

Compositional Operations of Mandarin Chinese Perception Verb “kàn”: A Generative Lexicon Approach*

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Abstract. The compositional operation of a predicate can be very complex. This paper captures a full picture of such an operation through investigating genuine corpus data of Chinese perception verb “看” (kàn, look at). The study reveals that context and qualia structure can affect the meaning of verb-argument composition of “kàn”. It also shows that the compositional ability of “kàn” varies under different senses, and each sense has its own type selection preference.

Keywords: kàn, selection, accommodation, exploitation, introduction

1 Introduction

Distributional information based on distributional analysis is widely used in many natural language processing tasks. However, distributional analysis does not emphasize enough on the semantic compositional manipulation of the word within context. In view of this, (Pustejovsky, 2006; Pustejovsky & Jezek, 2008) thus focused on domain-preserving shifting within the entity domain, and predicted the operations shown in Table 1.

Table 1: Verb-Argument Composition

Argument is	Verb selects		
	Natural	Artifactual	Complex
Natural	Selection/Accommodation	Qualia Introduction	Dot Introduction
Artifactual	Accommodation	Selection/Accommodation	Dot Introduction
Complex	Dot Exploitation	Dot Exploitation	Selection/ Accommodation

Nevertheless, (Pustejovsky & Jezek, 2008) found from the corpus that *listen* can be combined with strikingly different kinds of arguments and it is hard to map them to the verb-argument composition slots listed in Table 1. They also pointed out that the type system and the compositional operations are more complex than that illustrated in the above table.

In this study, we will try to capture a full picture of the interaction between types and compositional operations of Mandarin Chinese perception verb “kàn” (look at) by analyzing corpus data. (Huang & Hong, 2005) and (Zhung, 2002) are two of the most related works to “kàn”. To be more specific, (Huang & Hong, 2005) revealed that in the visual sense, “kàn” is an active extension of observation, while “jiàn” (see) is a passive cognition of introspection. Also,

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(Zhung, 2002) classified the meaning extension of “kàn” into physical, mingle and mental categories; and all of which are derived out of the interaction of metaphor and metonymy. However, no formal theory was used in these two studies to test the compositional mechanism of Chinese data. Therefore, this paper will explore the compositional operation of different senses of “kàn”, and capture the characteristics of such operations within the frame of the generative lexicon.

The following sections are organized as follows. We first introduce the theoretical basis in Section 2. The compositional operation of different senses of “kàn” is then explored next in Section 3. Afterwards, Section 4 explains the factors that affect the meaning of verb-argument composition of “kàn”, and Section 5 explores the characteristics of the compositional mechanism of “kàn”. Finally, we summarize the paper and suggest future studies in Section 6.

2 Theoretical Basis

(Pustejovsky, 2001, 2006; Pustejovsky & Jezek, 2008) which divided the type system into three distinct levels:

Natural Types: which direct at the Formal and Constitutive qualia roles;

Artifactual Types: which refer to Telic or Agentive roles;

Complex Types: which make references to the relation between types.

Furthermore, (Pustejovsky, 2006; Pustejovsky & Jezek, 2008) proposed three mechanisms at work when a predicate selects arguments of the above three types. They are repeated as follows for reader’s convenience:

Pure Selection (Type Matching): The type a function requires is directly satisfied by the argument;

Accommodation: the type a function requires is inherited by the argument;

Type Coercion: the type a function requires is imposed on the argument type. This is accomplished by either:

Exploitation: taking a part of the argument’s type to satisfy the function;

Introduction: wrapping the argument with the type required by the function.

In the following parts, we will utilize the above three levels of the type system and the three compositional mechanisms to capture the argument selection operation of “kàn” under various distinct senses.

3 Compositional Operation of “kàn”

In this section, a detailed analysis on the compositional operations of “kàn” will be presented. The majority of data is retrieved from *Chinese Word Sketch Engine*¹; however, *google*² and *Baidu*³ is sometimes also used to get online data as a complement.

3.1 “kàn”: visual activity

The most basic sense of “kàn” is *visual activity*. Under this sense, it can combine anything with visual projection as its argument. Next we will show the compositional operation of it under different types.

