Description of Chinese Intransitive Verbs and Adjuncts  
Within the LFG Formalism

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Abstract

This paper presents an approach for the description of Chinese intransitive verbs and related adjuncts within the LFG formalism, as part of the attempt to establish an LFG-type grammar for Chinese, i.e., a Chinese Lexical-Functional Grammar (C-LFG). Variant types of adjuncts and their grammatical relations with the major verbs are discussed together with the necessary adaptation of LFG for Chinese, including the introduction of new grammatical features and the formulation of constraints on annotated CF-rules and functional control for predicative and clausal adjuncts. Finally, a fragment of C-LFG for intransitive sentences is achieved.

Key words: Lexical-Functional Grammar, Chinese grammar, Intransitive verb, Adjunct.

1. Introduction

The Lexical-Functional Grammar (LFG) (Kaplan and Bresnan 1982) provides an elegant formalism for the characterization of grammatical relations in natural languages. Attempts have been made to employ LFG to study variant languages, from the configurational ones like English to the nonconfigurational ones such as Malayalam (Mohanan 1982) and Wirrpilir (Simpson 1991). A number of systems for MT and sentence parsing, e.g., KBMT (Carbonel and Tomita 1985, Nirenburg 1989) at Carnegie Mellon, also show the successful application of LFG in NLP. There is an attempt in Kit (1992, 1993 forthcoming), Kit and Webster (1992) to employ LFG to parse Chinese sentences of different constructions. It is known that the formal description of grammatical relations is the basis for parsing. Kit (1993) first tries to establish an LFG-type grammar for Chinese, known as Chinese Lexical-Functional Grammar (C-LFG). The intransitive sentences are believed to be an appropriate starting point for this. This paper, as a part of such attempt, aims at characterizing Chinese intransitive verbs and adjuncts.

Intransitive sentences are the simplest sentence pattern, in the sense that the verbs of the simplest subcategorization are concerned. While adjuncts are involved, however, the description of Chinese intransitive sentences will become rather complicated. The syntactic relation between adjuncts and major verbs is an important topic in the construction of the C-LFG. We expect the LFG formalism can help us achieve a better understanding of Chinese linguistic phenomena.

In the following sections, I will first discuss the simplicity and complexity in the grammatical encoding of Chinese intransitive sentences in the LFG formalism, and then focus upon Chinese intransitive verbs, variant adjuncts, and their grammatical relations. Consequently, a set of annotated CF-rules with appropriate constraints are formulated for the description of Chinese intransitive sentences.

2. Chinese intransitive sentences

With reference to Kaplan and Bresnan (1982:295) and Bresnan (1975, 1977), we know that
"transitive", as one of the two primitive category features (another one is "predicative"), can be defined in terms of the functional primitive OBJ. Simply put, transitive verbs take at least one OBJ function, whereas intransitive verbs take none. As in other languages, a Chinese intransitive verb subcategorizes for a SUBJ only. Usually, the semantic form for an intransitive verb is simply as below:

(1) \((\uparrow\text{PRED}) = 'V-sem <(\uparrow\text{SUBJ})>'\)

where v-sem denotes the semantic meaning of a verb. For example, the following are some entries of Chinese intransitive verbs:

(2) a. pao (run), V, \((\uparrow\text{PRED})='PAO<(\uparrow\text{SUBJ})>'\)
   b. lai (come), V, \((\uparrow\text{PRED})='LAI<(\uparrow\text{SUBJ})>'\)
   c. xiao (laugh), V, \((\uparrow\text{PRED})='XIAO<(\uparrow\text{SUBJ})>'\)
   d. zou (go, walk), V, \((\uparrow\text{PRED})='ZOU<(\uparrow\text{SUBJ})>'\)
   e. gongzuo (work), V, \((\uparrow\text{PRED})='GONGZUO<(\uparrow\text{SUBJ})>'\)

In addition to the similarity in subcategorization of verbs, the word order, more precisely, the phrase-order, in a Chinese single-verb sentence is quite similar to that in English. The usual phrase-order of a bare single-verb sentence is as in (3) above. For example, the backbones of the following sentences in the two languages are identical:

(3) NP V (NP*)

In dealing with intransitive verbs, we just need the simplest VP rule with no NP. It seems that there exists certain simplicity in the grammatical encoding of intransitive sentences. First, the intransitive sentences are the simplest sentence pattern. Second, though Chinese involves both configurational and nonconfigurational sentences (Kit 1993), all intransitive sentences are obviously configurational. Third, LFG has provided a fairly standard set of procedures and formalisms for encoding configurational sentences like English ones in Bresnan (1982) and other literature. The existing LFG system appears rather adequate for characterizing Chinese sentences of this type, no matter whether transitive or intransitive verbs are involved.

