on the above discussion of the linguistic indicators, we can find that most the indicators are not unique for one particular sentence type or event type. For example, the modal auxiliary verb 應該 *ying1gai1* 'should' can appear in deontic and epistemic modalities. Question mark '？' can appear in questions and evaluations. Meanwhile, it is difficult to build up a dictionary that could cover all possible cases for indicating different sentence type or event types.

Rather than using specific linguistic rules to generate binary features, i.e. whether it obeys a rule or not, we can use more general syntactic features and let classifiers to capture the potential indicators. For example, the features of aspectual markers, particles, modal operators, negations that have been used in previous studies (Siegel, 1999; Siegel and McKeown, 2000; Zhu et al., 2000; Cao et al., 2006), could be easily captured by dependent constituents of the main verb of the sentence.

Similarly, we can also setup templates for some combinations of the unitary features, e.g. the occurrence of two LEs in the same sentence, the argument structure that combines the part-of-speech and phrase structure of the verbs and their arguments. We can also expect that the phrase structure can capture the information including the numeral classifier constructions, the existing of a demonstrative etc. All the features are listed in Table 1 with some examples.

The advantage to use pure syntactic features without any linguistic constrains is that it offers an easy way for feature extraction avoiding extra linguistic resources and linguistic rules with a complicated extraction process.

ID	Feature	Example
f_1	Head	head:word:看, head:pos:verb, head:subj:word:他, head:subj:pos:pron, head:obj:xp:NP, head:obj:xp:noun-noun
f_2	Dependency	dep:word:他, dep:pos:pron, dep:word:不, dep:pos:adv, dep:word:小说, dep:pos:noun, dep:word:了, dep:pos:particle,
f_3	COMB	subj:word:他-head:word:看-obj:xp:noun-noun, subj:pos:pron-head:pos:verb-obj:xp:NP,
f_4	Theta	theta:agent:word:他, theta:agent:pos:pron theta:neg:word:不, theta:neg:pos:adv, theta:theme:xp:NP, theta:theme:xp:noun-noun theta:asp:word:了, theta:asp:pos:particle,

Table 1: Feature template we use for our classification of event types. Feature examples are based on the sentence 他不看侦探小说了 *ta1 bu4 kan4 zhen1tan4xiao3shuo1 le0* 'he doesn't read detective novel anymore'.

7.3.2. Feature Extraction

Sinica Treebank is annotated with Information-based Case Grammar (ICG). The following is an example. The constituents in the same level are flattened. The syntactic head is labeled as 'Head'. If one constituent, e.g. NP, has sub constituents, all the sub constituents are bracketed. Each item, either lexical or syntactic, is made up of three attributes: the thematic role, part-of-speech and the word or sub structure.

S(agent:NP(Head:Nca:證管會)|time:Dd:尚未|Head:VE2:決定|goal:VP(reason:Dj:是否|Head:VE12:准予|theme:VP(manner:VH16:公開|Head:VC31:承銷)))

For f_1 feature set, the main verb could be extracted by searching the 'Head' item in the first level of the sentence. The subject and object of the main verb could be derived by the thematic role of agent, theme, location, instrument, goal, source. In the example, the item with agent (證管會 *zheng4guan3hui4* 'the Securities and Exchange Commission') is treated as the subject. The item *VP* with the goal is treated as the object. For f_2 feature set, the dependency relation could be derived in a way that all the constituents depend on the *Head* item in the same level. The *Head* item in one level then depends on the 'Head' item of the upper level. If there is no upper level, then the *Head* is the head of the whole sentence.

For f_3 feature set, the combination feature is only limited to the arguments of the main verb and the aspectual markers. Other constituents are ignored. For f_4 feature set, the thematic role information is used. For all the four feature sets, word and part-of-speech are used separately. As we may imagine that word features will be sparse due to the small size of the corpus, the use of part-of-speech could alleviate the problem of data sparseness.

7.3.3. Classifiers

There are many machine learning approaches that are designed especially for classification, such as Naïve Bayesian (NB), Decision Tree (DT), K-Nearest Neighbors (KNN), Maximum Entropy (ME), Support Vector Machine (SVM) and so on. Different classifiers perform differently in different applications. The overall performances of the classifiers are quite similar. On the other hand, feature selection is more important to obtain a good performance.

For aspectual classification, Siegel compared three different classifiers, DT, Logistic Regression and Generic Programming, and found that DT performs the best. Zarcone (2008) adopt a ME model for aspectual classification on Italian and obtains a good performance. Cao (2006) adopted SVM for the classification on Chinese and obtained a very high performance. In the experiments in the following, I will also adopt SVM classifier. In addition, our purpose by now is not to construct a real application that could gain the best performance. Instead, the study here is more linguistically motivated, the purpose of which is to reveal some linguistic insights on aspectual studies.

