



An Analysis of the Inferential Meaning of Chinese Even-Construction for Semantic Parsing

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Abstract. The even-construction in Chinese, whose form is *lian* + X + *dou* + Y, has been thoroughly investigated in Chinese linguistics. However, in natural language processing, the representation and acquisition of the full meaning of the construction remains to be a tough question. From the perspective of construction grammar, we compare the semantic functions of the even-construction and the corresponding subject-predicate structure. The meanings of the even-construction include a basic proposition and an inferential meaning. The basic proposition of the construction is the occurrence of an unlikely event. There are three kinds of interrelated but distinguishable inferential meanings: (1) the occurrence of an unlikely event means some related and more likely events will happen or have happened; (2) the occurrence of an unlikely event indicates an entity involved in the event has some special attributes; (3) the speaker expresses some subjective attitudes towards the occurrence of an unlikely event. Based on the analysis of the meaning of the even-construction, the ways to compute the meaning are discussed in this paper. It is also pointed out that the semantic computation of the construction depends on much linguistic knowledge, world knowledge and common sense, and temporary contextual information in communication.

Keywords: Even-construction · Semantic computation · Construction grammar · Event extraction

1 Introduction

Many natural language processing tasks intend to acquire the sentence meanings of a language. For example, the task of event extraction (Linguistic Data Consortium 2005) aims at extracting an event from the sentence and so also aims at finding the trigger of an event and event elements from a sentence, such as participants, time, modality, and polarity, thus. However, in language use, the trigger of an event may not appear in the text.

- (1a) 战士 上 战场, 别说 奖金 了, 可能 连 命 都 搭上
 soldier go battlefield let.alone reward FP possible *lian* life *dou* lose

“When soldiers go to the battlefield, they may not survive, let alone getting rewards.”

- (1b) 他们 生活 在 那个 连 麻雀 都 吃 不 饱
 3PL live in DEM_{DIST} *lian* sparrow *dou* eat NEG full
 的 年代。
 POSS age

“They lived in the age when even sparrows did not have enough to eat.”

There are three events in the sentence (1a): soldiers go to the battlefield; soldiers may lose their lives; and soldiers may not get rewards. The trigger of the third event, i.e. the verb “get”, is not in the text. This kind of event is hard to be detected in natural language processing. In (1b), the event “sparrows did not have enough to eat” can be extracted from the text. However, the sentence intends to express that life was very poor and people lacked food in that age. This property of “the age” is the more important piece of information that needs to be extracted, which is also not presented by a trigger in the sentence.

In (1a-b), even-construction is used and it is such construction that challenges the semantic computation of the sentences. The even-construction in Chinese takes the form of $T + \textit{lian} + X + \textit{dou} + Y$, where the constant *dou* can also be replaced by *ye* (also) with no constraints. The construction has two common variations: $X + \textit{dou} + Y$ and $\textit{lian} + X + T + \textit{dou} + Y$. The variable T is the topic of the clause containing the construction, the variable X can be a noun phrase, a verb phrase, a morpheme, etc., and Y is usually an adjective or a verb. Among the two variations, the variation $X + \textit{dou} + Y$ is ambiguous. For example, the sentence “*cai* (dishes) *dou* (dou) *liang* (cold) *le* (FP)” can mean “the dishes were all cold”, or “even the dishes were cold”.

The construction usually functions as a predicate or a clause. It can also be used as a modifier or be used in a complex sentence. When the construction is used in a complex sentence, the other clause of the sentence may contain connectives such as *genghekuang/bieshuo* (let alone/not to mention) and *bujin* (not only).

The basic proposition of the even-construction $T + \textit{lian} + X + \textit{dou} + Y$ is its literal meaning, which is the proposition composed of T , X , and Y . The relationships between the variables can be complicated. T and X can be the arguments of Y , and they may also have no thematic relationships. For example:

- (2a) 第一 题 连 玛丽 都 不 会 做。
 first question *lian* Mary *dou* NEG can do
 “Even Mary cannot solve the first question.”
- (2b) 约翰 连 第一 题 都 不 做。
 John *lian* first question *dou* NEG do
 “John even did not solve the first question.”
- (2c) 连 一 分钟 约翰 都 等 不 了。
lian one minute John *dou* wait NEG can
 “John cannot wait even for a minute.”
- (2d) 约翰 一次 都 没 及格。
 John once *dou* NEG pass
 “John did not pass even once.”