In Chinese, however, single-verb sentences are more usually used with variant adjuncts. While adjuncts are involved, the phrase-orders in Chinese intransitive sentence will appear not so parallel to that in English, though still comparable in some cases. For example,

(6) a. Laoren yijing tongkuai di da xiao le yi hui'er.
   (Old man already happy DI loudly laugh ASP one moment)
   The old man already happily laughed in a loud voice for a moment.

   b. Tamen yanzhe Sichou-zhilu cong Xi'an zou dao Ouzhou.
   (They along the Silk Road from Xi'an walk to Europe)
   They walked from Xi'an to Europe along the Silk Road.

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1This semantic form is given for unergative intransitive verbs. Verbs in Chinese that are comparable with ergative intransitives are believed to be intransitives in reflexive usage, which is formulated as reflexivization in Kit (1993).

2The Chinese Pinyin schema is adopted here to spell Chinese words, without tone marks.

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c. Cong Xi‘an tamen yanzhe Sichou-zhilu zou dao Ouzhou.
(From Xi‘an they along the Silk Road walk to Europe)
They walked from Xi‘an to Europe along the Silk Road.

d. Women mingtian zaoshang tushuguan (li) jian.
(We tomorrow morning library inside see/meet)
Let us meet tomorrow morning in the library.

According to the observation on Chinese phrase-order, rules in (5) above need to be extended into (7) as below for the intransitive sentences such as the above (6):

\[
(7) \quad a. \quad S \rightarrow (AP^*) - (PP^*) \quad NP \quad VP \\
\quad \downarrow \epsilon(\tau \text{ADJ}) \quad \downarrow \epsilon(\tau \text{ADJ}) \quad (\uparrow \text{SUBJ})=\downarrow \quad \uparrow \epsilon(\tau \text{OBJ})=\uparrow \\
\quad b. \quad VP \rightarrow (AP^*) - (PP^*) \quad V \quad (\text{ASP}) - (AP)/(PP) \quad e. \quad AP \rightarrow \text{Num} \quad \text{CL} \\
\quad \downarrow \epsilon(\tau \text{ADJ}) \quad \downarrow \epsilon(\tau \text{ADJ}) \quad \downarrow \epsilon(\tau \text{ADJ}) \quad (\uparrow \text{ClsC})=\epsilon \text{V} \\
\quad c. \quad AP \rightarrow (\text{Adv}^*) \quad \text{Adv/Adj} \quad (\text{Prt}) \\
\quad \downarrow \epsilon(\tau \text{ADJ}) \quad (\uparrow \text{PrtC})=\downarrow \\
\]

where the hyphen "-" indicates that the categories so connected may exchange their positions, the symbol "\(/\)" means "or", for the sake of convenience in presenting the rules in a concise way. The Prt denotes a Chinese syntactic category, namely, particles, which are also known as structural auxiliary words, PrtC is the feature for the case of an particle of this kind. The category CL denotes classifiers\(^3\), and ClsC is the case feature indicating whether the classifier is one for verbs or nouns. The value domain for ClsC feature is \{V, N\}.

Note also that in (3.8.b), AP\(^*\) - PP\(^*\) allows for many flexible but meaningful category ordering such as PP AP PP. For example,

\[
(8) \quad a. \quad \text{Jundui cong A xunsu di xiana B zhuanyi.} \\
\quad (\text{troop from A quickly Prt toward B move}) \\
\quad \text{The troop quickly moved from A to B.} \\
\quad b. \quad \text{Tamen cong Xi‘an manman di yanzhe Sichou-zhilu wane Ouzhou zouqu.} \\
\quad (\text{They from Xi‘an slowly Prt along the Silk Road toward Europe walk}) \\
\quad \text{They walked slowly along the Silk Road from Xi‘an to Europe.}
\]

Of course, the set of rules in (7) still need to be improved in order to eliminate overgeneration. For example, some adverbials, such as yijing (already) in (6.a), cannot be followed by an Prt, some APs with a certain Prt may not appear in a pre- or post-verbal position, etc. As shown in the following sections, as more adjuncts are involved, the structures of intransitive sentences will become more complicated, and accordingly, more constraints of this kind need to be imposed upon the CF-rules.