7.4. Experiments

There are two main sets of experiments. The first set of experiments is done based on the gold standard features from the annotated Sinica Treebank. The aim is to evaluate different sets of features as described in Section 3 in terms of their contribution on the classifications. The second set of experiments is done based on the features that are automatically annotated by Stanford parser. The aim is to understand the real perform we could obtain from the raw corpus. For all experiments, we conduct 5-fold cross validation test using a SVM classifier implemented in LibSVM (Chang and Lin, 2011) package.

7.4.1. Sentence Type Classification

The first experiment is trying to classify the sentences into the three coarse categories based on their functions: event, modality and speech act as shown in Figure 1.

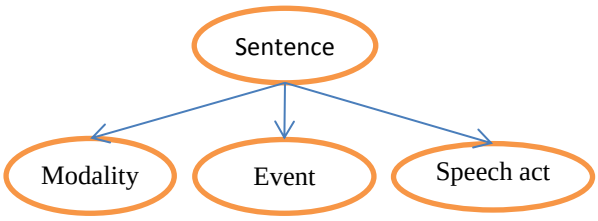

Figure 1: Coarse-grained sentence types.

By combining the subcategories into the three coarse-grained categories, we can get the corpus information as shown in Table 2.

Sentence Type	No. of Instances
Modality	1044
Speech Act	761
Events	3811

Table 2: Class Distribution on Sentence Types.

I use the first feature set as the baseline and add the second and third sets of features gradually. The result is shown in Table 3. Table 4 shows the precision, recall and F1-Measure when all the features are used. We can see that the features that only consider head verb of sentences give very low performance.

	f_1	$+f_2$	$+f_3$	$+f_4$
Event	0.8128	0.9015	0.9100	0.9122
Modality	0.1917	0.6259	0.5931	0.6288
SpeechAct	0.2089	0.6389	0.7380	0.7380
MacroAvg	0.4044	0.7221	0.7470	0.7597
Accuracy	0.6880	0.8264	0.8391	0.8458

Table 3: 5-fold cross validation result in F-Measure with different features sets.

	Precision	Recall	F1
Event	0.8626	0.9679	0.9122
Modality	0.7458	0.5440	0.6288
SpeechAct	0.8587	0.6493	0.7380
MacroAvg	0.8223	0.7204	0.7597
Accuracy	0.8458		

Table 4: 5-fold cross validation result in coarse level sentence classification.

	Event		Modality		SpeechAct	
	f_1	f_4	f_1	f_4	f_1	f_4
Event	742	737	13	21	6	2
Modality	182	81	18	113	8	13
SpeechAct	115	36	6	17	31	99

Table 5: Confusion matrix comparison with f1 features and f4 features.

The confusion matrix is shown in Table 5. We can see that many instances of modal and speech act have been misclassified as events. Intrinsically, this show that main verb itself with its argument structure cannot precisely decide the sentence type. When adding dependency features, the performance is significantly improved. This is consistent with our analysis that, dependency information could capture the implicit linguistic cues, e.g. modal operator, negation, etc. When adding thematic/theta role features, the performance is slightly decreased. This is due to the inaccurate annotation of the thematic role features of Sinica treebank.

7.4.2. Classification on Different Modalities

Here, I test the finer-grained classification on different modalities: epistemic, deontic, dynamic and evaluation as shown in Figure 2. The distribution information is shown in Table 6.

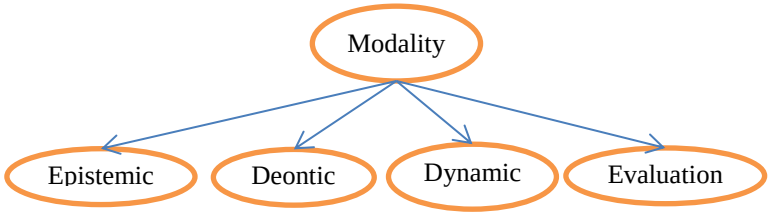

Figure 2: Subtypes of modality.

Sentence Type	No. of Instances
Epistemic	303
Deontic	219
Dynamic	111
Evaluation	411

Table 6: Class Distribution on Modalities.