X in (2a) and (2b) is “Mary” and “the first question” respectively; the predicates in Y are “cannot do” and “not do”. In (2a), X is the agent of the predicate in Y while in (2b), X is the patient. Both of them are the core arguments. In (2c) and (2d), X is “one minute” and “once” respectively, which are the non-core arguments of time and quantities of the predicate in Y (i.e. “cannot wait” in (2c) and “not pass” in (2d)).

- (3a) 在 计算机 方面, 他 连 自学 都 不 知
 in computer aspect 3SG *lian* self-study *dou* NEG know
 如何 下手。
 how start
 “As for computers, he did not even know how to start self-studying them.”
- (3b) 玛丽 脸色 苍白, 连 哭 都 不 敢 大声。
 Mary look pale *lian* cry *dou* NEG dare loud
 “Mary looked pale and did not even dare to cry loudly.”
- (3c) 这 本 书 他 连 目录 都 没 读。
 DEM_{DIST} CL book 3SG *lian* content *dou* NEG read
 “He had not even read the contents of this book.”

Contrarily in some cases, X may not be a direct argument of the main predicate in Y. For example, in (3a), X is “self-studying” and Y is “not know how to start”. In this case, X is the theme of the main predicate in Y. In (3b), the variable X “cry” is not an argument of Y “loudly”. Instead, Y is a modifier of X. The variable T is usually an argument of the main predicate in Y, but can also be a non-argument entity related to the event represented by Y, such as the “book” in (3c).

In the CCL corpus (Zhan, et al. 2019), 22685 documents contain the construction *lian* + X + *dou/ye* + Y in which X is a string of no more than 3 characters, and nearly 95% of which are instances of the even-construction. That is to say, in the CCL corpus, there are about 3.2 documents containing the even-construction in every 1000 documents. The proportion will be higher if we also consider the variations of the construction and instances whose variables are longer. This shows that the even-construction is a construction with relatively high frequency in use. So, it should not be neglected in semantic computation.

Besides, the premise of the literal meaning of even-construction is that the literal meaning is related to an unlikely event, of which the unlikeliness is determined usually by world knowledge, such as the knowledge “sparrows feed easily” in (1b). Therefore, the semantic computation of the even-construction can also help computers acquire some world knowledge.

The even-construction has been thoroughly investigated in linguistics, but hardly received any attention in computational linguistics and natural language processing. In this paper, we analyze the meanings of the construction from the perspective of construction grammar and hence discuss the representation and acquisition of the inferential meaning of the construction.

2 A Brief Review of Previous Studies

Based on the semantic functions of the components of the even-construction, there have been many previous studies on the meaning of the construction from different perspectives. Linguists including Lv (1980) and Zhu (1982) concluded the meaning of the construction as “emphasizing”; Paris (1979), Cao (1987), Liu and Xu (1998), and Yuan (2006) discussed the properties of the variables of the construction from the perspective of topic and focus; Ding (1994) and Yuan (2006; 2011) suggested that the construction had the semantic function of counter-expectation; Zhou (1990) and Yuan (2006) also suggested that the construction has the meaning of contrast.

Using sets or scale semantics is a common way to analyze the meaning of even-constructions. Based on the meanings of the constants *lian*, *dou*, and *ye*, Paris (1979), Cui (1984), Cao (1987), Zhou (1990), and Yuan (2011) pointed out that the variable X is at the top or bottom of a scale. For example:

- (4) 约翰 连 香蕉 都 不 吃。
 John *lian* banana *dou* NEG eat
 “John even did not eat bananas.”
- (5) 约翰 连 澡 都 不 洗。
 John *lian* bath *dou* NEG wash
 “John even did not take a bath.”

The even-construction in (4) can be analyzed as introducing a set of foods or fruits, in which “bananas” are the most unlikely to be not eaten. Zhou (1990) and Liu (2005) also noticed that some instances of *lian* + X + *dou* + Y did not introduce a scale of entities including X, but introduced a series of parallel events that can be linked together including the event composed of X and Y. This kind of even-constructions is called “atypical even-constructions” by Liu (2005). For example, in (5), “taking a bath” may be associated with events such as “sleeping”, “eating”, “resting”, etc., all of which are common activities in daily life.