The complexity of grammatical encoding of Chinese intransitive sentences lies in that, though there be no overt agreement and few inflections in Chinese, there are many constraints upon the formation of phrase, e.g., an adjunct, and the grammatical environment the phrase can show up. The relations between grammatical functions in the main clause and those in the adjuncts are also very complicated, because a phrase of almost any kind, even a VP, for example, can be an adjunct to a major verb in a Chinese sentence.

3. Chinese adjuncts to a major verb

In traditional Chinese linguistics, adjuncts to a major verb are classified into two types: the pre-verbal, denoted by the Chinese term zhuangyu (adverbial modifying phrases), e.g., adverbial phrases, and the post-verbal, denoted by the term buyu (complementary modifying phrases). Some Chinese phrases, e.g., prepositional phrases, can perform as an adjunct of either type.

\(^3\)Classifiers are also referred to as measure-words or quantifiers by some Chinese linguists.
It appears that this classification, in which all adjuncts prior to the major verb are called \textit{zhuangyu} and the others are called \textit{buyu}, is to discriminate their grammatical properties. But phrase-order is the only criterion. So it becomes trivial at the f-structure level which is independent of surface phrase order in LFG. Both the pre-verbal and post-verbal modifiers to a verb perform the same grammatical function, i.e., \textit{ADJ(unct)}. What is still very important in c-structure is that different positions in a Chinese sentence permit adjuncts of different grammatical features and different kinds of phrase formation.

3.1 Structural auxiliary words for adjuncts

There are three typical function words in Chinese, namely, \textit{-d}, \textit{di} and \textit{de}, conventionally known as \textit{structural auxiliary words} or \textit{particles}. They are pronounced similarly, but function rather distinctively. We distinguish them from now on with the above spelling forms.

They are all used as connectives for a modifying phrase and a head (phrase). The \textit{-d} connects a modifier, e.g., an adjective or noun phrase, and a head noun. In a sense, it is comparable with -'s, of and the adjective suffix such as -al, -tive, etc., in English. The \textit{di} functions as a connective between a modifier, such as an adverbial phrase, and a verb. It is comparable with English adverbial suffix -ly, while the modifier is an adverbial. The \textit{de} connects a verb and a post-verbal modifier, such as an adverbial phrase or a complementary subclause. No grammatically comparable English counterparts for \textit{de}, but so ... that can be taken as its translation.

These function words do not bear concrete semantic meanings in addition to their grammatical function in the formation of a phrase or sentence. So, we need a new feature, namely, \textit{PrtC}, for particle case/class, to distinguish their grammatical properties. The following values for the \textit{PrtC} need to be encoded in their lexical entries, as follows:

(9) a. -d, Prt, (£PrtC)=D; b. di, Prt, (£PrtC)=DI; c. de, Prt, (£PrtC)=DE.

With respect to this, corresponding constraints to prevent \textit{di} and \textit{de} from appearing in a post- and pre-verbal position, respectively, also need to be added to the related rules as below:

(10) a. S $\rightarrow$ (AP*) $-$ (PP*) \quad NP \quad VP \quad d. AP $\rightarrow$ Prt \quad S'/VP
\hspace{1cm} \therefore \quad \therefore \quad \therefore \quad \therefore
\hspace{1cm} (£PrtC)=DI \quad (£PrtC)=DE

b. VP $\rightarrow$ (AP*) $-$ (PP*) \quad V \quad (ASP) \quad $-$ (AP) \quad / \quad (PP)
\hspace{1cm} \therefore \quad \therefore \quad \therefore \quad \therefore
\hspace{1cm} (£PrtC)=DI/0 \quad (£PrtC)=DE

c. AP $\rightarrow$ (Adv*) \quad Adv/Adj (Prt) \quad e. AP $\rightarrow$ Prt \quad (Adv*) \quad Adv/Adj
\hspace{1cm} \therefore \quad \therefore \quad \therefore \quad \therefore \quad \therefore \quad \therefore
\hspace{1cm} (£PrtC)=DI \quad (£PrtC)=DE