The classification result is shown in Table 7. Table 8 shows the detailed performance when all the features are used. Table 9 shows the averaged confusion matrix. We could see that f_1 and f_2 features obtain the best performance. The shows that the dependency features captures most of the important that are needed for classification of modalities. When f_3 and f_4 are added, the

performance is even decreased. This may be due to the over-fitting problem that the classifier got the wrong rules based on non-relevant features.

	f_1	$+f_2$	$+f_3$	$+f_4$
Epistemic	0.4017	0.7638	0.7423	0.7641
Deontic	0.4470	0.7672	0.7088	0.7359
Dynamic	0.3048	0.5773	0.3972	0.5303
Evaluation	0.6167	0.8131	0.8221	0.8269
MacroAvg	0.4425	0.7303	0.6676	0.7143
Accuracy	0.5028	0.7672	0.7432	0.7643

Table 7: Classification result of modality classification.

	Precision	Recall	F1
Epistemic	0.7632	0.7656	0.7641
Deontic	0.7701	0.7074	0.7359
Dynamic	0.6679	0.4407	0.5303
Evaluation	0.7806	0.8807	0.8269
MacroAvg	0.7454	0.6986	0.7143
Accuracy	0.7643		

Table 8: Classification result of modality classification with all features.

	Epistemic		Deontic		Dynamic		Evaluation	
	f1	all	f1	all	f1	all	f1	all
Epistemic	22	46	8	3	1	2	29	10
Deontic	8	5	19	31	2	2	14	6
Dynamic	5	4	6	4	5	10	6	5
Evaluation	12	6	9	3	3	1	59	72

Table 9: Averaged confusion matrix of fine-grained result on modality classification.

7.4.3. Classification on Different Speech Acts

Here, I test the finer-grained classification on different speech acts: interrogative, assertive, expressive, directive, commissive and declarative as shown in Figure 3. The distribution information is shown in Table 10. Due to the small number of examples in expressive and declarative, we exclude these two categories in order to get a reliable evaluation.

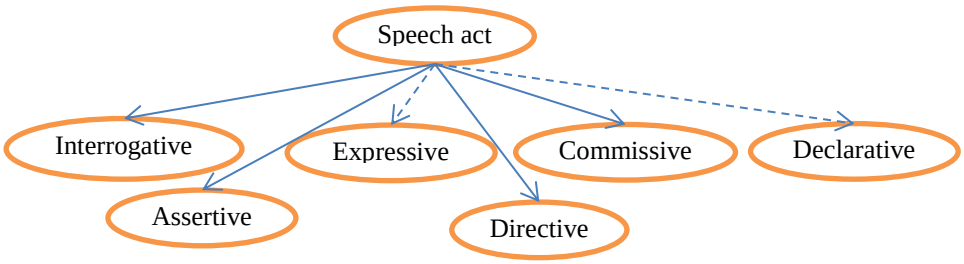

Figure 3: Subtypes of speech act sentences.

Sentence Type	No. of Instances
Interrogative	559
Assertive	64
Directive	65
Commissive	58

Table 10: Class Distribution on Speech Acts.

The classification result is shown in Table 11. The detailed performance when all the features are used in shown in Table 12. Table 13 shows the averaged confusion matrix. We could see that the performance is gradually improved when the features are gradually added.

	f_1	$+f_2$	$+f_3$	$+f_4$
Question	0.8593	0.8838	0.8962	0.8993
Directive	0.1975	0.4304	0.4080	0.4488
Assertive	0.0	0.2266	0.3771	0.3390
Commissive	0.0333	0.1633	0.1116	0.2729
MacroAvg	0.2725	0.4260	0.4482	0.4900
Accuracy	0.7466	0.7855	0.8002	0.8109

Table 11: Classification result on speech acts.

	Precision	Recall	F1
Question	0.8183	0.9982	0.8993
Directive	0.8184	0.3384	0.4488
Assertive	0.8333	0.2179	0.3390
Commissive	0.6055	0.1909	0.2729
MacroAvg	0.7689	0.4363	0.4900
Accuracy	0.8109		

Table 12: Classification result on speech act with all features.

	Question		Directive		Assertive		Commissive	
	f1	all	f1	all	f1	all	f1	all
Question	109	112	1	0	0	0	1	0
Directive	10	7	2	4	0	0	1	2
Assertive	12	10	0	0	0	3	0	0
Commissive	11	8	1	1	0	0	0	2

Table 13: Averaged confusion matrix of the classification result of speech acts.

7.4.4. Classification on Mid-Level Event Types

Here, I test the finer-grained classification on mid-level event types: dynamic, static, accomplishment and achievement, as shown in Figure 4. The static event is the combination of static state, delimitative; the dynamic event is the combination of dynamic state, bounded dynamic state and semelfactive. The consideration is also based on the small size of delimitative, bounded dynamic state and semelfactive. The distribution information is shown in Table 14.