We believe that the above analyses are untenable to a certain extent. First, the set cannot be determined easily. A speaker knows what is included in a set relatively easily, but the set is hard to be defined for computation. For example, in the set of “foods” mentioned above, it is difficult for us to list the items of the set precisely, such as whether

the set contains rice, apples, or meat. Sometimes, it is even uncertain as to whether there is such kind of a set. For example:

- (6) 胡适 应酬 太多, 连 学问 都 退步 了。
 Hu.Shi social.activity too much *lian* knowledge *dou* fall.behind FP
 “Hu Shi had so many social activities that he even lost his knowledge.”

In (6), it is hard to find a set containing “knowledge”, in which “knowledge” is the most unlikely information to be lost by the great scholar Hu Shi. The members of the set are unknown. Thus, it is difficult to define a set containing the event of “losing knowledge”.

Second, even if we find a set/scale, the even-construction is usually not used to express the existence of the scale or the position of the variable X on the scale. For example, in (6), the construction mainly expresses the huge impact of Hu Shi’s social activities on him.

Other than the above analyses, many linguists examined the meanings of the even-construction from different aspects, including its literal meaning/basic proposition, presupposition/premise, and implication/inference of the construction, including Paris (1979), Cui (1984), Tsai (2004), Yuan (2011) and others. Most of them suggested that the presupposition/premise of the construction is that there is an entity of the same kind as X with the property Y, and the implication/inference of the construction is that any entity of the same kind as X has the property Y. As is discussed above, the construction does not necessarily express a set/scale related to X, so these analyses need to be studied further.

Above all, the previous studies were mainly based on the composition of the components of the construction and deduced the meaning of the construction from the meanings and semantic functions of the variables and constants. These analyses differ from each other in the actual meaning and the function of the even-construction in a sense and need to be improved for the semantic computation of the construction.

3 Inferential Meaning of Even-Construction

This paper takes the constructional approach and explores the meaning of the even-construction by comparing the construction with the construction without “even”.

Consider a situation in which John and Mary took part in an examination. In the examination, the first question is the easiest, and the rest of the questions are much harder. Based on this situation, we designed two interrogative sentences and two declarative sentences used for their dialogue. (8a) is an instance of even-construction and (8b) is the corresponding subject-predicate structure.

- (7a) Mary: 你 第三 题 做 对 了 吗?
 Mary 2SG third question do right FP QU
 Mary: "Did you do the third question correctly?"
- (7b) Mary: 你 第一 题 做 对 了 吗?
 Mary: 2SG first question do right FP QU
 Mary: "Did you do the first question correctly?"
- (8a) John: 我 连 第一 题 都 做 错 了。
 John: 1SG *lian* first question *dou* do wrong FP
 John: "I even made a mistake in the first question."
- (8b) John: 我 第一 题 做 错 了。
 John: 1SG first question do wrong FP
 John "I made a mistake in the first question."

If the question is (7a), (8a) is a suitable response. Mary knows that John answered the third question wrongly from the response. On the contrary, (8b) is an irrelevant answer. Logically, the first question being easier than the third question does not necessarily mean that one will also answer the third question wrongly if he/she answers the first question wrongly, but if a person hears the dialogue in (7a-8a), he/she will be sure John answered the third question wrongly. This indicates that the even-construction makes an assertion about the third question.

If the question is (7b), (8b) is a suitable response, and (8a) is not, indicating that although literally an assertion about the first question is made, it is not the focal information of the construction. Therefore, it can be concluded that the primary information of the even-construction is the inference of the literal meaning rather than the literal meaning itself.

The even-construction has several types of inferences. For example, when the question is (7a), the response (8a) infers that the speaker answered the third question wrongly; if the question is whether John did well in the exam, (8a) infers that the speaker did not do well; if John says (8a) out of blue, the inference is likely to be that John is angry or believes that it is terrible to answer the first question wrongly. When (8a) is used in other contexts, it can draw different inferences. For example:

- (9a) 别说 其他 题, 我 连 第一 题 都 做
 let.alone other question 1SG *lian* first question *dou* do
 错 了。
 wrong FP
 "I was not even correct in the first question, let alone the other questions."
- (9b) 我 连 第一 题 都 做 错 了, 简直
 1SG *lian* first question *dou* do wrong FP absolutely
 太 粗心 了。
 too careless FP
 "It is too careless for me to even make a mistake in the first question."