Notice that a node with a $\uparrow\downarrow$ annotation is known as a \textit{functional head} of the CF-rule in LFG. Normally, a CF-rule contains one functional head, e.g., the above (10.a) and (10.b). But in (10.c), we have two nodes with $\uparrow\downarrow$. It may be a sound understanding that in Chinese, a functional head can split into two: a \textit{grammatical/syntactic head} and a \textit{semantic head} (Kit 1993). The grammatical head plays the role of organizing the whole phrase and licensing each single constituent in terms of its syntactic requirement(s), whereas the semantic head determines the semantic interpretation of the phrase. In (10.c), Prt is a grammatical head and Adv/Adj is a semantic head, if Prt shows up. Otherwise, Adv/Adj has to function as both grammatical and semantic head, i.e., functional head. But more important, the essence of $\uparrow\downarrow$ is to indicate that all information of the node is to be passed to its father node in the f-structure derivation.

It is shown in rule (10.a) that only an adjunct with \textit{di} can appear in a pre-SUBJ position. In (10.b), we can see that a post-verbal adjunct must be introduced by \textit{de}, whereas a pre-verbal adjunct can show up with or without \textit{di}. AP rules (10.d) and (10.e) also show that a post-verbal
adjunct is obligatory to bear a particle with DE as the value for PrtC feature. Note, however, the different effects of the similar constraints upon different rules: the constraints on the PrtC feature in (10.a) and (10.b) regulate whether an AP can appear in that position, those in (10.c), (10.d) and (10.e) tell whether an auxiliary word can join with other constituents to form an AP in such way. These rules will become the basis for our further discussion on Chinese intransitive sentences and the derivation of the corresponding c- and f-structures in the following sections.

3.2 Adverbial (and adjective) adjuncts

Adverbials are the simplest and the most common type of adjuncts to a verb. An adverbial in Chinese usually imposes some constraints upon whether a particle and which particle can get together with it to form an adjunct phrase. For example, yijing (already) and da (loudly) never take a particle, tongkuai (happily) must have one (either di or de), but it is optional for renzhen to take a particle. This is determined by the lexical properties of each word. So, their lexical entries have to contain the following lexical items about their PrtC value:

(11) a. yijing, Adv, (TPRED)='YIJING', (TPrtC)=DE/0;
    b. da, Adv, (TPRED)='DA', (TPrtC)=DE/0;
    c. tongkuai, Adv, (TPRED)='TONGKUAI', (TPrtC); (i.e. (TPrtC)=D, DI or DE)
    d. renzhen, Adv, (TPRED)='RENZHEN'.

In (11.d), we have no stipulation for a PrtC feature, because any value for it will be acceptable/grammatical. Similarly, this kind of information needs to be encoded in the lexical entries of Chinese adjectives which can be used like an adverbial to modify a major verb.

Many Chinese adjectives can perform quite like an adverbial in modifying a verb, but it is still a mystery whether an adjective has to "change" into an adverbial before it can modify a verb. In other words, there is an adverbial counterpart for most adjectives in Chinese. A problem is that though many adjectives appear very easy to "change" into an adverbial once they combine with the function word di or de to form an adjunct phrase, e.g., renzhen in (12.a) and (12.b), many other adjectives seem to remain as adjectives in any context, e.g., tianmi (sweet) in (12.c) and (12.d).

(12) a. renzhen-d taidu
    (serious Prt attitude)
    the serious attitude.
    b. Lisi renzhen di gongzuo.
        (Lisi seriously Prt work)
        Lisi works seriously.
    c. tianmi-d xiaorong
        (sweet Prt smile)
        a sweet smile.
    d. Ta tianmi di xiao le
        (She sweet Prt smile ASP)
        She smiled sweetly.
    e. Ta xiao de hen tongku.
        (He laugh Prt very painful)
        He laughed very painfully.