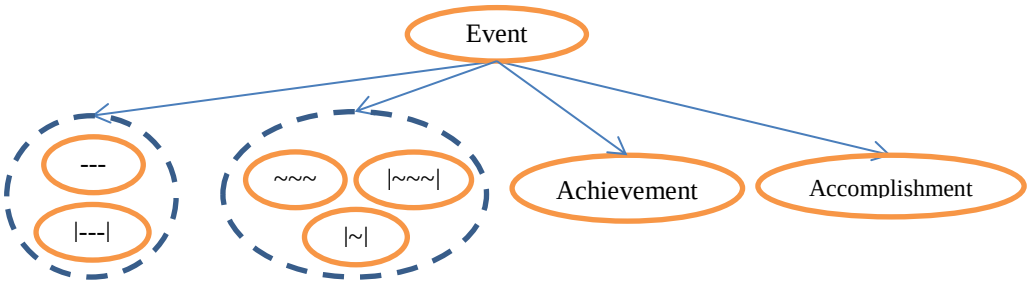

Figure 4: Collapsed subtypes of events.

Sentence Type	No. of Instances
Static	2481
Dynamic	218
Achievement	648
Accomplishment	460

Table 14: Class distribution of mid-level event types.

The classification result is shown in Table 15. The detailed information and the confusion matrix are shown in Table 16 and Table 17 respectively. The best performance is obtained on $f_1 + f_2$.

	f_1	$+f_2$	$+f_3$	$+f_4$
---	0.8196	0.8771	0.8650	0.8708
~~	0.1417	0.3759	0.3734	0.3748
Achievement	0.4438	0.6298	0.6033	0.6125
Accomplishment	0.4433	0.5151	0.4866	0.5263
MacroAvg	0.4621	0.5995	0.5821	0.5961
Accuracy	0.7092	0.7819	0.7706	0.7795

Table 15: Classification result of mid-level event types.

	Precision	Recall	F1
Static	0.8006	0.9547	0.8708
Dynamic	0.7206	0.2571	0.3748
Achievement	0.7310	0.5277	0.6125
Accomplishment	0.6682	0.4347	0.5263
MacroAvg	0.7301	0.5435	0.5961
Accuracy	0.7795		

Table 16: Classification result of mid-level event types with all features.

	Static		Dynamic		Achievement		Accomplishment	
	f1	all	f1	all	f1	all	f1	all
Static	456	473	2	2	21	11	16	9
Dynamic	32	30	4	11	4	0	3	2
Achievement	79	51	1	2	47	68	3	9
Accomplishment	51	38	1	0	8	14	33	40

Table 17: Averaged confusion matrix of classification result of mid-level event types.

7.4.5. Classification on Different Accomplishments

Considering that the accomplishment with dynamic final state is rare, I don't discriminate the final state in the classification task. The combined categories are shown in Figure 5. I will use '=' to denote a general state, that could be either static '-' or dynamic '~'. Finally, there are 257 examples for instantaneous accomplishment '|~|===' and 203 examples for durative accomplishment '|~~~|===', as shown in Table 18.

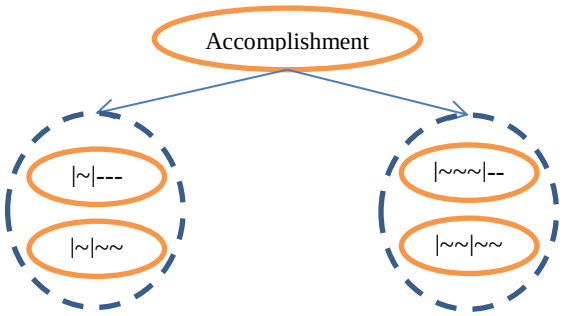

Figure 5: Collapsed sub types of accomplishment.

Sentence Type	No. of Instances
|~|===	257
|~~~~|===	203

Table 18: Class distribution of accomplishments.

The classification result is shown in Table 19. Table 20 shows the detailed performance when all the features are used. The corresponding confusion matrix is shown in Table 21. The best performance is obtained with $f_1 + f_2$ features.

	f_1	$+f_2$	$+f_3$	$+f_4$
|~~~|===	0.6945	0.6937	0.6774	0.6602
|~|===	0.7843	0.7705	0.7634	0.7489
MacroAvg	0.7394	0.7321	0.7204	0.7046
Accuracy	0.7478	0.7391	0.7282	0.7130

Table 19: The classification result of accomplishments.