In (9a), the inference is that the speaker answered the other questions wrongly. In (9b), the inference is that the speaker was very careless.

In a word, there are three types of inferential meanings of the even-construction:

- 1) IM1: The occurrence of an unlikely event→the occurrence of a series of more likely events. This is the deductive inference of the even-construction. The speaker and hearer deduce the occurrence of other related events from the occurrence of the unlikely event. All of the related events form a scale, with the event denoted by the basic proposition locating at the minimum point, and the event with comparatively high probability at the maximum end. The contrasting event is the inferred event of the construction.
- 2) IM2: The occurrence of an unlikely event→the special attribute of the entity causing the occurrence of the event. This is the abductive inference of the even-construction. The speaker and hearer abduce the unlikely event from its occurrence.
- 3) IM3: The occurrence of an unlikely event→the subjective attitude of the speaker. This is the subjective attitudinal inference of the even-construction. The speaker expresses his/her attitudes and/or emotions towards the unlikely event.

We randomly selected 529 instances of the even-construction from the CCL corpus and labeled the types of inferences of each instance. It should be noted that the three types of inferences are not mutually exclusive. A construction instance can draw all the three types of inferences, but usually only one or two types are more prominent. For example, in the sentence (9b), the basic proposition is that the speaker answered the first question wrongly. The deductive inference is that the speaker made mistakes in some other easier questions. The abductive inference is that the speaker was very careless. The subjective attitudinal inference is that the speaker was dissatisfied. The context indicates that the abductive inference is the prominent type of inference of (9b). Table 1 shows the statistics of different types of inferences of the even-construction.

Table 1. Statistics of different types of inferences of the even-construction

Inference	Number	Percentage
IM2	276	52.2%
IM1	98	18.5%
IM2 + IM3	73	13.8%
IM1 + IM3	31	5.9%
IM3	29	5.5%
IM1 + IM2	17	3.2%
IM1 + IM2 + IM3	5	0.9%
	529	100%

According to the Table 1, the most common inference of the even-construction is the abductive/backward inference, and only about 1/5 of the inferences are deductive/forward inferences, indicating that the even-constructions may not necessarily be

used in a typical way to draw deductive inferences, as suggested by the frequency shown above.

4 Requirements in Semantic Parsing of Inferential Meaning of Even-Construction

In current NLP practice, deep learning methods are widely used. In these methods, the input is usually the original texts, and the meaning of a language is acquiesced as being acquired from the distribution of the texts. However, as is discussed in the examples above, the inference of even-constructions may not appear in the texts. For example, the inference of the even-construction in sentence (6), i.e., social activities had great impact on Hu Shi, is hidden from the text. The text does not provide words that are directly relevant with “great impact”. We acquire the inference from our understanding of the basic proposition of the construction, i.e. Hu Shi lost his knowledge. Therefore, the inferences are related to contexts including the speaker, the hearer, and the world surrounding them, rather than only the words used in the construction. The following sub-sections discuss the knowledge needed in the acquisition of the inferential meanings of the even-constructions.

4.1 Semantic Parsing of Forward Inferences

If an unlikely event has happened or is going to happen, usually some more likely event has also happened or is also going to happen. For example, in (8a) “I even made a mistake in the first question”, the more likely event is “I made a mistake in the third question”; in (9a) “I was not even correct in the first question, let alone the other questions”, the more likely event is “I made mistakes in the other questions”.

To acquire the forward inference of an even-construction, other events should be extracted from the context of the construction. Forward inference appears in the context in different forms. The predicate of the forward inference may appear in the context, being the same as the predicate of the basic proposition, or being hidden from the context.

The forward inference may be expressed on the surface of the context. For example:

- (10) 所有 人 都 要 交 人口税, 连 小孩 都 要。
 all people all need pay poll.tax *lian* kid *dou* need
 “Everyone needed to pay poll taxes, even children had to.”
- (11) 约翰 不 敢 这么 写, 或许 连 想 都 不
 John NEG dare such write maybe *lian* think *dou* NEG
 敢 这么 想。
 dare such think
 “John dared not write about this, maybe even dared not think about this.”