(13) a)  

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However, it is implausible to maintain that all adjectives introduced by a di or de have to change into an adverbial, for example, tianmi (adj) in (12.b), in comparison with renzhen (adv) in (12.d). It is intuitively believed that tianmi remains as an adjective in (12.b). We can have more convincing evidence from (12.e) with a post-verbal adjunct, where tongku clearly remains as a predicative adjective. That is why we keep an Adj in rules (10.c) and (10.d). With the above rules, we can draw the c- and f-structures for (12.d) and (12.e), for example, as (13) above.

3.3 Prepositional phrase adjuncts

Prepositional phrases in Chinese can be either an adjunct or a complement to a verb. For example, the PP gei Lisi (to Lisi) in (4.c) is a complement to the verb song (give, send), for the verb subcategorizes for it. Many intransitive verbs can also take a PP as a complement. But in many cases, Chinese PPs perform as an adjunct, for instance, Pps in (6.c). In this paper, we just discuss PP adjuncts to a verb.

In order to identify PP adjunct in f-structure, as is done in LFG literature, we adopt a PCASE feature for Chinese prepositions of single-valency. Normally, we assign a value to PCASE for such prepositions in association with its semantic meaning. For example,

\[
\begin{align*}
\text{(14) a. } & \text{zi (from), P, (tPCASE)=ZI, (tPRED)='ZI<(tOBJ)>';} \\
\text{b. } & \text{xian (toward), P, (tPCASE)=XIANG, (tPRED)='XIANG<(tOBJ)>';} \\
\text{c. } & \text{yu (at, in), P, (tPCASE)=YU, (tPRED)='YU<(tOBJ)>';} \\
\text{d. } & \text{gei, (to), P, (tPCASE)=GEI, (tPRED)='GEI<(tOBJ)>';} \\
\text{e. } & \text{cong, (from), P, (tPCASE)=CONG, (tPRED)='CONG<(tOBJ)>'}.
\end{align*}
\]

So, PP adjuncts can be distinguished from the other types in terms of this feature, and any two prepositions may differ from each other in terms of the value of this feature.

Many Chinese PPs are very flexible to appear in a pre- or post-verbal position, as formulated in the previous CF-rules (10.a) and (10.b). Here, we have the following examples:

\[
\begin{align*}
\text{(15) a. } & \text{Tamen xiang qian zou. (They toward front walk)} \\
\text{b. } & \text{Lisi lai zi Xianggang. (Lisi come from Hong Kong)}
\end{align*}
\]

Sometimes a preposition can be modified by an adverbial, e.g., (16.a) in comparison with (16.b).

\[
\begin{align*}
\text{(16) a. } & \text{Tamen zhijie xiang qian zou. (They directly toward front walk)} \\
\text{b. } & \text{Tamen zhijie zou xiang qian. (They immediately walk toward front)}
\end{align*}
\]

4There are many multiple-valency prepositions in Chinese, like ba, bei, etc., which subcategorize not only for a OBJ but also for a SUBJ and an XCOMP. Notice that there is another preposition gei with multiple-valency in the same word form as the one in (14.d). See Kit (1993 forthcoming), in which prepositions of this kind are also referred to as co-verbs.
So, rule (7.d) needs to be modified as (17.a) below in order to cover this kind of sentence. With this rule, sentences in (16) may have the c- and f-structures in (18).

(17) a. PP → Adv* P NP
    S
    ↓ ι(ADJ)    (TOBJ)=↓
    NP
    (↑SUBJ)=↓
    PP
    ↓ ι(ADJ)
    Adv
    (↑ADJ)
    P NP
    (↑OBJ)=↓
    Tamen zhijie xiang qian zou
    (They directly toward front walk)

3.4 Nominal adjuncts

In many languages, some nouns can perform as an adjunct to a verb or verbal phrase. For example, tomorrow, yesterday, in English. In Chinese, a wider range of nouns can be used as an adjunct to a verb, in many very flexible ways. A nominal adjunct AP in Chinese is usually concerned with time, location or direction, and composed of an optional directional or locative noun, like qian (ago, before, front), hou (after, later, back), li (in, inside, during), etc., known as fangweici (directional-locative nouns) in Chinese term. (6.d) is a typical sentence of this sort.