	Precision	Recall	F1
|~~~|===	0.6938	0.6401	0.6602
|~|===	0.7356	0.7706	0.7489
MacroAvg	0.7147	0.7053	0.7046
Accuracy	0.7130		

Table 20: The classification result of accomplishments with all features.

	|~~~|===		|~|===	
	f1	all	f1	all
|~~~|===	26	26	14	15
|~|===	9	12	42	40

Table 21: Averaged confusion matrix of the classification result of accomplishments.

7.4.6. Classification on Different Achievements

Here, I test the finer-grained classification of subtypes of achievements: SSChange, SDChange, DSChange and DDChange. Since the size of the DDChange is quite small, we exclude this category. The collapsed categories are shown in Figure 6. The distribution information is shown in Table 22.

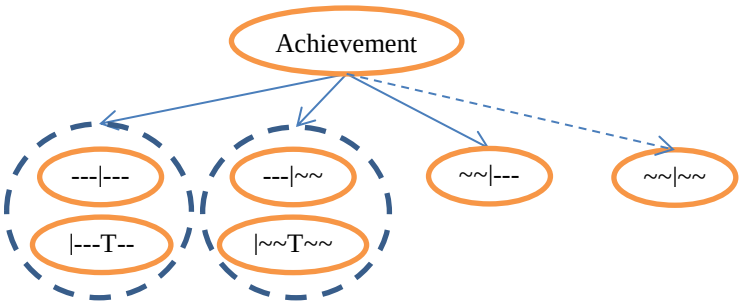

Figure 6: Collapsed sub types of achievement.

Sentence Type	No. of Instances
---|---	471
---|~~~	96
~~|---	79

Table 22: Class distribution of achievements.

The classification result is shown in Table 23. Table 24 shows the detailed performance when all the features are used. The corresponding confusion matrix is shown in Table 25. The best performance is obtained on $f_1 + f_2$ features.

	f_1	$+f_2$	$+f_3$	$+f_4$
---|---	0.8662	0.8629	0.8579	0.8550
---|~~~	0.4704	0.4938	0.3636	0.3655
~~|---	0.1467	0.0705	0.0915	0.0679
MacroAvg	0.4945	0.4757	0.4377	0.4295
Accuracy	0.7770	0.7724	0.7616	0.7569

Table 23: Classification result on achievements.

	Precision	Recall	F1
---|---	0.7566	0.9830	0.8550
---|~~~	0.8142	0.2394	0.3655
~~|---	0.4	0.0375	0.0679
MacroAvg	0.6569	0.4199	0.4295
Accuracy	0.7569		

Table 24: Classification result on achievements with all features.

	---|---		---|~~~		~~~|---	
	f1	All	f1	all	f1	all
---|---	93	93	1	1	0	1
---|~~~	13	15	6	5	0	0
~~|---	14	15	0	0	1	1

Table 25: Averaged confusion matrix of the classification result on achievements.

It seems not a coincidence that the best performance is obtained with f_1 + f_2 features. One important reason I have found is that the thematic role information annotated in Sinica Treebank is sometimes unreliable as the discrimination of different roles are even difficult for human judgment.

7.4.7. Experiments with predicated features

After evaluating the contribution of different features, we would like to use automatically extracted feature in order to observe the real performance we could gain based on plain text. To get the syntactic structure of the sentences we use Stanford word segmenter (Tseng et al., 2005) and Stanford parser (Chang et al., 2009) to process the corpus. Similar features as shown in Table 1 are used. In this experiment, I don't compare different feature sets but use all the features at once.

7.4.7.1. Feature Extraction from Syntactic Parse Tree and Dependency Tree

Stanford parser outputs two tree structures. One is the syntactic parse tree that is the previous version of the tree structure from Chomsky's theory. The other is the dependency tree. Extracting features from Stanford dependency structure is quite straight forward. However, for Stanford parser, it only provides limited information on thematic role information (agent). Phrase structure features could be easily obtained based on syntactic tree.

	Precision	Recall	F1
Event	0.830	0.971	0.895
Modality	0.717	0.416	0.525
SpeechAct	0.838	0.607	0.703
MacroAvg	0.795	0.665	0.708

Table 26: Coarse-grained classification result with predicated features.

7.4.7.2. Experimental Results

The result of the coarse-grained classification for modality, event and speech act is shown in Table 26. We can see that the overall performance decreased a little compared to the performance obtained with annotated features. But the performance is still reasonable.