In (10) and (11), the forward inferences appear as subject-predicate structures in the contexts. The inference in (10) is “all people needed to pay taxes”, and the one in (11) is “John dared not write in such manner”. The inferences of the two even-constructions are

identical to the proposition expressed by the clause before the even-constructions, and the even-constructions function to emphasize the events in the previous clauses. If the basic proposition and the inferences both involve events that have already happened, such as in (10), the construction emphasizes that the inferred event happened indeed. If the event denoted by the basic proposition and also the inferred event has not happened yet, such as the ones in (11), the construction emphasizes the confidence of the estimations.

It is relatively easier to extract the main predicate and the participants of the inferred event in these even-constructions. However, sometimes the modality and polarity of the inferred event are hard to determine.

- (12a) 下雨 天, 别说 打 不 到 车, 连
 rain day let.alone call NEG can Taxi *lian*
 地铁 都 会 挤爆。
 subway *dou* will crowded
 “On rainy days, even the subways will be crowded, not to mention that you cannot find a taxi.”
- (12b) 下雨 天, 别说 打 到 车, 连 地铁
 rain day let.alone call can taxi *Lian* subway
 都 会 挤爆
 dou will crowded
 “On rainy days, even the subways will be crowded, not to mention if you can find a taxi.”
- (12c) 下雨 天, 别说 打 车 , 连 地铁
 rain day let.alone call taxi *Lian* subway
 都 会 挤爆。
 dou will crowded
 “On rainy days, even the subways will be crowded, not to mention finding a taxi.”

In (12a-c), the basic proposition is “the subways will be crowded on rainy days”, and the inference is “you cannot find a taxi on rainy days”. What differ among the three sentences is that in (12b) the negator *bu* is omitted which is used in (12a), and in (12c), the bare verb is used without the negator or the modality marker *dao*. In order to correctly understand the polarity and the modality involved in the inference, it is necessary to have some world knowledge to fully understand the events in the basic proposition and those inferred ones. To be specific, one needs to know that the subways being crowded means being unable to get on a subway, and it is usually easier to get on a subway than to find a taxi.

The inferred event may be manifested by the same predicate as that by the basic proposition. In this case, the predicate may not be repeated in the context. For example:

- (13) 连 我 都 吓坏 了, 别说 其他 人 了。
lian 1SG *dou* scared FP let.alone other people FP
 “Even I was scared, not to mention other people.”
- (14) 别说 是 春天, 连 寒冬腊月 这里 都 绿 草
 let.alone COP spring *lian* winter here *dou* green grass
 如 茵
 like carpet
 “The grass looks like a green carpet here even in winter, not to mention in spring.”

The inference in (13) is “other people were scared”, and the inference in (14) is “the grass looks like a green carpet here in spring”. In current semantic computing tasks, a predicate is usually used in only one proposition, so for this kind of even-constructions, only the basic propositions can be acquired. The events in the inferences will be neglected. However, when the basic proposition and the inference of an even-construction share the same predicate, some participants of the inferred event are not participants of other events. For example, the “other people” in (13) and the “spring” in (14) are not participants of other events. Therefore, these entities can help draw potential inferences.

In more complicated cases, the predicate of the inferred event may not appear in the context. For example:

- (15) 在 这 家 百货公司, 有的 货 一 天 顾客
 in DEM_{DIST} CL department.store some goods one day customer
 就 抢 光 了, 有的 货 顾客 连 看 都 不 看。
 Just rob all FP some goods customer *lian* see *dou* NEG see
 “In this department store, some goods are sold out in only one day, while some are not even looked at.”
- (16) 有人 质疑 编辑部, 读者 的 来稿 是否 连
 someone question editorial.office reader POSS contribution whether *lian*
 信封 都 不 拆 就 扔 进 纸篓。
 envelope *dou* NEG open just throw into bin
 “Someone suspected that the editorial office might have thrown the contributions from readers into the bin without even opening the envelope.”

The inferred event in (15) is “customers do not buy some of the goods”, and the inferred event in (16) is “the editorial office did not reply to the contributions from readers”. The main predicates “buy” and “reply” do not appear in the context. Readers acquire these inferred events from the understanding of the contexts and the relationships between the events. In (15), the clause before the even-construction expresses that some goods are sold out quickly, in contrast to the event inferred from the even-construction. Thus the even-construction expresses that customers do not buy some of the goods. In (16), the person intended to express his/her dissatisfaction with not getting a reply, because the contribution can only be considered after the editors opened the envelope. To acquire the inferences in these even-constructions, a computerized system thus should be trained to have a thorough understanding of the contexts and the relevant events.