It is observed in Chinese that nominal adjuncts can only appear in a pre-verbal position, and that only time, locative and directional nouns can function as an adjunct to a verb like an adverbial. For the latter, we need to introduce a feature NounC to indicate this property of the three types of nouns. A NounC feature can only be assigned a value from \{T(ime), L(ocation), D(irection)\}. In the lexical entry of each noun of these kinds, the value of NounC must be specified. For example,

(18) a. mingtian (tomorrow), N, (↑NounC)=T, (↑PRED)=‘MINGTIAN’;
b. zaoshang (morning), N, (↑NounC)=T, (↑PRED)=‘ZAOSHANG’;
c. tushuguan (library), N, (↑NounC)=L, (↑PRED)=‘TUSHUGUAN’.

The semantic forms for directional/locative nouns are quite different from the above ones, because a directional/locative noun bears a special subcategorization.

3.4.1 Subcategorization of directional/locative nouns

Directional/locative nouns were sometimes referred to as post-positions by some Chinese linguists. They are in fact a kind of noun, though they are comparable with post-positions in that they both subcategorize for a grammatical function in front of them in surface configuration. It
is very important to recognize their difference from normal nouns in subcategorizing for a special grammatical function which must be realized by a NP or an S (complete or incomplete) in surface configuration. For example,

(19) a. wu gian/hou (house front/back)
in front/at back of a house
b. tushuguan/jia li (library /home inside)
in (the) library/at home
c. 3 nian gian/hou (3 year ago/after)
3 years ago/later
e.(nimen) chi fan gian ...
(you eat rice before ...
before (your) having the meal...

The evidence in favour of the position that directional/locative nouns bear a subcategorization is that they never show up in isolation from an necessary function preceding them. They play the role of a head in the above NPs. A comparable word in English with these Chinese directional/locative nouns is ago, which never appears alone, except in company with a time NP in front of it, like many years ago. It is necessary to give a name to the grammatical function for which the directional/locative nouns subcategorize. Here, I temporarily refer to it as a MOD, simply based on the fact that it is a modifier to a directional/locative noun. It may be an open function, for example, in (19.e). In such case, we refer to it as XMOD.

So, in addition to bearing a NounC feature of the value D, Chinese directional/locative nouns also carry a semantic form with the subcategorized function MOD or XMOD in their lexical entries, for example, li, qian and yiqian in (20) below. Furthermore, it is important to note the significance of the feature NounC. Many prepositions in Chinese can only accept an OBJ with such feature of some particular value, for example, the PPs in (21).

(20) a. li (inside), N, (TNounC)=L,
(↑PRED)='LI<(↑MOD)>';
be at home
b. qian (front), N, (TNounC)=D,
(↑PRED)='QIAN<(↑MOD)>';
be in/out of the house
c. yiqian (before), N, (TNounC)=D,
(↑PRED)='YIQIAN<(↑MOD)>';
be in the house

Because the preposition zai⁵ requires an OBJ with NounC feature of the value L or D, but the noun wu (house) doesn't bear it. Besides, we can also see from (21.a) that jia (home) differs from wu in that it bears a NounC of the value L. zai cannot take wu but wu li as its OBJ, as shown in (21.b) and (21.c), because wu li gets an L value for NounC from the locative noun li.

Accordingly, the annotated CF-rules for this kind of AP are postulated as (22) below. In order to prevent a nominal adjunct from appearing in a post-verbal position, the VP rule (10.b) need to be revised as (22.b).

(22) a. AP → NP* → NP
↓ε(↑ADJ) ⌦=↓
(↓NounC)
b. VP → (AP*) - (PP*) V (ASP) (AP) - (PP)
↓ε(↑ADJ) ↓ε(↑ADJ) ↓ε(↑ADJ)
[(↑PrtC)=c,DI/Φ] (↓PrtC)= DE
or (↓NounC)

where (↓NounC) is known as an existential constraint. In this case, it is in disjunction with the

⁵Note that there is a co-verb zai which subcategorizes for a SUBJ and an XCOMP, for example, in the sentence Wo zai du shu (I am reading a book).
other constraints, and means that a pre-verbal AP adjunct must be with a DI or empty value for the PrtC feature, or with a NounC feature of a non-empty value. With this revised rule, sentence (6.d) may have its c- and f-structures in (23).