	Precision			Recall			F1		
	Hier	All	Upper	Hier	All	Upper	Hier	All	Upper
---	0.77	0.577	0.8	0.963	0.964	0.955	0.855	0.722	0.87
~~	0.9	0.9	0.721	0.023	0.023	0.257	0.045	0.0455	0.375
---|---	0.638	0.427	0.755	0.803	0.327	0.983	0.78	0.37	0.854
---|~~~	0.833	0.8	0.808	0.094	0.052	0.229	0.167	0.097	0.352
~~|---	0.5	0.5	0.4	0.051	0.038	0.038	0.0915	0.071	0.068
|~~~|==	0.617	0.583	0.702	0.423	0.108	0.64	0.499	0.182	0.664
|~|===	0.6	0.551	0.738	0.549	0.132	0.779	0.572	0.213	0.754
Epistemic	0.682	0.672	0.763	0.472	0.277	0.766	0.556	0.387	0.764
Deontic	0.585	0.516	0.77	0.452	0.315	0.707	0.509	0.388	0.736
Dynamic	0.45	0.424	0.668	0.198	0.126	0.441	0.271	0.187	0.53
Attitude	0.639	0.532	0.781	0.574	0.229	0.881	0.604	0.319	0.827
Question	0.792	0.838	0.82	0.921	0.707	0.998	0.851	0.766	0.9
Directive	0.843	0.733	0.79	0.231	0.169	0.338	0.359	0.272	0.443
Assertive	0	0	0.833	0	0	0.218	0	0	0.339
Commissive	0.74	0.6	0.606	0.294	0.052	0.191	0.416	0.095	0.273
MacroAvg	0.639	0.577	0.73	0.403	0.235	0.561	0.434	0.274	0.583

Table 27: Classification result of finer-grained classification with predicated features. Hier: hierarchical classification; All: all-at-once classification; Upper: upper bound performance.

For finer-grained classification, we use two different ways. The first way is to use a hierarchical classification scheme. An instance is first classified as event, modality or speech act. According to the result of the first round classification, the instance is put into the corresponding fine-grained model for further classification. For example, an instance that is classified as event at the first level will be passed to the classification model of subtypes of events. The second way is to classify all instances all at once based on a model trained on all fine-grained categories.

The result is shown in Table 27. We can see that the hierarchical classification outperform the all-at-once classification. The hierarchical classification is reasonable compared to evaluated upper bound given in Section 3.4.

7.4.8. Discussions

Firstly, the performance of the classification is surely dependent on the parsing accuracy of the parser used. The identification of the right head verb is quite critical for the future classification. However, there is no other way to bypass this step. This is also the case for other semantic related applications.

Besides the parsing problem, there are still some linguistic issues behind. Many modal operators could result in different modalities, such as 應該 *ying1gai1* 'should', 會 *hui4* 'will/can/may', 要 *yao4* 'want/will/should/must' etc. Sometimes, it is hard to decide which meaning should be selected in a context. For example, sentence (16.a) denotes a deontic modality, while (16.b) denotes an epistemic modality. The annotator may just choose a most possible meaning, however, without being aware of that. This is actually similar for English and other languages (c.f. Perkins and Fawcett, 1983).

(16) a. 你应该做一个好人。

ni3	ying1gai1	zuo4	yi1	ge4	hao3	ren2
you	should	do	one	CL	good	person

Be a good man.

b. 你应该是一个好人。

ni3	ying1gai1	shi4	yi1	ge4	hao3	ren2
you	should	be	one	CL	good	person

You should be a good person.

Some errors are due to the fact that most verbs only occur once in the corpus. Many verbs that occur in training data don't appear in test data and vice versa. In this way, the classification model prefers to give higher weights for the features that occur in training data. On the other hand, the classifier could not capture the verb semantic information in the test data based on the training data.

7.5. Summary

In this chapter, I conducted a set of experiments. The results show that it is possible to predict the aspectual class automatically. This signifies the usefulness of the theory proposed in this thesis. We should know that there are still some linguistic indicators that are not fully explored and captured effectively based on this experiment setting described here. By further refining the features, it is promising that the classification could be expected to gain better performance. As most verbs only occur once in the corpus, which makes the classifier unable to capture enough information for the right prediction.

In all, the classification shows a promising result, which reflects the effectivity of the theory I proposed in the thesis. However, there is still a lot of work remaining. In future, annotating more data in order to get more reliable statistical information is the most important step before going further to study the lexical semantics of the verbs. How to represent the event structures for the sentences that involve more than one event in a systematic way is also an interesting but challenging work.