Above all, it is relatively easy to acquire the inference when the predicate of the inferred event is in the context. When the predicate of the inferred event is the same as that of the basic proposition, the participants of the inferred event can help make the inference. When the predicate of the inferred event is not in the text, a thorough understanding of the context is required in the acquisition of the inference.

4.2 Semantic Parsing of Backward Inferences

If an entity causes the occurrence of an unlikely event, the entity is likely to have some special properties. For example:

- (17) 在 努力 后, 他 写出 了 连 自己 都 不
 at strive after 3SG write FP *lian* REFL *dou* NEG
 敢 相信 的 文章
 dare believe POSS article
 “After working hard, he wrote an article that even he himself dared not believe he could have written.”

- (18a) 约翰 看 爸爸 妈妈 吵架, 吓 到 连 哭 都 不
 John see father mother argue scared to *lian* cry *dou* NEG
 敢 哭 。
 dare cry
 “Witnessing his father and mother argue, John was so scared that he did not even dare to cry.”

- (18b) 约翰 看 爸爸 妈妈 吵架, 连 哭 都 不 敢 哭
 John see father mother argue *lian* cry *dou* NEG dare cry
 “Witnessing his father and mother argue, John did not even dare to cry.”

The even-construction in (17) indicates that “the article he wrote” is very good. In (18a), the property of John is “scared”. The special properties of entities may not be directly expressed in the contexts. For example, the property of “being scared” in (18a) can be omitted and the sentence becomes (18b), which is synonymous with (18a).

It is easy to identify the entity and its attribute if they are expressed directly in the text, such as John’s attribute in (18a). When the attributes are not in the contexts, a few syntactic features can indicate that backward inferences are expressed. For example, in (17), the even-construction is a modifier; in (18a), the even-construction is a complement. Their grammatical function is to modify entities, so these even-constructions expresses the properties of entities.

- (19) 在 新泽西, 人口 每 22 年 将 增加 一倍;
 at New.Jersey population per 22 year FUT increase double
 而 在 罗得岛, 连 22 年 都 不 要。
 but at Rhode.Island *lian* 22 year *dou* NEG want
 “In New Jersey, the population will double every 22 years; but on Rhode Island, it takes lesser time than 22 years for the growth of population.”

If the even-construction is used in a complex sentence, and the other clause expresses an event contrary to the basic proposition of the even-construction, the even-construction

expresses backward inference. For example, in (19), we infer that “the speed of population growth on Rhode Island is very fast”.

In most cases, there are no syntactic features to help determine whether an even-construction expresses a backward inference. Theoretically, the understanding of events and attributes is needed in the discovery of backward inferences. For example:

- (20a) 约翰 说好 请 我 吃饭 , 但 他 走 的
 John promise invite 1SG eat but 3SG leave POSS
 时候 连 招呼 都 不 打。
 time *lian* hail *dou* NEG say
 “John promised to invite me to dinner, but when he left, he did not even let me know.”
- (20b) 时代 抛弃 你 的 时候 , 连 招呼 都 不
 time throw 2SG POSS time *lian* hail *dou* NEG
 打。
 say
 “When the time throws you away, it will not even let you know that.”

The even-constructions in (20a-b) are both “even not letting someone know”. They have different inferences in the two sentences. The inference in (20a) is “John was impolite”, and the inference in (20b) is “the time throws you away suddenly”. According to our common knowledge of daily communication, we know that if someone wants to do something concerning another person and to make that person prepared, he/she needs to let that person know about his actions. If a person does not let the other person know what he is going to do, the other person would be unprepared, and his/her action would be unexpected. If the “letting someone know” has a metaphoric meaning, whose agent is not a human, such as in (20b), the phrase mainly expresses the suddenness of the event. The automatic acquisition of these inferences requires plenty of world knowledge.

Contextual information is also needed in the acquisition of backward inferences. For example, in (20b), besides the meaning of “politeness”, a computerized system also needs to know that John had invited the speaker before he left, and so it was improper for him to leave without informing the speaker. The invitation John made is a piece of contextual information that appears in the clause before the even-construction.

Above all, linguistic knowledge, world knowledge, and contextual information is needed in the analysis of backward inference of the even-construction.