(23)  

It is easy to see that the NounC feature will play an important role in the semantic interpretation of this kind of adjunct, because the three possible values for nominal adjuncts, i.e., \{T, L, D\}, have a close correspondence with the semantic cases Time, Locative and Direction. Though the details on this aspect is beyond the scope of this paper, it is believed of certain significance in semantics studies.

3.5 Predicative adjuncts

It is very interesting that in Chinese, not only adverbials, PPs and NPs but verbs and predicative adjectives can also perform as adjuncts to a verb. For example,

(24) a. Lisi shouwu-zudao di chang zhe.  (Lisi dance-for-joy Prt sing ASP)  
   b. Tamen wanr de hao yukuai.  (They play Prt very happily)  
   Lisi is singing with dance for joy  
   They play so joyfully.  
   c. Xiao guniang bangbeng-tiaotiao di zou le.  (Little girl gamble/frisk Prt walk ASP)  
   The little girl walks away friskily.

This kind of adjunct, which contains a verb (normally a fixed verbal expression or idiom) or a predicative adjective missing a SUBJ, plays the role of XADJ instead of ADJ, and the related CF-rules for the phrase formation can be formulated as follows:

(25) a. AP \rightarrow VP Prt   b. AP \rightarrow Prt Adj   c. AdjP \rightarrow Adv Adj  
   (\uparrow PrtC)=Di   (\downarrow PrtC)=DE   \downarrow(e(\uparrow Adj))  

where rule (a) is known as an *exocentric* rule. This kind of exocentric rule exists in many languages, e.g., in English, we have a rule **NP \rightarrow NP's VP** for a phrase like the man's coming.

It seems that the rules in (25) are adequate for the construction of c-structure. But the remaining problem is from where can we get a SUBJ for a verb or a predicative adjective in such XADJs? This is believed to be the grammatical properties of the particle *di* and *de* in functional control. In order to derive appropriate f-structures for this kind of predicative adjunct, it is necessary to attach to the lexical entries of *di* and *de* the lexical rules for functional control as below:

(26) a. Lexical rule of functional control for *di*:  
   (\uparrow XADJ SUBJ)=(^SUBJ), if the head verb or predicative adjective in the XADJ misses a SUBJ and \(\gamma(\uparrow OBJ)\);
b. Lexical rules of functional control for *de*:

i. \((†\text{XADJ SUBJ})=\langle\text{SUBJ}\rangle\), if the head verb or predicative adjective in the XADJ misses a SUBJ, and \(\langle\text{OBJ}\rangle\);

ii. \(\langle\text{OBJ}\rangle=\langle†\text{XADJ SUBJ}\rangle\), if there is a missing OBJ in the immediate upper level of f-structure and \((†\text{XADJ SUBJ})\).

Please note that the condition \(\langle\text{OBJ}\rangle\) above implies that the verb in the immediate upper level of f-structure is an intransitive verb. It is an important condition, otherwise the functional control may not hold. These rules are obviously language-specific for functional control in Chinese. They are also referred to as conditional functional control in Kit (1993 forthcoming), with emphasis upon the conditionality. With these lexical rules, sentence (24.a) and (24.b), for instance, may have the following c- and f-structures:

\[(27) \]

(a) \[
\begin{align*}
\text{S} & \quad \text{VP} \\
\text{NP} \quad & \quad \text{AP} \\
(†\text{SUBJ}) & = \downarrow \\
\end{align*}
\]

SUBJ PRED 'LISI' 
PERS 3 
NUM SG 
XADJ PrtC DI 
PRED 'SHOUWU-ZUDAO\langle†\text{SUBJ}\rangle' 
SUBJ \[\langle\text{SUBJ}\rangle\] 
PRED 'CHANG\langle†\text{SUBJ}\rangle' 
ASP LE

Lisi shouwu-zudao di chang zhe. 
(Lisi dance-for-joy di chang zhe.