3.1.1 “kàn”+ Natural Types

(1) Selection/Accommodation

¹ <http://wordsketch.ling.sinica.edu.tw/>

² <http://www.google.com.hk/>

³ <http://www.baidu.com/>

There are a lot of natural type arguments that “kàn” can combine with. For examples, they can be human such as “他” (he), “伯伯” (uncle) and “公婆” (mother-in-law), or physical object (phyo) such as “太陽” (sun), “雲彩” (clouds) and “大海” (sea), or even illusion such as “海市蜃樓”(mirage), to name a few. All these arguments have one thing in common: they all have visual projection.

The compositional operation can be selection such as “看太陽” (look at the sun). It can also be accommodation as shown in the following example:

司機 奇怪地 看 了 他 一 眼。
 Driver strangely look at ASP him one eye
 “The driver strangely gave him a glance.”

In such a case, it is probably that the driver only saw a certain facial part of him, not the whole body of him; thus the compositional operation here is accommodation.

(2) Qualia Introduction

On the other hand, “黑洞” (black hole) is a natural object which has formal value, but it is so special an object that it has no visual projection, since light will be absorbed by “黑洞” (black hole). However, we can say “看黑洞” (look at the black hole) as if it gets visual projection. Actually people introduce the formal value “sth. with visual projection” to “黑洞” (black hole), which can be expressed as follows.

black hole \otimes_{formal} sth. with visual projection: “黑洞” (black hole)

3.1.2 “kàn” + Artifactual Types

(1) Accommodation

An artifactual type has a head and a tail. If the head alone is exploited, the operation is type *accommodation* (Pustejovsky & Jezek, 2008). For example, when “kàn” is in combination with “冰箱” (refrigerator), “窗簾” (curtain), “裙子” (skirt) and “相機” (camera), the head *physical object* is exploited and an accommodation operation happens.

(2) Artifactual Exploitation

According to (Pustejovsky & Jezek, 2008), if the tail of an artifactual type is exploited, then it is artifactual exploitation. For example, in the following cases, the tail is either an agentive or telic role:

human \otimes_{agent} write : “金庸” (Jin Yong), “古龍” (Gu Long), “叔本華” (Schopenhauer)
 human \otimes_{agent} play: “李白” (Li Bai), “李小龍” (Bruce Lee), “花木蘭” (Lady Mu Lan), “岳飛” (Yue Fei), “包青天” (Justice Bao), “唐明皇” (Emperor Minghuang)
 literature \otimes_{agent} write or play: “雙城記” (Tale of Two Cities), “羅生門” (Rashomon), “三國演義” (The Three Kingdoms)
 place \otimes_{telic} show exhibits: “博物館” (museum), “家電館” (home appliance museum)

(3) Dot Introduction

Introduce Physical Manifestation

“kàn” selects physo-info in order to mean “get information”, but arguments like “厚黑學” (thick and black theory) and “兵法” (art of war) only have an information representation. Thus a physical manifestation should be introduced to arguments like “厚黑學” (thick and black theory), “兵法”(art of war).

Introduce Information Property

An argument like “屏幕” (screen) is just a physical object, but it is clear that in the following sentence “屏幕” (screen) refers to the information on the internet or of a computer. Here information property is introduced to “屏幕” (screen).

父母 無論如何 不可能 一直 盯 看 孩子的 電腦 屏幕。
 parents whatever impossible all the time stare at look at children's computer screen
 “Parents can not look at children's computer screen all the time.”

3.1.3 “kàn” + complex types: dot exploitation

Complex types can have more than one meaning facets. When they are in combination with kàn, either one or two meaning facets can be exploited.

(1) Both meaning facets can be exploited.

Some examples in this case (physo-info) are: “圖片” (picture), “雜誌” (magazine), “原作” (original work), “古籍” (ancient book), “文件” (document), “路牌” (sign), “報紙” (newspaper).

When these words are the arguments of “kàn”, any of the two aspects of meaning is likely to be exploited. But in the majority of cases, the information aspect is most frequent, which is shown in the following example.

physo-organization: “豐田” (Toyota)

“看豐田” (lit. look at Toyota) can mean look at Toyota cars or visit Toyota company, depending on which aspect of “豐田” (Toyota) is exploited.

(2) Only one meaning facet can be exploited.