4.3 Semantic Parsing of Subjective Attitudes

The basic proposition of an even-construction is the occurrence of an unlikely event, and people usually have their subjective attitudes or estimations on an unlikely event. This kind of inferences is common in spoken languages, but relatively rare in formal texts such as news. If the speaker is willing to see the occurrence of the unlikely event, the attitude and emotion of the speaker are usually positive, and vice versa. For example, in (21), the attitude of the speaker can be considered as “appreciative”.

- (21) 他 连 每个 角落 都 打扫 得 干干净净。
 3SG *lian* every corner *dou* wipe COMP clean
 “He made even every corner clean.”

Compared with the acquisition of forward and backward inferences, the acquisition of subjective attitudes is more difficult. If the even-construction is in a quotation, the subjective attitude of the speaker may appear outside the quotation. For example, in (22), the emotion of the speaker is angry.

- (22) 玛丽 生气 了, 说: “我 的 话 你 连 一 句
 Mary angry FP say 1SG POSS word 2SG *lian* one CL
 都 不 信。
dou NEG believe
 “Mary got angry and said, “you did not believe even one word of mine.””

However, in most cases, the subjective attitude of the speaker does not appear in the context. To identify the emotion and evaluation of the speaker, it is necessary to understand the basic proposition of the even-construction and the contextual information, and to know about the relationship between the emotion and the events.

- (23) 我 三 岁 时 连 球拍 都 拿 不 稳。
 1SG three year time *lian* racquet *dou* hold NEG steady
 “I could not even hold the racquet well when I was three years old.”

The context of (23) is that the speaker saw a three-year-old boy playing badminton with an adult for several rounds. The basic proposition of the even-construction contrasts with the context, indicating that the speaker believed the boy was exceptional and his attitude was admiration for the boy.

As is shown in the above analysis, similar to the acquisition of the backward inference of the even-construction, the acquisition of the subjective attitude of the even-construction also requires linguistic knowledge, world knowledge, and contextual information.

5 Conclusive Remarks

In Chinese information processing, the representation and acquisition of the meaning of the even-construction remain to be a tough question. This paper discusses the meaning of this commonly-used structure from the perspective of constructions. We believe that previous studies have been affected by the meanings and functions of the constants of the construction and have only been able to account for a part of the construction meaning. By comparing the use of the even-constructions and the corresponding phrase structures, we discover that the even-construction mainly expresses the inference beyond the basic proposition. There are three types of inferences: (1) forward inference: emphasizing the occurrence of a more likely event that is relevant to the basic proposition; (2) backward inference: highlighting a special property of an entity related to the basic proposition; (3) subjective attitude: expressing the emotion or evaluation of the speaker on the basic proposition.

This paper discusses the requirements for the automatic acquisition of the meanings of the even-construction. The acquisition of the basic proposition requires linguistic knowledge, including argument structures and collocations. The acquisition of forward inference also requires world knowledge, which is the constant common knowledge of social communities. The acquisition of the backward inference and subjective attitude also requires contextual information, including the temporary background of the communication. The requirements for the semantic computation of the even-construction are concluded in Fig. 1.

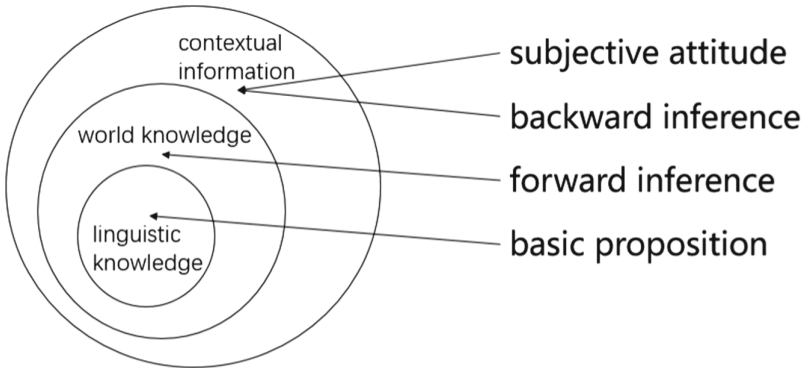


Fig. 1. Requirements for semantic computation of the even-construction

Besides the even-constructions, many other constructions also pose challenges to Chinese information processing, such as constructions expressing subjective quantities, complex constructions, etc. The full meaning of the constructions cannot be acquired directly from the texts. These linguistic phenomena need further research from the perspective of semantic computation.

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