(b) \[
\begin{align*}
\text{S} & \quad \text{VP} \\
\text{NP} \quad & \quad \text{AP} \\
(†\text{SUBJ}) & = \downarrow \\
\end{align*}
\]

SUBJ PRED 'LISI' 
PERS 3 
NUM SG 
XADJ PrtC DE 
PRED 'YUKUAI\langle†\text{SUBJ}\rangle' 
ADJ PRED 'HAO' 
SUBJ \[\langle\text{SUBJ}\rangle\] 
PRED 'WANR\langle†\text{SUBJ}\rangle'

Tamen wanr de hao yukuai. 
(They play de hao yukuai.

where the \[\langle\text{SUBJ}\rangle\] denotes a SUBJ in an immediate upper level of f-structure, in place of an index arc to represent the coreferential relation in functional control. From the derived f-structures above, we can see that the predicative adjuncts are in fact some uncompleted (incomplete at c-structure level) subclauses functioning as an adjunct to the major verb.

3.6 Clausal adjuncts

In addition to the uncompleted subclauses, completed subclauses can also be adjuncts to a verb in Chinese. But this kind of clausal adjuncts only appear in a post-verbal position, being introduced by the function word *de*. The post-verbal clausal adjuncts can be either complete or incomplete. For example, the adjunct in the above (27.b) can be considered an incomplete subclause with an adjective predicative which misses a subject. Here are some more examples:

\[(28) \]

(a) Mar lei de paxia le. 
(Horse tired Prt down ASP) 
The horse is so tired that it is down.

(b) Wo3 zou de ke ji le. 
(I walk Prt thirsty extremely ASP) 
I walk (so far/fast that) I am extremely thirsty.
The difference between these adjuncts and the ones in (27.b) is that a verb, instead of an adjective, is involved and functions as the functional head. The corresponding CF-rule was given in (10.d), where the VP may be headed by an intransitive or a transitive verb. Two intransitive verbs are illustrated in (28). The c- and f-structures for (28.a), for example, will be as follows:

(29)

where the missing SUBJ of the verb in the XADJ is acquired via the functional control formulated in (26.b) above. Many clausal adjuncts are complete subclauses which contain a subject (and perhaps an object also). For example,

(30) a. Ta xiao de yanlei dou chulai le.
(He laugh Prt tear even come out ASP)
He so laughed that (his) tears came out.

b. Li Ming lei de tui choujin le.
(Li Ming tired Prt leg have-a-cramp ASP)
Li Ming is so tired that he has a cramp in his leg.

The derivation of c- and f-structures for them is similar to that in (29). But a more interesting thing is that in such kind of intransitive sentences, the subject of the main clause is usually the possessor of the subclause subject. In order to characterize this relation, an optional functional control involving POSS can be formulated for the particle de as below:

(31) If (tXADJ SUBJ) exists in an XADJ introduced by de to an intransitive verb, the functional control (tXADJ SUBJ POSS)=(A SUBJ) can be applied.

With this lexical rule, one more grammatical relation can be encoded in the f-structure. For example, (30.b) can be characterized as the following c- and f-structures:

(32)
4. Conclusion

In this attempt of applying LFG to characterize Chinese intransitive verbs and variant related adjuncts, it has been shown that the LFG is a formalism with high adaptability to Chinese. Most part of the existing LFG system, including grammatical categories, features and, even more important, procedures of deriving c- and f-structures and the mechanism of functional control play important roles in the description of Chinese sentences. From the viewpoint of LFG, we also find many important principles underlying Chinese linguistic facts, such as how the value of the PrtC feature is passed from the lexical entry of a function word to the top level of an ADJ for a verb, and how this value determines whether the formation of an adjunct AP can be allowed and in which position in a sentence the AP can appear.

From this work, we can see that the f-structure of a Chinese sentence is similar to that of other languages, e.g., English, because of the universality of the grammatical functions. In contrast, the c-structure is rather language-specific. Many distinct constraints have been formulated on this level for the formation of Chinese adjunct phrases. Comparing with the feature agreement in English, Chinese seems more sensitive to the factors of phrase formation and position. So, it is very important for us to find a systematic way to characterize these constraints within such a complex-feature based grammar as LFG. With the elegance and computational power of LFG formalism, we expect to achieve a more thorough and novel understanding of Chinese linguistic phenomena through the construction of C-LFG.

5. Acknowledgements

I would like to thank Jonathan J. Webster, my MPhil supervisor, City Polytechnic of Hong Kong, for his comments and help. An anonymous reviewer of PACLING 93 also gave helpful comments on a draft version.

6. References