Some examples in this case (event•info) are: “新聞” (news), “戲” (drama), “歌舞秀” (dance show), “電影” (movie), “恐怖片” (horror film).

When “kàn” combines with these arguments, only the information aspect can be exploited.

3.2 “kàn”: to observe and then make judgments

“kàn” is not just a visual activity; it can involve cognitive denotation as well. Thus it can be extended to mean “to observe and make judgments”. In such a case, it can combine with anything that leads to a judgment. The following sub-sections explore the compositional mechanisms at play under the type system.

3.2.1 “kàn” + natural types

(1) Selection

For example, “kàn” can combine with “相” (appearance) and “面” (face) through selection. “看相” (look at appearance, “practice physiognomy”) and “看面” (look at face, “practice physiognomy”) mean “to observe and then make judgments about the fate of a person”.

(2) Qualia Introduction

Arguments like “眼前” (at present), “眼下” (at present) and “今朝” (at present) are time expressions, and they do not have visual projection. When they are selected by “kàn”, the formal role is introduced to them, which would mean “to observe and then make judgments about the situation at present”. Some examples in this case (Time \otimes_{formal} sth. with visual projection) are: “眼前” (at present), “眼下” (at present) and “今朝” (at present).

3.2.2 “kàn” + Artifactual Types

(1) Selection

“kàn” can select artifactual types like “臉色” (complexion) and “民情” (the conditions of the people) as its arguments, which means “judging from the complexion” (e.g., “看臉色”) and “judging from the conditions of the people” (e.g., “看民情”) respectively.

3.3 “kàn”: to visit

“kàn” can also mean “to visit” and purely select natural type argument “somebody” as its argument. For instance, “看朋友” (visit a friend) and “看老師” (visit a teacher) are two such cases.

3.4 “kàn”: to cure

When “kàn” means “to cure”, it selects a disease or coerces body parts as its argument. It is further explained as follows.

3.4.1 “kàn” + Natural Types

(1) Selection

When the sense of kàn is “to cure”, it selects a disease as its arguments, such as “病” (illness), “感冒” (cold) and “發燒” (fever).

(2) Natural Exploitation

kàn can also be in composition with some body parts, which includes inner body parts such as “心臟” (heart) and “胃” (stomach), outer body parts such as “牙” (tooth), “腿” (leg) and “胳膊” (arms). These natural type arguments have the conventional attribute of “making the body functions well”. When they are not in good condition, they are “kàn” (to cure) in order to recover from abnormal condition.

3.4.2 kàn + Artifactual Types

(1) Artifactual Exploitation

“kàn” is able to combine with a medical department like “內科” (internal medicine), or a human in medical profession like “醫生” (doctor). That is because the telic role of these arguments is exploited. Related examples are shown as follows.

medical department \otimes_{telic} cure a disease: “內科” (internal medicine), “外科” (surgery)

human \otimes_{telic} treat disease of a patient: “醫生” (doctor), “牙醫” (dentist)

3.5 “kàn”: to correct or grade sth.

When “kàn” means “to correct or grade something”, its argument is usually an academic task done by students. Its compositional operation is selection or dot exploitation.

3.5.1 “kàn” + Artifactual Type

(1) Selection

In the educational circle, especially elementary and secondary school, a teacher is always involved in the activity of “看作業” (correct or grade homework). Here the compositional operation is selection.

(2) Dot Exploitation

Arguments like “試卷” (exam paper) and “考卷” (exam paper) are dot objects, and can refer to the physical object or the information. Information on an exam paper can point to two things: the exam questions or answers given by a student. When a teacher looks at answers given by a student, “看試卷” can mean “grading the student’s answer”.

The above analysis is summarized in the following table:

Table 2: Mechanism of Composition of “kàn”

Sense	Argument	“kàn” selects		
		Natural Types	Artifactual Types	Complex Types
visual activity	anything with visual projection	selection/accommodation	accommodation	dot exploitation, artifactual exploitation, dot introduction, qualia introduction
observe and then make judgments	anything that can lead to a judgment	selection, qualia introduction	selection	-
visit	human	selection	-	-
cure	disease	selection, natural exploitation	artifactual exploitation	-
correct or grade sth.	academic task done by a student	-	selection	dot exploitation

4 Factors Affect the Meaning of Verb-Argument Composition of “kàn”

Senses of “kàn” depend on intention of the subject. The subject decides what information to “kàn”. The meaning of “kàn + argument” combination can be affected by context and qualia structure. Further explanation for context and qualia structure is given in the following sections.