Chapter 8

Conclusion and Future Work

8.1. Summarization of the Thesis

In the thesis, I described a systematic study on the Chinese aspectual system. Firstly, I introduced the ontological layer between linguistic units and situation types propsed by Vendler (1957). Previous studies tried to classify linguistic units into situation types directly. Mostly, linguistic units can be uniquely classified into one situation type. However, I have shown that one linguistic unit can be used to express different ontological situation types in different context. This, I suggest, posed the main difficulty in previous studies. By introducing the ontological situation type, viewpoint aspect can also be discussed independently. I proposed six theorectical existing situation types with subcategories. With viewpoint aspect, there are totally eighteen linguistic event types. The task of aspectual classification is then changed to indentify the ontological situation type for each sentence in a specific context. In Chapter 3, I showed that this covers a more comprehensive list of cases in Chinese.

Based on the theory proposed in Chapter 3, the Chinese aspectual markers including ZHE, LE, GUO, and ZAI are dicussed based on their compatibility with different linguistic events in Chapter 4. In other words, the semantics of ZHE, LE, GUO, and ZAI are studied based on the analysis of what linguistic event types they can express. Then, the Chinese RVCs and SVCs are discussed in terms of what situation types they can usually express. I cover most of the cases that could be found in Chinese.

In Chapter 5, I adopted event semantic theory to represent the ontological situation types and linguistic event types. The formal representations of the semantics of the Chinese aspectual markers are also given in a simpler way. I maintained one single LE and GUO while being able to explain all the linguistic phenomena that have been discussed before.

Besides the theoretical framework, I also presented a Chinese corpus within which all aspectual information is annotated for each sentence. To be comprehensive, the modality information and illocutionary acts are also annotated. All the sentences can be manually classified into one category in the theoretical framework, although some category that theoretically exists didn’t encounter any real examples in the corpus.

In Chapter 7, a machine learning approach was proposed for the automatically classification of Chinese sentences. The experiments on the annotated corpus showed a promising performance in terms of accuracy and F-measure. This indirectly proved the effectiveness of the theoretical framework proposed in Chapter 3 and 4.

Finally, I can claim that this thesis presents the most systematic study on the Chinese aspectual system from a novel perspective. It covers most of the linguistic issues related to aspect of Chinese and provides convincing explanation to them. The theory proposed in this thesis can potentially contribute to both linguistic field and computation linguistic field.

8.2. Consequences of the Study

8.2.1. Ontology and Lexicon

The differentiation between ontology and lexicon is important. Ontology concerns the shared concepts among different countries and societies. Language not only lexicalize concept but also lexicalize language specific elements such as aspect, e.g. progressive, perfective and other functional constituents.

WordNet has been mainly used for computing of semantic similarity between two lexical items. Some works for word sense annotation and disambiguation are done based on WordNet. However, WordNet is not a good resource for accurate semantic representation which allows reasoning and inference in meaning. This is also the motivation for some works that link WordNet synsets to ontological concepts, e.g. SUMO. However, the link only provides approximate information in terms of which lexical items could possibly denote a concept. It is still not clear how the lexical items could be used in syntactic and aspectual perspectives.

Explicitly modeling relation between lexical items only approximates the relations among concepts. On contrary, it is better to leave lexical items independent. Their relation could be indirectly derived according to their link to the ontological concepts. For each lexical item, not only conceptual information should be included, but also other perspectives, e.g. syntactic and aspectual information. One important advantage for doing this is that ontology is universal across language. By linking different languages to the same ontology, it will allow reasoning across languages.

Even for the same concept, there could be different words that lexicalize different facets of the concept, e.g. in frame semantics (Fillmore 1967). For example, trade refers to the whole transaction while buy and sell are two different facets from the persepctives of different roles in

the trade process. However, they will have different argument structures which may be reflected in different syntactic behaviors. In this way, different verbs and nouns could be linked semantically.

GL concerns more on the semantic links between nouns and verbs with Qualia structure. Formal quale is to capture the subclass relation between the concepts the nouns represent. Constitutive quale is to capture the part-of relation also from ontological point of view, however with lexical items. Telic quale mainly captures the relation between the concept the noun corresponds and its main function for which it is invented. For example, a book is invented to be read by readers. The traditional way is to give semantic type constraints for different arguments, which sometimes is difficult to decide which type should be used for the constraints. Telic quale is thus another way to model argument structure for verbs, which implicitly form the semantic constrains for verb arguments. Meanwhile, the qualia structure also allows inheritance. For example, all the subclasses of book should also have read() as part of their telic quale. Agentive quale captures how an object comes into exist. For example, a book is written by an author and printed by a machine etc.

8.2.2. Extended Generative Lexicon

The verb classes derived in the thesis is not the end of the study but only a start to build a model for verbal semantics. For example, the verb net buy Palmer is built on an extended English verb classes based on Levin's framework by observing the verb alternations. FrameNet (Baker, 1998) is built upon the case semantic theory by Fillmore.