4.1 Context

In context, the visual activity sense of “kàn” is extended to mean other things:

(1) Appreciate

For example, “看畫” (look at a picture, “appreciate a picture”) and “看山” (look at a mountain, “appreciate a mountain”) can not only mean to look at these objects, but also mean to appreciate them.

(2) An Event of Going to Look at or Appreciate sth.

For example, “看花” literally means to look at flowers, but it can also mean an event of “going to look at or appreciate flowers”.

(3) Potential to Buy

Some examples in this case (phyo ⊗_{agent} produced involving human labor) are: “房子” (house), “畫” (picture), “冰箱” (refrigerator) and “禮服” (dress). A physical object that involves human labor is potential to be a commodity. When they are selected by “kàn”, the combination means the potential to buy something. Artifactual types usually have such property. Some natural types, such as “水” (water), “橘子” (orange), “樹” (tree), can also involve human labor, , so when they combine with “kàn”, they have the possibility of meaning being bought.

4.2 Qualia Structure

Which qualia role is used is crucial to the meaning of a phrase. For example, “看張柏芝” (lit. look at Cecilia Cheung) can mean “read a book about her”, “watch a movie about her”, “watch a TV program about her” and “watch a movie played by her” according to different agentive values.

5 Characteristics of Verb-Argument Composition of “kàn”

(1) Compositional ability of different senses of “kàn” is different, as is shown in Table 3 derived from Table 2.

Table 3: Number of Argument Types and Compositional Types of “kàn”

Sense	Argument types	Compositional types
visual activity	3	6
observe and then make judgments	2	3
visit	1	1
cure	2	3
correct or grade sth.	2	2

Please note that the sense “visual activity” in the above table is highly active: it not only selects all three kinds of argument types, but also goes through six kinds of composition. Other senses select less argument types and have less compositional types.

(2) Different senses of “kàn” show different type selection preference, and are summarized in Table 4.

Table 4: Type System of “kàn” under Different Senses

Sense	“kàn” selects		
	Natural types	Artifactual types	Complex types
visual activity	+	+	+
observe and then make judgments	+	+	-
visit	+	-	-
cure	+	+	-
correct or grade sth.	-	+	+

(3) The compositional operation of Mandarin verb “kàn” is very complex.

After having compared Table 1 and Table 2, the following striking differences can be observed.

In Table 1, it supposes that a verb has a typical type to choose, either natural types, artifactual types or complex types. But in Table 2, “kàn” does not have such a trait when it means “visual activity” or “observe and then make judgments”.

Also, in Table 1, if a verb selects natural types, then the composition operation would be selection/accommodation. In Table 2, when “kàn” means “to cure”, it selects a natural types bing (disease); but it can also have a natural exploitation operation.

Furthermore, in Table 1, when an argument is a complex type, the operation would be dot exploitation or selection/accommodation. However, in Table 2, under the sense “visual activity”, the operation of “kàn” is much richer (namely: dot exploitation, artifactual exploitation, dot introduction and qualia introduction).

The corpus-based analysis on “kàn” clearly shows that the compositional operation can be much more complex than that proposed by in Table 1. This observation matches what (Pustejovsky & Jezek, 2008) pointed out after investigating *listen*, “how difficult it is to map each context into the appropriate slot” in Table 1.

6 Conclusion and Future Work

In summary, this study shows a full picture of the complex compositional operation of “kàn” under different senses using genuine corpus data. It also observes that context and qualia structure can affect the meaning of verb-argument composition of “kàn”. The compositional ability of “kàn” varies under different senses, and each sense of “kàn” has its own type selection preference.

Further study is required to explain why the compositional mechanism of different senses of kàn can take place, to suggest various ways of representing metaphorical extension, such as “看手腕” (look at the wrist, “according to ability”), and to find out the necessary and sufficient conditions that constrain the unacceptable constructions in a language, such as *看醫院 (see a hospital). Also, more verbs should be analyzed for comparison.

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