The aspectual framework will serve as a basic tool for us to understand the semantic boundary of Chinese verbs. Aspectual information will be in the position of the interface between semantics and syntax. All different perspectives should be combined in order to provide a comprehensive semantic representation for lexical items. For example, frame structure (FRAME), argument structure (ARG), qualia structure (QUALIA), syntactic structure (SYNTAX), aspectual structure (ASP) and ATTRIBUTE that is a part of Ontology, e.g. SUMO, could be the five basic components for semantics. I would suggest that QUALIA, FRAME, ARG, ASP and ATTRIBUTE are pure semantic component that are universal across language and could be potentially put into the ontology. SYNTAX and ASP as an interface to link to the ASP structure in Ontology are language specific and should be put into lexical semantics.

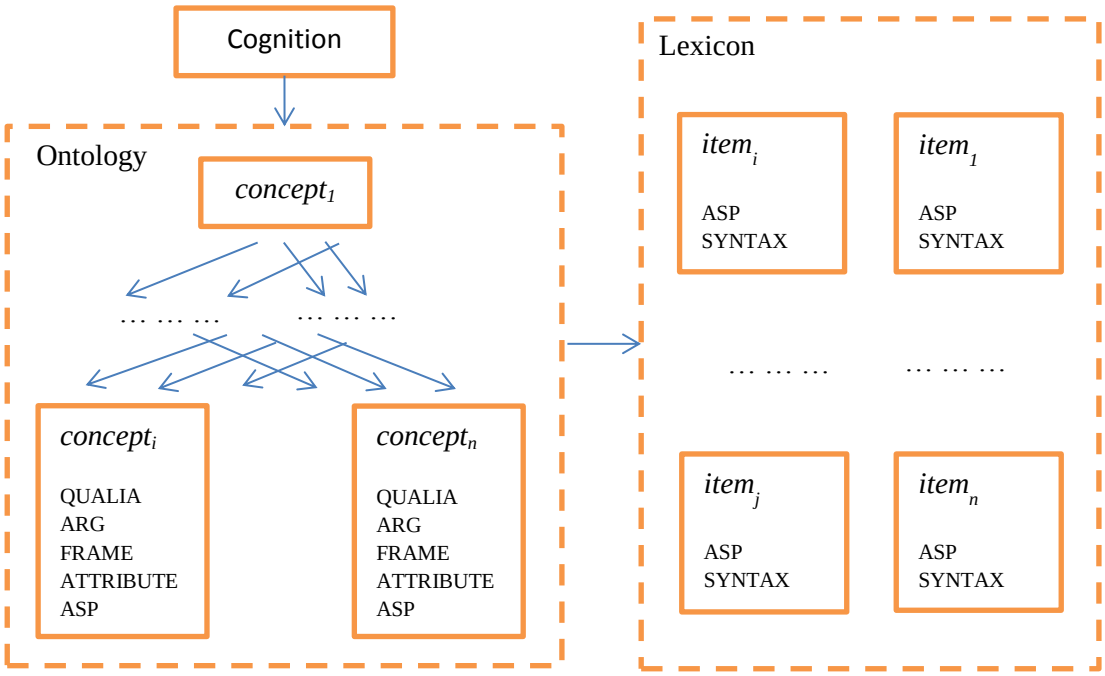

Figure 1: A Generative Model for Ontology and Lexicon.

My future study will first continue on the classification of verbs based on their aspectual behaviors. Secondly, I will try to combine different semantic theories to provide a comprehensive semantic representation model.

8.2.3. Computational Semantics

The most important motivation of the study proposed in this thesis is its potential use in computational lingusitc applications. Currently, there are many computational applications that involve semantic treatment of natural languages, such as semantic role labeling, question answering, event processing and temporal reasoning, machine translation, human-computaion conversation, factuality computing and so on. One of the most critical bottlenecks for these applications is the theoretical support of the modality and aspectual information expressed in natural languages.

By incorporating the theory framework proposed, we can possibly provide a more sophisticated semantic annotation framework for natural languages. The annotation scheme would be especially designed to be easily mapped to an ontological system, such as SUMO and DOLCE, which have been widely used in knowledge-based applications. In this way, the annotation labor could be expected to be much decreased that only the individual instances of modalities, speech acts or events and their elements need to be annotated. The semantic relation of the instances and the corresponding consequences could be inferred through ontology computing. This is an advantage

to the other annotation framework, such as TimeML, where relations of events need to be explicitly annotated.

The experiments for automatic identification of the modalities and the aspectual information of Chinese sentences show that it is indeed possible to improve the performance of these applications mentioned above.

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